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SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

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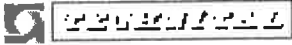
PROGETTAZIONE

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IL RESPONSABILE: **ALBERTO SCOTTI**


PROGETTAZIONE SPECIALISTICA



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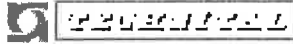
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1. SCOPO DEL DOCUMENTO

La presente Appendice riporta informazioni tecniche relative ai seguenti componenti dell'impianto elettrico, con caratteristiche simili a quelle riportate nella Specifica N. MV146P-PE-GES-2001:

- Motori e generatori ad induzione
- Convertitori
- Avviatori
- MCC
- MCT
- Strade cavi



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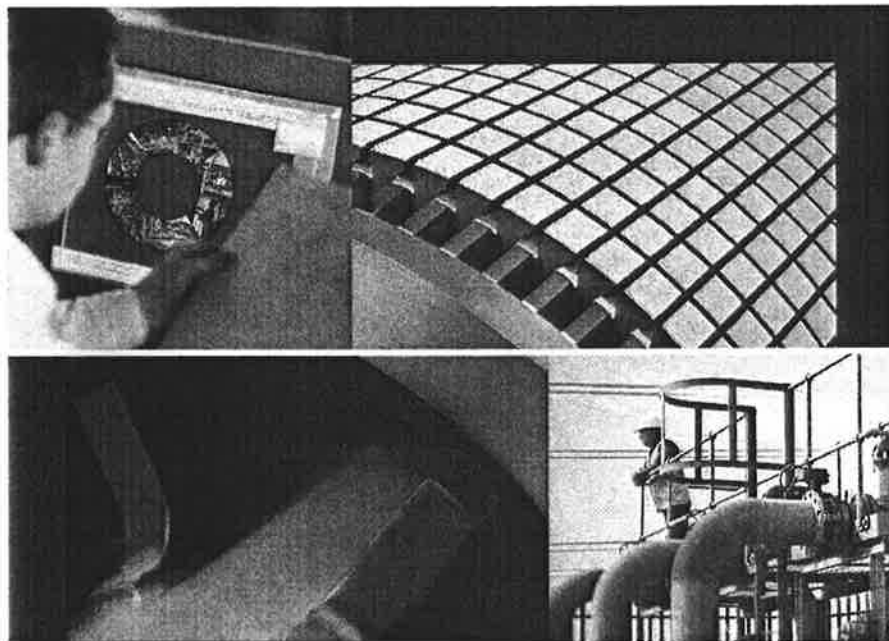
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2. MOTORI E GENERATORI AD INDUZIONE

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ABB

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Safety Instructions

AMA, AMB, AMG, AMH, AMI, AMK, AMZ, HXR, M3BM, M3GM

1. General

General safety regulations, specific agreements made for each work site and safety precautions shown in this document must be observed at all times.

2. Intended use

Electric machines have dangerous live and rotating parts and may have hot surfaces. All operations serving transport, storage, installation, connection, commissioning, operation and maintenance shall be carried out by responsible skilled persons (in conformity with EN 50 110-1 / DIN VDE 0105 / IEC 60364). Improper handling may cause serious personal injury and damage to property. Danger!

These machines are intended for industrial and commercial installations as components as defined in the Machinery Directive (MD) 98/37/EC. Commissioning is prohibited until conformity of the end product with this directive has been established (follow particular local safety and installation rules as, for example, EN 60204).

These machines comply with the harmonized series of standards EN 60034 / DIN VDE 0530. Their use in explosive atmosphere is prohibited unless they are expressly designed for such use (follow additional instructions).

On no account, use degrees of protection \leq IP23 outdoors. Air-cooled models are typically designed for ambient temperatures of -20°C up to $+40^{\circ}\text{C}$ and altitudes of \leq 1000 m above sea level. Ambient temperature for air-/water-cooled models should be not less than $+5^{\circ}\text{C}$ (for sleeve-bearing machines, see manufacturer's documentation). By all means, take note of deviating information on the rating plate. Field conditions must conform to all rating plate markings.


3. Transport, storage

Immediately report damage established after delivery to transport company. Stop commissioning, if necessary. Lifting eyes are dimensioned for the weight of the machine, do not apply extra loads. Ensure the use of correct lifting eyes. If necessary, use suitable, adequately dimensioned means of transport (for example, rope guides). Remove shipping braces (for example, bearing locks, vibration dampers) before commissioning. Store them for further use.

When storing machines, make sure of dry, dust and vibration free location (danger of bearing damage at rest). Measure insulation resistance before commissioning. At values of \leq 1 k Ω per volt of rated voltage, dry winding. Follow the manufacturer's instructions.

4. Installation

Make sure of even support, solid foot or flange mounting and exact alignment in case of direct coupling. Avoid resonances with rotational frequency and double mains frequency as a result of assembly. Turn rotor and listen for abnormal slip noises. Check direction of rotation in uncoupled state.

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Follow the manufacturer's instructions when mounting or removing couplings or other drive elements and cover them with a touch guard. For trial run in uncoupled state, lock or remove the shaft end key. Avoid excessive radial and axial bearing loads (note manufacturer's documentation). The balance of the machine is indicated as H = Half and F = Full key. In half-key cases, the coupling too, must be half-key balanced. In case of protruding, visible part of the shaft end key, establish mechanical balance.

Make necessary ventilation and cooling system connections. The ventilation must not be obstructed and the exhaust air, also of neighbouring sets, not taken in directly.

5. Electrical connection

All operations must be carried out only by skilled persons on the machine at rest. Before starting work, the following safety rules must be strictly applied:

- De-energize!
- Provide safeguard against reclosing!
- Verify safe isolation from supply!
- Connect to earth and short!
- Cover or provide barriers against neighbouring live parts!
- De-energize auxiliary circuits (for example, anti-condensation heating)!

Exceeding of limit values of zone A in EN 60034-1 / DIN VDE 0530-1 - voltage $\pm 5\%$, frequency $\pm 2\%$, waveform and symmetry - leads to higher temperature rise and affects the electromagnetic compatibility. Note rating plate markings and connection diagram in the terminal box.

The connection must be made in a way that the permanent safe electrical connection is maintained. Use appropriate cable terminals. Establish and maintain safe equipotential bonding.

The clearances between uninsulated live parts and between such parts and earth must not be below the values of appropriate standards and values possibly given in manufacturer's documentation.

No presence of foreign bodies, dirt or moisture is allowed in the terminal box. Close unused cable entrance holes and the box itself in a dust- and watertight manner. Lock the key when the machine is run without coupling. For machines with accessories, check satisfactory functioning of these before commissioning.

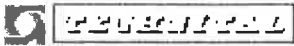
The proper installation (for example, segregation of signal and power lines, screened cables etc.) lies within the installer's responsibility.

6. Operation

Vibration severity in the "satisfactory" range ($V_{rms} \leq 4.5$ mm/s) according to ISO 3945 is acceptable in coupled-mode operation. In case of deviations from normal operation - for example, elevated temperature, noises, vibrations - disconnect machine, if in doubt. Establish cause and consult manufacturer, if necessary.

Do not defeat protective devices, not even in trial run. In case of heavy dirt deposits, clean cooling system at regular intervals. Open blocked condensate drain holes from time to time.

Grease the bearings during commissioning before start-up. Regrease antifriction bearings while the machine is running. Follow instructions on lubrication plate. Use right kind of grease. In

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case of sleeve-bearing machines, observe time-limit for oil-change and if equipped with oil supply system make sure the system is working.

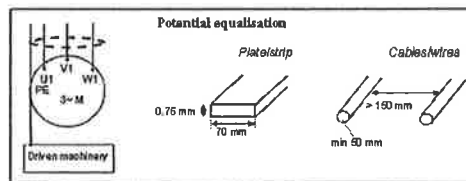
7. Maintenance and servicing

Follow the manufacturer's operating instructions. For further details, see the comprehensive User's Manual. Preserve these safety instructions!

8. Frequency converter

In frequency converter applications motor frame external earthing must be used for equalising the potential between the motor frame and the driven machine, unless the two machines are mounted on the same metallic base. For motor frame sizes over IEC 280, use 0.75 x 70 mm flat conductor or at least two 50 mm² round conductors. The distance of the round conductors must be at least 150 mm from each other.

This arrangement has no electrical safety function; the purpose is to equalise the potentials. When the motor and the gearbox are mounted on a common steel fundament, no potential equalisation is required.



To comply with EMC-requirements, use only cables and connectors approved for this purpose. (See instruction for frequency converters.)

Additional Safety Instructions for Permanent Magnet Synchronous Machines


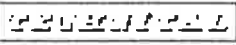
Electrical connection and operation

When the machine shaft is rotating, a permanent magnet synchronous machine induces voltage to the terminals. The induced voltage is proportional to the rotational speed, and can be hazardous even at low speeds. Prevent any rotation of the shaft before opening the terminal box and/or working at the unprotected terminals.

WARNING: The terminals of a machine with frequency converter supply may be energized even when the machine is at a standstill.

WARNING: Beware of reverse-power when working at the supply system.

WARNING: Do not exceed the maximum allowed speed of the machine. See product specific manuals.

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Maintenance and servicing

Permanent magnet synchronous machines must only be serviced by repair shops qualified and authorised by ABB. For more information concerning service of permanent magnet synchronous machines, please contact ABB.

WARNING: Only qualified personnel familiar with the relevant safety requirements are allowed to open and maintain permanent magnet synchronous machines.

WARNING: It is not allowed to remove the rotor of a permanent magnet synchronous machine without the special tools designed for this purpose.

WARNING: Magnetic stray fields, caused by an open or disassembled permanent magnet synchronous machine or by a separate rotor of such a machine, may disturb or damage other electrical or electromagnetic equipment and components, such as cardiac pacemakers, credit cards and equivalent.

WARNING: Loose metallic parts and waste must be prevented from entering the interior of the permanent magnet synchronous machine as well as getting into contact with the rotor.

WARNING: Before closing an opened permanent magnet synchronous machine, all parts which does not belong to the machine and wastes must be removed from the interior of the machine.

NOTE: Beware of magnetic stray fields and possible induced voltages when rotating the separate rotor of a permanent magnet synchronous machine as they may cause damage to surrounding equipment, for example lathes or balancing machines.


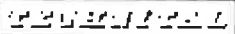


Additional Safety Instructions for Electrical Motors for Explosive Atmosphere

NOTE: These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of anyone who installs, operates or maintains this equipment. Ignoring the instruction may invalidate the warranty.

WARNING: Motors for explosive atmosphere are specially designed to comply with official regulations concerning the risk of explosion. If improperly used, badly connected, or altered, no matter how minor, their reliability could be in doubt.

Standards relating to the connection and use of electrical apparatus in explosive atmosphere must be taken into consideration, especially national standards for installation. (see standards: EN 60079-14, EN 60079-17, EN 61241-14, EN 61241-17 IEC 60079-14, IEC 60079-17, IEC 61241-14 and IEC 61241-17). All repairs and overhauls must be carried out according to the standard IEC 60079-19. Only trained personnel familiar with these standards should handle this type of apparatus.

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Declaration of Conformity

All ABB Ex-machines intended for explosive atmosphere comply with the ATEX Directive 94/9/EC and have a CE-mark on the rating plate.

Validity

These instructions are valid for the following ABB Oy's electrical motor types, when the machine is used in explosive atmosphere.

Non-sparking Ex nA, Class I Div 2, Class I Zone 2

- AMA Induction Machines, sizes 315 to 500
- AMB Induction Machines, sizes 560 to 630
- AMI Induction Machines, sizes 560 to 630
- HXR Induction Machines, sizes 315 to 560
- AMZ Synchronous Machines, sizes 710 to 2500
- M3GM Induction Machines, sizes 315 to 450

Increased safety Ex e

- AMA Induction Machines, sizes 315 to 500
- AMB Induction Machines, sizes 560 to 630
- AMI Induction Machines, sizes 560 to 630
- HXR Induction Machines, sizes 315 to 560

Pressurisation Ex px0, Ex pze, Ex px, Ex pz

- AMA Induction Machines, sizes 315 to 500
- AMB Induction Machines, sizes 560 to 630
- AMI Induction Machines, sizes 560 to 630
- HXR Induction Machines, sizes 315 to 560
- AMZ Synchronous Machines, sizes 710 to 2500

Dust Ignition Protection (DIP), Ex tD, Class II Div 2, Class II Zone 22, Class III

- AMA Induction Machines, sizes 315 to 500
- AMB Induction Machines, sizes 560 to 630
- AMI Induction Machines, sizes 560 to 630
- HXR Induction Machines, sizes 315 to 560
- M3GM Induction Machines, sizes 315 to 450

(Additional information may be required for some machine types used in special applications or with special design.)

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Conformity according to standards

As well as conforming to the standards relating to mechanical and electrical characteristics, motors designed for explosive atmospheres must also conform to the following IEC or EN standards:

EN 60079-0; Std. concerning General Requirements for Explosive Atmospheres

EN 60079-2; Std. concerning Ex p protection

EN 60079-7; Std. concerning Ex e protection

EN 60079-15; Std. concerning Ex nA protection

EN 61241-1; Std. concerning combustible dust, Ex tD protection

IEC 60079-0; Std. concerning General Requirements for Explosive Atmospheres

IEC 60079-2; Std. concerning Ex p protection

IEC 60079-7; Std. concerning Ex e protection

IEC 60079-15; Std. concerning Ex nA protection

IEC 61241-0; Std. concerning General Requirements for combustible dust

IEC 61241-1; Std. concerning combustible dust, Ex tD protection

NFPA 70; National Electric Code (NEC)

C 22-1-98; Canadian Electrical Code, Part I (CE Code)

ABB machines (valid only for group II) can be installed in areas corresponding to following marking:

Zone (IEC)	Category (EN)	Marking
1	2	Ex px, Ex pxe, Ex e
2	3	Ex nA, Ex N, Ex pz, Ex pze

Atmosphere (EN);

G - explosive atmosphere caused by gases


D - explosive atmosphere caused by dust

Incoming inspection

- Immediately upon receipt check the machine for external damage and if found, inform the forwarding agent without delay.
- Check all rating plate data, especially voltage, winding connection (star or delta), category, type of protection and temperature marking.

Notice following rules during any operations!

WARNING: Disconnect and lock out before working on the machine or the driven equipment. Ensure no explosive atmosphere is present while the work is in progress.

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Starting and Re-starting

- The maximum number of the sequential starts has been declared in machine's technical documents.
- The new starting sequence is allowed after the machine has cooled to the ambient temperature (-> cold starts) or to operating temperature (-> warm starts).

Earthing and Equipotentialing

- Check before starting that all earthing and equipotentialing cables are effectively connected.
- Do not remove any earthing or equipotentialing cables, which has been assembled by the manufacturer.

Clearances, creepage distances and separations


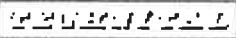
- Do not make any removal or adjustment in terminal boxes, which could decrease clearances or creepage distances between any parts.
- Do not install any new equipment to terminal boxes without asking for advises from ABB Oy.
- Be sure that air gap between rotor and stator is measured after any maintenance for the rotor or bearings. The air gap shall be the same in any point between stator and rotor.
- Centralize the fan to the center of the fanhood or the air guide after any maintenance. The clearance shall be at least 1% of the maximum diameter of the fan and in accordance with standards.

Connections in terminal boxes

- All connections in main terminal boxes must be made with Ex-approved connectors, which are delivered with the machine by the manufacturer. In other cases ask an advice from ABB Oy.
- All connections, in auxiliary terminal boxes, as marked intrinsically safe circuits (Ex i or EEx i) must be connected to proper safety barriers.

Space heaters

- If an anti-condensation heater, without self-regulation, is turned on immediately after the motor is shut down, take suitable measures to control the inside motor housing temperature. The anti-condensation heaters can only operate within a temperature-controlled environment.

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Pre-start ventilation

- Ex nA and Ex e machines may, or in some cases, have to be equipped with a provision for pre-start ventilation.
- Before starting, check the need to purge the machine enclosure to make sure that the enclosure is free of flammable gases. Based on the risk assessment, the customer and/or the local authorities will make the decision, whether the customer needs to use the pre-start ventilation or not.

NOTE: If there are any conflicts between these safety instructions and the user manual, these safety instructions are prevailing.

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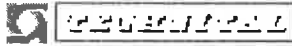
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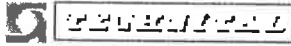
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Chapter 1 Introduction

1.1 General information

This User's Manual contains information on the transport, storage, installation, commissioning, operating and maintenance of rotating electrical machines manufactured by ABB.

This manual provides information regarding all aspects of operation, maintenance and supervision of the machine. Careful study of the contents of this manual and other machine related documentation before any actions are taken is necessary to ensure proper functionality and a long lifetime of the machine.

NOTE: Some customer specific items may not be included in this User's Manual. Additional documentation will be found in the project documentation.

Actions described in this manual are only to be performed by trained personnel with previous experience in similar tasks, and authorized by the user.

This document and parts thereof must not be reproduced or copied without the express written permission of ABB, and the contents thereof must not be imparted to a third party nor be used for any unauthorized purpose.

ABB constantly strives to improve the quality of the information provided in this User's Manual, and will welcome any improvement suggestions. For contact information, see *Chapter 9.1.5 After Sales contact information*.

NOTE: These instructions must be followed to ensure safe and proper installation, operation and maintenance of the machine. They should be brought to the attention of anyone who installs, operates or maintains this equipment. Ignoring the instruction invalidates the warranty.

1.2 Important note


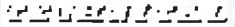
The information in this document may sometimes be of a general nature and applicable to various machines produced by ABB.

Where a conflict exists between the contents herein and the actual machinery supplied, the user must make an engineering judgment as to what to do. If any doubt exists, contact ABB.

The safety precautions presented in the *Safety Instructions* at the beginning of the manual must be observed at all times.

Safety is dependent on the awareness, concern and prudence of all those who operate and service machines. While it is important that all safety procedures be observed, care near machinery is essential - always be on your guard.

NOTE: To avoid accidents, safety measures and devices required at the installation site must be in accordance with the instructions and regulations stipulated for safety at work. This applies to general safety regulations of the country in question, specific agreements made for each work site and safety instructions included in this manual and separate safety instructions delivered with the machine.

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1.3 Limitation of liability

In no event shall ABB be liable for direct, indirect, special, incidental or consequential damages of any nature or kind arising from the use of this document, nor shall ABB be liable for incidental or consequential damages arising from use of any software or hardware described in this document.

The warranty issued covers manufacturing and material defects. The warranty does not cover any damage caused to the machine, personal or third party by improper storage, incorrect installation or operating of the machine. The warranty conditions are in more detail defined according to Orgalime S2000 terms and conditions.

NOTE: The warranty issued is not valid, if the operation conditions of the machine are changed or any changes in the construction of the machine, or repair work to the machine have been made without prior written approval from the ABB factory, which supplied the machine.

NOTE: Local ABB sales offices may hold different warranty details, which are specified in the sales terms, conditions or warranty terms.

For contact information, please see the back page of this User's Manual. Please remember to provide the serial number of the machine when discussing machine specific issues.

1.4 Documentation

1.4.1 Documentation of the machine


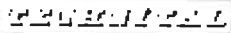
It is recommended that the documentation of the machines is studied carefully before any actions are taken. This manual and safety instructions are delivered with each machine and is located in a plastic cover attached on the machine frame.

NOTE: The documentation is delivered to the ordering customer. For additional copies of these documents, please contact your local ABB office or the After Sales department, see *Chapter 9.1.5 After Sales contact information*.

In addition to this manual, each machine is supplied with a Dimension Drawing, an Electrical Connection Diagram and a Data Sheet indicating the following:

- Mounting and outline dimensions of the machine
- Machine weight and load on the foundation
- Location of lifting eyes of the machine
- Instrumentation and location of accessories
- Bearing oil and lubricant requirements
- Main and auxiliary connections.

NOTE: Some customer specific items may not be included in this User's Manual. Additional documentation will be found in the project documentation. In case of conflict between this manual and the additional documentation of the machine, additional documentation will prevail.

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1.4.2 Information not included in documentation

This User's Manual does not include any information about any starting, protection or speed control equipment. This information is provided in the user's manuals for respective equipment.

1.4.3 Units used in this User's Manual

The measurement units used in this User's Manual are based on the SI (metric) system and the US system.

1.5 Identification of the machine

1.5.1 Serial number of the machine

Each machine is identified with a 7-digit serial number. It is stamped on the rating plate of the machine as well as on the machine frame.

The serial number must be provided in any future correspondence regarding a machine, as it is the only unique information used for identifying the machine in question.

1.5.2 Rating plate

A stainless steel rating plate is attached permanently to the machine frame, and it must not be removed. For the location of the rating plate, see *Appendix Typical position of plates*.

The rating plate indicates manufacturing, identification, electrical and mechanical information, see *Figure 1-1 Rating plate for direct on line machines manufactured according to IEC (Ex-machine according to ATEX Directive)*.

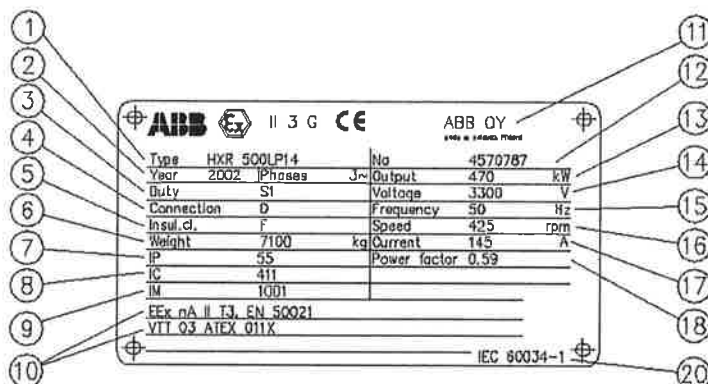


Figure 1-1 Rating plate for direct on line machines manufactured according to IEC (Ex-machine according to ATEX Directive)

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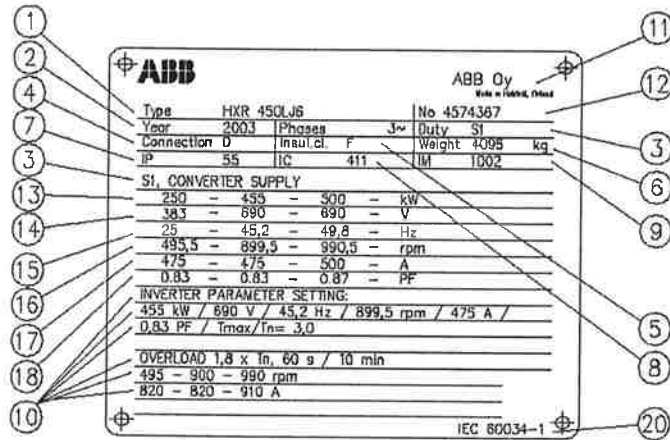


Figure 1-2 Rating plate for frequency converter machines manufactured according to IEC

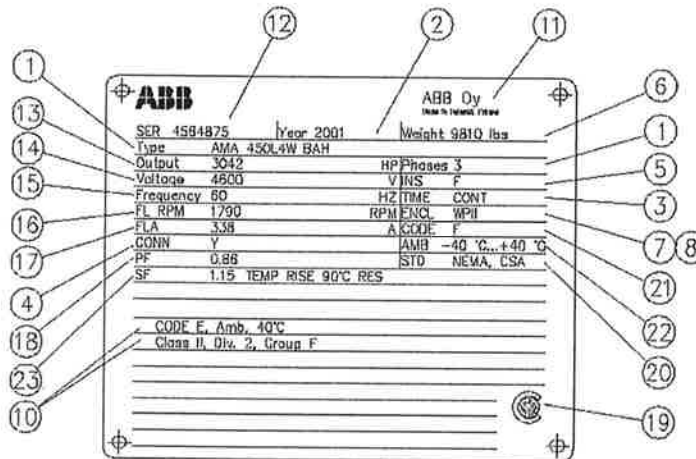




Figure 1-3 Rating plate for direct on line machines manufactured according to NEMA

1. Type designation
2. Manufacturing year
3. Duty
4. Type of connection
5. Insulation class
6. Machine weight [kg] or [lbs]
7. Degree of protection [IP class]
8. Type of cooling [IC code]

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9. Mounting arrangement [IM code] (IEC)
10. Additional info
11. Manufacturer
12. Serial number
13. Output [kW] or [HP]
14. Stator voltage [V]
15. Frequency [Hz]
16. Rotating speed [rpm]
17. Stator current [A]
18. Power factor [cosφ]
19. CSA marking
20. Standard
21. Designation for locked-rotor kVA/ HP (NEMA)
22. Ambient temperature [°C] (NEMA)
23. Service factor (NEMA)

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Chapter 2 Transport and Unpacking

2.1 Protective measures prior to transport

2.1.1 General

The following protective measures are taken before delivery of the machine from the factory. The same protective measures should be taken, whenever the machine is moved:

- Some machines, and all machines with sleeve or roller bearings, have transport locking devices installed

*****Following bullet for bearing type: Rolling bearing**

- Ball and roller bearings are greased with lubricant indicated on the bearing plate, which is attached to the machine frame, see *Chapter 2.1.2 Bearing plate*

*****Following bullet for bearing type: Sleeve bearing**

- Sleeve bearings are flooded with oil and drained. All oil in- and outlets, as well as oil tubes are plugged. This gives sufficient protection against corrosion

*****Following bullet for cooling method: Air-to-water**

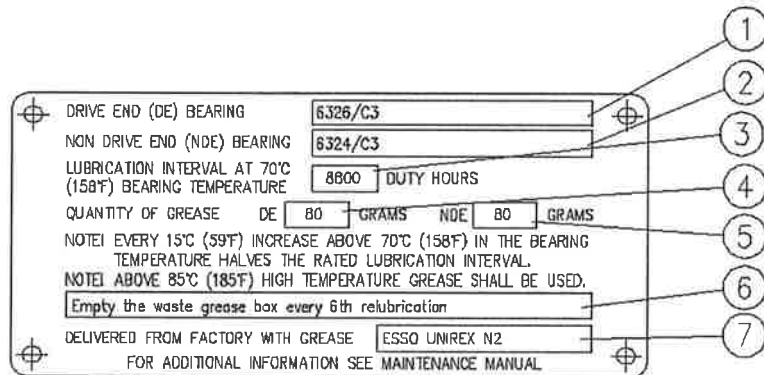
- Air-to-water coolers are drained and the cooler in- and outlets are plugged
- Machined metal surfaces, such as the shaft extension, are protected against corrosion with an anti-corrosive coating
- In order to protect the machine properly against water, salt spray, moisture, rust and vibration damages during loading, sea transport and unloading of the machine, the machine should be delivered in a seaworthy package.

2.1.2 Bearing plate

A stainless steel bearing plate is attached to the machine frame. For the location of the bearing plate, see *Appendix Typical position of plates*.

The bearing plate indicates the type of the bearings and lubrication to be used, see *Figure 2-1 Bearing plate for grease lubricated rolling bearings* and *Figure 2-2 Bearing plate for sleeve bearings*.

***Following figure for bearing type: Rolling bearing

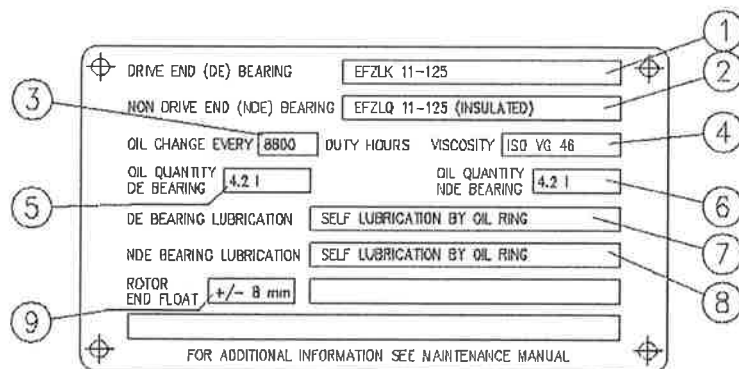


DRIVE END (DE) BEARING	6326/C3
NON DRIVE END (NDE) BEARING	6324/C3
LUBRICATION INTERVAL AT 70°C (158°F) BEARING TEMPERATURE	8800 DUTY HOURS
QUANTITY OF GREASE DE	80 GRAMS
QUANTITY OF GREASE NDE	80 GRAMS
NOTE! EVERY 15°C (59°F) INCREASE ABOVE 70°C (158°F) IN THE BEARING TEMPERATURE HALVES THE RATED LUBRICATION INTERVAL.	
NOTE! ABOVE 85°C (185°F) HIGH TEMPERATURE GREASE SHALL BE USED.	
Empty the waste grease box every 6th relubrication	
DELIVERED FROM FACTORY WITH GREASE	ESSO UNIREX N2
FOR ADDITIONAL INFORMATION SEE MAINTENANCE MANUAL	

Figure 2-1 Bearing plate for grease lubricated rolling bearings


1. Bearing type of D-end
2. Bearing type of ND-end
3. Lubrication interval
4. Quantity of grease for D-end bearing
5. Quantity of grease for ND-end bearing
6. Additional information
7. Type of grease delivered from factory

***Following figure for bearing type: Sleeve bearing



DRIVE END (DE) BEARING	EFZLK 11-125
NON DRIVE END (NDE) BEARING	EFZLQ 11-125 (INSULATED)
OIL CHANGE EVERY	8800 DUTY HOURS
VISCOSITY	ISO VG 46
OIL QUANTITY DE BEARING	4.2 l
OIL QUANTITY NDE BEARING	4.2 l
DE BEARING LUBRICATION	SELF LUBRICATION BY OIL RING
NDE BEARING LUBRICATION	SELF LUBRICATION BY OIL RING
ROTOR END FLOAT	+/- 8 mm
FOR ADDITIONAL INFORMATION SEE MAINTENANCE MANUAL	

Figure 2-2 Bearing plate for sleeve bearings

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1. Bearing type for D-end
2. Bearing type for ND-end
3. Oil change interval
4. Viscosity class
5. Oil quantity for D-end bearing (for self lubricated)
6. Oil quantity for ND-end bearing (for self lubricated)
7. Method of lubrication for D-end bearing. Oil flow and pressure for flood lubricated bearing
8. Method of lubrication for ND-end bearing. Oil flow and pressure for flood lubricated bearing
9. Rotor end float (axial play)

NOTE: The information given on the bearing plate must imperatively be followed. Failure to do so will void the warranty for the bearings.

2.2 Lifting the machine

Before the machine is lifted, ensure that suitable lifting equipment is available and that the personnel is familiar with lifting work. The weight of the machine is shown on the rating plate, dimension drawing and packing list.

NOTE: Use only the lifting lugs or eyes intended for lifting the complete machine. Do not use any small additional lifting lugs or eyes available, as they are there only for service purposes.


NOTE: The center of gravity of machines with the same frame may vary due to different outputs, mounting arrangements and auxiliary equipment.

NOTE: Check that eyebolts or the lifting lugs integrated with the machine frame are undamaged before lifting. Damaged lifting lugs must not be used.

NOTE: Lifting eyebolts must be tightened before lifting. If needed the position of the eyebolt must be adjusted with suitable washers.

2.2.1 Lifting a machine in a seaworthy package

The seaworthy package is normally a wooden box, which is covered with lamina paper on the inside. The seaworthy package should be lifted by forklift from the bottom, or by crane with lifting slings. The sling positions are painted on the package.

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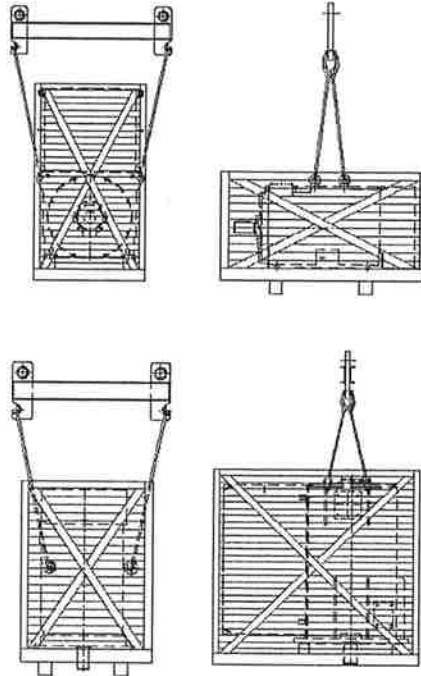
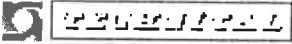


Figure 2-3 Lifting of horizontal and vertical machines in seaworthy packages

2.2.2 Lifting a machine on a pallet

A machine mounted on a pallet should be lifted by crane from the lifting eyes of the machine, see Figure 2-4 Lifting of horizontal and vertical machines on pallets, or by forklift from the bottom of the pallet. The machine is fixed to the pallet with bolts.

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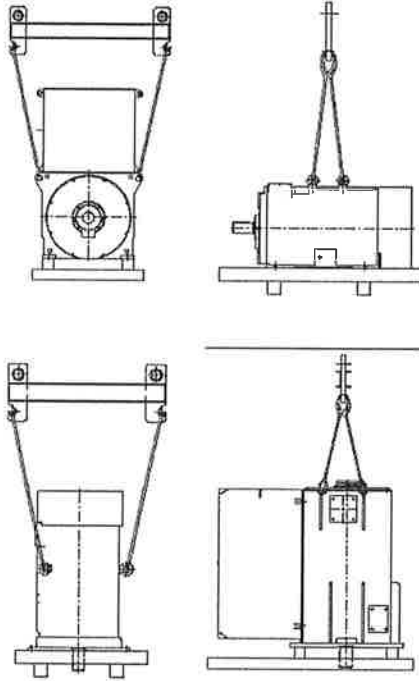
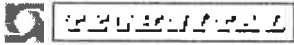


Figure 2-4 Lifting of horizontal and vertical machines on pallets

2.2.3 Lifting an unpacked machine

Suitable lifting equipment must be used! The machine should always be lifted by crane from the lifting eyes on the frame of the machine, see *Figure 2-5 Lifting of unpacked machines*. The machine should *never* be lifted by forklift from the bottom or the feet of the machine.

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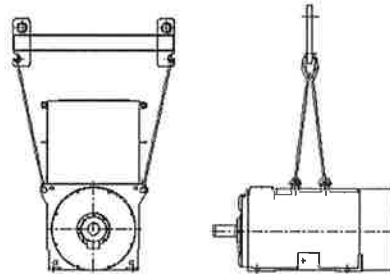


Figure 2-5 Lifting of unpacked machines

***Following chapter for mounting type: Vertical

2.3 Turning a vertically mounted machine

Vertically mounted machines may be necessary to turn from vertical to horizontal position, e.g. when changing the bearings, and vice versa. This is shown in Figure 2-6 Machine with turnable lifting eyes: lifting and turning. Avoid damaging the painting or any parts during the procedure. Remove or install the bearing locking device only when the machine is in vertical position.

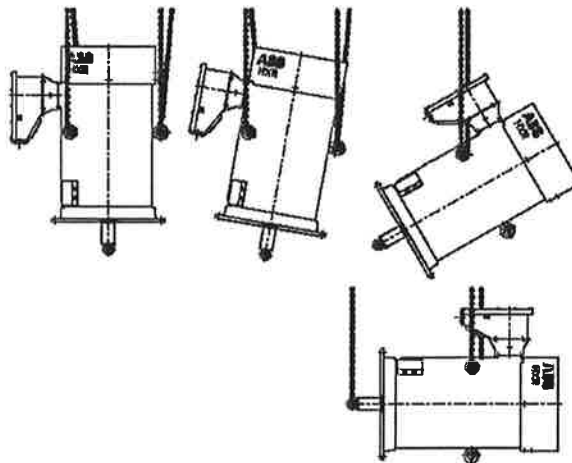



Figure 2-6 Machine with turnable lifting eyes: lifting and turning

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2.4 Checks upon arrival and unpacking

2.4.1 Check upon arrival

The machine and the package must be inspected immediately upon arrival. Any transport damage must be photographed and reported immediately, i.e. within less than one (1) week after arrival, if the transport insurance is to be claimed. It is, therefore, important that evidence of careless handling is checked and reported immediately to the transport company and the supplier. Use checklists in *Appendix COMMISSIONING REPORT*.

A machine, which is not to be installed immediately upon arrival, must not be left without supervision or without protective precautions. For more details, see *Chapter 2.6 Storage*.

2.4.2 Check upon unpacking

Place the machine so that it does not hinder the handling of any other goods and on a flat, vibration-free surface.

After the package has been removed, check that the machine is not damaged and that all accessories are included. Tick off the accessories on the packing list which is enclosed. If there is any suspected damage or if accessories are missing, take photographs thereof and report this immediately to the supplier. Use checklists in *Appendix COMMISSIONING REPORT*.

For correct recycling and disposal of the packaging material, see *Chapter 10.3 Recycling of packaging material*.

2.5 Installation instructions for main terminal box and cooler parts

These instructions are applied, when the machine is delivered on site with disassembled main components, such as the main terminal box or cooler parts. Refer to the Dimension Drawing included in the project documentation for the correct positions of the parts. All bolts, nuts and washers are included in the delivery.

Mechanical assembly should be done only by experienced personnel. Electrically active parts such as stator cables should be installed by skilled persons only.


Safety instructions must be observed at all times, for more information see *Safety Instructions* at the beginning of the manual.

To ensure that the warranty terms agreed in the purchase order contract of the project are not invalidated, these instructions should be followed carefully.

2.5.1 Installation of main terminal box

The main terminal box is delivered with the machine in a separate box/slide package. The installation of the main terminal box is performed according to these guidelines.

1. Open the package and lift the main terminal box with a suitable lifting device (for example a crane) from the lifting eyes of the main terminal box.
2. Check that all connection parts are free of dust and dirt.
3. Prepare the delivered bolts and washers for installation.

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4. Lift the main terminal box directly onto the machine frame at the position where the main terminal box has to be connected (see Dimension Drawing included in the project documentation).
5. For NEMA main terminal box only: pull the stator cables through the ceiling membrane.
6. Connect the main terminal box with the screws delivered with the machine frame. Make sure that the isolation sealing is available to the connection surface of the machine housing.
7. Tighten all screws with max. 200 Nm. (see *Table 7-2 General tightening torques*).

For NEMA main terminal box only: After connecting the main terminal box mechanically to the machine housing, the stator cables are connected to the terminals:

1. Check the markings of the stator cables and the terminals.
2. Connect the stator cables to the corresponding terminals according to the cable markings (U1, V1, W1 or L1, L2, L3). See the Electrical Connection Diagram for more information.
3. Tighten the preinstalled screws with max. 80 Nm. (see *Appendix Typical main power cable connections*).

2.5.2 Installation of cooler parts

If the cooler or parts of the cooling system (for example silencer, air lead channel) are delivered separately, they have to be installed on site according to the following instructions.


1. Open the package of the cooler/cooler parts and lift the part(s) using a suitable lifting device (for example a crane) from the lifting eyes of the package.
2. Check that all connection parts are free of dust and dirt.
3. Check the correct installation positions from the Dimension Drawing delivered with the project documentation.
4. Check that all connection parts, bolts, washers and nuts are included in the delivery.
5. Lift the cooler part to its correct position and connect it with the delivered installation parts. Make sure that all sealing parts are installed at correct locations.
6. Tighten all screws with max. 80 Nm. (see *Table 7-2 General tightening torques*).

2.6 Storage

2.6.1 Short term storage (less than 2 months)

The machine should be stored in a proper warehouse with a controllable environment. A good warehouse or storage place has:

- A stable temperature, preferably in the range from 10°C (50°F) to 50°C (120°F). If the anti-condensation heaters are energized, and the surrounding air is above 50°C (120°F), it must be confirmed that the machine is not overheated
- Low relative air humidity, preferably below 75%. The temperature of the machine should be kept above the dew point, as to prevent moisture from condensing inside the machine. If the machine is equipped with anti-condensation heaters, they should be energized. The operation of the anti-condensation heaters must be verified periodically. If the machine is not equipped with anti-condensation heaters, an alternative method of heating the machine

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and preventing moisture from condensing in the machine must be used

- A stable support free from excessive vibrations and shocks. If vibrations are suspected to be too high, the machine should be isolated by placing suitable rubber blocks under the machine feet
- Air which is ventilated, clean and a free from dust and corrosive gases
- Protection against harmful insects and vermin.

If the machine needs to be stored outdoors, the machine must never be left 'as is' in its transportation package. Instead the machine must be

- Taken out from its plastic wrap
- Covered, as to completely prevent rain from entering the machine. The cover should allow ventilation of the machine
- Placed on at least 100 mm (4") high rigid supports, as to make sure that no moisture can enter the machine from below
- Provided with good ventilation. If the machine is left in its transportation package, large enough ventilation openings must be made in the package
- Protected from harmful insects and vermin.

Use checklists in Chapter 2 Storage in *Appendix COMMISSIONING REPORT*.

2.6.2 Long term storage (more than 2 months)

In addition to the measures described with short-term storage, the following should be applied.


Measure the insulation resistance and temperature of the windings every three months, see *Chapter 7.6 Maintenance of stator and rotor windings*.

Check the condition of the painted surfaces every three months. If corrosion is observed, remove it and apply a coat of paint again

Check the condition of anti-corrosive coating on blank metal surfaces (e.g. shaft extensions) every three months. If any corrosion is observed, remove it with a fine emery cloth and perform the anti-corrosive treatment again

Arrange small ventilation openings when the machine is stored in a wooden box. Prohibit water, insects and vermin from entering the box, see *Figure 2-7 Ventilation holes*.

Use checklists in Chapter 2 Storage in *Appendix COMMISSIONING REPORT*.

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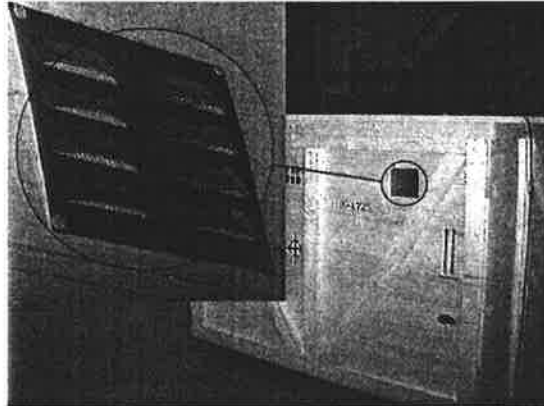


Figure 2-7 Ventilation holes

*****Following paragraph for cooling method: Water jacket**

Machines with so-called water jacket cooling are to be filled with a mixture of water and glycol with a minimum of 50% glycol. Instead of glycol, another similar liquid can be accepted. Make sure that the liquid mixture tolerates the storage temperature without freezing. The liquid inlets and outlets are to be closed after filling.

*****Following chapter for bearing type: Rolling bearing**


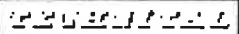
2.6.3 Rolling bearings

Apply the following measures:

- Rolling bearings should be well lubricated during storage. Acceptable grease types are presented in *Chapter 2.1.2 Bearing plate*
- Turn the rotor 10 revolutions every three months to keep the bearings in good condition. Remove any possible transport locking device during turning the rotor
- Machines may be provided with a locking device to protect the bearings against damage during transport and storage. Check the bearing locking device periodically. Tighten the transport locking device according to the axially locating bearing type, see *Table 2-1 Tightening torque for horizontal machines (lubricated screw)*.

NOTE: A too high tightening torque on the transport locking device will damage the bearing.

NOTE: The type of bearings used are found on the bearing plate, see *Chapter 2.1.2 Bearing plate*, and axially locating bearing information from the dimension drawing.


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*****Following table for mounting type: Horizontal**

Table 2-1. Tightening torque for horizontal machines (lubricated screw)

Axially locating bearing type	Tightening torque [Nm]	Tightening torque [pound foot]
6316	45	33
6317	50	37
6319	60	44
6322	120	90
6324	140	100
6326	160	120
6330	240	180
6334	300	220
6034	140	100
6038	160	120
6044	230	170

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***Following table for mounting type: Vertical

Table 2-2. Tightening torque for vertical machines (lubricated screw)

Axially locating bearing type	Tightening torque [Nm]	Tightening torque [pound foot]
7317	30	22
7319	30	22
7322	60	44
7324	60	44
7326	90	66
7330	160	120
7334	350	260


***Following chapter for bearing type: Sleeve bearing

2.6.4 Sleeve bearings

Apply the following measures:

- Machines with sleeve bearings are delivered *without lubricant*, i.e. oil. The inside of the bearings should be checked for a protective oil layer. Tectyl 511 or other corresponding substance should be sprayed into the bearing through the filling hole, if the storing period is longer than two months. The corrosion protection treatment is repeated every six months for a period of two years. If the storing period is longer than two years, the bearing has to be taken apart and treated separately
- The bearings should be opened, and all parts inspected after storage and before commissioning. Any corrosion must be removed with a fine emery cloth. If the shaft has left imprints on the lower liner-half, it must be replaced with a new one
- Machines with sleeve bearings are provided with a transport locking device to protect the bearings against damage during transport and storage. Check the transport locking device periodically. Tighten the transport locking device according to the axially locating bearing, see Table 2-1 Tightening torque for horizontal machines (lubricated screw).

NOTE: A too high tightening torque on the transport locking device will damage the bearing.

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Table 2-3. Tightening torque (lubricated screw). Axially locating bearing carries the locking force


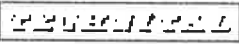
Axially locating bearing type	Tightening torque [Nm]	Tightening torque [pound foot]
ZM_LB 7	100	74
EF_LB 9	250	180
EF_LB 11	300	220
EF_LB 14	600	440
EM_LB 14	600	440
EF_LB 18	900	670

2.6.5 Openings

If there are any openings where cables are not connected to terminal boxes or flanges that are not connected to the piping, they are to be sealed. The coolers and the piping within the machine are to be cleaned and dried before they are sealed. The drying is made by blowing warm and dry air through the pipes.

2.7 Inspections, records

The storage period, taken precautions and measurements, including dates, should be recorded. For relevant check-lists, see *Appendix COMMISSIONING REPORT*.

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Chapter 3 Installation and Alignment

3.1 General

Good planning and preparation result in simple and correct installation and assure safe running conditions and maximum accessibility.

*****Following paragraph for protection type: All machines for hazardous areas**

Standards relating to the connection and use of electrical apparatus in hazardous areas must be taken into consideration, especially national standards for installation (see standard IEC 60079-14).

NOTE: General, as well as local work safety instructions must be followed during installation.

NOTE: Ensure the protection of the machine while working nearby.

NOTE: Do not use the machine as a welding earth.

3.2 Foundation design

3.2.1 General


The design of the foundation should assure safe running conditions with maximum accessibility. Sufficient free space should be left around the machine to ensure easy access for maintenance and monitoring. The cooling air should flow to and away from the machine without obstruction. Care has to be taken to ensure that other machines or equipment nearby do not heat the machine cooling air or constructions such as bearings.

The foundation must be strong, rigid, flat and free from external vibration. The possibility of machine resonance with the foundation has to be verified. In order to avoid resonance vibrations with the machine, the natural frequency of the foundation together with machine must not be within a $\pm 20\%$ range of the running speed frequency.

A concrete foundation is preferred, however, a correctly designed steel construction is also acceptable. The anchorage to the foundation, the provision of air, water, oil and cable channels as well as the location of the grouting holes should be considered prior to construction. The position of the grouting holes and the height of the foundation must agree with the corresponding dimensions on the provided dimensional drawing.

The foundation shall be designed to permit 2 mm (0.8 inch) shim plates under the feet of the machine in order to ensure an adjustment margin, and facilitate the possible future installation of a replacement machine. Machine shaft height and foundation feet location have a certain manufacturing tolerance, which are compensated with the 2 mm (0.8 inch) shim plate.

NOTE: The calculation and design of the foundation is not included in the ABB scope of supply and the customer or a third party is therefore responsible for it. Furthermore, the grouting operation is also normally outside the scope and responsibility of ABB.

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3.2.2 Forces to the foundation

The foundation and the mounting bolts must be dimensioned to withstand a sudden mechanical torque, which occurs every time the machine is started, or at short circuit. The short circuit force is a gradually damped sine wave that changes direction. The magnitude of these forces is mentioned on the dimensional drawing of the machine.

***Following chapter for mounting type: Vertical

3.2.3 Flanges for vertically mounted machines

Vertical flange mounted machines are equipped with a mounting flange according to IEC-standard publication 60072. The flange of the machine should always be mounted to an opposite flange on the foundation.

A mounting adapter is recommended to enable an easy coupling connection and inspection during operation.

3.3 Machine preparations before installation

Prepare the machine for installation as follows:

- Measure the insulation resistance of the winding before any other preparations are done as described in *Chapter 3.3.1 Insulation resistance measurements*
- Remove the transport locking device when applicable. Store it for future use. See *Chapter 3.3.2 Disassembly of the transport locking device* for further instructions
- Verify that the grease available is according to the specification on the bearing plate, see *Chapter 2.1.2 Bearing plate*. Additional recommended greases can be found in *Chapter 7.5.3.5 Bearing grease*

***Following bullet and note for bearing type: Sleeve bearing


- Fill the sleeve bearings with an appropriate oil. For suitable oils, see *Chapter 7.5.2.4 Oil qualities*

NOTE: Sleeve bearings are always delivered without oil!

- Remove the anti-corrosive coating on the shaft extension, and machine feet with white spirit
- Install the coupling half as described in *Chapter 3.3.4 Assembly of the coupling half*
- Check that the drain plugs at the lowest part of both ends of the machine are in open position, see *Chapter 3.3.6 Drain plugs*.

3.3.1 Insulation resistance measurements

Before a machine is started up for the first time, after a long period of standstill or within the scope of general maintenance work, the insulation resistance of the machine must be measured. This includes measuring the stator winding and all auxiliary devices. For machines equipped with slip ring, the measuring also includes the rotor winding, see *Chapter 7.6.4 Insulation resistance test*.

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3.3.2 Disassembly of the transport locking device

Some machines and all machines with sleeve or roller bearings have transport locking devices installed. For machines with sleeve or cylindrical roller bearings, the transport locking device is made of a steel bar attached to both the bearing shield on the D-end and to the end of the shaft extension.

The transport locking device has to be removed prior to installation. The shaft extension has to be cleaned of its anti-corrosive coating. The locking device should be stored for future use.

NOTE: In order to avoid bearing damages, the transport locking device must be fitted to the machine whenever the machine is moved, transported to another location or stored. See *Chapter 2.1 Protective measures prior to transport*.

3.3.3 Coupling type

***Following paragraph for bearing type: Rolling bearing

Machines with rolling bearings must be connected to the driven machine with flexible couplings, e.g. pin couplings, or gear couplings.

If the axially locked bearing is at the N-end (see dimension drawing), make sure that a continuous free axial movement is possible between the coupling halves in order to permit thermal expansion of the machine shaft without damaging the bearings. The expected axial thermal expansion of the rotor can be calculated as defined in the *Chapter 3.6.4 Correction for thermal expansion*.

***Following paragraph for mounting type: Vertical

Vertical machines may be designed to carry some load from the shaft of the driven machine. If this is the case, the coupling halves have to be locked against slipping in the axial direction by a lock plate on the end of the shaft.

NOTE: The machine is not suitable for belt, chain or gear connection unless it is specifically designed for such use. The same applies for high axial thrust applications.

***Following two paragraphs and figure for bearing type: Sleeve bearing with axial float

The sleeve bearing construction allows the rotor to move axially between the mechanical end float limits. Standard bearings cannot withstand any axial forces from the driven machine. Any axial force from the load will cause bearing damage. Therefore, all axial forces must be carried by the driven machine and the coupling must be of limited axial float type.


3.3.4 Assembly of the coupling half

3.3.4.1 Balancing of coupling

The rotor is dynamically balanced with half key as standard. The way of balancing is stamped to the shaft end:

- H = half-key and
- F = full key

The coupling half must be balanced respectively.

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3.3.4.2 Assembly

The following instructions must be taken into account when assembling the coupling half.

- Follow the general instructions of the coupling supplier
- The weight of the coupling half can be considerable. A suitable lifting gear may be needed
- Clean the shaft extension of its anti-corrosive coating, and check the measurements of the extension and the coupling against the provided drawings. Ensure also that the keyways in the coupling and the shaft extension are clean and free from burrs
- Coat the shaft extension and hub bore with a thin layer of oil as to facilitate the mounting of the coupling half. Never coat mating surfaces with molybdenum disulphide (Molykote) or similar products
- The coupling must be covered with a touch guard.

NOTE: In order not to damage the bearings, no additional forces should be applied to the bearings when assembling the coupling half.

3.3.5 Belt drive

Machines designed for belt drives are always equipped with cylindrical roller bearing in the D-end. If a belt drive is used, make sure that the driving and the driven pulleys are correctly aligned.

NOTE: Suitability of the shaft end and the bearings for the belt drive must be always checked before use. Do not exceed the radial force specified in the order definitions.

3.3.6 Drain plugs

The machines are equipped with drain plugs in the lowest part of the machine. The drain plug is constructed in such a way that it keeps the dust outside the machine and lets the condensation water to drain out. The drain plugs should always be open, i.e. half of the plug is inside and half of the plug is outside. The drain plug is opened by pulling it out from the frame. In AMI machines the drain plug (M12 screw) is opened 6 - 12 mm (0.2" - 0.5").


***Following paragraph for mounting type: Horizontal

For horizontal machines, two drain plugs are fitted at both ends of the machine.

***Following paragraph for mounting type: Vertical

For vertical machines, two drain plugs are fitted to the lower end shield.

The main terminal box has one drain plug at the lowest part of the box which has to be closed during operation.

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***Following chapter for mounting type: Horizontal with concrete foundation

3.4 Installation on concrete foundation

3.4.1 Scope of delivery

The machine delivery does not normally include installation, shim plates, mounting bolts, foundation plate set or sole plate set. These are delivered according to special orders.

If new fixing holes need to be drilled, please contact ABB to ensure suitability.

3.4.2 General preparations

Before starting the installation procedure, consider the following aspects:

- Reserve sheet steel material for shimming the machine. Possible alignment adjustments require shims with thicknesses of 1, 0.5, 0.2, 0.1 and 0.05 mm (40, 20, 8, 4 and 2 mil)
- Reserve a recoil hammer, adjusting screws or hydraulic jacks for axial and horizontal adjustments
- Reserve dial indicator gauges, or preferably a laser optical analyzer, to achieve accurate and precise alignment of the machine
- Reserve a simple lever arm for turning the rotor during alignment
- With outdoor installations provide sun and rain protection to eliminate measuring errors during installation.

NOTE: Machines are delivered with jacking screws for vertical adjustment at each foot.

3.4.3 Foundation preparations

3.4.3.1 Foundation and grouting hole preparations

Foundation studs or sole plates are used when the machine is anchored to a concrete foundation.

Consider the following aspects when preparing the foundation:

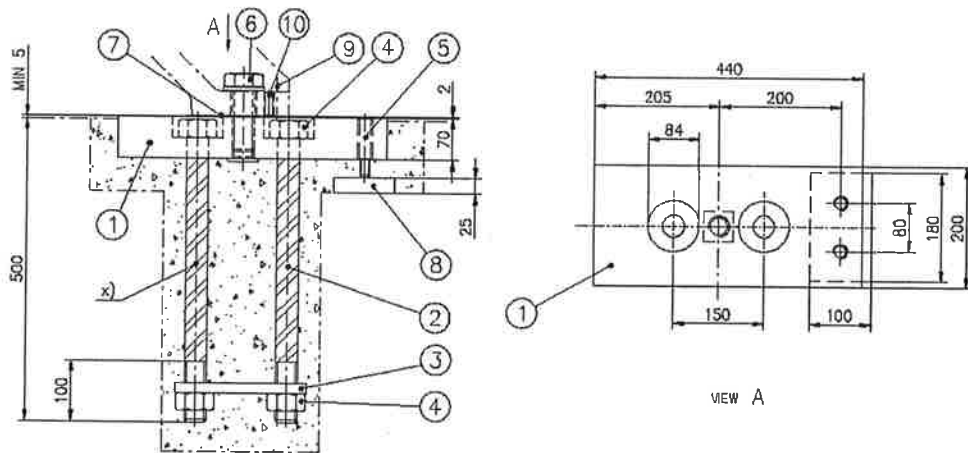
- The upper part of the foundation has to be swept or vacuum cleaned
- Walls of the grouting holes must have rough surfaces to give a good grip. For the same reason they must be washed and rinsed and thus free from pollution and dust. Oil or grease must be removed by chipping away slices of the concrete surfaces
- Check that the position of the grouting holes and the height of the foundation agree with corresponding measurements on the drawing provided
- Attach a steel wire on the foundation to indicate the center line of the machine. Mark also the axial position of the machine.

3.4.3.2 Foundation studs or sole plate preparations

If shims and foundation studs are part of the delivery, they will be delivered as separate items. The assembly of these will be made at site.

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NOTE: To ensure that the foundation studs will be satisfactorily attached to the concrete, they must be unpainted and free from pollution and dust.



ITEM	NAME OF THE PARTS	SIZE	QUANTITY/SET [PCS]
1	PLATE	70x200x440	4
2	STUD	M38x300/45+100	8
3	FLANGE	10x80x210	4
4	NUT	M38	16
5	JACKING SCREW	M24x80	8
6	FIXING SCREW	M38x90/60	4
7	SAW	2x170x280	4
8	SUPPORT PLATE	25x100x180	4
9	TAPER PIN	10x100	2
10	JACKING SCREW	M16x55	4


THE TAPER PIN (PART 9) IS NEEDED ONLY AT DRIVE-END OF THE MOTOR.
X) THE TAPE IS NOT INCLUDED IN THE DELIVERY.

ANCHOR BOLT TO BE MOUNTED IN THE FOUNDATION.
FOUNDATION STUD WILL BE DELIVERED AS LOOSE ITEMS.
ONE SET INCLUDES PARTS FOR ONE MACHINE (4 PCS).

Figure 3-1 Typical foundation stud assembly

In order to assemble the foundation stud or sole plate set, the machine must be suspended above the floor by a crane. Proceed as follows, see Figure 3-1 Typical foundation stud assembly:

- Clean the parts protected by an anti-corrosive coating with white spirit
- Screw the greased leveling screws into the foundation studs (part 5) or sole plates
- Wrap a layer of tape around the upper part of the anchor bolts (part 2) according to Figure 3-1 Typical foundation stud assembly. The tape will prevent the upper part of the bolt from being stuck in the concrete and enables it to be retightened after the concrete has set
- Fit the anchor bolt (part 2) in the foundation plates (part 1) or sole plates so that the top of the anchor bolts is 1...2 mm (40...80 mil) above the upper surface of the nuts (part 4)
- Fit the anchor flange (part 3) and the lower nut (part 4) to the anchor bolts (part 2). Bridge the anchor flange (part 3) to the bolts by welding and tighten the nuts. If the bridging cannot be done, lock the anchor flange between two nuts

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- After the assembly of the foundation plates is done; the machine should be lifted up and suspended above the floor. The machine feet, and the side and bottom surfaces of the foundation plates as well as anchor bolts should be cleaned with white spirit
- Mount the assembled foundation studs or sole plates under the machine feet with the mounting bolt (part 6) and washer (part 3). Center the mounting bolt (part 6) in the hole of the machine by wrapping e.g. paper, cardboard or tape on the upper part of the bolt
- Place the 2 mm (0.8 inch) shim (part 7) between the foot and the plate (part 1). Fasten the plate tightly against the foot with the mounting bolt (part 6)
- Place the leveling plate (part 8) under the leveling screw (part 5)
- Check that the space between the plate (part 1) and the anchor bolts (part 2) is tight. If concrete penetrates through this interstice up to the nuts, the retightening cannot be done.

NOTE: The tape and the steel plate are not included in the delivery of the foundation studs.

3.4.4 Erection of machines

The machine is carefully lifted and placed onto the foundation. A rough horizontal alignment is made with the aid of the previously installed steel wire and the marking of the axial location. A vertical alignment is made with the leveling screws. Required positioning accuracy is within 2 mm (80 mil).

3.4.5 Alignment

The alignment is made as described in *Chapter 3.6 Alignment*.

3.4.6 Grouting

The grouting of the machine into the foundation is a very important part of the installation. The instructions of the grouting compound supplier must be followed.

Please use high-quality non-shrinking grouting materials to avoid difficulties with the grouting in the future. Cracks in the grouting compound or a poor attachment to the concrete foundation cannot be accepted.


3.4.7 Final installation and inspection

After the concrete has set, lift the machine from the foundation and retighten the anchor bolts. Lock the nuts by bridging or hitting sufficiently hard with a center punch. Lift the machine back on the foundation and tighten the mounting bolts.

Check the alignment in order to ensure that the machine will run with the permissible vibration. If necessary, make the adjustment with shims, and then complete the doweling according to the holes in the feet at the machine D-end.

3.4.7.1 Dowelling of the machine feet

The machine has one dowel hole per foot at the D-end. Deepen the holes by drilling through to the steel foundation. After that, the holes are tapered with a reaming tool. Suitable tapered pins are fitted to the holes to ensure the exact alignment, and to allow easier reinstallation after any possible removal of the machine.

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3.4.7.2 Covers and enclosures

Complete the coupling installation by attaching both coupling halves to each other according to the coupling manufacturer's instruction.

NOTE: The coupling must be covered with a touch guard.

After the machine has been erected, aligned and its accessories are installed, check carefully that no tools or foreign objects have been left inside of the enclosures. Clean also any dust or debris.

Check that all sealing strips are intact when installing the covers.

Store the alignment and assembly accessories together with the transport locking devices for future use.

*****Following chapter for mounting type: Horizontal with steel foundation**

3.5 Installation on steel foundation

3.5.1 Scope of delivery

The machine delivery does not normally include installation, shim plates or mounting bolts. These are delivered according to special orders.

If new fixing holes need to be drilled, please contact ABB to ensure suitability.

3.5.2 Check of foundation

Before lifting the machine onto the foundation, the following checks should be made.

- Clean the foundation carefully
- The foundations shall be flat and plain parallel within 0.1 mm (4.0 mil) or better
- The foundation shall be free from external vibration.

3.5.3 Erection of machines

The machine is carefully lifted and placed onto the foundation.


3.5.4 Alignment

The alignment is made as described in *Chapter 3.6 Alignment*.

3.5.5 Final installation and inspection

3.5.5.1 Doweling of the machine feet

The machine has one dowel hole per foot at the D-end. Deepen the holes by drilling through to the steel foundation. After that, the holes are tapered with a reaming tool. Suitable tapered pins are fitted to the holes to ensure the exact alignment, and to allow easier reinstallation after any possible removal of the machine.

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3.5.5.2 Covers and enclosures

Complete the coupling installation by attaching both coupling halves to each other according to the coupling manufacturer's instruction.

NOTE: The coupling must be covered with a touch guard.

After the machine has been erected, aligned and its accessories are installed, check carefully that no tools or foreign objects have been left inside of the enclosures. Clean also any dust or debris.

Check that all sealing strips are intact when installing the covers.

Store the alignment and assembly accessories together with the transport locking devices for future use.

*****Following chapter only for mounting type: Vertical**

3.5.6 Installation of flange mounted machines on steel foundation

The purpose of a mounting flange for vertically mounted machines is to enable an easy installation and coupling connection, as well as an easy inspection of the coupling during operation. In order to fit the ABB machines, the mounting flanges shall be designed according to the IEC standard.

The mounting flange is not included in the ABB scope of delivery.

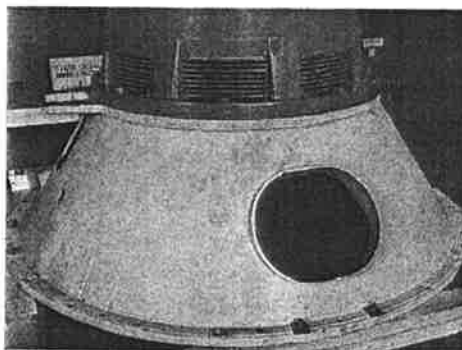



Figure 3-2 Mounting flange

The machine is lifted and placed onto the mounting flange. The mounting bolts are tightened lightly.

3.6 Alignment

3.6.1 General

In order to ensure a long and satisfactory lifetime of both the driving and the driven machine, the machines need to be properly aligned to each other. This means that the radial, as well as the

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angular deviation between the two shafts of the machines have to be minimized. The alignment must be performed with great caution because alignment errors will lead to bearing and shaft damages.

Before the alignment procedure is started, the coupling halves have to be installed, see *Chapter 3.3.4 Assembly of the coupling half*. The coupling halves of the driving and driven machines must be bolted together loosely in order to move freely in respect to each other during the alignment.

The following text refers to installation on both concrete and steel foundations. Shimming is not necessary in case of a concrete foundation if the alignment and grouting is done correctly.

3.6.2 Rough levelling

In order to facilitate the alignment and enable the mounting of shims, jacking screws are fitted to the feet of the machine, see *Figure 3-3 Vertical positioning of machine foot*. The machine is left standing on the jacking screws. Note that the machine must stand on all four feet (screws) on a plain parallel within 0.1 mm (4.0 mil) or better. If this is not the case, the frame of the machine will be twisted or bent, which can lead to bearing or other damages.

Check that the machine is vertically, horizontally and axially in level. Make adjustments accordingly by placing shims under the four feet. The horizontal level of the machine is checked with a spirit level.

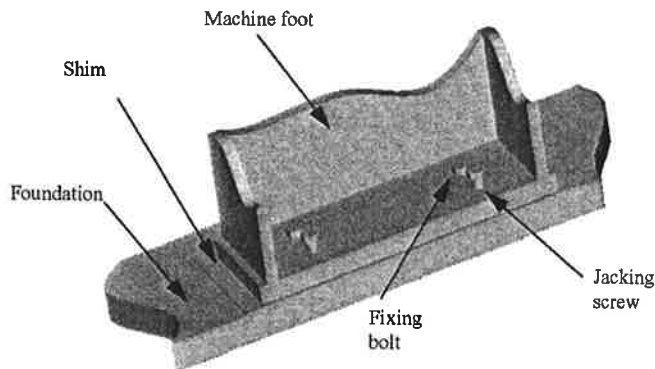


Figure 3-3 Vertical positioning of machine foot

3.6.3 Rough adjustment

In order to facilitate the alignment in axial and transversal directions, place bracket plates with adjusting screws at the corners, see *Figure 3-4 Positioning of bracket plates*.

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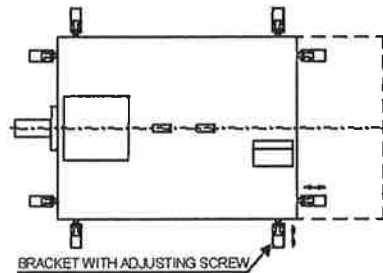


Figure 3-4 Positioning of bracket plates

Bracket plates are placed against the foundation edge and tied down with expansion bolts, see *Figure 3-5 Mounting of the bracket plate*. Move the machine by using the adjusting screws until the shaft centerline and the driven machine centerline are aligned roughly and the desired distance between the coupling halves is reached. Leave all adjusting screws only lightly tightened.

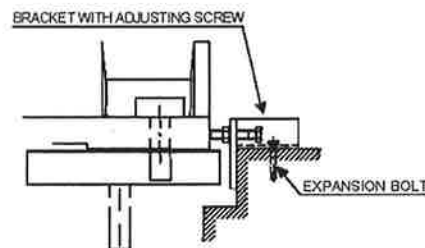


Figure 3-5 Mounting of the bracket plate

NOTE: *Figure 3-5 Mounting of the bracket plate* shows bracket plate mounted to concrete foundation, place similar bracket plate on steel foundation.

*****Following paragraph for bearing type: Sleeve bearing with axial float**

The sleeve bearing in the D-end is equipped with a pointer for showing running center, which is marked with a groove on the shaft. There are also grooves on the shaft for rotor mechanical end float limits. The position is correct when the tip of the pointer is in line with the machined running center groove on the shaft, see *Figure 3-6 Markings on shaft and running center pointer*. Notice that the running center is not necessarily the same as the magnetic center as the fan may pull the rotor from the magnetic center.

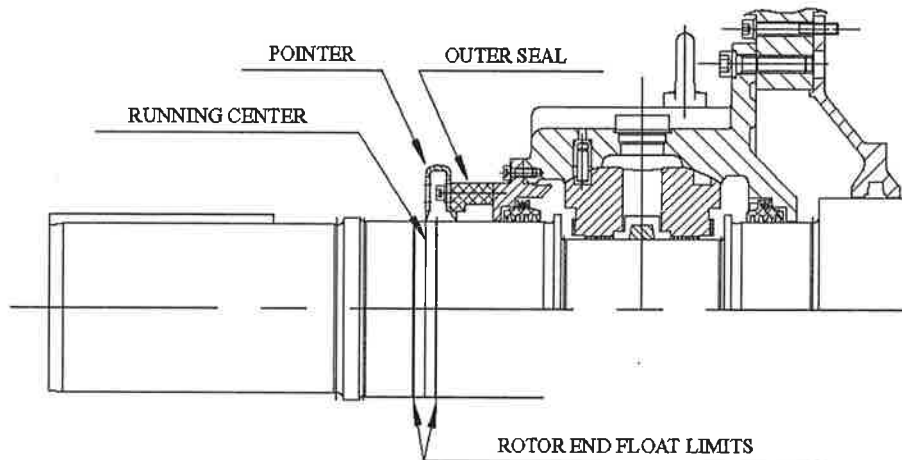


Figure 3-6 Markings on shaft and running center pointer

3.6.4 Correction for thermal expansion

3.6.4.1 General

Running temperatures have a considerable influence on the alignment, and should therefore be considered during the alignment. The machine temperature is lower during erection than under operating conditions. For this reason, the shaft center will be higher, i.e. further away from the feet during operation than standstill.

It may therefore be necessary to use heat compensated alignment depending on the operating temperature of the driven machine, coupling type, distance between machines, etc.

3.6.4.2 Thermal expansion upwards

The thermal expansion of the distance between the feet and the shaft center of the electrical machine can be approximately calculated according to the formula:

$$\Delta H = \alpha \times \Delta T \times H \text{ where}$$


ΔH = thermal expansion [mm]

$$\alpha = 10 \times 10^{-6} \text{ K}^{-1}$$

$$\Delta T = 40 \text{ K}$$

H = shaft height [mm]

NOTE: Consider the thermal expansion of the driven machine in respect to the electrical machine in order to define the total thermal expansion.

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3.6.4.3 Thermal axial growth

The thermal axial expansion needs to be taken into consideration if the axial movement of the non-drive end bearing is locked. See the dimension drawing in order to determine which end is locked.

The expected axial thermal expansion of the rotor is proportional to the length of the stator frame, and can be approximately calculated according to the formula:

$$\Delta L = \alpha \times \Delta T \times L \text{ where}$$

$$\Delta L = \text{thermal expansion [mm]}$$

$$\alpha = 10 \times 10^{-6} \text{ K}^{-1}$$

$$\Delta T = 50 \text{ K (for AMA, AMB, AMK, AMI), 80 K (for AMH, HXR, M3BM, M3GM)}$$

$$L = \text{frame length [mm]}$$

NOTE: Make sure that a continuous free axial movement is possible between the coupling halves (excluding rigid couplings) in order to permit axial thermal expansion of the machine shaft as not to damage the bearings.

3.6.5 Final alignment

3.6.5.1 General

In the following, the final alignment is made with dial gauges, although there is other and more exact measuring equipment on the market. The reason for using dial gauges in this text is to provide some alignment theory.

NOTE: Measurements should be made only after proper shimming and with fixing bolts properly tightened.

NOTE: The final alignment measurements should always be recorded for future reference.

3.6.5.2 Run-out of the coupling halves

The alignment procedure is started by measuring the run-out of the coupling halves. This measurement will show any inaccuracy of the shaft and/ or coupling halves.

The run-out of the coupling half in respect to the bearing housing of the machine is measured. Place the gauges according to *Figure 3-7 Measuring the run-out at the coupling half*. Similarly check the run-out of the coupling half of the driven machine in respect to its bearing housing.

A simple lever arm is needed to turn a rotor of a sleeve-bearing machine.

***Following note for bearing type: Sleeve bearings

NOTE: Sleeve bearings must be filled with oil before turning.

The admissible run-out error is less than 0.02 mm (0.8 mil).

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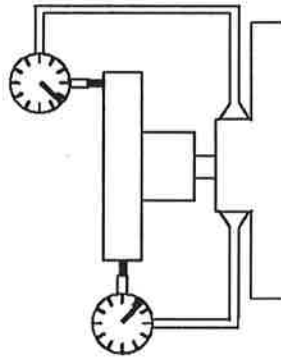



Figure 3-7 Measuring the run-out at the coupling half

3.6.5.3 Parallel, angular and axial alignment

After the machine has been roughly positioned, as described in *Chapter 3.6.2 Rough levelling* and *Chapter 3.6.3 Rough adjustment*, the final alignment can start. This step must be performed with great caution. Failure to do so can result in serious vibrations and damage to both driving and driven machine.

The alignment is done in accordance with the recommendations given by the coupling manufacturer. Parallel, angular and axial alignment of the machine is required. Some standard publications give recommendations for coupling alignment, e.g. BS 3170:1972 "*Flexible couplings for power transmission*".

In accordance with common practice, parallel and angular misalignment should not exceed 0.05-0.10 mm and axial misalignment should not exceed 0.10 mm, see *Figure 3-8 Definition of misalignment*. The corresponding run-out is 0.10-0.20 mm for parallel and angular misalignment.

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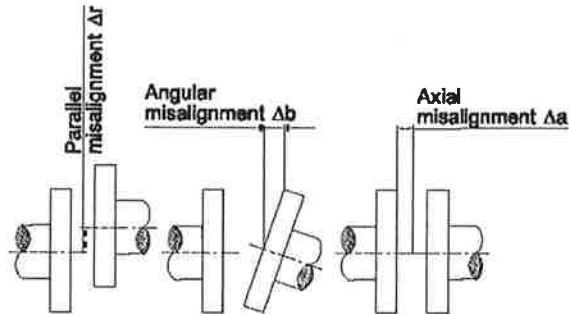


Figure 3-8 Definition of misalignment

3.6.5.4 Alignment

The alignment of the machine is performed according to these guidelines.

1. The machine should stand on its jacking screws
2. Rotate the rotor and check the axial end float, see *Chapter 3.6.3 Rough adjustment*

*****Following note for bearing type: Sleeve bearings**

NOTE: Sleeve bearings must be filled with oil before turning.

3. Mount the alignment equipment. If gauges are used, it is practical to adjust the dial gauge in such way that approximately half of the scale is available in either direction. Check the rigidity of the gauge brackets in order to eliminate the possibility of sag, see *Figure 3-9 Alignment check with gauges*

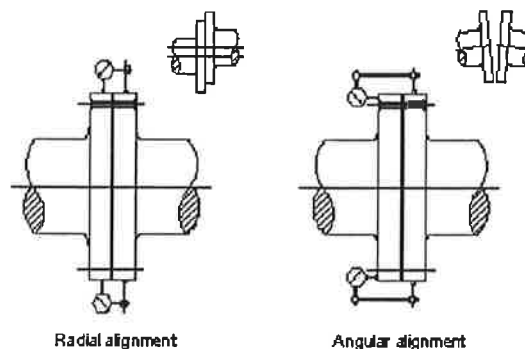



Figure 3-9 Alignment check with gauges

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4. Measure and note readings for parallel, angular and axial misalignment in four different positions: top, bottom, right and left, i.e. every 90°, while both shafts are turned simultaneously. The readings are recorded
5. Align the machine vertically by turning the jacking screws or by jacking with hydraulic jacks. To facilitate the alignment in the vertical plane, jacking screws are fitted to the feet of the horizontal machine, see *Figure 3-3 Vertical positioning of machine foot*. The alignment accuracy of the machine is sometimes affected by the thermal expansion of its frame, see *Chapter 3.6.4 Correction for thermal expansion*
6. Measure the distance between the bottom of the machine feet and the bedplate and make corresponding solid blocks or wedges or reserve necessary amount of shims
7. Fit the solid blocks or shims under the machine feet. Slacken the jacking screws and tighten the fixing bolts
8. Check the alignment again. Make corrections if necessary
9. Draw up a record for future checks
10. Re-tighten nuts and lock the nuts by tack welds or hitting sufficiently hard with a center punch
11. Dowel the feet of the machine for easy future re-installation of the machine, see *Chapter 3.4.7.1 Dowelling of the machine feet*.

3.6.5.5 Permissible misalignment

Definite alignment tolerances are impossible to state as too many factors have an influence. Too large tolerances will cause vibration and may possibly lead to bearing or other damages. Therefore, it is recommended to aim at as narrow tolerances as possible. Maximum permissible misalignments are shown in *Table 3-1 Recommended permissible misalignments*. For definitions of misalignment, see *Figure 3-8 Definition of misalignment*.

NOTE: Tolerances given by the coupling manufacturers indicate tolerances for the coupling, not for the driving-driven machine alignment. The tolerances given by the coupling manufacturer should be used as a guideline for the alignment only if they are narrower than the maximum permissible misalignments shown in *Table 3-1 Recommended permissible misalignments*.


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Table 3-1. Recommended permissible misalignments

Coupling Information		Permissible Misalignment		
Coupling Diameter	Coupling Type	Parallel	Angular	Axial
		Δr	Δb	Δa
100 – 250 mm (4 – 10")	Rigid Flange	0.02 mm (0.8 mil)	0.01 mm (0.4 mil)	0.02 mm (0.8 mil)
	Gear	0.05 mm (2 mil)	0.03 mm (1 mil)	0.05 mm (2 mil)
	Flexible	0.10 mm (4 mil)	0.05 mm (2 mil)	0.10 mm (4 mil)
250 – 500 mm (10 – 20")	Rigid Flange	0.02 mm (0.8 mil)	0.02 mm (0.8 mil)	0.02 mm (0.8 mil)
	Gear	0.05 mm (2 mil)	0.05 mm (2 mil)	0.05 mm (2 mil)
	Flexible	0.10 mm (4 mil)	0.10 mm (4 mil)	0.10 mm (4 mil)

3.7 Care after installation


If the machine will not be in operation for a longer period after it has been installed, the same measures as mentioned above in *Chapter 2.6.1 Short term storage (less than 2 months)* should be applied. Remember to rotate the shaft 10 revolutions at least every 3 months, and that self-lubricated bearings must be filled with oil. If external vibration is present, the shaft coupling should be opened and suitable rubber blocks should be placed under the feet of the machine.

*****Following note for bearing type: Rolling bearing**

NOTE: External vibration will damage the bearing rolling surfaces and therefore shorter the bearing lifetime.

*****Following note for bearing type: Sleeve bearing**

NOTE: External vibration will damage the bearing sliding surfaces and therefore shorter the bearing lifetime.

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Chapter 4 Mechanical and Electrical Connections

4.1 General

Mechanical and electrical connections are made after the installation and alignment procedures. The mechanical connections include the connection of air ducts, water tubes and/or oil supply system where applicable.

The electrical connections include the connection of main and auxiliary cables, earthing cables and possible external blower motors.

In order to determine proper actions, please read the Dimensional Drawing, the Connection Diagram and the Data Sheet provided with the machine.

NOTE: Additional installation holes or threads should never be drilled through the frame, as this may damage the machine.

4.2 Mechanical connections

*****Following chapter for cooling method: Ducted air**

4.2.1 Cooling air connections

Machines designed for cooling airflow to and/or from the machine with air ducts have connection flanges as specified in the dimensional drawing.

Clean the air ducts thoroughly before connecting them to the machine, and check for possible obstructions in the ducts. Seal the joints with appropriate gaskets. Check for possible leaks in the air ducts after they have been connected.

*****Following chapter for cooling method: Air-to-water, and water jacket**

4.2.2 Cooling water connections

*****Following chapter for cooling method: Air-to-water**


4.2.2.1 Air-to-water coolers

Machines equipped with an air-to-water heat exchanger have flanges specified in standards DIN 633 or ANSI B 16.5. Connect the flanges and seal the joints with appropriate gaskets. Prior to starting the machine, the water has to be turned on.

*****Following chapter for cooling method: Water jacket**

4.2.2.2 Water cooled frames

Steel frame water-cooled construction is only to be used with a closed fresh water circulation. The water cooling circuit flanges are made according to the customer's specifications, and are defined on the dimensional drawing.

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The cooling water circulates in ducts integrated in the machine frame. The material of the frame and ducts is carbon steel according to the standard EN 10025: S235 JRG2, equivalent with DIN 17100 - RSt 37-2. This material is prone to corrosion in saline and foul water. The corrosion products and fouling deposits might block the water flow in the ducts. This is why it is important to use pure and inhibited water in the cooling system.

Standard values for the cooling water to be used in the cooling system:

- pH 7.0 - 9.0
- Alkalinity (CaCO₃) ≥ 1 mmol/kg
- Chloride (Cl) < 20 mg/kg
- Sulphate < 100 mg/kg
- KMnO₄-concentration < 20 mg/kg
- Al-concentration < 0.3 mg/kg
- Mn-concentration < 0.05 mg/kg

In most of the cases, normal tap water, i.e. water for domestic consumption, fulfils all these requirements.

The cooling water must also be inhibited with an agent protecting the cooling system against corrosion, fouling and when necessary, against freezing. All materials in touch with the cooling water (pipes, heat exchanger, etc.) must be taken into account when selecting a suitable inhibitor.

Recommended inhibitor:

Manufacturer ASHLAND
Product RD-25

which is suitable for steel, copper, aluminium and many other materials.

Use only suitable and high-class connection parts and seals to connect the machine to the water circuit. Check for possible leaks after the piping and joints have been connected.

*****Following chapter for bearing type: Sleeve bearing**



4.2.3 Sleeve bearing oil supply

Machines with flood lubrication system are equipped with oil pipe flanges, and possibly with pressure gauges and flow indicators. Install all necessary oil pipes and connect the oil circulating units.

Install the oil supply system near the machine in equal distance from each bearing. Before connecting the pipes to the bearings, test the oil supply system by flowing rinsing oil through it. After this, remove the oil filter and clean it.

Install and connect the oil inlet pipes to the bearings. Install the oil outlet pipes downwards from the bearings at a minimum angle of 15°, which corresponds to a slope of 250 - 300 mm/m (3 - 3½ inch/ft). The oil level inside the bearing will increase if the slope of the pipes is too small; the oil will flow too slowly from the bearing to the oil container, and this can result in oil leaks or disturbances in the oil flow.

NOTE: Do not drill holes through the frame during the installation of the pipes or any other equipment, as this can damage the machine seriously.

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Fill the oil supply system with appropriate oil with correct viscosity. The correct type of oil and viscosity is indicated on the dimensional drawing. If in any doubt of the cleanness of the oil, use a 0.01 mm (0.4 mil) mesh to filter unwanted debris from the oil.

Turn the oil supply on, and check the oil circuit for possible leaks prior to starting the machine. The normal oil level is obtained when half of the oil sight glass is covered.

NOTE: The bearings are delivered without lubricant.

NOTE: Running the machine without lubricant will result in immediate bearing damage.

*****Following chapter for protection type: Ex p**

4.2.4 Connection of purging air pipe

The EEx p or Ex p machine is explosion protected by pressurizing. It is equipped with a control system, which includes an air control unit and a relief valve. The system works with uncontaminated pressurized air as the protective gas. Before the start, the machine is purged to remove any hazardous gases. During operation, the machine is kept under over-pressure to keep hazardous gases from entering the machine.

Purging and pressurizing air supply is connected to the flange provided on the air control unit. The air supply pressure must be between 4 and 8 bar. Required flow rate during purging and pressurizing is specified on the Ex - certificate. For more detailed information of the control system, see the supplier's instruction manual.

4.2.5 Mounting of vibration transducers

If the installed vibration transducers project from the machine frame, they are delivered uninstalled in order to avoid damages during transportation.


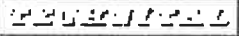
For taking vibration transducers into use, proceed as follows:

1. Disconnect the detached vibration transducers from their cables.
2. Remove the shield plugs from the tapped mounting holes on the end shield of the machine.
3. Protect the mounting surfaces against rust with a suitable anti-corrosion agent.
4. Mount the vibration transducers to the tapped mounting holes. The tightening torque depends on the used transducer type:
 - PYM TRV18 : 10 Nm
 - PYM 330400_ : 3,3 Nm
 - PYM 330500_ : 4,5 Nm
5. Finally, connect the cables to the vibration transducer.

4.3 Electrical connections

4.3.1 General information

The safety information in *Safety Instructions* at the beginning of the manual must be observed at all times.

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The electrical installation should be thoroughly planned before taking any action. The connection diagrams received with the machine have to be studied before starting the installation work. It is important to verify that the supply voltage and the frequency are the same as the values indicated on the rating plate of the machine.

The network voltage and frequency should be within given limits according to the applicable standard. Note rating plate markings and connection diagram in the terminal box. For additional information, see the machine performance data sheet.

NOTE: Prior to installation work, it is important to check that the incoming cables are separated from the supply network, and that the cables are connected to protective earth.

NOTE: Check all rating plate data, especially the voltage and winding connection.

*****Following paragraph for rotor type: Permanent magnet**

Machines are intended only for variable speed drives, i.e. to be supplied by frequency converters. The frequency converter must be designed to operate with a permanent magnet synchronous machine. If there is uncertainty concerning the compatibility of the permanent magnet synchronous machine and the frequency converter, please contact ABB Sales Office.

4.3.2 Safety

Electrical work must be carried out only by skilled persons. The following safety rules must be applied:


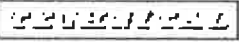
- De-energize all equipment, including auxiliary equipment
- Provide safeguard against re-energizing the equipment
- Verify that all parts are isolated from their respective supply
- Connect all parts to protective earth and short the circuits
- Cover or provide barriers against live parts in the surrounding area
- If the secondary circuit of the current transformer is extended, make sure that it does not become open-circuited in use

*****Following bullet for rotor type: Permanent magnet rotor**

- The permanent magnet synchronous machine produces voltage when the shaft is rotating. Prevent rotation of the shaft before opening the terminal box. Do not open or touch the unprotected terminals while the shaft of the machine is rotating. Follow *Safety Instructions* at the beginning of the manual.

4.3.3 Insulation resistance measurements

Before a machine is started up for the first time, after a long period of standstill or within the scope of general maintenance work, the insulation resistance of the machine must be measured, see *Chapter 7.6.4 Insulation resistance test*.

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4.3.4 Main terminal box options

The inside of the main terminal box must be free from dirt, moisture and foreign debris. The box itself, cable glands, and unused cable entrance holes must be closed in a dust- and watertight manner.

The main terminal box is equipped with a drain plug at the lowest part of the box. The plug should be in open position, i.e. half of the plug is inside and half of the plug is outside, during transportation and storage. During operation of the machine, the plug should be kept in shut position but opened from time to time. If the box is turned after delivery the drain plug function must be checked, and possibly re-positioned at the lowest part of the box.

Some main terminal boxes can be turned in 90 degrees steps. Before turning, check that the length of the cables between the stator winding and the terminal box is sufficient.

4.3.4.1 Delivery without main terminal box

If the machine is delivered without a main terminal box, the stator connection cables have to be covered with earthed protective structure before commissioning. The structure must have the same or higher enclosure classification and hazardous area certifications as the machine.

To avoid cable failure, stator connection cables must be shortened to minimize free movement of the cables. The supplier of the terminal arrangement is responsible for ensuring that adequate stator connection cable supports are used. The stator connection cable arrangement has to be spacious in order to avoid overheating of the cables. Stator connection cables must not touch sharp corners. The minimum bending radius of stator connection cable is 6 times the cable outer diameter.

4.3.5 Insulation distances of main power connections


The connections of the main power cables must be designed to withstand demanding operation conditions where the insulators can be subjected to dirt, humidity and surge voltages. In order to ensure lasting and trouble-free running, it is therefore important that the length of the insulation and creepage distances are sufficient. The minimum insulation and creepage distances should be equal or exceed demands set by:

- Local requirements
- Standards
- Classification rules
- Hazardous area classification.

The insulation and creepage distances apply both for insulation distances between two different phases, and for insulation distances between one phase and earth. The air insulation distance is the shortest distance through air between two points with different electrical potential (voltage). The surface creepage distance is the shortest distance along surfaces next to each other between two points with different electrical potential (voltage).

4.3.6 Main power cables

The size of the input cables has to be adequate for the maximum load current and in accordance with local standards. The cable terminals have to be of appropriate type and of correct size. The connection to all devices has to be checked.

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The main power cable connections should be tightened correctly to ensure reliable operation. For details, see *Appendix Typical main power cable connections*.

*****Following note for protection type: All hazardous areas**

NOTE: For Ex-machines, cable glands or cable bushings for supply cables must be Ex certified. Glands or bushings are not included in the manufacturer's delivery.

NOTE: Prior to installation work, it is important to check that the incoming cables are separated from the supply network, and that the cables are connected to protective earth.

The stator terminals are marked with letters U, V and W according to IEC 60034-8 or T1, T2, and T3 according to NEMA MG-1. The neutral terminal is marked with N (IEC) or with T0 (NEMA). Stripping, splicing and insulating of the high-voltage cables must be performed in accordance with instructions by the cable manufacturer.

The cables must be supported so that no stress is applied to the bus bars in the terminal box.

NOTE: Check the phase sequence from the connection diagram.

*****Following paragraph for rotor type: Permanent magnet rotor**

NOTE: Permanent magnet synchronous machines must be cabled by using shielded symmetrical cables and cable glands providing 360° bonding (also called EMC glands).

*****Following paragraph for rotor type: Slip rings**

4.3.7 Secondary cables for slip ring connections

The slip ring housing at the non-drive end of the machine serves as a terminal box for the secondary cables, and it has the same degree of protection as the machine.

The cables can be connected from either side. The connection is made to the rotor terminals on the termination plate, which is designed to fit up to six cable lugs per phase. The terminals are marked K, L and M in accordance with IEC Publications 60034-8.

NOTE: Study the connection diagram delivered with the machine carefully before connecting any cables.


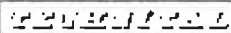
4.3.8 Auxiliary terminal box

Auxiliary terminal boxes are attached to the frame of the machine according to accessories and customer needs, and their positions are shown on the dimensional drawing of the machine.

The auxiliary terminal boxes are equipped with terminal blocks and cable glands, see *Figure 4-1 Typical auxiliary terminal box*. The maximum size of the conductors is normally limited to 2.5 mm² (0.004 sq. in.), and the voltage is limited to 750 V. The cable glands are suitable for cables of 10 – 16 mm (0.4”– 0.6”) diameter.

*****Following note for protection type: All machines for hazardous areas**

NOTE: For Ex-machines, cable glands or cable bushings for supply cables must be Ex certified. Glands or bushings are not included in manufacturer's delivery.

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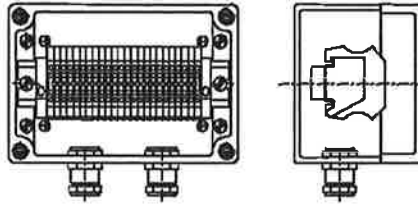


Figure 4-1 Typical auxiliary terminal box

4.3.8.1 Connection of auxiliaries and instruments

Connect the instruments and auxiliary equipment according to the connection diagram.

NOTE: Study the connection diagram delivered with the machine carefully before connecting any cables. The connection and functioning of accessories must be checked before commissioning.

NOTE: Label terminals of accessories, which are normally under voltage when the machine is switched off, correspondingly.

4.3.8.2 Connection of external blower motor

The external blower motor is normally a three phase asynchronous motor. A connection box is usually located on the frame of the blower motor. The external blower motor rating plate shows the voltage and frequency to be used. The direction of rotation of the fan is indicated by an arrow plate on the flange of the main machine.

NOTE: Check visually the direction of rotation of the external blower motor (fan) before starting the main machine. If the blower motor is running in the wrong direction, the phase sequence of the blower motor must be changed.


4.3.9 Earth connections

The machine frame, main terminal box, auxiliary terminal box and associated equipment must be connected to protective earth. The connections to protective earth and power supply have to be able to protect the machine frame from harmful or dangerous electrical potential (voltage).

NOTE: The earthing must be carried out according to local regulations before the machine is connected to the supply voltage.

NOTE: The warranty does not cover destroyed bearings due to improper earthing or cabling.

Mark the machine and terminal boxes with earth symbols according to relevant national standards.

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*****Following chapter for application type: Variable speed drive**

4.3.10 Requirements for machines fed by frequency converters

In compliance with the EMC directive (89/336/EEC, as amended by 93/68/EEC) it is required that an AC machine fed with frequency converter is installed with screened cables as specified below. For information on other equivalent cables, please contact your local ABB representative.

4.3.10.1 Main cable

The main supply cable between the machine and the frequency converter must be a symmetrical three conductor screened cable in order to fulfil the radiated emission requirements stated in the generic emission standard for industrial environment, EN 50081-2. For further information, see ABB manual *Grounding and cabling of the drive system (3AFY 61201998 R0125 REV A)*.


4.3.10.2 Earthing of main cable

The compliance with EMC directive requires high-frequency earthing of the main cable. This is achieved by a 360° earthing of the cable screens at the cable entries in both the machine and in the frequency converter. The earthing at the machine is implemented for example by means of the EMC ROX SYSTEM cable transits for shielded installations.

NOTE: 360° high-frequency earthing of cable entries is made in order to suppress electromagnetic disturbances. In addition, cable screens have to be connected to protective earth (PE) in order to meet safety regulations.

4.3.10.3 Auxiliary cables

The auxiliary cables must be screened to meet the EMC requirements. Special cable glands must be used for the 360° high-frequency earthing of the cable screens at the cable entries.

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Chapter 5 Commissioning and Start-up

5.1 General

A commissioning report is a vital tool for future service, maintenance and fault finding.

The commissioning is not to be considered finalized before an acceptable commissioning report has been documented and filed.

The commissioning report has to be available in warranty requests in order to obtain warranty for the machine. For contact information, see *Chapter 9.1.5 After Sales contact information*.

The recommended commissioning report can be found in *Appendix COMMISSIONING REPORT*.

5.2 Check of mechanical installation

Check alignment of the machine prior to commissioning:

- Go through the alignment report and ensure that the machine is accurately aligned according to ABB alignment specifications in *Chapter 3.6 Alignment*
- The alignment protocol should always be included in the commissioning report

Check that the machine is properly anchored to the foundation:

- Check for cracks in the foundation and the general condition of the foundation
- Check the tightness of the mounting bolts.

Additional checks, when applicable:

- Check that the lubrication system is commissioned and is running before the rotor is turned
- If possible, turn the rotor by hand and make sure that the rotor turns freely and that no abnormal sound can be heard
- Check the assembly of the main terminal box and cooling system
- Check the connection of oil and cooling water pipes and check for leaks when running
- Check pressure and flow for oil and cooling water.

5.3 Insulation resistance measurements


Before a machine is started up for the first time, after a long period of standstill or within the scope of general maintenance work, the insulation resistance of the machine must be measured, see *Chapter 7.6.4 Insulation resistance test*.

5.4 Check of electrical installation

The power cables can be permanently connected to the terminals in the main terminal box when the stator insulation resistance has been measured, see *Chapter 7.6.4 Insulation resistance test*.

Check connection of power cables:

- Check that the cable lug bolts are tightened with proper torque

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- Check that the power cables are suitably routed
- Check that the power cables are stress-relieved in a proper way
- Check the connections of the auxiliary equipment.

NOTE: If the machine is delivered without a main terminal box, see *Chapter 4.3.4.1 Delivery without main terminal box*.

*****Following note for protection type: All machines for hazardous areas**

NOTE: If an anti-condensation heater, without self-regulation, is turned on immediately after the motor is shut down, take suitable measures to control the inside motor housing temperature. The anti-condensation heaters can only operate within a temperature-controlled environment.

5.5 Control and protection equipment

5.5.1 General

The machine is equipped with temperature detectors to be connected to a temperature monitoring and protection system. The location and type, as well as the settings for these detectors, can be found on the dimensional drawing, and the connection diagram of the machine.

The temperature alarm level for resistance temperature detectors (RTD, Pt-100) should be set as low as possible. The level can be determined based on the test results, or the noticed operating temperature. The temperature alarm can be set 10K (20°F) higher than the operating temperature of the machine during maximal load at highest ambient temperature.

If a two-function temperature monitoring system is used, the lower level is normally used as an alarm level and the higher as a trip level.

NOTE: In case the machine trips, the reason must be found and eliminated before the machine is restarted. In case of an alarm, find the reason and correct the situation. Use the trouble shooting guide, see *Chapter 8.1 Trouble shooting*.


*****Following note for rotor type: Permanent magnet rotor**

NOTE: Permanent magnet synchronous machines are equipped with Pt100 resistance elements and/or thermistors. The use of these protective elements is mandatory to avoid the risk of overloading the machine.

5.5.2 Stator winding temperature

5.5.2.1 General

The stator windings are manufactured according to temperature rise class F, which has a temperature limit of 155°C (300°F). A high temperature will age the insulation and shorten the lifetime of the winding. Therefore, thorough consideration should be made when deciding the temperature trip and alarm levels for the winding.

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5.5.2.2 Resistance temperature detectors

Recommended maximum temperature settings:

For determining the temperature settings, see the Connection Diagram delivered with the machine. It is recommended to apply the method described in *Chapter 5.5.1 General* when setting the temperature alarm.

5.5.2.3 Thermistors

If the machine is equipped with thermistors (PTC), the operating temperature of the thermistors is found on the Connection Diagram. The operating function can be chosen to be an alarm or a trip signal. If the machine is equipped with six thermistors, both alarm and trip signals can be used respectively.

5.5.3 Bearing temperature control

5.5.3.1 General

The bearings can be equipped with temperature detectors for monitoring the bearing temperatures. The viscosity of the grease or oil used will become smaller as a function of higher temperature. When the viscosity falls below a certain limit, the ability to form a lubricating film inside the bearing will cease, and the bearing will fail, and possibly, shaft damage will occur as a result.

If the machine is equipped with resistance temperature detectors, the temperature of the bearings should preferably be monitored continuously. If the temperature of a bearing unexpectedly starts to rise, the machine should be shut down immediately, as the temperature rise might indicate a bearing failure.

5.5.3.2 Resistance temperature detectors

Recommended maximum temperature settings:


For determining the temperature settings, see the Connection Diagram delivered with the machine. It is recommended to apply the method described in *Chapter 5.5.1 General* when setting the temperature alarm.

5.5.3.3 Thermistors

If the rolling bearings are equipped with thermistors (PTC), the operating temperature of the thermistors is found on the Connection Diagram. The operating function can be chosen to be an alarm or a trip signal. If the rolling bearings are equipped with two thermistors, both alarm and trip signals can be used respectively.

5.5.4 Protection equipment

The machine has to be protected against various disturbances, faults and overloading that might damage the machine. The protection must be in accordance with the instructions and regulations for each country where the machine is used.

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The machine parameter values for relay settings are informed in the document "Performance data of machine" which is included in the documentation provided with the machine.

NOTE: The machine manufacturer is not responsible for the adjusting the protection equipment at the site.

5.6 First test start

5.6.1 General

The first test start is a standard procedure after the installation and alignment procedure is finished, the mechanical and electrical connections are made, the commissioning procedure is gone through and the protective devices are active.

NOTE: If possible, the first start is made with uncoupled coupling between the driving and driven machine. The load on the machine must in any case be as small as possible.

5.6.2 Precautions before first test start

A visual inspection of the machine and its equipment is made before the first test start. It is verified that all necessary tasks, checking and adjustments have been performed.

Before the test start, the following checks and measures must be made:

- If the coupling half is not assembled, the shaft extension key is either locked or removed

***Following bullet for bearing type: Sleeve bearing

- The sleeve bearing oil reservoirs and possible oil supply systems are filled with recommended oil to the correct level. The oil supply system is turned on

***Following bullet for bearing type: Rolling bearing


- The rotor is turned by hand, and it is verified that no abnormal noises are heard from the bearings. To turn a rotor with sleeve bearings, a simple lever arm is needed

***Following bullet for cooling method: Air-to-water

- In case of water-cooled machines, the cooling water is turned on. The tightness of the flanges and the cooling unit is checked
- The cabling, cables and bus bar connections are verified to be according to the connection diagram
- The earth connections and earthing devices are verified
- The starting, control, protection, and alarm relays of each device are inspected
- The insulation resistance of the windings and other equipment verified
- The machine covers are assembled, and the shaft seals are tightly fitted in
- The machine and the environment are cleaned

***Following bullet for protection type: Ex p

- Ex machine enclosure has been purged and it is pressurized. Refer to the purging and pressurizing system instructions.

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5.6.3 Starting

The first start should last only about one (1) second, during which the direction of rotation of the machine is verified. The direction of rotation of possible external blower motors must also be verified. It is also verified that the rotating parts do not touch any stationary parts.

NOTE: If the machine does not have an axially locating bearing, and the machine is started uncoupled, it is normal that the shaft will move axially before stabilizing.

5.6.3.1 Direction of rotation

The objective of the first starting is to check the direction of rotation of the machine. The machine should turn in the same direction as is shown with an arrow located on the frame or the fan cover. The direction of rotation of the external blower motor is indicated by an arrow near the blower motor. The machine may only be operated in the specified direction of rotation. The direction of rotation is indicated on the marking plate, see *Appendix Typical position of plates*.

Machines suitable for reversing operation are labelled with a double-headed arrow on the rating plate, as well as on the frame.

If the desired direction of rotation for some reason is different from the one specified on the machine, the cooling fans, in inner and/or outer cooling circuit, must be changed, as well as the stamp on the rating plate.

To alter the direction of rotation, interchange the power supply phases.

*****Following chapter for rotor type: Slip rings**

5.6.3.2 Starting of machines with slip rings

Machines with slip rings cannot be operated without a starter. The starter is typically a variable resistance connected to each rotor phase via the slip rings. The selection of the starter is done according to required starting torque and current. Starting is typically done with nominal current and nominal torque.

During starting the starter resistance is decreased and speed for breakdown torque is shifted towards higher speed. The speed of the machine is always between actual breakdown torque speed and synchronous speed. Operation between standstill and breakdown torque, or stalling during starting, is not allowed.


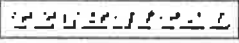
NOTE: Failure in starting the machine without checking the adjustments of the complete slip ring gear can result in serious damage! The connections to the starter and its functions shall also be verified.

NOTE: The brush-lifting device must be in starting position before starting the machine.

*****Following chapter for protection type: Ex p**

5.6.3.3 Starting of Ex p machines

The Ex p machine enclosure is explosion protected during operation by pressurizing. Before pressurizing, the machine enclosure shall be purged with clean air. Detailed commissioning instructions for the purge and pressurization equipment are given in a separate manual. In case

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of eventual noticeable air leaks from the machine enclosure, the leaking joints shall be properly sealed.

The purging and pressurizing system must be included in the starting interlocking system. Connect the alarm and status switch signals of the unit to the main circuit breaker control system. This ensures that it is not possible to start the machine before the purge is complete and the machine enclosure is pressurized.

5.7 Running the machine the first time

After a successful first test start, the coupling between the driving and driven machine should be coupled, and the machine can be restarted.

5.7.1 Supervision during the first run

During running the machine the first time, it is verified that the machine functions as expected. The vibration level, the temperature of the windings and bearings, and other equipment are monitored frequently. If the machine functions as expected, the machine can be left running for a longer time.

Check the operating load of the machine by comparing the load current with the value given on the rating plate of the machine.

Record the temperature readings given by the temperature detectors placed in the windings and possibly in the bearings. Check the temperatures frequently to ensure that they remain below the limits. Continuous temperature monitoring is recommended.

NOTE: If resistance temperature detector (RTD, Pt-100) or equivalent is not available, the surface temperature of the bearing area shall, if possible, be measured. The bearing temperature is approximately 10°C (20°F) higher than the surface temperature.

In case of any deviations from expected normal operation, e.g. elevated temperatures, noise or vibration, shut down the machine, and find the reason for the deviations. If necessary, consult the manufacturer of the machine.


NOTE: Do not disengage any protective devices during running of the machine, or during search for a reason for unexpected function of the machine.

5.7.2 Checks during running of the machine

During the first days of running, it is important to keep a close surveillance of the machine in case of any changes in vibration or temperature levels or abnormal sounds should occur.

5.7.3 Bearings

The rotating electrical machines manufactured by ABB are equipped with either rolling or sleeve bearings.

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***Following chapter for bearing type: Rolling bearing

5.7.3.1 Machines with rolling bearings

In case of a newly installed machine or a machine, which has been out of service for more than 2 months, inject new grease into the bearings immediately after start-up. New grease must be injected when the machine is running, and is injected until old grease or excess new grease is discharged through the lubrication channel in the bottom of the bearing housing, see *Figure 5-1 Example of lubrication channel through bearing arrangement of horizontal machine.*

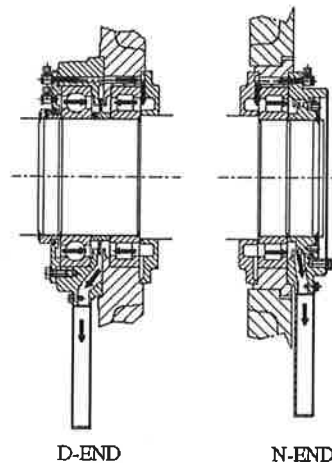



Figure 5-1 Example of lubrication channel through bearing arrangement of horizontal machine

NOTE: The re-lubrication interval will never be longer than 12 months.

The type of original grease used is found on the bearing plate on the machine. Acceptable types of grease can be found in *Chapter 7.5.3 Rolling bearings.*

The temperature of the bearings will initially increase because of the excess grease. After few hours, the excess grease will be discharged through the lubrication valve and the temperature of the bearing will return to normal running temperature.

If available, and after the machine has been running for several hours, measure the vibrations or SPM-values from the SPM-nipples, and record the values for future reference use.

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***Following chapter for bearing type: Sleeve bearing

5.7.3.2 Machines with sleeve bearings

Verify that no rotating parts rub against any stationary parts. Verify through the oil sight glass that the oil level inside bearing is correct. The correct oil level is in the middle of the oil sight glass, but as long as the oil level is within the oil sight glass, the level is acceptable.

Check the temperature and the oil level of the bearings continuously in the beginning. This is particularly important for self-lubricating bearings. If the temperature of the bearing suddenly rises, the machine should be stopped immediately, and the reason for the temperature rise must be found before the machine is re-started. If no logical reason is found from the measurement equipment, it is recommended that the bearing is opened, and its condition verified. If the machine is under warranty, the manufacturing factory must always be contacted before any action is taken.

For self-lubricating bearings, the rotation of the oil ring is verified through the inspection window on top of the bearing. If the oil ring is not rotating, the machine must be stopped immediately, as a stopped oil ring will result in bearing failure.

For flood-lubricated machines, the oil supply pressure is adjusted with the pressure valve and orifice. The normal supply pressure is 125 kPa \pm 25 kPa (18 psi \pm 4 psi). This gives the right flow of oil to the bearing. Using higher supply pressure gives no additional benefit, but can cause bearing oil leakages. The rate of oil flow is also specified on the dimensional drawing.

NOTE: The lubrication system should be constructed so that the pressure inside the bearing is equal to the atmospheric (outside) pressure. Air pressure entering the bearing from either inlet or outlet oil pipes will cause bearing oil leakages.

5.7.4 Vibrations

For a comprehensive discussion on vibrations, see *Chapter 7.4.2 Vibration and noise*.


5.7.5 Temperature levels

The temperatures of the bearings, stator windings and cooling air should be checked when the machine is running.

The winding and bearing temperature may not reach a stable temperature until after several (4-8) hours, when running at full load.

The stator winding temperature depends on the load of the machine. If full load cannot be obtained during or soon after commissioning, the present load and temperature should be noted and included in the commissioning report.

Recommended settings for alarm and trip levels see main connection diagram and *Chapter 7.4.3.3 Evaluation*.

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*****Following chapter for cooling type: Air-to-air and air-to-water**

5.7.6 Heat exchangers

Prior to start, check that the connections are tight and there is no leakage in the system. After running the machine for some time, the cooling system should be checked. Verify that the cooling fluid, where applicable, and air is circulating without any obstruction.

*****Following chapter for rotor type: Slip rings**

5.7.7 Slip rings

Check that the brushes on the slip rings are not sparking.


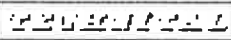
5.8 Shut down

The shutdown of the machine depends on the application, but main guidelines are:

- Reduce the load of the driven equipment, if applicable
- Open the main breaker
- Switch possible anti condensation heaters on, if not automatically done by switch gear

*****Following bullet for cooling type: Air-to-water, and water jacket**

- On water cooled machines, switch off the cooling water flow to avoid condensation inside the machine.

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Chapter 6 Operation

6.1 General

To ensure trouble-free running a machine must be looked after and carefully supervised.

Always before starting up the machine ensure that:

- The bearings are greased or filled with oil to a correct level in accordance with the manufacturer's technical specifications and the dimensional drawing
- The cooling system is functioning
- The machine enclosure has been purged and is pressurized if applicable
- No maintenance is ongoing
- The personnel and equipment associated with the machine are ready to start up the machine.

For start-up procedure, see *Chapter 5.6.3 Starting*.

In case any deviations from expected normal operation are noticed, e.g. elevated temperatures, noise or vibration, shut down the machine, and find the reason for the deviations. If necessary, consult the manufacturer of the machine.

NOTE: The machine may have hot surfaces when running with load.

***Following note for rotor type: Permanent magnet rotor

NOTE: Overloading the machine may cause demagnetization of the permanent magnets as well as winding damages.

6.2 Normal operating conditions


The machines manufactured by ABB are individually designed to operate in normal operation conditions according to the IEC or NEMA standards, customer specifications and internal ABB standards.

The operation conditions, such as maximum ambient temperature and maximum operating height, are specified in the performance data sheet delivered as a part of the project documentation. The foundation shall be free from external vibration, and the surrounding air shall be free of dust, salt and corrosive gases or substances

NOTE: The safety precautions shown in *Safety Instructions* at the beginning of the manual must be observed at all times.

6.3 Number of starts

The number of allowed consecutive starts of direct on line supplied machines depends essentially on the load characteristics (torque curve vs. rotational speed, inertia), and on the machine type and design. Too many and/or too heavy starts cause abnormally high temperatures and stresses on the machine, thus accelerating the ageing of the machine and resulting in an abnormally short lifetime, or even a machine failure.

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For information on the allowed consecutive or annual starts, please see the performance data sheet or consult the manufacturer. The load characteristics of the application are needed for determining the starting frequency. As a guideline, the maximum number of starts in a typical application is 1000 starts per year.

A counter system for controlling the number of starts should be used and maintenance intervals should be determined based on equivalent operating hours, see *Chapter 7.3 Maintenance program*.

NOTE: The safety precautions shown in the *Safety Instructions* at the beginning of the manual must be observed at all times.

6.4 Supervision

The operating personnel should inspect the machine at regular intervals. This means that they should listen, feel and smell the machine and its associated equipment in order to obtain a feeling for normal operating condition.

The object of the supervision inspection is to familiarize the personnel with the equipment. This is essential in order to detect and fix abnormal occurrences in time.

The difference between supervision and maintenance is rather diffuse. Normal supervision of operation includes logging of operating data such as load, temperatures and vibrations. This data is useful basis for maintenance and service.

- During the first period of operation (- 200 hours) supervision should be intensive. Temperatures of bearings and windings, load, current, cooling, lubrication and vibration shall be checked frequently
- During the following duty period (200 - 1000 hours), a check-up once a day is sufficient. A record of supervision inspections should be filed and saved for further reference. The time between inspections may be extended if the operation is continuous and stable.

For relevant check-lists, see *Appendix COMMISSIONING REPORT*.

6.4.1 Bearings


The bearing temperatures and lubrication should be monitored closely, see *Chapter 5.7.3 Bearings*.

6.4.2 Vibrations

The vibration levels of the driving-driven machine system should be monitored, see *Chapter 7.4.3 Vibrations*.

6.4.3 Temperatures

The temperatures of the bearings, stator windings and cooling air should be checked when the machine is running, see *Chapter 5.7.5 Temperature levels*.

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*****Following chapter for cooling type: Air-to-air, and air-to-water**

6.4.4 Heat exchanger

Check that the connections are tight and there is no leakage in the system. Verify that the cooling fluid, where applicable, and air is circulating without any obstruction.

*****Following chapter for rotor type: Slip rings**

6.4.5 Slip ring unit

Follow the wear of the carbon brushes and change them before the wear limit is reached. Verify that the brushes are not sparking.

Ensure that the slip ring surfaces are smooth. If not, the slip rings must be smoothed on a lathe. Under ideal conditions, an even layer of brown patina will form on the slip rings during the first few hours of operation.

Check the tightness of the slip ring housing. Water, grease, oil, or dust should not be permitted to enter the housing.

6.5 Follow-up

The follow-up of operation includes logging of operating data such as load, temperatures and vibrations. This data is useful basis for maintenance and service.


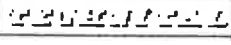
6.6 Shut down

When the machine is not in operation, anti-condensation heaters have to be switched on where applicable. This is to avoid condensation effect inside the machine.

*****Following paragraph for cooling method: Air-to-water, and water jacket**

For machines with water-cooling, the cooling water supply must be switched off in order to avoid condensation inside the machine.

NOTE: Voltage may be connected to the terminal box for heating element.

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Chapter 7 Maintenance

7.1 Preventive maintenance

A rotating electrical machine often forms an important part of a larger installation and if it is supervised and maintained properly, it will be reliable in operation and guarantee a normal lifetime.

The purpose of maintenance is therefore to:

- Secure that the machine will function reliably without any unforeseen actions or interventions
- Estimate and plan service actions in order to minimize down time.

The difference between supervision and maintenance is rather diffuse. Normal supervision of operation and maintenance includes logging of operating data such as load, temperatures, vibrations, as well as verification of the lubrication, and measurement of the insulation resistances.

After commissioning or maintenance, the supervision should be intensive. Temperature of bearings and windings, load, current, cooling, lubrication and vibration shall be checked frequently.

This chapter presents recommendations regarding maintenance program, and work instructions how to conduct common maintenance tasks. These instructions and recommendations should be read carefully and be used as a basis when planning the maintenance program. Note that the maintenance recommendations presented in this chapter represent a minimum level of maintenance. By intensifying maintenance and supervision activities, the reliability of the machine and the long-term availability will increase.

The data obtained during supervision and maintenance is useful for estimating and planning additional service. In case some of this data indicates something out of the ordinary, the trouble shooting guides in *Chapter 8 Trouble Shooting*, will aid in locating the reason for the trouble.

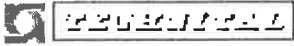
ABB recommends the use of experts in the creating maintenance programs, as well as in performing the actual maintenance and possible trouble shooting. The ABB After Sales organization is happy to assist in these issues. The ABB After Sales contact information can be found in *Chapter 9.1.5 After Sales contact information*.

An essential part of the preventative maintenance is to have a selection of suitable spare parts available. The best way to have access to critical spare parts is to keep them on stock. Ready-made spare part packages can be obtained from the ABB After Sales, see *Chapter 9.1.2 Spare Parts*.

7.2 Safety precautions

Before working on any electrical equipment, general electrical safety precautions are to be taken into account, and local regulations are to be respected in order to prevent personnel injury. This should be made according to instructions of the security personnel.

Personnel performing maintenance on electrical equipment and installations must be highly qualified. The personnel must be trained in, and familiar with, the specific maintenance procedures and tests required for rotating electrical machines.

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*****Following three paragraphs for protection type: All machines for hazardous areas**

Machines for hazardous areas are specially designed to comply with official regulations concerning the risk of explosion. If improperly used, badly connected, or altered, no matter how minor, their reliability could be in doubt.

Standards relating to the connection and use of electrical apparatus in hazardous areas must be taken into consideration, especially national standards for installation (see standards: IEC 60079-14, IEC 6000-17 and IEC 6007-19). Only trained personnel familiar with these standards should handle this type of apparatus.

Disconnect and lock out before working on the machine or the driven equipment. Ensure that no explosive atmosphere is present while the work is in progress.

For general safety instructions, see *Safety Instructions* at the beginning of the manual.

*****Following note for rotor type: Permanent magnet rotor**



NOTE: The permanent magnet synchronous machine produces voltage when the shaft is rotating. Prevent rotation of the shaft before opening the terminal box. Do not open or touch the unprotected terminals while the shaft of the machine is rotating. Follow the *Safety Instructions* at the beginning of the manual.

*****Following note for application type: Variable speed drive**


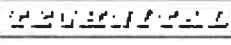
NOTE: The terminals of a machine with frequency converter supply may be energized even when the machine is at standstill.

7.3 Maintenance program

This chapter presents a recommended maintenance program for ABB machines. This maintenance program is of a general nature, and should be considered as a minimum level of maintenance. Maintenance should be intensified when local conditions are demanding or very high reliability is required. It should also be noted that even when following this maintenance program, normal supervision and observation of the machine's condition is required.

Please note that even though the maintenance programs below have been customized to match the machine, it might contain references to accessories not available on all machines.

The maintenance program is based on four levels of maintenance, which rotate according to operating hours. The amount of work and down time vary, so that level 1 includes mainly quick visual inspections and level 4 more demanding measurements and replacements. More information about the spare part packages suitable for these maintenances can be found in *Chapter 9.2 Spare parts for rotating electrical machines*. The recommended maintenance interval can be seen in *Table 7-1 Maintenance intervals*. The operation hour recommendation in this chapter is given as equivalent operating hours (Eq. h), that can be counted by the following formula:

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*****Following paragraph for application type: Variable speed drive**

Equivalent operating hours (Eq. h) = Actual operating hours

*****Following paragraph for application type: Constant speed drive**

Equivalent operating hours (Eq. h) = Actual operating hours + Number of starts x 20

Level 1 (L1)

Level 1 or L1 maintenance consists of visual inspections and light maintenance. The purpose of this maintenance is to do a quick check whether problems are beginning to develop before they cause failures and unscheduled maintenance breaks. It gives also suggestions what maintenance issues must be performed in the next lager overhaul.

The maintenance can be estimated to last approximately 4 - 8 hours, depending on the type and installation of the machine and the depth of the inspections. Tools for this maintenance include normal servicing tools i.e. wrenches and screw drives. The preparations consist of opening the inspection covers. It is recommended that at least the Operational spare part package is available when commencing this maintenance. The packages are shown in *Chapter 9.2.5 Typical recommended spare parts in different sets*.

The first Level 1 maintenance should be performed after 4 000 equivalent operating hours or six months after commissioning. Subsequently the L1 maintenance should be performed yearly halfway between Level 2 maintenances, see *Table 7-1 Maintenance intervals*.

Level 2 (L2)

Level 2 or L2 maintenance consists mainly of inspections and tests and small maintenance tasks. The purpose of this maintenance is to find out whether there are problems in the operation of the machine and to do small repairs to ensure uninterrupted operation.


The maintenance can be estimated to last approximately 8 - 16 hours, depending on the type and installation of the machine and the amount of servicing to be done. Tools for this maintenance include normal servicing tools, multi meter, torque wrench and insulation resistance tester. The preparations consist of opening the inspection covers and bearings if necessary. Spare parts suitable for this level of maintenance are included in the Operational spare part package. The packages are shown in *Chapter 9.2.5 Typical recommended spare parts in different sets*

The first Level 2 maintenance should be performed after 8 000 equivalent operating hours or one year after commissioning. Subsequently the L2 maintenance should be performed yearly or after every 8 000 equivalent operating hours, see *Table 7-1 Maintenance intervals*.

Level 3 (L3)

Level 3 or L3 maintenance consists of performing extensive inspections, tests and larger maintenance tasks that have come up during L1 and L2 maintenances. The purpose of this maintenance is to repair encountered problems and replace parts subjected to wear.

The maintenance can be estimated to last approximately 16 - 40 hours, depending on the type and installation of the machine and the amount of repairs and replacements to be done. Tools for this maintenance include the same tools as for L2 and in addition an endoscope and an oscilloscope. The preparations consist of opening the inspection covers, the bearings and the water cooler, if applicable. Spare parts suitable for this level of maintenance are included in the Recommended spare parts package. The packages are shown in *Chapter 9.2.5 Typical recommended spare parts in different sets*.

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The Level 3 maintenance should be performed after every 24 000 equivalent operating hours or at a three to five year interval. When L3 maintenance is conducted it replaces the L1 or L2 maintenance otherwise scheduled, and it leaves their rotation unaffected, see *Table 7-1 Maintenance intervals*.

Level 4 (L4)

Level 4 or L4 maintenance consists of performing extensive inspections and maintenance tasks. The purpose of this maintenance is to restore the machine into a reliable operating condition.

The maintenance can be estimated to last approximately 40 - 80 hours, depending mostly on the condition of the machine and the needed reconditioning actions. Tools for this maintenance include the same tools as for L3, and in addition, the rotor removal equipment. The preparations consist of opening the inspection covers, bearings and water cooler, if applicable, and the removal of rotor.

The amount of spare parts required for this level of maintenance needs to be determined before the maintenance. At least the Recommended spare part is needed. Spare parts included in the capital spare part package would ensure a fast and successful execution of this maintenance.

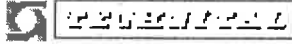
The Level 4 maintenance should be performed after every 80 000 equivalent operating hour. When a L4 maintenance is conducted it replaces the L1, L2 or L3 maintenance otherwise scheduled, and it leaves their rotation unaffected, see *Table 7-1 Maintenance intervals*.

7.3.1 Recommended maintenance program

Abbreviation used in maintenance program:

- V = Visual checking
- C = Cleaning
- D = Disassembling and assembling
- R = Reconditioning or replacement
- T = Testing and measurement

Not all options are applicable for all machines.



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Manual for Induction Motors and Generators**Table 7-1. Maintenance intervals**


Maintenance object	MAINTENANCE INTERVAL				Check / Test
	In equivalent operating hours or time period, which ever comes first				
	L1	L2	L3	L4	
	4 000 Eq. h 12 000 Eq. h 20 000 Eq. h 28 000 Eq. h	8 000 Eq. h 16 000 Eq. h	24 000 Eq.h	80 000 Eq.h	
	½ year	Annual	3-5 years	Overhaul	

7.3.1.1 General construction

Maintenance object	L1	L2	L3	L4	Check / Test
Machine operation	V / T	V / T	V / T	V / T	Starting, shut down, vibration measurement, no-load point
Mounting and foundation	V	V / T	V / T	V / T / D	Cracks, rust, alignment
Exterior	V	V	V	V	Rust, leakage, condition
Fastenings	V	V / T	V / T	V / T	Tightness of all fastenings
Anchor bolts	V	V	V / T	V / T	Fastening, condition

7.3.1.2 Main supply connection

Maintenance object	L1	L2	L3	L4	Check / Test
High voltage cabling	V	V / T	V / T	V / T / D	Wear, fastening
High voltage connections	V	V / T	V / T	V / T / D	Oxidation, fastening
Terminal box accessories, i.e. surge capacitors, arrestors and current transformers	V	V	V	V	General condition
Cable transits	V	V	V	V	Condition of cables entering the machine and inside the machine

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7.3.1.3 Stator and rotor

Maintenance object	L1	L2	L3	L4	Check / Test
Stator core	V	V	V	V / C	Fixing, cracks, welds
Stator winding insulation	V	V / T	V / T / C	V / T / C	Wear, cleanliness, insulation resistance, turn insulation test, (high voltage test)
Stator coil over hangs	V	V	V	V	Insulation damages
Stator coil supports	V	V	V	V	Insulation damages
Stator slot wedges	V	V	V	V	Movement, tightness
Stator terminal bars	V	V	V	V	Fixing, insulation
Instrumentation	V	V	V	V	Condition of cables and cable ties
Rotor winding insulation	V	V / T	V / T / C	V / T / C	Wear, cleanliness, insulation resistance
Rotor balancing weights	V	V	V	V	Movement
Shaft	V	V	V	V	Crack, corrosion
Connections in rotor	V	V	V / T	V / T	Fixing, general condition
Earthing brushes	V	V	V	V	Operation and general condition

NOTE: It is not recommended that totally enclosed machines are dismantled and inspected internally more often than every 3-5 years (L3).

7.3.1.4 Auxiliaries

Maintenance object	L1	L2	L3	L4	Check / Test
Pt-100 elements (stator, cooling air, bearing)	V	V / T	V / T	V / T	Resistance
Anticondensation heaters	V	V / T	V / T	V / T	Operation, insulation resistance
Encoders	V	V	V / T	V / T	Operation, general condition, alignment
Auxiliary terminal boxes	V	V / T	V / T	V / T	General condition, terminals, wiring condition

***Following table for rotor type: Slip rings

7.3.1.5 Slip ring unit

Maintenance object	L1	L2	L3	L4	Check / Test
Assembly	V	V/C	V/C	V/C	Mounting, insulation
Brush holders	v	V/T	V/T	V/T	Alignment
Brushes	V	V/T	V/T	V/T	Arching, clearance
Slip ring cabling	V	V	V	V	Wear, arching
Slip rings	V/T	V/T	V/T	V/T	Wear, roundness, patina
Brush gear	V	V/T	V/T	V/T	Insulation resistance
Pt-100 elements	V	V/T	V/T	V/T	Resistance
Anticondensation heaters	V	V/T	V/T	V/T	Operation, insulation resistance
Encoders	V	V	V/t	V/T	Operation, general condition, alignment
Auxiliary terminal boxes	V	V/T	V/T	V/T	General condition, terminals, wiring condition

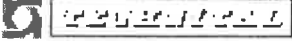
7.3.1.6 Lubrication system and bearings

***Following table for bearing type: Rolling bearing

Maintenance object	L1	L2	L3	L4	Check / Test
Bearing during operation	T	T	T/R	T/R	General condition, extra noise, vibration
Waste grease	V	V/C	V/C	V/C	Condition, purging
Re-greasing	V	V/R	V/R	V/R	According to bearing plate
Seals	V	V/D	V/D	V/D	Leakage
Bearing insulation	V/C	V/C	V/C/T	V/C/T	Endshield cleanliness, insulation resistance

***Following table for bearing type: Sleeve bearing

Maintenance object	L1	L2	L3	L4	Check / Test
Bearing assembly	V	V/T	V/T	V/T	Fixing, general condition
Bearing shells	V	V	V/T/D	V/T/D	General condition, wear
Seals and gaskets	V	V	V/T/D	V/T/D	Leakage
Bearing insulation	V	V/T	V/T/D	V/T/D	Condition, insulation resistance
Lubrication piping	V	V	V/T/D	V/T/D	Leakage, operation

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Maintenance object	L1	L2	L3	L4	Check / Test
Lubrication oil	V/R	V/R	V/R	V/R	Quantity, quality, flow
Oil ring	V	V	V	V	Operation
Oil flow regulator	V	V/T	V/T	V/T/D	Operation
Oil tank	V	V/C	V/C	V/C	Cleanliness, leakage
Jack-up system	V	V/T	V/T	V/T	Operation
Oils cooler / heater	T	T	T	T	Oil temperature

7.3.1.7 Cooling system

***Following table for cooling type: Open air

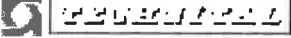
Maintenance object	L1	L2	L3	L4	Check / Test
Fan(s)	V	V	V	V	Operation, condition
Filters	V/C	V/C	V/C/R	V/C/R	Cleanliness, operation
Air ways	V	V/C	V/C	V/C	Cleanliness, operation

***Following table for cooling type: Air-to-air

Maintenance object	L1	L2	L3	L4	Check / Test
Fan(s)	V	V	V	V	Operation, condition
Tubes	V	V/C	V/C	V/C	Cleanliness, operation
Ducts	V	V/C	V/C	V/C	Cleanliness, operation
Plate fins	V	V/C	V/C	V/C	General condition
Vibration dampers	V	V	V	V	Condition and profile

***Following table for cooling type: Air-to-water

Maintenance object	L1	L2	L3	L4	Check / Test
Heat exchanger	V	V	V	V	Leakage, operation, pressure test
Fan	V	V	V	V	Operation, condition
Tubes	V	V/C	V/C	V/C	Cleanliness, corrosion
Ducts	V	V/C	V/C	V/C	Cleanliness, operation
End cases	V	V/C	V/C	V/C	Leakage, condition
Seals and gaskets	V	V/C	V/C	V/C	Leakage, condition

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Maintenance object	L1	L2	L3	L4	Check / Test
Plate fins	V	V/C	V/C	V/C	General condition
Vibration dampers	V	V	V	V	Condition and profile
Protective anodes			V/C	V/C	Condition, activity
Water flow regulator	V/T	V/T	V/T	V/T	Operation

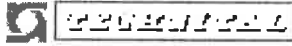
7.4 Maintenance of general constructions

To ensure a long life span for the general construction of the machine, the machine exterior should be kept clean and should periodically be inspected for rust, leaks and other defects. Dirt on the machine exterior exposes the frame to corrosion and can affect the cooling of the machine.

7.4.1 The tightness of fastenings

The tightness of all fastenings should be verified regularly. Special focus should be given to the grouting, the anchor bolts and the rotor parts, which must remain correctly tightened at all times. Loose fastening in these parts can lead to sudden and severe damage to the entire machine.

General values for tightening torques are presented in *Table 7-2 General tightening torques*.



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Table 7-2. General tightening torques


Size	Tightening torque in Nm (pound-feet) Property class 8.8 for bolts			
	Oiled [Nm]	Oiled [pound feet]	Dry [Nm]	Dry [pound feet]
M 4	2.7	2.0	3.0	2.2
M 5	5.0	3.7	5.5	4.1
M 6	9	6.6	9.5	7.0
M 8	22	12	24	18
M 10	44	32	46	34
M 12	75	55	80	59
M 14	120	88	130	96
M 16	180	130	200	150
M 20	360	270	390	290
M 24	610	450	660	490
M 27	900	660	980	720
M 30	1200	890	1300	960
M 36	2100	1500	2300	1700
M 39	2800	2100	3000	2200
M 42	3400	2500	3600	2700
M 48	5200	3800	5600	4100

NOTE: The values in *Table 7-2 General tightening torques* are general, and do not apply to various items, such as diodes, support insulators, bearings, cable terminals or pole fastenings, bus bar terminals, surge arrestors, capacitors, current transformers, rectifier and thyristor bridges, or if some other value is given elsewhere in this manual.

7.4.2 Vibration and noise

High or increasing vibration levels indicate changes in the machine's condition. Normal levels vary greatly depending on the application, type and foundation of the machine. The vibration measurements and levels are discussed in detail in *Chapter 7.4.3 Vibrations*. Some typical reasons that might cause high noise or vibration levels are:

- Alignment, see *Chapter 3 Installation and Alignment*
- Bearing wear or damage
- Vibration from connected machinery, see *Chapter 7.4.3 Vibrations*

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- Loose fastenings or anchor bolts, see *Chapter 3 Installation and Alignment*
- Rotor imbalance
- Coupling.

7.4.3 Vibrations

The following instructions are part of the following two ISO standards: ISO 10816-3:1998 Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts: Part 3: Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15 000 r/min when measured in situ and ISO 8528-9:1995 Reciprocating internal combustion engine driven alternating current generating sets: Part 9: Measurement and evaluation of mechanical vibrations.


7.4.3.1 Measurement procedures and operational conditions

Measurement equipment

The measurement equipment shall be capable of measuring broad-band r.m.s. vibration with flat response over a frequency range of at least 10 Hz to 1 000 Hz, in accordance with the requirements of ISO 2954. Depending on the vibration criteria, this may require measurements of displacement or velocity or combinations of these (see ISO 10816-1). However, for machines with speeds approaching or below 600 r/min, the lower limit of the flat response frequency range shall not be greater than 2 Hz.

Measurement locations

Measurements will usually be taken on exposed parts of the machine that are normally accessible. Care shall be taken to ensure that measurements reasonably represent the vibration of the bearing housing and do not include any local resonances or amplification. The locations and directions of vibration measurements shall be such that they provide adequate sensitivity to the machine dynamic forces. Typically, this will require two orthogonal radial measurement locations on each bearing cap or pedestal, as shown in *Figure 7-1 Measuring points*. The transducers may be placed at any angular position on the bearing housings or pedestals. Vertical and horizontal directions are usually preferred for horizontally mounted machines. For vertical or inclined machines, the location that gives the maximum vibration reading, usually in the direction of the elastic axis, shall be one of those used. In some cases it may be recommended to measure also in the axial direction. The specific locations and directions shall be recorded with the measurement.

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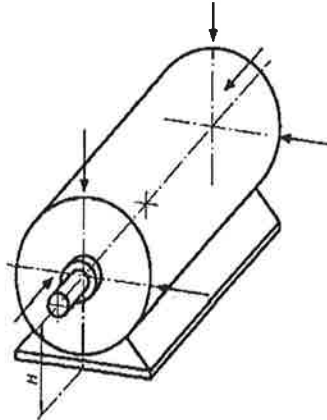


Figure 7-1 Measuring points

7.4.3.2 Classification according to support flexibility

Two conditions are used to classify the support assembly flexibility in specified directions:

- rigid supports
- flexible supports

These support conditions are determined by the relationship between the machine and foundation flexibilities. If the lowest natural frequency of the combined machine and support system in the direction of measurement is higher than its main excitation frequency (this is in most cases the rotational frequency) by at least 25 %, then the support system may be considered rigid in that direction. All other support systems may be considered flexible.

7.4.3.3 Evaluation


ISO 10816-1 provides a general description of the two evaluation criteria used to assess vibration severity on various classes of machines. One criterion considers the magnitude of observed broad-band vibration; the second considers changes in magnitude, irrespective of whether they are increases or decreases.

Evaluation zones

The following evaluation zones are defined to permit a qualitative assessment of the vibration of a given machine and provide guidelines on possible actions.

Zone A: The vibration of newly commissioned machines would normally fall within this zone.

Zone B: Machines with vibration within this zone are normally considered acceptable for unrestricted long-term operation.

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Zone C: Machines with vibration within this zone are normally considered unsatisfactory for long-term continuous operation. Generally, the machine may be operated for a limited period in this condition until a suitable opportunity arises for remedial action.

Zone D: Vibration values within this zone are normally considered to be of sufficient severity to cause damage to the machine.

Operational limits

For long-term operation, it is common practice to establish operational vibration limits. These limits take the form of ALARMS and TRIPS.

Setting of ALARMS

The ALARM values may vary considerably, up or down, for different machines. The values chosen will normally be set relative to a baseline value determined from experience for the measurement position or direction for that particular machine.

It is recommended that the ALARM value should be set higher than the baseline by an amount equal to 25 % of the upper limit for zone B. If the baseline is low, the ALARM may be below zone C.

Setting of TRIPS


The TRIP values will generally relate to the mechanical integrity of the machine and be dependent on any specific design features which have been introduced to enable the machine to withstand abnormal dynamic forces. The values used will, therefore, generally be the same for all machines of similar design and would not normally be related to the steady-state baseline value used for setting ALARMS.

Table 7-3. Classification of vibration severity zones for large machines with rated power above 300 kW and not more than 50 MW; electrical machines with shaft height H/315 mm or higher

Support class	Zone boundary	R.m.s. velocity [mm/s]
Rigid	A/B	2.3
	B/C	4.5
	C/D	7.1
Flexible	A/B	3.5
	B/C	7.1
	C/D	11.0

7.5 Maintenance of bearings and lubrication system

This chapter covers the most important maintenance tasks in the bearings and in the lubrication system.

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*****Following chapters for bearing type: Sleeve bearing**

7.5.1 Sleeve bearings

In normal operating conditions, sleeve bearings require little maintenance. To ensure reliable operation, the oil level and the amount of oil leakage should be regularly checked.

7.5.1.1 Oil level

The oil level of a self-lubricated sleeve bearing needs to be checked regularly. The correct oil level is in the middle of the oil sight glass, but as long as the oil level is within the oil sight glass, the level is acceptable.

If necessary, refill with suitable lubricant, see *Chapter 7.5.2.4 Oil qualities*.

The correct oil level of a flood-lubricated sleeve bearing is the same as for a self-lubricated bearing. In flood-lubricated bearings, the oil sight glass might be exchanged for an oil outlet flange.

7.5.1.2 Bearing temperature

The bearing temperatures are measured by Pt-100 resistance temperature detectors. Since a temperature rise above the alarm limit can be caused either by increased losses in the bearing, or by decreased cooling capacity, it often indicates a problem somewhere in the machine or in the lubrication system, and should therefore be closely monitored.

The reasons for abnormal bearing temperature vary, but for some possible reason see *Chapter 7.5.2 Lubrication of sleeve bearings* or *Chapter 8.1.2 Lubrication system and bearings*. If the temperature rise is followed by an increase in vibration levels, the problem might also be related to the machine's alignment, see *Chapter 3 Installation and Alignment* or to damage in the bearing shells in which case the bearing needs to be dismantled and checked.

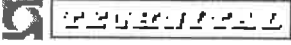
7.5.2 Lubrication of sleeve bearings

The machines are equipped with sleeve bearings with a very long service life provided that the lubrication functions continuously and that the oil type and quality are as per ABB recommendations, and that the oil change instructions are followed.

7.5.2.1 Lubrication oil temperature

The correct lubrication oil temperature is essential in keeping the bearing at the correct operating temperature, and in ensuring sufficient lubrication effect and the correct viscosity of the lubrication oil. For machines equipped with oil supply, the poor operation of oil cooler or heater and incorrect oil flow can cause oil temperature problems. For all bearings, the correct oil quality and quantity need to be checked if temperature problems appear. For more information, see *Chapter 7.5.2.3 Recommended control values for the lubricating oil* and *Chapter 7.5.2.4 Oil qualities*.

NOTE: The minimum ambient temperature in starting (without oil heater) is 0°C (32° F).

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7.5.2.2 Control of the lubricant

During the first year of operation, it is advisable to take samples of the lubricating oil after about 1000, 2000 and 4000 operating hours. The sample should be sent to the oil supplier for analysis. Based on the results it is possible to determine a suitable oil change interval.

After the first oil change, the oil may be analyzed at about the middle and the end of the oil change interval.

7.5.2.3 Recommended control values for the lubricating oil

The lubricating oil should be verified regarding the following aspects:

- Check the oil visually with respect to color, turbidity and deposits in a test bottle. The oil should be clear or negligibly turbid. The turbidity may not be caused by water
- The water content must not exceed 0.2%
- The original viscosity must be maintained within a tolerance of $\pm 15\%$
- The oil should be free from debris, and its cleanliness according to ISO 4406 class 18/15, or NAS 1638 class 9
- The quantity of metal impurities should be less than 100 PPM. An increasing trend of the value means that the bearing is wearing
- The total acid number (TAN) should not exceed 1 mg KOH per gram of oil. Please note that the TAN value is not the same as the TBN (total base number) value
- Smell the oil. Strong acid or burnt smell is not acceptable.

An oil check should be performed a few days after the first test run of the machine, just before the first oil change, and subsequently as required. If the oil is changed just after the commissioning, it can be used again after removing wear particles by filtering or centrifuging.

In doubtful cases, an oil sample may be sent to the laboratory to determine viscosity, acid number, foaming tendency, etc.

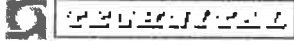
7.5.2.4 Oil qualities

The bearings are designed for one of the oil qualities listed below.

The oils listed below include the following additives:

- Oxidation and rust inhibitor
- Anti-foaming agent
- Anti-wear additive.

NOTE: Verify the correct oil quality from the bearing plate and the dimension drawing.

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	ISO VG 22 Viscosity 22 cSt at 40 °C	ISO VG 32 Viscosity 32 cSt at 40 °C	ISO VG 46 Viscosity 46 cSt at 40 °C	ISO VG 68 Viscosity 68 cSt at 40 °C	ISO VG 100 Viscosity 100 cSt at 40 °C
Environmentally Benign Oils:					
Aral	Vitam EHF 22	-	Vitam EHF 46	-	-
Mobil	-	EAL Hydraulic Oil 32	EAL Hydraulic Oil 46	-	-
Shell	-	Naturelle HF-E 32	Naturelle HF-E 46	Naturelle HF-E 68	-
Mineral Oils:					
Aral	Vitam GF 22	Vitam GF 32	Vitam GF 46	Vitam GF 68	Degol CL 100 T
BP	Energol CS 22	Energol CS 32	Energol CS 46	Energol CS 68	Energol CS 100
Castrol	Hyspin AWS 22	Hyspin AWS 32	Hyspin AWS 46	Hyspin AWS 68	Hyspin AWS 100
Chevron	Texaco Rando HDZ 22	Texaco Rando HDZ 32	Texaco Rando HDZ 46	Texaco Rando HDZ 68	Texaco Rando HDZ 100
Esso	Nuto H 22	Terrestic T 32	Terrestic T 46	Terrestic T 68	-
Klüber		LAMORA HLP 32	LAMORA HLP 46	LAMORA HLP 68	CRUCOLAN 100
Mobil	Velocite Oil No. 10	DTE Oil Light	DTE Oil Medium	DTE Oil Heavy Medium	DTE Oil Heavy
Shell	Tellus S 22	Tellus S 32	Tellus S 46	Tellus S 68	Tellus S 100
Total	Azolla ZS 22	Azolla ZS 32	Azolla ZS 46	Azolla ZS 68	Azolla ZS 100

7.5.2.5 Oil change schedule for mineral oils

For self-lubricated bearings cleaning intervals with oil changes of approximately 8000 operating hours are recommended and approx. 20000 operating hours for bearings with oil circulation systems.

Shorter oil change intervals may be necessary in case of frequent start-ups, high oil temperatures or excessively high contamination due to external influences.

The correct oil change interval can be found on the bearing plate and dimensional drawing, see *Chapter 2.1.2 Bearing plate*.

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*****Following chapter for bearing type: Rolling bearing**

7.5.3 Rolling bearings

7.5.3.1 Bearing construction

In normal operating conditions, rolling bearings require little maintenance. To ensure reliable operation, the bearings should be regularly re-greased with high-quality rolling bearing grease.

7.5.3.2 Bearing plate

All machines are supplied with bearing plates attached to the machine frame. The bearing plates provide bearing information, such as:

- Bearing type
- Lubricant used
- Re-greasing interval, and
- Re-greasing amount.

For more details regarding the bearing plate, see *Chapter 2.1.2 Bearing plate*.

NOTE: It is essential that the information provided on the bearing plate is taken into account when using and maintaining the machine.

7.5.3.3 Re-greasing intervals

Rolling bearings of electrical machines need to be re-greased at regular intervals. The re-greasing interval is found on the bearing plate.

NOTE: Regardless of the re-greasing interval, the bearings need to be re-greased at least once per year.


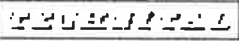
The re-greasing intervals are calculated for an operating temperature of 70°C (160°F). If the operating temperature is lower or higher than the assumed, the re-grease interval has to be altered accordingly. Higher operating temperature decreases the re-greasing interval.

NOTE: An increase in the ambient temperature raises the temperature of the bearings correspondingly. The values for the re-greasing interval should be halved for every 15°C (30°F) increase in bearing temperature and may be once doubled for a 15°C (30°F) decrease in bearing temperature.

Re-greasing intervals for frequency converter drives

Higher speed operation, e.g. in frequency converter applications, or lower speed with heavy load will require shorter lubrication intervals or a special lubricant. Consult manufacturing ABB factory After Sales department in such cases.

NOTE: The constructional maximum speed of the machine must not be exceeded. The suitability of the bearings for high-speed operation must be checked.

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7.5.3.4 Re-greasing

All rolling bearings of rotating electrical machines need to be re-greased, see *Chapter 7.5.3.3 Re-greasing intervals*. The re-greasing can be performed either manually or by means of an automatic system. In either case, it has to be verified that a suitable amount of the correct grease is entering the bearing at suitable intervals.

NOTE: Grease can cause skin irritation and eye inflammation. Follow all safety precautions specified by the grease manufacturer.

Manual re-greasing of the bearings

Machines suited for manual re-greasing are equipped with grease nipples. In order to prevent debris from entering the bearings, the grease nipples, as well as the surrounding area has to be cleaned thoroughly before re-greasing.

Manual re-greasing while the machine is running

Re-greasing while the machine is running:


- Verify that the grease to be used is suitable
- Clean the grease nipples and the area around them
- Verify that the lubrication channel is open, if equipped with a handle, open it.
- Press the specified amount and type of grease into the bearing
- Let the machine run 1-2 hours in order to ensure that all excess grease is forced out of the bearing. The bearing temperature may temporarily increase during this time
- If equipped with a handle, close it.

NOTE: Beware of all rotating parts during the re-greasing.

Manual re-greasing while the machine is at a standstill

Preferably, re-grease the machine while it is running. If this is not possible, or considered dangerous, the re-greasing has to be carried out while the machine is at a standstill. In this case:

- Verify that the grease to be used is suitable
- Stop the machine
- Clean the grease nipples and the area around them
- Verify that the lubrication channel is open, if equipped with a handle, open it.
- Press only half the amount of the specified type of grease into the bearing
- Run the machine for a few minutes at full speed
- Stop the machine
- After the machine has stopped, press the specified amount of the correct grease into the bearing
- Let the machine run 1-2 hours in order to ensure that all excess grease is forced out of the bearing. The bearing temperature may temporarily increase during this time
- If equipped with a handle, close it.

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Automatic re-greasing

A variety of automatic re-lubrication systems is available on the market. However, ABB recommends only the use of electromechanical re-lubrication systems. The quality of the grease entering the bearing has to be checked at least once per year: the grease has to look and feel like new grease. Any separation of the base oil from the soap is not acceptable.

NOTE: If an automatic re-greasing system is used, double the amount of grease indicated on the bearing plate.

7.5.3.5 Bearing grease

It is essential to use grease of good quality and with the correct base soap. This will ensure a long and trouble free lifetime of the bearings.

Grease used for re-greasing should have the following properties:

- Be special rolling bearing grease
- Be of good quality with a lithium complex soap, and with mineral-, or PAO-oil
- Have a base oil viscosity of 100 to 160 cSt at 40°C (105°F)
- Have a consistency NLGI grade between 1.5 and 3. For vertically or in hot conditions mounted machines, NLGI grade 2 or 3 is recommended
- Have a continuous temperature range between -30°C (-20°F) and at least +120°C (250°F).

Grease with the correct properties is available from all major lubricant manufacturers. If the make of grease is changed and compatibility is uncertain, consult the manufacturing ABB factory, see *Chapter 9.1.5 After Sales contact information*.

NOTE: Different makes of grease must not be mixed, unless the compatibility has been verified.

NOTE: Grease additives are recommended. However, a written guarantee should be obtained from the lubricant manufacturer stating that the additives do not damage the bearings or the properties of the grease in the field of the operating temperature. This is especially important for EP additives.

NOTE: Lubricants containing EP admixtures are not recommended.

Recommended rolling bearing grease

ABB recommends any of the following high performance greases to be used:

- Esso Unirex N2, N3 (lithium complex base)
- Mobilith SHC 100 (lithium complex base)
- Shell Albida EMS 2 (lithium complex base)
- Klüber Klüberplex BEM 41-132
- Lubcon Turmogrease Li 802 EP
- Total Multiplex S 2 A
- Fag Arcanol Temp 110

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Re-greasing intervals for greases fulfilling the required properties other than the ones mentioned above should be halved.

Rolling bearing grease for extreme temperatures

If the bearing operating temperature is above 100°C (210°F), please consult the manufacturing ABB factory for suitable greases.

7.5.3.6 Bearing maintenance

The lifetime of the bearings is likely to be shorter than the lifetime of the electrical machine. Therefore, the bearings will have to be changed periodically.

The maintenance of rolling bearings requires special care, tools and arrangements as to ensure a long lifetime of newly fitted bearings.

During bearing maintenance, ensure that:

- No dirt or foreign debris is allowed to enter the bearings at any time during the maintenance
- The bearings are washed, dried and pre-greased with suitable and high quality rolling bearing grease before assembly
- The disassembly and mounting of the bearings does not damage the bearings. The bearings must be removed by using pullers and fitted by heating, or using special tools for the purpose.

If there is a need to change bearings, please contact ABB After Sales. See After Sales contact information in *Chapter 9.1.5 After Sales contact information*.

7.5.4 Bearing insulation and bearing insulation resistance check

The bearing insulation resistance check is a maintenance operation made primarily in the factory during the final assembly and testing. It should also be made during all comprehensive overhauls of the machine. Good insulation is necessary in order to eliminate the possibility of circulating bearing currents, which might be induced by shaft voltages. The insulation of the non-drive end bearing cuts the path of the bearing current and thus eliminates the risk of bearing damages due to bearing currents.


Both the shaft ends should not be insulated from the frame, as an electrically floating shaft would have an unknown electrical potential compared to the surroundings and would, therefore, be a potential source of damage. However, to make the testing of the non-drive end bearing insulation easier, the drive end bearing is also often insulated. This insulation is short-circuited by an earthing cable during normal operation; see *Figure 7-2 D-end bearing earthing cable*.

NOTE: Not all machines are equipped with insulated bearings.

NOTE: Machines with insulated bearings have a sticker indicating the insulated bearing.

7.5.4.1 Procedure

For machines with an insulated drive end bearing, the short-circuit earthing cable in the drive end bearing must be removed prior to commencing the non-drive end bearing insulation resistance test. If the drive end bearing is not insulated, it is required to perform the non-drive

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end bearing insulation resistance test, to remove the drive-end bearing shells or the bearing shield and to lift the shaft. This ensures that there is no electrical contact between the shaft and any other part, for example, frame or bearing housing.

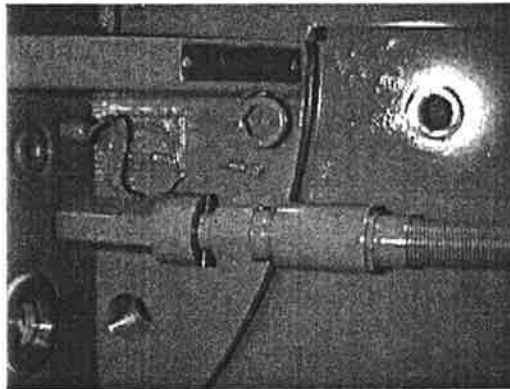


Figure 7-2 D-end bearing earthing cable

For all machines any optional shaft earthing brush, rotor earth fault brush and coupling (if it is made out of conductive material) must be removed. Measure the insulation resistance from the shaft to earth using no more than 100 VDC, see *Figure 7-3 Measuring the insulation resistance of a sleeve bearing* and *Figure 7-4 Measuring the insulation resistance of a roller bearing*. The measuring points over the bearing insulation are circled in the figures.

The insulation resistance is acceptable if the resistance value is more than 10 k Ω .

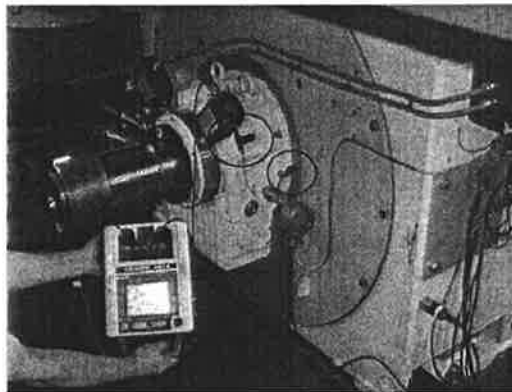



Figure 7-3 Measuring the insulation resistance of a sleeve bearing

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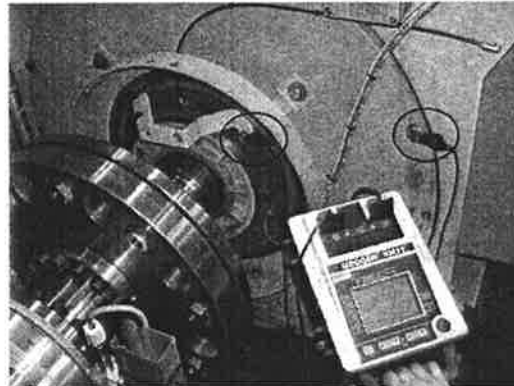


Figure 7-4 Measuring the insulation resistance of a roller bearing

***Following chapter for bearing type: Roller bearing

7.5.4.2 Cleanliness of bearing insulation

The bearing insulations are installed in the end shields. To avoid decrease of the insulation resistance caused by foreign agents (salt, dirt) building up on the insulation surface, the cleanliness of the bearing insulation and the end shield surfaces around it should be checked regularly and cleaned if necessary. See Figure 7-5 Bearing insulation and end shield surfaces for areas that should be checked regularly and kept clean. The areas are marked with a circle and the bearing insulation is pointed out by an arrow in the figure.

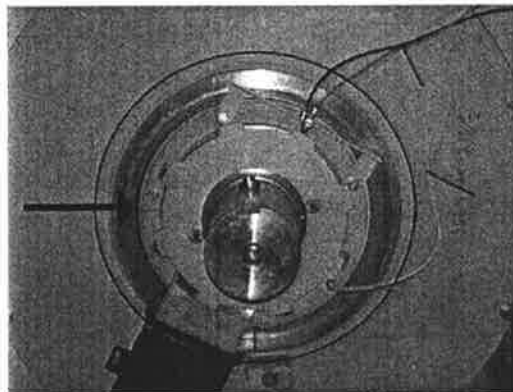



Figure 7-5 Bearing insulation and end shield surfaces

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7.6 Maintenance of stator and rotor windings

The windings of rotating electrical machines are subjected to electrical, mechanical and thermal stresses. The windings and insulation gradually age and deteriorate due to these stresses. Therefore, the service life of the machine often depends on the insulation durability.

Many processes leading to damages can be prevented or at least slowed down with appropriate maintenance and regular testing. This chapter offers a general description on how to perform basic maintenance and tests.

In many countries, ABB Service offers complete service maintenance packages, which include comprehensive testing.

Before conducting any maintenance work on the electrical windings, general electrical safety precautions are to be taken and local regulations are to be respected in order to prevent personnel accidents. See *Chapter 7.2 Safety precautions* for more information.

Independent test and maintenance instructions can also be found in the following international standards:

1. IEEE Std. 43-2000, IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machines
2. IEEE Std. 432-1992, IEEE Guide for Insulation Maintenance for Rotating Electrical Machinery (5 hp to Less Than 10 000 hp)

7.6.1 Particular safety instructions for winding maintenance

Some of the hazardous works of the winding maintenance include:

- Handling of hazardous solvents, varnishes, and resins. Hazardous substances are required for cleaning and re-varnishing windings. These substances can be dangerous if inhaled, swallowed or in any contact with skin or other organs. Seek proper medical care if an accident occurs
- Dealing with flammable solvents and varnishes. Handling and use of these substances should always be by authorized personnel and proper safety procedures must be followed
- Testing at high voltage (HV). High-voltage tests should only be conducted by authorized personnel and proper safety procedures must be followed.


Dangerous substances used in winding maintenance are:

- White spirit: solvent
- 1.1.1-trichloroethane: solvent
- Finishing varnish: solvent and resin
- Adhesive resin: epoxy resin.

NOTE: There are special instructions for handling dangerous substances during maintenance work. These instructions must be followed.

Some general safety measures during winding maintenance are as follows:

- Avoid breathing air fumes: ensure proper air circulation at the work site or use respiration masks
- Wear safety gear such as glasses, shoes, hardhat and gloves and suitable protective clothing to protect the skin. One should always use protective creams

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- Spray-varnish equipment, the frame of the machine, and the windings should be earthed during spray varnishing
- Take necessary precautions when working in pits and cramped places
- Only people trained to do high-voltage work can carry out a voltage test
- Do not smoke, eat, or drink at the work site.

For a test record for winding maintenance, see *Appendix COMMISSIONING REPORT*.

7.6.2 The timing of the maintenance

There are three main principles for timing the winding maintenance:

- Maintenance of the windings should be arranged according to other machine maintenance
- Maintenance should be performed only when necessary
- Important machines should be serviced more often than the less important ones. This also applies to windings that become contaminated rapidly and to heavy drives.

NOTE: As a thumb rule, an insulation resistance test should be made once a year. This should suffice for most machines in most operating conditions. Other tests should only be conducted if problems arise.

A maintenance program for the complete machine, including windings, is presented in *Chapter 7.3 Maintenance program*. This maintenance program however, should be adapted to the customer's particular circumstances, i.e. servicing of other machines and operating conditions as long as recommended servicing intervals are not exceeded.

7.6.3 The correct operating temperature

The correct temperature of the windings is ensured by keeping the exterior surfaces of the machine clean, by seeing to the correct operation of the cooling system and by monitoring the temperature of the coolant. If the coolant is too cold, water may condense inside the machine. This can wet the winding and deteriorate the insulation resistance.

***Following paragraph for cooling type: Open air


For air-cooled machines, it is important to monitor the cleanliness of the air filters. The cleaning and change interval of the air filters should be planned according to the local operating environment.

The stator operating temperatures must be monitored with resistance temperature detectors. Significant temperature differences among the detectors could be a sign of damage in the windings. Make sure that the changes are not caused by the drifting of the measuring channel.

7.6.4 Insulation resistance test

During general maintenance work and before the machine is started up for the first time or after a long period of standstill, the insulation resistance of stator and rotor windings must be measured.

The insulation resistance measurement provides information about the humidity and dirtiness of the insulation. Based upon this information, correct cleaning and drying actions can be determined.

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Manual for Induction Motors and Generators

For new machines with dry windings, the insulation resistance is very high. The resistance can, however, be extremely low if the machine has been subjected to incorrect transportation and storage conditions and humidity, or if the machine is operated incorrectly.

NOTE: Windings should be earthed briefly immediately after measurement in order to avoid risk of electric shock.

7.6.4.1 Conversion of measured insulation resistance values

In order to be able to compare measured insulation resistance values, the values are stated at 40°C. The actual measured value is therefore converted to a corresponding 40°C value with the help of the following diagram. The use of this diagram should be limited to temperatures fairly near to the standard value of 40°C, since large deviations from it could result in errors.

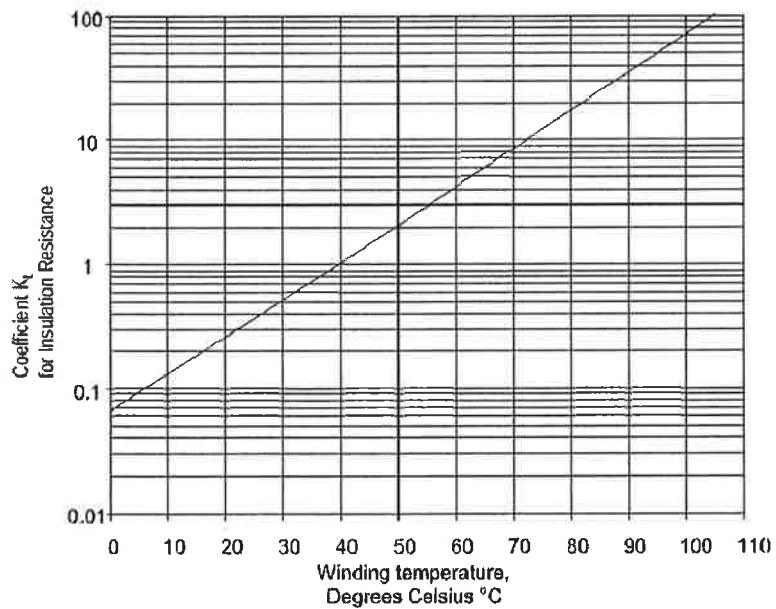


Figure 7-6 Correlation between the insulation resistance and the temperature

R = Insulation resistance value at a specific temperature

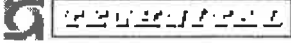
R40 = Equivalent insulation resistance at 40°C

$$R_{40} = k \times R$$

Example:

R = 30 MΩ measured at 20°C

k = 0.25

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$$R_{40} = 0.25 \times 30 \text{ M}\Omega = 7.5 \text{ M}\Omega$$

Table 7-4. Temperature values in degrees Celsius (°C) and degrees Fahrenheit (°F)

°C	0	10	20	30	40	50	60	70	80	90	100	110
°F	32	50	68	86	104	122	140	158	176	194	212	230

7.6.4.2 General considerations

The following consideration should be noted, before deciding any actions based upon the insulation resistance tests:

- If the measured value is considered too low the winding must be cleaned and/or dried. If these measures are not sufficient, expert help should be acquired
- Machines, that are suspected to have moisture problem, should be dried carefully independent of the measured insulation resistance value
- The insulation resistance value will decrease when the winding temperature rises
- The resistance is halved for every 10 ... 15 K temperature rise.

NOTE: The insulation resistance indicated in the test report is normally considerably higher than the values measured on site.

7.6.4.3 Minimum values for insulation resistance

Criteria for windings in a normal condition:

Generally, the insulation resistance values for dry windings should exceed the minimum values significantly. Definite values are impossible to give, because resistance varies depending on the machine type and local conditions. In addition, the insulation resistance is affected by the age and usage of the machine. Therefore, the following values can only be considered as guidelines.

The insulation resistance limits, which are given below, are valid at 40 °C, and when the test voltage has been applied for 1 minute or longer.

- Rotor

For induction machines with wound rotors: $R_{(1-10 \text{ min at } 40 \text{ }^\circ\text{C})} > 5 \text{ M}\Omega$


NOTE: Carbon dust on slip rings and naked copper surfaces lower the insulation resistance values of the rotor.

- Stator

For new stators: $R_{(1-10 \text{ min at } 40 \text{ }^\circ\text{C})} > 1000 \text{ M}\Omega$. If the measuring conditions are extremely warm and humid, $R_{(1-10 \text{ min at } 40 \text{ }^\circ\text{C})}$ values above 100 MΩ can be accepted

For used stators: $R_{(1-10 \text{ min at } 40 \text{ }^\circ\text{C})} > 100 \text{ M}\Omega$

NOTE: If the values given here are not reached, the reason for the low insulation resistance should be determined. A low insulation resistance value is often caused by excess humidity or dirt, although the actual insulation is intact.

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7.6.4.4 Stator winding insulation resistance measurement


The insulation resistance is measured using an insulation resistance meter. The test voltage is 1000 VDC. The test time is 1 minute, after which the insulation resistance value is recorded. Before the insulation resistance test is conducted, the following actions must be taken:

- Check that the secondary connections of the current transformers (CT's), including spare cores are not open. See *Figure 7-7 Connections of the stator windings for insulation resistance measurements*
- Verify that all power supply cables are disconnected
- Verify that the frame of the machine and the stator windings not being tested are earthed
- The winding temperature is measured
- All resistance temperature detectors are earthed
- Possible earthing of voltage transformers (not common) must be removed.

The insulation resistance measuring should be carried out in the terminal box. The test is usually performed to the whole winding as a group, in which case the meter is connected between the frame of the machine and the winding; See *Figure 7-7 Connections of the stator windings for insulation resistance measurements*. The frame is earthed and the three phases of the stator winding remain connected at the neutral point, see *Figure 7-7 Connections of the stator windings for insulation resistance measurements*.

If the measured insulation resistance of the whole winding is lower than specified, and the phase windings can easily be disconnected from each other, each phase can also be measured separately. This is not possible for all machines. In this measurement, the tester is connected between the frame of the machine and one of the windings. The frame and the two phases not measured are earthed; see *Figure 7-7 Connections of the stator windings for insulation resistance measurements*.

When phases are measured separately, all star-points of the winding system must be removed. If the star-point of the component cannot be removed, as in a typical tri-phase voltage transformer, the whole component must be removed.

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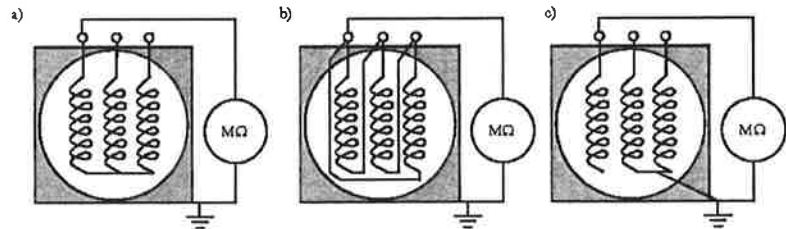


Figure 7-7 Connections of the stator windings for insulation resistance measurements

- a) Insulation resistance measurement for star connected winding
- b) Insulation resistance measurement for delta connected winding
- c) Insulation resistance measurement for one phase of the winding. The 'MΩ' represents the insulation resistance meter.

After the insulation resistance measurement the winding phases must be earthed briefly in order to discharge them.

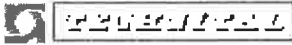
***Following chapter for rotor type: Slip rings

7.6.4.5 Rotor winding insulation resistance measurement

The insulation resistance of the rotor winding is measured with an insulation resistance meter. The test voltage of the rotor windings should be 1000 VDC. Required notes and measures:

- Verify that all power supply cables are disconnected from the main supply
- Verify the slip ring unit connection cables are disconnected from their supply
- Verify that the frame of the machine and the stator windings are earthed
- The shaft is earthed
- The rotor winding phases not been tested are earthed. The rotor winding can be internally connected in a delta or star connection. If this is the case, it is not possible to measure the phases individually
- The carbon brush connections are checked to be in good order
- The measurement device is checked
- The stator winding temperatures are measured, and considered as a reference value for the rotor winding temperature.

The insulation resistance meter is connected between the whole rotor winding and the shaft of the machine, see Figure 7-8 Insulation resistance measurement of the rotor winding. After performed rotor winding measurements, the rotor winding phases must be briefly earthed in order to discharge the windings.

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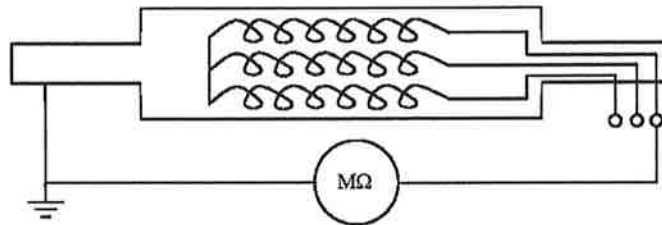


Figure 7-8 Insulation resistance measurement of the rotor winding

In the figure above the rotor is star-connected.

7.6.5 Insulation resistance measurement for auxiliaries

To ensure correct operation of the machines protections and other auxiliaries, their condition can be determined by an insulation resistance test. The procedure is described in detail in *Chapter 7.6 Maintenance of stator and rotor windings*. The test voltage for the space heater should be 500 VDC and for other auxiliaries 100 VDC. The insulation resistance measurement for Pt-100 detectors is not recommended.

7.6.6 The polarization index

For the polarization index test the insulation resistance is measured after the voltage has been applied for 15 seconds and 1 minute (or 1 minute and 10 minutes). The polarization index test is less dependent on the temperature than the insulation resistance. When the winding temperature is below 50°C (122°F), it may be considered independent of temperature. High temperatures can cause unpredictable changes in the polarization index, therefore the test should not be used at temperatures above 50°C (122°F).


Dirt and humidity accumulating in the winding normally reduces the insulation resistance, and the polarization index, as well as their dependence on temperature. Thus, the line in *Figure 7-6 Correlation between the insulation resistance and the temperature* becomes less steep. Windings with open creepage distances are very sensitive to the effects of dirt and humidity.

There are several rules for determining the lowest acceptable value with which the machine can be safely started. For the polarization index (PI), the values usually range between 1 and 4. Values close to 1 indicate that the windings are humid and dirty.

The minimum PI value for class F stator windings is more than 2.

NOTE: If the insulation resistance of the winding is in the range of several thousands of MΩ, the polarization index is not a meaningful criterion of the condition of the insulation, and it can be disregarded.

$$PI = \frac{R_{1\min}}{R_{15s}} \text{ or } \left(\frac{R_{10\min}}{R_{1\min}} \right)$$

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7.6.7 Other maintenance operations

Usually, ABB-made winding are trouble free and in addition to periodical monitoring they require only occasional cleaning and drying as described above. If extraordinary circumstances occur and other maintenance is required, it is best to acquire professional help. The ABB After Sales organization is eager to assist in questions regarding maintenance of electrical machine winding, for contact information see *Chapter 9.1.5 After Sales contact information*.

*****Following chapters for rotor type: Slip rings**

7.7 Maintenance of slip rings and brush gear

A machine with slip rings will function properly only if the slip rings and the brush gear are inspected and subjected to maintenance regularly.

7.7.1 Care of slip rings

The sliding surfaces of the slip rings should be kept smooth and clean. The slip rings should be inspected and the surfaces of the insulation cleaned. Wearing of brushes produces coal dust that easily builds up conducting bridges over the insulation surfaces. Electric discharges may take place between slip rings and a flash might appear, leading to interruption in operation of the machine. The contact surface of slip rings forms a patina, or skin, together with the brushes. The patina can be seen as a colored surface, it is normal behavior and in many cases a benefit to brush operation, so the patina is not be considered as a fault in operation and should not be cleared away.

7.7.1.1 Standstill period

When a longer standstill period for the machine begins, the brushes should be lifted up. During transport, storage, installation or longer interruptions, the sliding surfaces of the slip-rings might be tarnished or covered with dirt, etc. Before restarting the machine, the sliding surfaces should be inspected and cleaned.

7.7.1.2 Wear

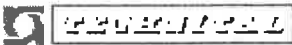
In case that the slip rings have become coarse or uneven, they should be ground or turned on a lathe. The asymmetry of the whole ring diameter should be less than 1.0 mm, but for a short distance, a value of maximum 0.2 mm is allowed. In case of the slip rings are worn out or badly burned, new rings should be assembled.

Measure the eccentricity of the slip-rings using a dial indicator gage. Let the measuring point lie on the slip ring or on the outer surface of a brush. The highest and lowest values during one turn of the shaft are recorded. The difference of the maximum and minimum values should be no more than 1.0 mm and locally no more than 0.2 mm. The difference of the outer diameters of the two slip rings shall preferably not be more than 2 mm.

7.7.2 Care of brush gear

The brush gear should be inspected and the surfaces of the insulation cleaned.

Wearing of brushes produces coal dust that easily builds up conducting bridges over the insulation surfaces. The coal dust is best removed by vacuum cleaning brush gear.

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7.7.2.1 Brush pressure

The brush pressure should be evenly distributed over the whole contact surface, i.e. the brush should conform to the slip ring curvature. Brush pressure is one of the most important single factors in brush operation. The pressure should be 18-20 mN/mm² (180-200 g/cm²). Use a spring-balance to measure the brush pressure. Attach a spring balance to the tip of the lever pressing the brush and pull in a radial direction until the pressure is just relieved from the brush. Use a piece of paper between brush and press lever to detect when pressure is relieved, see *Figure 7-9 Checking brush pressure with spring balance.*

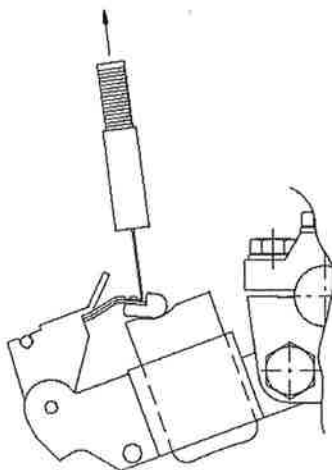


Figure 7-9 Checking brush pressure with spring balance

***Following chapters for cooling type: Open air, Air-to-water and Air-to-air

7.8 Maintenance of cooling units


The cooling units normally require little maintenance but it is advisable to regularly check their condition in order to ensure trouble-free operation.

***Following chapter for cooling type: Open air

7.8.1 Maintenance instructions for machines with open air cooling

The cooling air is normally circulated by a fan and/or by the rotor. The fan may be mounted on the shaft or driven by a separate motor. A connection to external air pressure is also possible. Depending on the machine design, the circulation may be axially symmetrical or asymmetrical. The cooling air should be as clean as possible, because any dirt, which drifts into the machine, causes contamination and reduces the efficiency of the cooling.

The upper covers of the standard weather protected machines are delivered with or without filters according to the specification. By special order, the upper cover is equipped with a differential pressure switch for monitoring the condition of the filters.

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If the winding or cooling air temperature detectors show an abnormal temperature, a check of the cooling system has to be made. The two maintenance issues are to check the condition of air filters and to ensure good air circulation inside the machine. The machine interior should be cleaned and checked during overhauls or if problems arise.

Other possible causes for poor cooling system performance might include elevated ambient temperature or high intake air temperature. In addition, lubrication or bearing malfunction might lead to high bearing temperature.

A seemingly high temperature might also be caused by a problem in the temperature measurement system *Chapter 8.3.2 Pt-100 resistance temperature detectors*.

7.8.1.1 Cleaning of filters

The filters should be cleaned regularly. The cleaning interval depends on the cleanliness of the air in the surrounding environment. The filters have to be cleaned when the temperature detectors in the winding show abnormal temperature or approach the alarm level.

If a filter differential pressure monitoring system is being used, the filters should be changed immediately after a pressure alarm. The alarm level is such that 50% of the air filter surface is obstructed. The operating personnel should also manually inspect the filters frequently.

Remove the air filters for cleaning. If the surrounding air is sufficiently clean, the filters can be changed during operation. They should regularly be cleaned by vacuuming first from the upstream side, then on the discharge side. Periodically, a thorough wash with clean water is recommended to release any dirt not removed by vacuuming. When heavy grease concentrations are encountered, the filters should be washed with a detergent solution. This solution should be rinsed thoroughly before returning the filter to service. Be careful to install the air filters in the correct direction, i.e. the arrows on the air filter frame indicate the direction of airflow. Some filters can be installed in either direction. Refer also to the air filter manufacturer information.

*****Following chapters for cooling type: Air-to-water**

7.8.2 Maintenance instructions for air-to-water heat exchangers

If the temperature detectors show normal operating temperature, and the leakage detectors indicate no leaks, usually no additional supervision is required for the cooling system.

*****Following chapters for cooling type: Air-to-air**


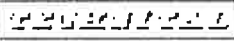
7.8.3 Maintenance instructions for air-to-air heat exchangers

The cooling unit is installed on the machine. The air tubes in the heat exchanger are normally made of Aluminium.

7.8.3.1 Air circulation

The inner air is normally circulated by a fan and/or by the rotor. The fan may be mounted on the shaft or driven by a separate motor. Depending on the machine design, the circulation may be axially symmetrical or asymmetrical.

The outer air flow is normally created by a fan, mounted on the shaft or driven by a separate motor. Connection to external air pressure is also possible.

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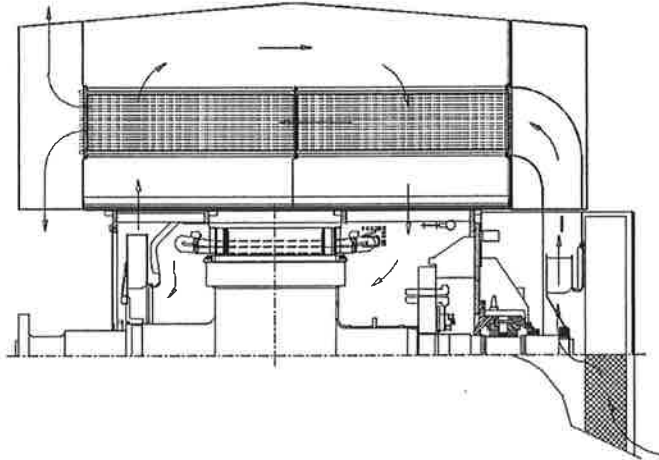


Figure 7-10 Cooling air flow (typical asymmetric construction)

The machine can be equipped with temperature detector(s) for monitoring the internal cooling air. If the temperature detectors show normal temperature, no additional maintenance to the supervision inspection is usually required for the cooling system.

If the temperature detectors show abnormal temperature or close to the alarm level in winding or in cooling air, the cooling system has to be checked. If the coolers have to be cleaned, see the instructions below.


7.8.3.2 Cleaning

Some fouling of the cooling surface and the tube wall will eventually occur. This fouling reduces the cooling capacity. The heat exchanger should therefore be cleaned at regular intervals, to be determined from case to case, depending of the properties of the cooling air. During the initial period of operation, the heat exchanger should be inspected frequently.

Blow the heat exchanger clean with compressed air or clean it with a suitable brush. Do not use a steel brush in aluminium tubes as it can damage the tubes; a soft round brass wire brush can be used instead.

7.8.4 Maintenance of external blower motors

The external blower motors are maintenance free units, e.g. the bearings of external blower motors are greased for life. A spare external blower motor is recommended. The maintenance of the blower motor is performed according to the motor's manual.

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7.9 Repairs, disassembly and assembly


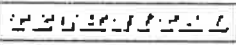
All the actions related to repairs, disassembly and assembly should be done by trained service personnel. For more information, please contact After Sales, see *Chapter 9.1.5 After Sales contact information*.

*****Following note for protection type: All machines for hazardous areas**

NOTE: Machines in hazardous areas must only be serviced by repair shops qualified and authorized by ABB.

*****Following note for rotor type: Permanent magnet**

NOTE: The permanent magnet synchronous machine must only be serviced by repair shops qualified and authorized by ABB. For more information on permanent magnet motors, please contact ABB.


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Chapter 8 Trouble Shooting

8.1 Trouble shooting

This chapter is intended as a help in the event of an operational failure with an ABB delivered rotating electrical machine. The trouble shooting charts given below can aid in locating and repairing mechanical, electrical and thermal problems, and problems associated with the lubrication system. The checks and corrective actions mentioned should always be conducted by qualified personnel. If in any doubt, the After Sales of ABB should be contacted for more information or technical assistance regarding trouble shooting and maintenance.


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8.1.1 Mechanical performance

Trouble shooting

Mechanical performance

Experienced malfunction		Possible cause		Corrective action
Vibration	Noise			
•	•	Lubrication malfunction		Check lubricant quality and quantity and lubrication system function
•	•	Bearing malfunction	Damaged bearing parts	Check bearing condition and replace bearing parts
•	•		Faulty bearing assembly	Open and readjust the bearing
•	•	Faulty cooling fan(s)	Imbalanced or damaged fan(s)	Check and repair cooling fan(s)
•	•			Malfunctioning cooling system
•	•	Machine misalignment		Check machine alignment
•	•	Rotor or shaft imbalance		Rebalance rotor
•	•	Vibration coming from connected machinery		Check the balance of connected machinery and coupling type
•	•	Axial load coming from connected machinery		Check alignment and coupling function and type
•	•	Faulty or incorrectly assembled coupling		Check coupling function
•	•	Insufficient foundation strength		Reinforce foundation as per ABB instructions
•	•	Winding fault		Check windings
•	•	Excessive network unbalance		Check that network balance fulfills requirements
•	•	Foreign material, moisture or dirt inside the machine		Check and clean machine interior, dry windings

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8.1.2 Lubrication system and bearings

***Following chapter for bearing type: Rolling bearing


8.1.2.1 Lubrication system and rolling bearings

Trouble shooting

Lubrication system and antifriction bearings

oil supply and self lubrication

Experienced malfunction	Possible cause		Corrective action
	High bearing temperature	Bearing noise or vibration	
●	●	Insufficient lubrication	Insufficient amount of grease Check bearing condition, add grease
●	●	Unsuitable grease quality or viscosity	Check ABB grease recommendations, change grease
●	●	Excessive axial forces	Faulty coupling or mounting Check coupling, mounting and alignment
●	●	Reduced grease quality	Incorrect regreasing period Check ABB recommendations, regrease
●	●		Faulty operating conditions Check ABB operating and grease recommendations
●	●	Excessive lubrication	Clean bearing and add correct amount of lubricant
●	●	Damaged bearing parts	Impurities in grease Change grease, check bearing condition
●	●		Bearing currents Check bearing and insulation condition
●	●		Complete bearing failure Replace bearing
●	●		Normal wearing Replace worn bearing parts
●	●	Faulty instrumentation	Faulty temperature detector Check bearing temperature measurement system
●	●	Faulty bearing seals	Check bearing seals and lubricant quality
●	●	Incorrectly assembled bearing	Replace bearing, ensure correct assembly
●	●	Outer ring is rotating due to unbalanced load	Rebalance machine, repair bearing bore and replace bearing
●	●	Bearing noise due to deformed roller element	Replace bearing
●	●	Foreign matter inside the bearing	Clean bearing assembly, check seal conditions and replace bearing

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***Following chapter for bearing type: Sleeve bearing

8.1.2.2 Lubrication system and sleeve bearings

***Following chart for bearing type: Sleeve bearing with self lubrication

Trouble shooting

Lubrication system and sleeve bearings self lubrication

Experienced malfunction				Possible cause		Corrective action	
High bearing temperature	Oil leaks	Oil inside the machine	Bearing noise or vibration	Visibly poor oil quality			
●			●	●	Insufficient lubrication	Low oil level	Check bearing for leakage, add oil
●	●	●		●	Unsuitable oil quality		Check ABB oil recommendations
●			●		Oil quality is reduced	Incorrect oil change period	Clean bearing and change oil
●	●	●	●	●	Excessive axial load	Faulty coupling or mounting	Check coupling, mounting and alignment
●	●		●		Machine misalignment		Realign machine
●			●		Incorrectly assembled bearing		Verify correct bearing assemblage and adjustments
●	●	●			Excessive amount of oil		Clean bearing and add correct amount of lubricant
●			●	●	Damaged bearing shells	Oil impurities	Change oil, check bearing condition, replace bearing shells
●			●			Bearing currents	Restore bearing insulation, replace bearing shells
●			●			Complete bearing failure	Replace bearing parts
●			●			Normal wearing	Replace bearing shells
●			●			Operating speed too low	Check the operating speed range of bearing
●					Faulty instrumentation	Faulty temperature detector	Check bearing temperature measurement system
	●				Damaged or worn-out bearing seals		Replace bearing seals
	●				External vacuum	Rotating equipment nearby	Check pressure levels, relocate rotating equipment
	●	●			Internal over pressure	Pressure compensation failure	Remove cause for internal over pressure
		●			Damaged machine seal		Replace or repair machine seal
●					Poor oil ring or disc operation		Open bearing and adjust operation
			●	●	Foreign matter inside the bearing		Clean bearing and check seal condition

***Following chart for bearing type: Sleeve bearing with flood lubrication

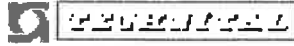
Trouble shooting

Lubrication system and sleeve bearings

flood lubrication

Experienced malfunction	Possible cause		Corrective action
	High bearing temperature	Oil leaks	
Oil inside the machine			
Bearing noise or vibration			
Visibly poor oil quality			
	Insufficient lubrication	Oil flow malfunction Oil viscosity too high	Check oil pump, oil reduction valve and oil filter Check oil temperature and oil type
	Unsuitable oil quality		Check ABB oil recommendations
	Oil inlet temperature too high		Check lubrication system and adjust oil temperature
	Oil quality is reduced	Incorrect oil change period	Clean bearing and change oil
	Excessive axial load	Faulty coupling or mounting	Check coupling, mounting and alignment
	Machine misalignment		Realign machine
	Incorrectly assembled bearing		Verify correct bearing assemblage and adjustments
	Damaged bearing shells	Oil impurities	Change oil, check bearing condition, replace bearing shells
		Bearing currents	Restore bearing insulation, replace bearing shells
		Complete bearing failure	Replace bearing parts
		Normal wearing	Replace bearing shells
		Operating speed too low	Check the operating speed range of bearing
	Faulty instrumentation	Faulty temperature detector	Check bearing temperature measurement system
	Damaged or worn-out bearing seals		Replace bearing seals
	Oil flow too high	Faulty regulator settings	Check and correct oil flow
	Problem in oil return flow	Faulty oil piping	Check oil return pipe inclination
	External vacuum	Rotating equipment nearby	Check pressure levels, relocate rotating equipment
	Internal over pressure	Pressure compensation failure	Remove cause for internal over pressure
	Damaged machine seal		Replace or repair machine seal
	Faulty assembled or maintained lubrication piping		Check pipeline connections and oil filter tightness
	Foreign matter inside the bearing		Clean bearing and check seal condition

NOTE: For oil leakage of sleeve bearings, see Chapter 8.2 Oil leakage of sleeve bearings.



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8.1.3 Thermal performance

***Following chapter for cooling type: Open air or ducted air


8.1.3.1 Thermal performance, open air cooling system

Trouble shooting

Thermal performance open air cooling system

Experienced malfunction		Possible cause		Corrective action
High winding temperature	High cooling air temperature			
•	•	Ambient temperature too high		Add ventilation to decrease ambient temperature
•	•	High intake air temperature	Exiting air is pulled back in	Ensure sufficient clear distances surrounding the machine
•	•		Heat source nearby	Place heat sources further away, check ventilation
•	•	Faulty air flow	Dirty machine interior	Clean machine parts and air gaps
•	•		Faulty cooling arrangement	Inspect cooling arrangement condition and correct assembly
•	•		Air intakes are blocked	Clear air intakes of debris
•	•		Air filter is clogged	Clean or replace air filters
•	•	Damaged cooling fan(s)		Replace fan(s)
•	•	Cooling fan rotating in the wrong direction		Replace fan(s) or change rotating direction of external fan
•		Overload	Control system setting	Check machine controls, eliminate overload
•	•	Overspeed		Check actual speed and ABB speed recommendation
•		Network unbalance		Check that network balance fulfils requirements
•	•	Faulty instrumentation or measurement system		Check measurements, sensors and wiring
•		Winding fault		Check windings

NOTE: For high bearing temperatures, see Table 8.1.2 Lubrication system and bearings.

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***Following chapter for cooling type: Air-to-air

8.1.3.2 Thermal performance, air-to-air cooling system

Trouble shooting

Thermal performance air-to-air cooling system

Experienced malfunction		Possible cause	Corrective action	
High winding temperature	High cooling air temperature			
•	•	Low primary cooling circuit performance	Damaged cooling fan(s)	Replace fan(s)
•	•		Fan rotating in wrong direction	Replace fan(s)
•	•		Dirty machine interior	Clean machine parts and air gaps
•	•	Low secondary cooling circuit performance	Damaged external fan	Replace fan
•	•		Fan rotating in wrong direction	Change shaft mounted fan or correct external blower motor operation
•	•		Leaking cooler	Repair cooler
•	•	High intake air temperature	Ambient temperature too high	Add ventilation to decrease ambient temperature
•	•		Exiting air is pulled back in	Ensure sufficient clear distances surrounding the cooler
•	•		Heat source nearby	Place heat sources further away, check ventilation
•	•	Overload	Control system setting	Check machine controls, eliminate overload
•	•	Overspeed		Check actual speed and ABE speed recommendations
•	•	Network unbalance		Check that network balance fulfills requirements
•	•	Faulty instrumentation or measurement system		Check measurements, sensors and wiring
•	•	Too many starts		Let the machine cool down before restarting
•	•	Winding fault		Check windings

NOTE: For high bearing temperatures, see Table 8.1.2 Lubrication system and bearings.

***Following chapter for cooling type: Air-to-water

8.1.3.3 Thermal performance, air-to-water cooling system


Trouble shooting

Thermal performance

air-to-water cooling system

Experienced malfunction	High winding temperature	High cooling air temperature	Water leakage alarm	Possible cause		Corrective action
•	•			Low primary cooling circuit performance	Damaged cooling fan	Replace fan
•	•				Fan rotating in wrong direction	Change shaft mounted fan or correct external blower motor operation
•	•				Dirty machine interior	Clean machine parts and air gaps
•	•			Low secondary cooling circuit performance	Coolant pipes are blocked	Open cooler and clean pipes
•	•				Faulty coolant pump	Check and repair the pump
•	•				Faulty flow regulator settings	Check and adjust coolant flow
•	•	•			Leaking cooler header	Replace the cooler header
•	•				Air inside the cooler	Bleed the cooler through bleeder screw
•	•				Emergency cooling hatch open	Close emergency cooling hatch tightly
•	•				Cooling water inlet temperature too high	Adjust cooling water temperature
•				Overload	Control system setting	Check machine controls, eliminate overload
•				Network unbalance		Check that network balance fulfills requirements
•	•	•		Faulty instrumentation or measurement system		Check measurements, sensors and wiring
•				Too many starts		Let the machine cool down before restarting
•				Winding fault		Check windings

NOTE: For high bearing temperatures, see Table 8.1.2 Lubrication system and bearings.

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***Following chapter for cooling type: Rib cooled


8.1.3.4 Thermal performance, rib cooled

Trouble shooting

Thermal performance rib cooled

Experienced malfunction	Possible cause		Corrective action
High winding temperature	• Overload	Control system setting	Check machine controls, eliminate overload
	• Overspeed		Check actual speed and ABB speed recommendations
	• Network unbalance		Check that network balance fulfils requirements
	• Faulty instrumentation or measurement system		Check measurements, sensors and wiring
	• Too many starts		Let the machine cool down before restarting
	• Winding fault		Check windings
	• Dirty machine exterior		Clean machine exterior
	• Air flow is reduced		Remove obstacles. Ensure sufficient air flow, see Dimension Drawing of the machine

NOTE: For high bearing temperature, see *Chapter 8.1.2 Lubrication system and bearings*.

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***Following chapters for bearing type: Sleeve bearing

8.2 Oil leakage of sleeve bearings

The construction of a sleeve bearing is such that it is very difficult to avoid oil leakage completely, and therefore small amounts of leakage should be tolerated.

However, oil leakage can also appear because of reasons other than the bearing design, such as incorrect oil viscosity, overpressure inside the bearing, underpressure outside the bearing, or high vibration levels at the bearing.

If excessive oil leakage is noted, please check/verify the following:

- Verify that the oil used is according to specifications
- Re-tighten the bearing housing halves, and the labyrinth seal cover. This is especially important, if the machine has been stopped for a long time
- Measure the vibrations of the leaking bearing in three directions under full load. If the vibration level is high, the bearing housing might "loosen" just enough to permit the oil to wash away the sealant between the housing halves
- Open the bearing, clean the surfaces and apply new sealant between the bearing housing halves
- Verify that there is nothing, which might cause low pressure next to the bearing. A shaft or coupling cover can for instance be designed so that it will cause low pressure near the bearing
- Verify that there is no overpressure inside the bearing. Overpressure may be entering the bearing through the oil outlet piping from the oil lubrication unit. Apply breathers or vents to the bearing housing as to relieve the overpressure from the bearing
- In case of a flood bearing lubrication system, check that the slope of the oil outlet pipes is sufficient.

If excessive oil leakage is found even after all of the above and below mentioned things have been checked and verified, please fill in the form Oil Leakage's at RENK Sleeve Bearings and send it to the after sales and market support department.


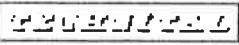
8.2.1 Oil

In order for the bearings to function as expected, the oil has to meet certain criteria like viscosity and cleanliness, see *Chapter 7.5.2.2 Control of the lubricant* and *Chapter 7.5.2.3 Recommended control values for the lubricating oil*.

Viscosity

The bearings are designed to run with an oil of a certain viscosity, which is mentioned in the documentation provided with the electrical machine.

Incorrect viscosity will lead to lubrication failures, and can damage the bearings, as well as the shaft.

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8.2.2 Sleeve bearings

The sleeve bearings used in rotating electrical machines are often 'standard bearings' used in a number of applications. Therefore, the bearing design in itself is normally not the cause of bearing leakages, and the reason for the leakage should be found elsewhere.

However, the bearing is assembled from several parts, and the joints between the parts can leak due to faulty assembly or lack of sealing compound.

Bearing housing

The bearing housing consists of an upper and lower half, which are joined together. In addition, labyrinth seals are mounted at the bearing housing entrance of the shaft. This construction is not completely hermetic, and therefore very small leakages have to be tolerated.

A tolerable amount of leakage for self-lubricating bearings is such that the bearing does not need a top-up between the oil change intervals.

The oil can leak from the bearing in two ways:

- Past the labyrinth seals
- Through the split line of the bearing housing.

Sealant

In order to prevent the oil from leaking from the bearing through any split lines, sealant is applied on the split lines. ABB recommends the Hylomar Blue Heavy sealing compound. Curil T or other similar compounds can be used as well.

8.2.3 Bearing verification

In case the oil leakage is suspected to originate from the bearing housing itself, the following steps can be taken:


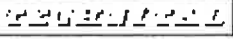
1. Re-tighten the bearing housing

This is especially important during the commissioning of the machine, or if the machine has been standing still for a longer period, as the parts may set.

If the bearing housing halves are not in a tight fit in respect to each other, the oil might wash away the sealant from the split line. This in turn will cause oil leakage.

2. Open the bearing housing

The bearing housing can be opened, and new sealant applied on the split lines. Care has to be taken that no dirt or foreign matter enter the bearing during this procedure. The split lines have to be completely degreased before a thin layer of sealant is applied.

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*****Following chapter for bearing type: Sleeve bearing with flood lubrication**

8.2.4 Oil container and piping

A separate oil container and piping is used only for flood-lubricated bearings.

Oil container

The oil container can be either a separate container, or in some cases, the crankcase of a diesel engine. In both cases, the container has to be well below the bearings, in order for the oil to flow to the container from the bearing.

The oil container should be constructed in such a way that no pressure can enter the oil return piping from the container towards the bearing.

Oil piping

The function of the oil return piping is to allow the oil to return to the oil tank with as little of friction as possible. This is normally obtained by choosing a piping diameter of a large enough diameter, so that the flow of the oil in the return line does not exceed 0.15 m/s (6 inch/s) based on the pipe cross section.

Install the oil outlet pipes downwards from the bearings at a minimum angle of 15° which corresponds to a slope of 250 - 300 mm/m (3 - 3½ inch/ft).

The assembling of the piping must be performed in such-a-way that above mentioned slope is present at all points of the piping.

*****Following chapter for bearing type: Sleeve bearing with flood lubrication**

8.2.5 Oil container and piping verification

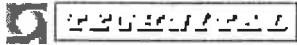
In case the oil leakage is suspected to originate from the construction of the oil container or the oil piping, the following steps can be taken:

Pressure in oil container

The atmospheric pressure inside the oil container must be verified. The pressure may not be larger than the pressure outside the bearing. If this is the case, a breather must be installed to the oil container.

Oil piping

It should be verified that the piping has a sufficient diameter, is not clogged, and that the slope is downward and sufficient throughout the oil return piping.

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8.2.6 Use

Causes for bearing leakages, apart from being installation-related, some causes are 'use' related.

***Following paragraphs for bearing type: Sleeve bearing with flood lubrication

Oil pressure

The inlet oil pressure for each bearing is calculated according to the desired oil flow, and therefore the oil pressure should be adjusted accordingly during commissioning.

The specific oil pressure value for each machine must be verified from the documentation provided with the machine.

***Following paragraph for bearing type: Sleeve bearing with self lubrication

Oil level

The oil level of a self-lubricated sleeve bearing needs to be checked regularly, see *Chapter 7.5.1.1 Oil level*.

Oil temperature

The correct lubrication oil temperature is essential in keeping the bearing at the correct operating temperature, in ensuring sufficient lubrication effect, and correct viscosity of the lubrication oil, see *Chapter 7.5.2.1 Lubrication oil temperature*.

Vibrations

All machines are subjected to, and designed to withstand vibrations. Large vibrations might cause the various parts in the bearing to function different as intended.

Heavy vibrations can cause different phenomena in the oil film between the shaft and the white metal, but this will rather seldom lead to oil leakages, but to bearing failures.

Heavy vibrations can cause the bearing housing parts to set, or to 'loosen up' just enough to allow the oil to enter the split surface between the upper and the lower bearing housing halves. The vibrations will cause the bearing housing parts to move in respect of each other. This can cause a 'pumping' effect in such a way, that oil will be pumped in and out from the split surface. This will eventually remove the sealant, and cause the bearings to leak.


Air pressure inside bearing

The bearing housing is not a hermetic compartment, and therefore any overpressure inside the bearing housing will escape the bearing housing via the labyrinth seals. In escaping, the air will bring oil mist with it, thus causing the bearing to leak.

Overpressure inside the bearing is normally caused by other components than the bearing itself. The most common reason for overpressure inside the bearing is overpressure in the oil return piping.

Air pressure outside of bearing

Similar to overpressure inside the bearing, under pressure outside the bearing will 'suck' air out from inside the bearing, thus bringing oil with it, and causing the bearing to leak oil.

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Under pressure inside the bearing is normally not caused by the bearing itself, but by parts outside the bearing.

Under pressure near the bearing housing is caused by rotational parts moving the air next to them in such a way that a local under pressure is formed next to the exit of the shaft of the bearing.

8.2.7 Use verification

Oil

The oil quality must be verified.

***Following paragraphs for bearing type: Sleeve bearing with flood lubrication

The inlet pressure of the oil must be verified and adjusted accordingly.

The normal value for the oil pressure is 125 kPa \pm 25 kPa (1.25 bar \pm 0.25 bar), but the specific oil pressure value for each machine must be verified from the documentation provided with the machine.

***Following paragraphs for bearing type: Sleeve bearing with self lubrication

The oil level in the bearing must be verified.

The temperature of the oil must be verified. A too high temperature will cause the viscosity of the oil to diminish, thus making it easier to escape from the bearing.

NOTE: Bearings with only one Pt-100 temperature detector normally detect the temperature of the bearing, not the oil. The temperature of the oil is approximately 10°C (20°F) lower than the bearing temperature.

***Following paragraph for bearing type: Sleeve bearing with flood lubrication

The normal oil inlet temperature is in the range of 65°C to 75°C (150°F - 170°F), but must be verified from the documentation provided with the machine.

Vibrations

Vibration readings of the bearing housings should be taken in three directions: axial, transversal (horizontal) and vertical, see *Chapter 7.4.3 Vibrations*.

Air pressure inside the bearing

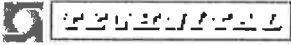
The air pressures inside and outside the bearings should be verified.

Overpressure is, as stated above, normally caused by overpressures in the oil tank. The overpressure from the oil tank is then transmitted to the bearing via the oil return piping.

The best way to measure the pressure inside a bearing, is from the oil fill entrance or the inspection glass on top of the bearing.

In case overpressure inside the bearing is found, the following measures should be taken in the following order:

- Mount breather in the oil tank if possible. This is not suitable for diesel engine crankcases
- Make sure the oil return pipe enters the oil tank below the oil level. This is essential for diesel engine crankcases

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- Make a U-shaped 'water lock' on the oil return piping
- Install a breather on top of the bearing housing.

Air pressure outside the bearing

The air pressure near the exit of the shaft from the bearing needs to be verified. This is especially important if the bearing is flange mounted to the machine, or if the shaft is mounted inside a cover or other construction which might form a 'centrifugal fan' together with the shaft.

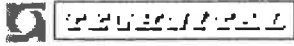
Flange bearings have two canals between the bearing housing and the flange, which normally are enough to compensate for any under pressure near the exit of the shaft from the bearing housing. However, if for some reason a very large under pressure is present near this area, the two canals might not be enough, and some air is additionally sucked from inside the bearing. This is especially likely to happen to sleeve bearings with axial thrust pads, as the oil flow in these bearings is larger than in pure radial bearings.

If a large under pressure is noticed or suspected, the air pressure has to be measured near the exit of the shaft from the bearing housing.

In order to verify that the under pressure outside the bearing can cause the leakage, the pressure outside the bearing (p_0) inside the bearing (p_2), and the pressure in the area between the end shield and the machine seal (p_1) must be measured as well. When measuring (p_1), the tube has to be inserted as deep as possible, and the canals must be temporarily closed, see *Figure 8-1 Verification of air pressure inside and outside of a sleeve bearing*.

In order to analyze the situation, p_1 and p_2 have to be compared with p_0 , which has to be measured free from any disturbances or turbulence near the machine. The following situations can appear:

- $p_0 = p_1 = p_2$. If all pressure readings are the same, the leakage is not caused by pressure differences. However, bear in mind what has been stated about diesel engines earlier
- $p_2 > p_1 (= p_0)$. If the pressure inside the bearing is larger than the outside pressure, there is only a situation with overpressure inside the bearing
- $p_2 (= p_0) > p_1$. If the pressure outside the bearing is smaller the pressure elsewhere, there is under pressure near the bearing
- $p_2 > p_0 > p_1$. If all pressure readings are different, there might be a situation where both overpressure inside the bearing, and under pressure outside the bearing are present.

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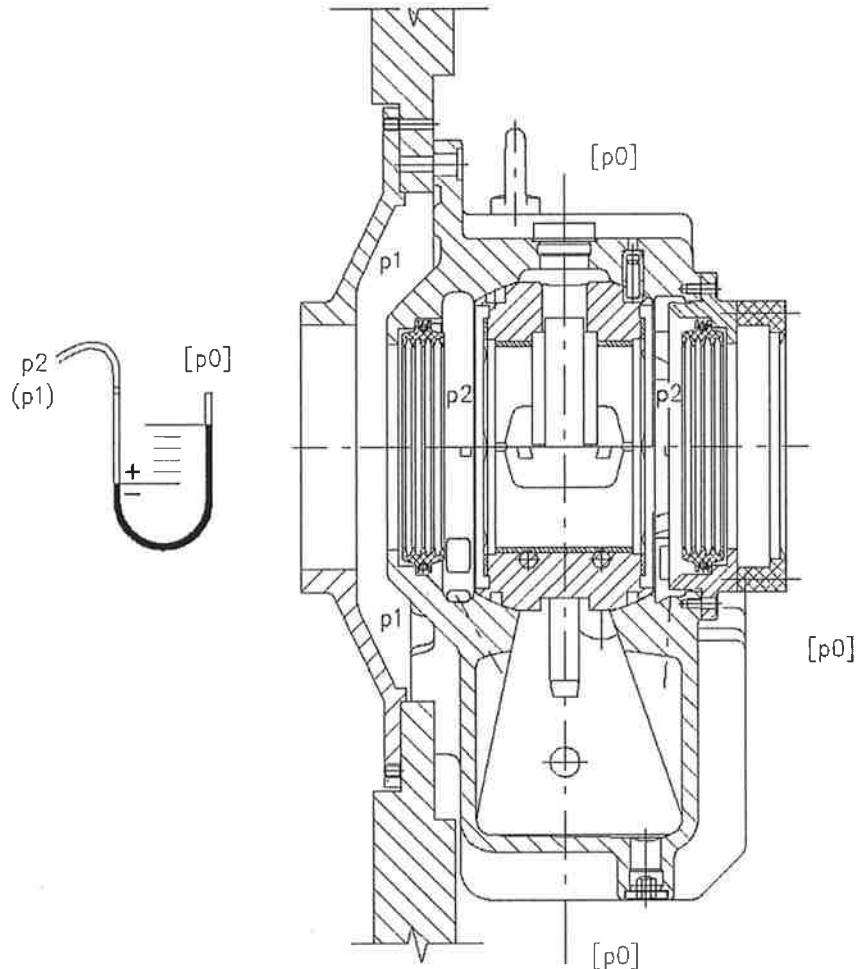



Figure 8-1 Verification of air pressure inside and outside of a sleeve bearing

If a large under pressure is found to be inside the machine, e.g. between the end shield and the machine seal, the situation is tricky; it is normally very difficult to remove the machine seal, and to re-seal it.

NOTE: In no case should a breather be installed to remedy under pressure in the bearing, as it will only make the leakage worse.

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8.3 Electrical performance, excitation, control and protection

The electrical performance of a rotating electrical machine is mostly defined by the condition of the rotor and stator windings, and the operation of the excitation system, if applicable. The main machine winding maintenance is described in *Chapter 7.6 Maintenance of stator and rotor windings*. In this chapter, the focus is on the trouble shooting of the excitation, the control and protection systems.

8.3.1 Protection trips

The machine needs to be protected with alarms and trips for abnormal running conditions, both electrical and mechanical. Some of these protections can be reset and the machine restarted directly as the fault is located.

Examples of protections that, if they give an alarm or trip, may need further investigation:

- Diode fault protection
- High temperature in bearing, see *Chapter 7.5 Maintenance of bearings and lubrication system*
- High temperature in winding or in cooling air, see *Chapter 7.6 Maintenance of stator and rotor windings* and *Chapter 8.5 Thermal performance and cooling system*
- Overcurrent, current and voltage unbalance, bus bar voltage
- Vibration protection, *Chapter 7.4.2 Vibration and noise*.

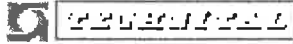
8.3.2 Pt-100 resistance temperature detectors

Pt-100 resistance temperature detectors are an essential part in the machine's condition monitoring and protection system. They are used to measure temperatures in the windings, bearings and in the cooling air. The Pt-100 detector uses a fine platinum filament for the temperature measurement, which can be damaged e.g. by incorrect handling or excessive vibration.

The following symptoms might suggest a problem in a Pt-100 detector:

- Infinite or zero resistance over the detector
- Disappearance of measurement signal during, or after start up
- A significantly different resistance value in a single detector.

If a Pt-100 failure is suspected the findings should always be confirmed from the connection box, by measuring the resistance at the detector with its cables disconnected. The findings should be registered. For the correct measuring current see the appropriate Pt-100 detector. For resistance values at different temperatures, see *Table 8-1 Temperature values for Pt-100 elements*.



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ELETTRICO*Manual for Induction Motors and Generators**Table 8-1. Temperature values for Pt-100 elements*

PT100 RES Ω	TEMP $^{\circ}\text{C}$	TEMP $^{\circ}\text{F}$	PT100 RES Ω	TEMP $^{\circ}\text{C}$	TEMP $^{\circ}\text{F}$	PT100 RES Ω	TEMP $^{\circ}\text{C}$	TEMP $^{\circ}\text{F}$
100.00	0	32.00	127.07	70	158.00	153.58	140	284.00
100.78	2	35.60	127.84	72	161.60	154.32	142	287.60
101.56	4	39.20	128.60	74	165.20	155.07	144	291.20
102.34	6	42.80	129.37	76	168.80	155.82	146	294.80
103.12	8	46.40	130.13	78	172.40	156.57	148	298.40
103.90	10	50.00	130.89	80	176.00	157.31	150	302.00
104.68	12	53.60	131.66	82	179.60	158.06	152	305.60
105.46	14	57.20	132.42	84	183.20	158.81	154	309.20
106.24	16	60.80	133.18	86	186.80	159.55	156	312.80
107.02	18	64.40	133.94	88	190.40	160.30	158	316.40
107.79	20	68.00	134.70	90	194.00	161.04	160	320.00
108.57	22	71.60	135.46	92	197.60	161.79	162	323.60
109.35	24	75.20	136.22	94	201.20	162.53	164	327.20
110.12	26	78.80	136.98	96	204.80	163.27	166	330.80
110.90	28	82.40	137.74	98	208.40	164.02	168	334.40
111.67	30	86.00	138.50	100	212.00	164.76	170	338.00
112.45	32	89.60	139.26	102	215.60	165.50	172	341.60
113.22	34	93.20	140.02	104	219.20	166.24	174	345.20
113.99	36	96.80	140.77	106	222.80	166.98	176	348.80
114.77	38	100.40	141.53	108	226.40	167.72	178	352.40
115.54	40	104.00	142.29	110	230.00	168.46	180	356.00
116.31	42	107.60	143.04	112	233.60	169.20	182	359.60
117.08	44	111.20	143.80	114	237.20	169.94	184	363.20
117.85	46	114.80	144.55	116	240.80	170.68	186	366.80
118.62	48	118.40	145.31	118	244.40	171.42	188	370.40
119.40	50	122.00	146.06	120	248.00	172.16	190	374.00
120.16	52	125.60	146.81	122	251.60	172.90	192	377.60
120.93	54	129.20	147.57	124	255.20	173.63	194	381.20
121.70	56	132.80	148.32	126	258.80	174.37	196	384.80
122.47	58	136.40	149.07	128	262.40	175.10	198	388.40
123.24	60	140.00	149.83	130	266.00	175.84	200	392.00
124.01	62	143.60	150.57	132	269.60	176.57	202	395.60
124.77	64	147.20	151.33	134	273.20	177.31	204	399.20
125.54	66	150.80	152.04	136	276.80	178.04	206	402.80
126.31	68	154.40	152.83	138	280.40	178.78	208	406.40

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There are two possible remedies for stator Pt-100 detector damage. If there are operational spare detectors remaining in the stator core, they can be taken into use. If all the working factory assembled detectors are in use, a new detector can be retrofitted in the winding end.

*****Following chapter for rotor type: Slip rings**

8.4 Slip rings and brushes

8.4.1 Brush wear

In case the brushes are wearing rapidly or unevenly, the following points shall be observed:

- Is the brush pressure within the specified range? See *Chapter 7.7.2.1 Brush pressure*.
- Are all brush pigtail cables reliably connected?
- Are the sliding surfaces of the slip rings deteriorated?
- Is it probable that carbon brushes have absorbed oil or moisture?
- Is the brush quality as specified for the machine?


Always when feasible:

- Control that the brushes are in good condition and that they can move freely in the brush holders
- Check that the brush pigtail cables are in order and that they are reliably connected
- Remove coal dust by vacuum cleaning.

8.4.2 Brush sparking

Any possible sparking of the brushes can be observed through a window in the slip ring enclosure. Sparking is often an indication of inadequate operation. Measures to prevent sparking must be taken immediately. The reasons of sparking shall be cleared up and undisturbed running restored. Possible causes for sparking:

- Inadequate loading condition
- Brushes sticking in their holders
- Brushes too loose in their holders
- Loose connection of brush terminal
- Imperfect brush bedding
- Incorrect or unequal brush pressure
- The sliding surfaces of the slip-rings are deteriorated
- The type of carbon brushes is not acceptable for the operating conditions
- Misalignment of shaft couplings
- The machine is out of balance
- Worn bearings giving unequal air gaps.

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8.5 Thermal performance and cooling system

There are two fundamental reasons that might cause an increase in the machine's temperature:

- The effect of the cooling system has declined
- The machine is producing excessive amount of heat.

If the machine temperature exceeds the normal values, measures should be taken to determine which one of the above mentioned two causes is dominant cause in a particular incident.

NOTE: An excessive heat production might be caused by a winding problem or by network unbalance, and in these cases corrective actions on the cooling system would be ineffective or harmful.


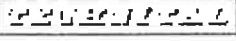
If the winding or cooling air temperature detectors show an abnormal temperature, a check of the cooling system has to be done. Two separate maintenance issues affect the cooling system. The apparent part is to ensure the uninterrupted and correct operation of the heat exchanger. This task is accomplished by periodically cleaning and checking the heat exchanger for correct operation.

The air or water flow through the heat exchanger must also be checked. If the cooler is equipped with an external blower fan, its operation needs also to be checked.

The less apparent but equally important part is to ensure good air circulation in the primary cooling circuit inside the machine. This task can be fulfilled by cleaning and checking the machine interior during overhauls or if problems arise.

Other possible causes for poor heat exchanger performance might include elevated ambient temperature, high intake air or water temperature, and low air or water flow.

In addition, lubrication or bearing malfunction might lead to high bearing temperature. A seemingly high temperature might also be caused by a problem in the temperature measurement system *Chapter 8.3.2 Pt-100 resistance temperature detectors*.

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Chapter 9 After Sales Support and Spare Parts

9.1 After Sales

The After Sales support for rotating electrical machines manufactured by ABB, and Strömberg in Helsinki, Finland since 1889.

9.1.1 Site Services

The Site Services department provides:

- Installation and commissioning
- Maintenance and inspections
- Trouble shooting and service
- Upgrading and modifications.

9.1.2 Spare Parts

The Spare Parts department:

- Co-ordinates spare parts packages delivered with the machine
- Sells genuine spare parts after the machines has been delivered.

For spare part packages, see *Chapter 9.2 Spare parts for rotating electrical machines*.

9.1.3 Support and Warranties

The Support department:

- Handles warranty issues under warranty period based on written claims
- Makes warranty determination
- Decides about corrective actions
- Provides technical support.


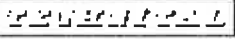
9.1.4 Support for Service Centers

The Service Center Support provides help for authorized Service Centers in questions concerning the mechanical construction as well as in electromagnetic and insulation technology issues.

9.1.5 After Sales contact information

Contact the After Sales department by:

- Phone 7 am - 5 pm (GMT +2): +358 (0)10 22 11
- 24-Hour Support Line: +358 (0)10 22 27100

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- Fax: +358 (0)10 22 22544
- e-mail for spare parts: aftersales.machines@fi.abb.com
- e-mail for site services: siteservice.machines@fi.abb.com
- e-mail for warranties and technical support: support.machines@fi.abb.com

NOTE: If available, please add the serial number of the machine (seven digits, starting with 45#####) to your e-mail for reference information.

9.2 Spare parts for rotating electrical machines

9.2.1 General spare part considerations

The machines manufactured by ABB are designed and manufactured to provide reliable and trouble-free operation for decades. This requires, however, that the machines are properly maintained and operated. This maintenance includes changing of parts subjected to normal wear.

There is always an inevitable amount of uncertainty related to wearing. The wear rates of these parts vary greatly according to application, environment and particular conditions. Therefore, the condition of these parts should be checked regularly and a sufficient amount of spare parts should be kept in stock. These spares help to minimize down time if the need appears. The extent of the stock should be decided based upon the importance of the application, the availability of the particular spare part and the expertise of the local maintenance personnel.

9.2.2 Periodical part replacements


There is always mechanical wear when two moving surfaces are in contact with each other. In electrical machines most of the mechanical wear occurs between the rotating shaft and stationary parts. The bearing parts such as rolling bearings, bearing shells and oil rings in sleeve bearings will eventually wear out and need to be replaced, even if correct lubrication is maintained. Other wearing parts include seals that are in constant contact with the rotating shaft and brushes, brush gears and slip rings of the slip ring unit.

The parts mentioned above make an extensive, but not a complete, list of the mechanically wearing parts. These parts have an estimated life span, but as mentioned earlier, their actual durability can vary significantly. For this reason, at least these parts should be kept in stock. It should also be noted that the replacement of these parts, due to normal wearing, is not covered by the warranty.

9.2.3 Need of spare parts

Other types of wear occur due to elevated temperatures, electrical disturbances and chemical reactions. The wear of the diodes in the rectifier bridge is usually related to abnormal electrical operating conditions. It is usually a slow process, but it is strongly dependent on the operation conditions of the machines and system disturbances.

Air filters, which protect the machine interior from contamination, become themselves saturated with air impurities and need to be replaced to ensure the correct operation of the cooling unit, and the continuous protection of sensitive machine parts.

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The electrical windings of the ABB machines have good protection against wear, but only if correct maintenance and operating conditions are followed. The correct operating temperature must not be exceeded and the windings must be cleaned from dirt regularly. The winding can also be subjected to accelerated wear due to a number of electrical disturbances.

There are stator winding Pt-100 temperature detectors located inside the stator core slots, which cannot be replaced. Therefore, the ABB practice is to add spare Pt-100 detectors in the stator core. These detectors are not to be considered as regular spare parts because they are intended to be used as a replacement in case of a stator Pt-100 element failure during commissioning. However, these elements can be taken into use also during operation if the primary detector fails. If the spare element should fail, the possible corrective action is to add Pt-100 elements into the stator winding end.

9.2.4 Selection of the most suitable spare part package

ABB provides three levels of ready-made spare part packages. The personnel best informed of the machine's operational conditions should select the most suitable package based on criticality of the application and on the financial risk related to the duration of downtime and loss of production.

Operational spare part package for commissioning and to ensure usability:

- These are the most essential spare parts that should always be available.

Recommended spare part package for trouble shooting and scheduled maintenance:

- These parts should be available during medium term maintenance. These parts also enable fast recovery in case of failure in the accessories.

Capital spare parts to reduce repair time in case of serious damage:

- These spare parts are recommended when the machine is a part of an essential process. These spare parts enable fast recovery even in case of a serious damage.

9.2.5 Typical recommended spare parts in different sets

Below is presented a general recommendation of the typical spare parts for different packages. To receive a quotation for specific parts for a specific machine, please contact the ABB After Sales organization.

Please note that even though ABB has customized the spare part sets to match the machine, they might contain references to accessories not found on all machines.

*****The following chapters for product family: HXR**

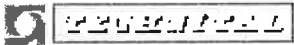
9.2.5.1 Operational spare part package

Spare part	Amount
Bearing RTD	1 pc

Alternatively for rolling bearing machines:

Rolling bearing	2 pcs
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Alternatively for sleeve bearing machines:

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Spare part	Amount
Bearing shell for DE	1 pc
Bearing shell for NDE	1 pc
Bearing oil ring for DE	1 pc
Bearing oil ring for NDE	1 pc
Bearing labyrinth seals for DE	2 pcs
Bearing labyrinth seals for NDE	2 pcs

9.2.5.2 Recommended spare part package

Spare part	Amount
Operational spare part package	1 pc
Space heater	1 pc
Stator Pt-100, retrofit kit	1 pc
Support or bushing insulators	1 pc

9.2.5.3 Capital spare parts

Spare part	Amount
Stator	1 pc
Rotor	1 pc

***The following chapters for product family: AMA, AMB and AMI

9.2.5.4 Operational spare part package

Spare part	Amount
Air filters (for IPW24/IC01 machine)	1 set
Water leakage detector (for IP55/IC81W machine)	1 pc
Bearing RTD	1 pc
Alternatively for rolling bearing machines:	
Rolling bearing	2 pcs

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Spare part	Amount
Alternatively for sleeve bearing machines:	
Bearing shell for DE	1 pc
Bearing shell for NDE	1 pc
Bearing oil ring for DE	1 pc
Bearing oil ring for NDE	1 pc
Bearing labyrinth seals for DE	2 pcs
Bearing labyrinth seals for NDE	2 pcs

9.2.5.5 Recommended spare part package

Spare part	Amount
Operational spare part package	1 pc
Space heater	1 pc
Stator Pt-100, retrofit kit	1 pc
Water cooler element	1 pc
Support or bushing insulators	1 pc

9.2.5.6 Capital spare parts

Spare part	Amount
Rotor	1 pc
Stator	1 pc

***The following chapters for product family: AMK

9.2.5.7 Operational spare part package

Spare part	Amount
Air filters (for IPW24/IC01 machine)	1 set
Air filter for slip ring carbon dust	1 pc
Brushes	1 set
Brush holder	1 set
Water leakage detector (for IP55/IC81W machine)	1 pc
Bearing RTD	1 pc

Alternatively for rolling bearing machines:

Rolling bearing	2 pcs
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Alternatively for sleeve bearing machines:

Bearing shell for DE	1 pc
Bearing shell for NDE	1 pc
Bearing oil ring for DE	1 pc
Bearing oil ring for NDE	1 pc
Bearing labyrinth seals for DE	2 pcs
Bearing labyrinth seals for NDE	2 pcs

9.2.5.8 Recommended spare part package

Spare part	Amount
Operational spare part package	1 pc
Space heater	1 pc
Space heater for slip ring unit	1 pc
Slip ring unit	1 pc
Stator Pt-100, retrofit kit	1 pc
Pressure switch for condition monitoring of brush dust filter	1 pc
Water cooler element	1 pc
Support or bushing insulators	1 pc

9.2.5.9 Capital spare parts

Spare part	Amount
Rotor	1 pc
Stator	1 pc

9.2.6 Order information

To ensure fast and correct spare part order and delivery, our After Sales personnel should be provided with the serial number of the machine in question. The serial number can be found either on the rating plate fixed to the machine frame, or stamped on the machine frame. In addition, provide specific and detailed information about the parts ordered.

The contact information of ABB's After Sales organization can be found in *Chapter 9.1.5 After Sales contact information*.



Chapter 10 Recycling

10.1 Introduction

ABB is committed to its environmental policy. ABB continuously strives to make its products more environmentally sound by applying results obtained in recyclability and life cycle analyses. Products, manufacturing processes and even logistics have been designed to take environmental aspects into account. ABB's environmental management system, certified to ISO 14001, is the tool for carrying out the environmental policy.

The following instructions should only be seen as recommendations for environmentally sound disposal of machines. It is the customer's responsibility to ensure that local regulations are followed. Some customer-specific items may not be included in this User's Manual. Additional documentation will be found in the project documentation.

10.2 Average material content


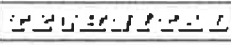
The average material content used in the manufacturing of the electrical machine is as follows:

	Cast iron frame induction machines	Modular steel frame induction machines
Steel	46 - 55 %	77 - 83 %
Copper	7 - 12 %	10 - 12 %
Cast iron	35 - 45 %	1 - 5 %
Aluminium	0 - 2 %	0 - 1 %
Plastics, rubber, insulation materials etc.	1 - 2 %	1 - 2 %
Stainless steel	less than 1 %	less than 1 %
Other	less than 1 %	less than 1 %

10.3 Recycling of packaging material

Once the machine has arrived on site, the packaging material will need to be removed.

- Any wood packaging can be burned
- For some countries, the packaging used for shipping by sea is made of impregnated wood that must be recycled according to local regulations
- Plastic material around the machine can be recycled
- Any anti-corrosive agent covering the machine surface can be removed using a petrol based detergent and a cleaning rag. The rag must be disposed of in accordance with local regulations.

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10.4 Dismantling of the machine

Dismantling the machine is a basic procedure as it is assembled with bolts. However, due to the weight, it requires an operator trained in handling heavy components to prevent dangerous situations.

10.5 Separation of different materials

10.5.1 Frame, bearing housing, covers and fan

These parts are made of structural steel, which can be recycled according to local instructions. All the auxiliary equipment, cabling as well as bearings have to be removed before melting the material.

10.5.2 Components with electrical insulation

The stator and the rotor are the main components, which include electrical insulation materials. There are, however, auxiliary components which are constructed of similar materials and which are hence dealt with in the same manner. This includes various insulators used in the terminal box, exciter, voltage and current transformers, power cables, instrumentation wires, surge arrestors and capacitors. Some of these components are used only in synchronous machines and some are used only in a very limited number of machines.

All these components are in an inert stage once the manufacturing of the machine has been completed. Some components, in particular the stator and the rotor, contain a considerable amount of copper which can be separated in a proper heat treatment process, where the organic binder materials of the electrical insulation are gasified. To ensure a proper burning of the fumes, the oven shall include a suitable after burning unit. The following conditions are recommended for the heat treatment and for the after burning to minimize the emissions from the process:

Heat treatment

Temperature: 380-420°C (716...788°F)

Duration: After obtaining 90% of the target temperature, the object shall stay a minimum of five hours at this temperature


After burning of the binder fumes

Temperature: 850-920°C (1562-1688°F)

Flow rate: The binder fumes shall stay a minimum of three seconds in the burning chamber

NOTE: The emission consists mainly of O₂-, CO-, CO₂-, NO_x-, C_xH_y-gases and microscopic particles. It is on the user's responsibility to ensure that the process complies with the local legislation.

NOTE: The heat treatment process and the maintenance of the heat treatment equipment require special care in order to avoid any risk for fire hazards or explosions. Due to various installations used for the purpose it is not possible for ABB to give detailed

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instructions of the heat treatment process, or the maintenance of the heat treatment equipment and these aspects must be taken care of by the customer.

10.5.3 Permanent magnets

If the permanent magnet synchronous machine is melted down as a whole, nothing needs to be done to the permanent magnets.

If the machine is dismantled for more thorough recycling and if the rotor must be transported after it, it is recommended that the permanent magnets are demagnetized. The demagnetization is done by heating the rotor in the oven until the permanent magnets reach a temperature of +300 °C (572°F).

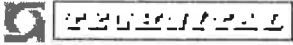
WARNING: Magnetic stray fields, caused by an open or disassembled permanent magnet synchronous machine or by a separate rotor of such a machine, may disturb or damage other electrical or electromagnetic equipment and components, such as cardiac pacemakers, credit cards and equivalent.

10.5.4 Hazardous waste

The oil from the lubrication system is a hazardous waste and has to be handled according to local instructions.

10.5.5 Land fill waste


All insulation material can be handled as a land fill waste.

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COMMISSIONING REPORT

Rating plate information:	
	Serial no.
Manufacturer:	ABB Oy
Address:	P.O. Box 186 FIN-00381 HELSINKI FINLAND
Telephone:	+358 (0) 10 22 11
Fax:	+358 (0) 10 22 22544
Customer:	
Customer address:	
Contact person:	
Telephone:	
Mobile phone:	
Fax:	
Email:	

 GENERALI	Rev. C0	Data: 31/10/08	EI. MV146P-PE-GES-2004-C0	Pag. n. 139
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1 Transportation

General:

Arrival date of the machine:	
Inspection date and location:	
Signature of consignee:	
Open box inspection:	<input type="checkbox"/> no <input type="checkbox"/> yes, done by:

Damages:

Packing list:	<input type="checkbox"/> no <input type="checkbox"/> yes, missing items:
Machine:	<input type="checkbox"/> no <input type="checkbox"/> yes, what kind of:
Package:	<input type="checkbox"/> no <input type="checkbox"/> yes, what kind of:
Accessories:	<input type="checkbox"/> no <input type="checkbox"/> yes, what kind of:
Spare parts + tools:	<input type="checkbox"/> no <input type="checkbox"/> yes, what kind of:


Actions taken in response to damages:

Photographed:	<input type="checkbox"/> no <input type="checkbox"/> yes, date:	
Reported to the transportation company:	<input type="checkbox"/> no <input type="checkbox"/> yes, to whom:	date:
Reported to the supplier:	<input type="checkbox"/> no <input type="checkbox"/> yes, to whom:	date:
Reported to the insurance company:	<input type="checkbox"/> no <input type="checkbox"/> yes, to whom:	date:

Method of transportation:

Railway
 Airfreight
 Truck
 Mail
 Shipped by M/S _____
 Other:

Comments:

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2 Storage

General:

Storage:	<input type="checkbox"/> no	<input type="checkbox"/> yes, begin: _____ end: _____
Storage time longer than 6 months:	<input type="checkbox"/> no	<input type="checkbox"/> yes
Person responsible for storage:		

Storage place:

	<input type="checkbox"/> indoors	<input type="checkbox"/> outdoors
	<input type="checkbox"/> in packing case	<input type="checkbox"/> protected by a waterproof cover
	Daily temperature: min/max. _____ - _____ °C Humidity: _____ %	


Storage actions:

Transportation package is ventilated:	<input type="checkbox"/> no	<input type="checkbox"/> yes
External heating/fan is used:	<input type="checkbox"/> no	<input type="checkbox"/> yes, type: _____
Machine space heaters are used:	<input type="checkbox"/> no	<input type="checkbox"/> yes, voltage: _____
Bearings are flushed:	<input type="checkbox"/> no	<input type="checkbox"/> yes, oil type: _____
Bearing shells are removed:	<input type="checkbox"/> no	<input type="checkbox"/> yes, date: _____
Shaft end anti-corrosion protection checked:	<input type="checkbox"/> no	<input type="checkbox"/> yes, type: _____
Shaft end anti-corrosion protection renewed:	<input type="checkbox"/> no	<input type="checkbox"/> yes, date: _____
The rotor is turned 10 revolutions every two months:	<input type="checkbox"/> no	<input type="checkbox"/> yes
There are vibrations in the storage place:	<input type="checkbox"/> no	<input type="checkbox"/> yes, _____ mm/s, rms
There are corrosive gases in the air:	<input type="checkbox"/> no	<input type="checkbox"/> yes, what kind of: _____
Brushes are lifted up:	<input type="checkbox"/> no	<input type="checkbox"/> yes
Machine documents are saved and protected for future use:	<input type="checkbox"/> no	<input type="checkbox"/> yes, location: _____

Comments:


3 Mechanical Installation

Foundation is checked according to machine drawing:	<input type="checkbox"/> no <input type="checkbox"/> yes, drawing number: _____						
Possible foundation anchor bolts or sole plates are mounted according to instructions:	<input type="checkbox"/> no <input type="checkbox"/> yes						
Air gap is measured, if applicable: For pedestal bearings, mark values 1-4, and for flanged bearings, values A-D	<table border="0"> <tr> <td style="text-align: center;">D-end top</td> <td style="text-align: center;">N-end top</td> <td style="text-align: center;">Exciter N-end top</td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </table>	D-end top	N-end top	Exciter N-end top			
D-end top	N-end top	Exciter N-end top					
1 _____ A _____ 2 _____ B _____ 3 _____ C _____ 4 _____ D _____							
For alignment of the coupling, use either values 1-4 or values A-D	<table border="0"> <tr> <td style="text-align: center;">Radial alignment of coupling top</td> <td style="text-align: center;">Angular alignment of coupling top</td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </table> Axial position of the rotor: ET #1: _____ mm, ET #2: _____ mm Axial distance between shaft ends: _____ mm Rotor support distance: _____ mm _____ mm	Radial alignment of coupling top	Angular alignment of coupling top				
Radial alignment of coupling top	Angular alignment of coupling top						
1 _____ 2 _____ 3 _____ 4 _____ A _____ B _____ C _____ D _____							
Crankshaft deflection is checked:	<input type="checkbox"/> no <input type="checkbox"/> yes						
Tapered guide pins are used to lock the position of the machine after alignment:	<input type="checkbox"/> no <input type="checkbox"/> yes						
Foundations bolts are tightened with torque wrench:	<input type="checkbox"/> no <input type="checkbox"/> yes, bolt size: _____ torque: _____ Nm						
Bolt lubrication:	<input type="checkbox"/> dry <input type="checkbox"/> oil, <input type="checkbox"/> MoS ₂						
Cooling water:	<input type="checkbox"/> no <input type="checkbox"/> yes, amount: _____ m ³ /s						
Cooling element piping:	<input type="checkbox"/> flexible <input type="checkbox"/> rigid						
Transport locking device is removed:	<input type="checkbox"/> no <input type="checkbox"/> yes						
Rotor rotates without noise or scraping:	<input type="checkbox"/> no <input type="checkbox"/> yes						

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4 Lubrication check

4.1 Self lubrication

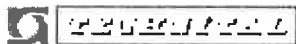
Bearing oil:	Manufacturer: _____ Type: _____
The oil quality is the same as recommended:	<input type="checkbox"/> no <input type="checkbox"/> yes
Bearing oil is filled up to the indicated level: <i>Please mark the level in the sight glass circle on the right</i>	 Sight Glass
Lubrication rings rotate freely:	<input type="checkbox"/> no <input type="checkbox"/> yes

4.2 Flood lubrication

Bearing oil:	Manufacturer: _____ Type: _____
The oil quality is the same as recommended:	<input type="checkbox"/> no <input type="checkbox"/> yes
Lubrication rings rotate freely:	<input type="checkbox"/> no <input type="checkbox"/> yes
Flood lubrication oil pressure:	_____ kPa
Oil flow:	_____ liters/min
Rotation of the pumps checked:	<input type="checkbox"/> no <input type="checkbox"/> yes
Jack-up pumps checked:	<input type="checkbox"/> no <input type="checkbox"/> yes, alarm setting: _____ kPa, relief valve setting: _____ kPa
Oil filters checked:	<input type="checkbox"/> no <input type="checkbox"/> yes

4.3 Grease lubricated bearings:

Grease:	Manufacturer: _____ Type: _____
The grease quality is the same as recommended on the bearing plate:	<input type="checkbox"/> no <input type="checkbox"/> yes
The first greasing has been done:	Date: _____ Quantity: _____ g
Comments:	



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5 Electrical installation


Network variation:	<input type="checkbox"/> no	<input type="checkbox"/> yes, voltage: _____ V, frequency: _____ Hz
Space heater operation:	<input type="checkbox"/> no	<input type="checkbox"/> manual <input type="checkbox"/> automatic, controlled by: _____
Space heater for slip ring unit:	<input type="checkbox"/> no	<input type="checkbox"/> yes, voltage: _____ V, power: _____ W

5.1 Insulation resistance test

Stator winding (1 min., 1000 VDC):	_____ M Ω , tested by _____ kV, winding temperature: _____ °C
Stator winding (15 / 60 s. or 1 / 10 min.):	PI = _____, tested by _____ kV, winding temperature: _____ °C
Rotor winding (1 min.):	_____ M Ω , tested by _____ kV, winding temperature: _____ °C
Exciter stator (1 min., 500 VDC):	_____ M Ω , tested by _____ kV, winding temperature: _____ °C
Space heater:	_____ M Ω (500 VDC)
Temperature detectors:	_____ M Ω (100 VDC)
N-end bearing insulation:	_____ M Ω (100 VDC)

5.2 Accessories resistance test

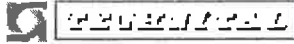
Stator 1 Pt 100:	_____ Ω
Stator 2 Pt 100:	_____ Ω
Stator 3 Pt 100:	_____ Ω
Stator 4 Pt 100:	_____ Ω
Stator 5 Pt 100:	_____ Ω
Stator 6 Pt 100:	_____ Ω
Bearing Pt 100 D-end:	_____ Ω
Bearing Pt 100 N-end:	_____ Ω
Air temperature 1 Pt 100:	_____ Ω
Air temperature 2 Pt 100:	_____ Ω
Anti-condensation heater:	_____ Ω

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6 Machine protection settings

Overcurrent tripping:	_____ A _____ s
Instant overcurrent tripping:	_____ A _____ s
Overvoltage setting:	<input type="checkbox"/> no <input type="checkbox"/> yes, setting: _____
Earth fault setting:	<input type="checkbox"/> no <input type="checkbox"/> yes, setting: _____
Reverse power setting:	<input type="checkbox"/> no <input type="checkbox"/> yes, setting: _____
Differential protection setting:	<input type="checkbox"/> no <input type="checkbox"/> yes, setting: _____
Vibration monitoring:	<input type="checkbox"/> no <input type="checkbox"/> yes, alarm: _____ mm/s, trip: _____ mm/s
Temperature monitoring:	
- in stator winding	<input type="checkbox"/> no <input type="checkbox"/> yes, alarm: _____ °C, trip: _____ °C
- in bearing	<input type="checkbox"/> no <input type="checkbox"/> yes, alarm: _____ °C, trip: _____ °C
- in _____	<input type="checkbox"/> no <input type="checkbox"/> yes, alarm: _____ °C, trip: _____ °C
Other protection units:	<input type="checkbox"/> no <input type="checkbox"/> yes, type: _____



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7 Test Run

7.1 First start (a few seconds only)

Note: Check that possible flood lubrication is on!

Direction of rotation (viewed from D-end):	<input type="checkbox"/>  CW	<input type="checkbox"/>  CCW
Are there abnormal noises?	<input type="checkbox"/> no <input type="checkbox"/> yes, from:	

7.2 Second start (uncoupled, if possible)

Note: Check that possible flood lubrication is on!

Are there abnormal noises?	<input type="checkbox"/> no <input type="checkbox"/> yes, from:	
Does the machine vibrate abnormally?	<input type="checkbox"/> no <input type="checkbox"/> yes, where/how:	
Bearing vibration level measured:	D-end: _____ mm/s, rms; N-end: _____ mm/s, rms	
Running:	<input type="checkbox"/> machine run OK <input type="checkbox"/> operation stops, why:	

Checking schedule and information

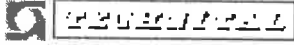
Time	Bearing temperature		Bearing vibration levels		Stator			Stator winding temperature		
	D-end	N-end	D-end	N-end	Current	Power Factor	Excit. Current	U	V	W
h:min	°C	°C	mm/s	mm/s	A	cos φ	A	°C	°C	°C
0:00										
0:05										
0:10										
0:15										
0:20										

Comments:

Observations:

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8 Test run (with load)


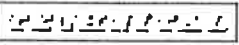
Checking schedule and information

Time h:min	Load %	Bearing temp.		Bearing vibration levels		Stator			Stator winding temperature		
		D-end °C	N-end °C	D-end mm/s rms	N-end mm/s rms	Current A	Power Factor cos φ	Excit. Current A	U °C	V °C	W °C
0:00											

Vibration spectrum attached:	<input type="checkbox"/> no <input type="checkbox"/> yes
Acceleration time:	_____ s.
Cooling air temperature:	Inlet: _____ °C Outlet: _____ °C
Cooling water temperature:	Inlet: _____ °C Outlet: _____ °C
Comments:	

9 Machine approval

Machine approved for use	Date:
Commissioning done by:	
Approved by:	

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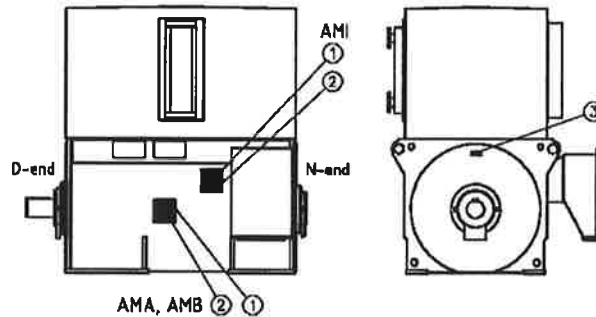
Fax Cover Sheet

Date:	
To:	ABB Oy Telefax: +358 (0) 10 22 22544
From:	
Fax number:	
Phone number:	
Email:	
Number of pages:	1 + 9 + _____

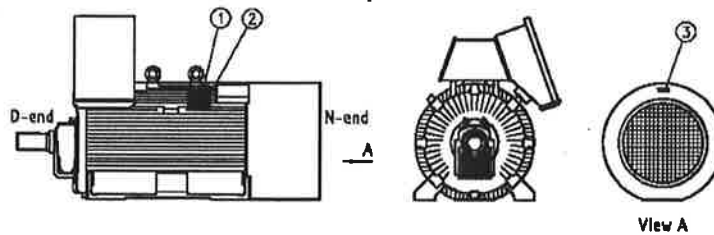
Message:

Typical position of plates

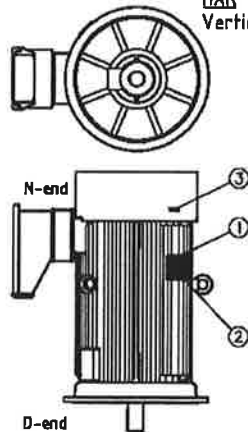
AMA, AMB, AMI



HXR Horizontally mounted



HXR Vertically mounted

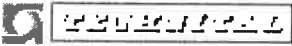


- ① Rating plate of the machine
- ② Bearing plate of the machine
- ③ Marking plate for direction of rotation

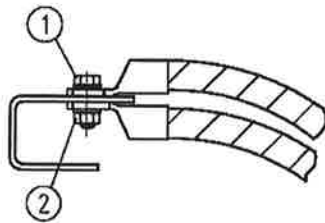
Direction of rotation seen from
the drive end towards the machine:

Clockwise
 Counter-clockwise
 Reversing operation

Machine ends:
D-end = drive end
N-end = non-drive end

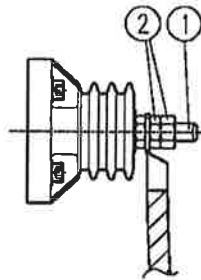
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Typical main power cable connections



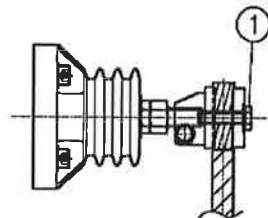
CONNECTION SCREW M12

- ① Screw: M12-steel
- ② Hexagon nut: M12-steel
- Tightening torque 55 Nm.



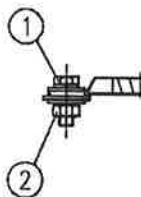
CONNECTION SCREW

- ① Screw: M16-bronze
- ② Hexagon nut: M16-brass
- Tightening torque 40 Nm.




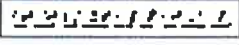
ROUND-TERMINAL: DIN 46223

- ① Screw: M10-steel
- Tightened until a reliable connection is obtained



EARTHING SCREW M12

- ① Screw: M12 - AISI 316
- ② Hexagon nut: M12-AISI 316
- Tightening torque 55 Nm. Do not tighten with machine.
- It is recommended to use grease with spring locked nuts.


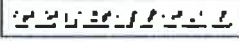
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ABB

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3. CONVERTITORI

ABB industrial drives

ACS800, stand-alone single drives, 0.55 kW - 2800 kW

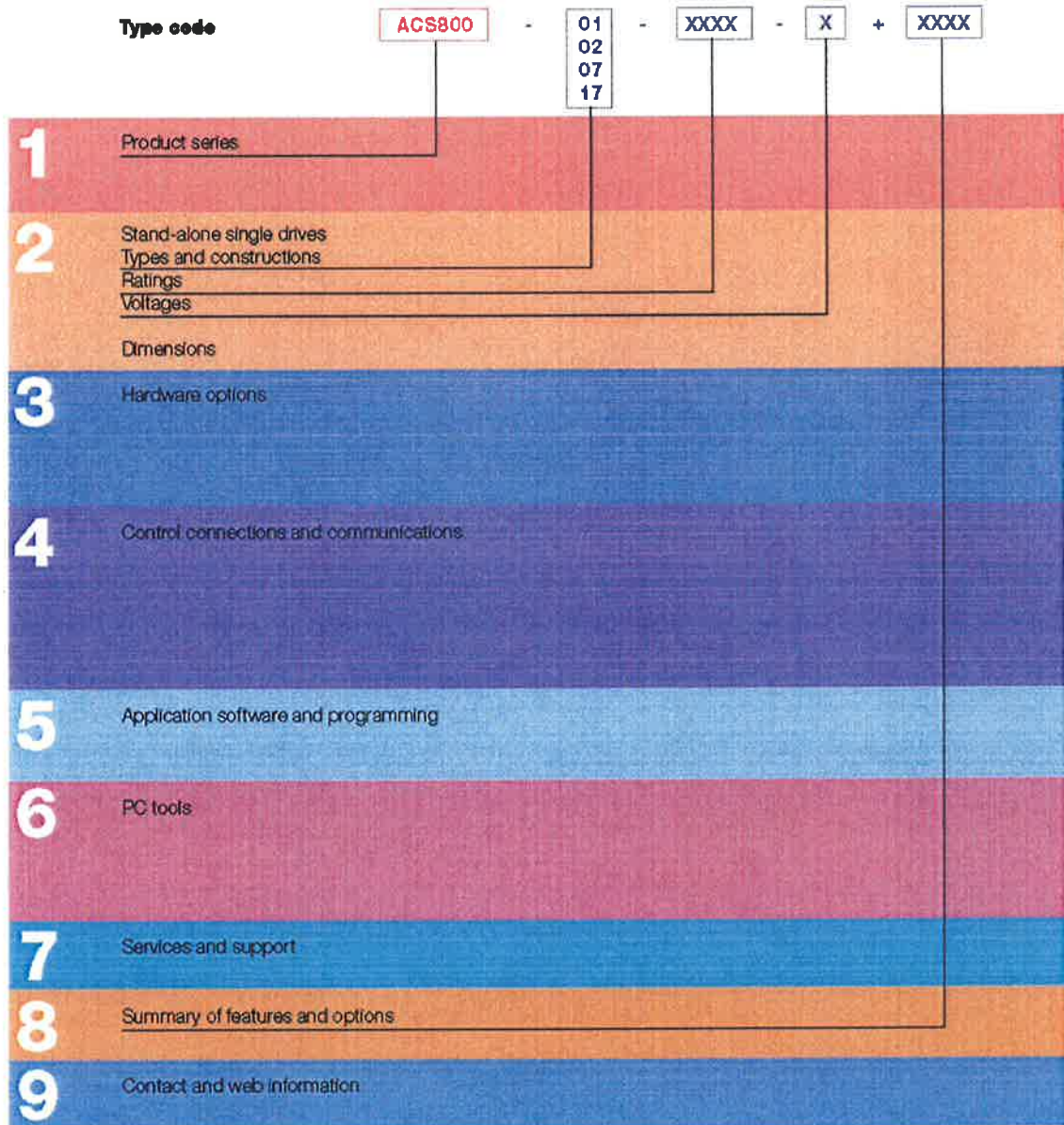
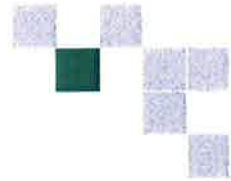
Technical catalogue



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ABB industrial drives

ACS800 -
 01
02
07
17 -
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 X +
 XXXX

ABB industrial drives

ABB industrial drives are designed for industrial applications, and especially for applications in process industries such as the pulp & paper, metals, mining, cement, power, chemical, and oil & gas industries.

ABB industrial drives are highly flexible AC drives that can be configured to meet the precise needs of industrial applications, and hence order-based configuration is an integral part of the offering. These drives cover a wide range of powers and voltages, including industrial voltages up to 690 V. ABB industrial drives come with a wide range of inbuilt options. A key feature of these drives is programmability, which makes adaptation to different applications easy.

Industrial design

ABB industrial drives are designed with current ratings to be used in industrial environments for applications requiring high overloadability. The heart of the drive is DTC, Direct Torque Control, that provides high performance and significant benefits: e.g. accurate static and dynamic speed and torque control, high starting torque and long motor cables. Inbuilt drive options make the installation work fast and easy. The robust enclosures and cabinets, with a wide range of enclosure classes, as well as power terminals, are designed for harsh environments.

One of the most significant design criteria of ABB industrial drives has been the long lifetime. Wearing parts such as fans and capacitors have been selected accordingly. This means - together with extensive protection features - excellent reliability in the demanding industrial market.

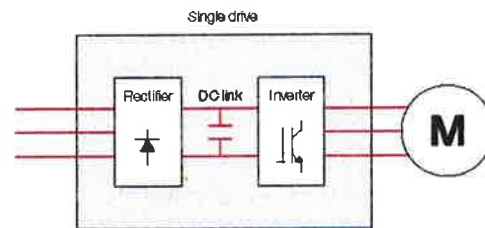


Industrial^{IT} enabled

ABB industrial drives are Industrial^{IT} enabled. This guarantees the user that ABB industrial drives can be easily integrated into ABB Industrial IT systems.

Stand-alone single drives

The single drive configuration contains a rectifier, DC link and an inverter in one single AC drive unit.



The stand-alone single drives are complete AC drives that can be installed without any additional cabinet or enclosure. The stand-alone single drives are available as wall-mounted, free-standing and cabinet-built constructions. The protection class of the stand-alone single drives is at least IP 21, and higher protection classes are available as an option.

Type code

This is the unique reference number that clearly identifies your drive by construction, power rating voltage and selected options. By type code you can specify your drives from the wide range of available options, customer specific ones are added to the type code using the corresponding + code.

Other products

Please also see the separate technical catalogues ACS800, multidrive, code 3AFE 68248531 EN and ACS800, drive modules, code 3AFE 68404592 EN.



Wall-mounted drive, ACS800-01

The wall-mounted drive, ACS800-01 offers all that you need up to 110 kW. All important features and options are built inside the drive: line choke, EMC filter, brake chopper etc. The user gets everything in a single and complete IP 21 or IP 55 package. Still the drive is also extremely small. A wide range of software alternatives makes this drive suitable for any application.

Free-standing drive, ACS800-02

The free-standing drive, ACS800-02 is a new innovative bookshelf enclosure. The power ratings start from 45 kW and go up to 560 kW. The ACS800-02 is available in an extremely compact IP 21 enclosure and uniquely offers two mounting directions. It also offers a wide range of inbuilt options including, EMC filters, brake choppers, line apparatus such as fuse switch and contactor.

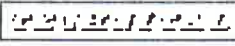
Cabinet-built drive, ACS800-07

The cabinet-built drive, ACS800-07 offers standardized configurations that can be adapted to any application. It covers a wide power range up to 2800 kW and is very compact, the largest drive is only 3.2 meters wide. It is available with IP 21, IP 22, IP 42, IP 54 and IP 54R protection classes. A wide range of inbuilt options is available and application engineering services can be offered when customization is needed.

Cabinet-built regenerative drive, ACS800-17

The cabinet-built regenerative drive, ACS800-17 is equipped with active supply unit. It is intended for drive applications where regenerative operation is needed, or for installations where exceptionally low network harmonic content is required. It covers a wide power range and has a wide range of standardized configurations that can be adapted to any application. It is available with IP 21, IP 22, IP 42 and IP 54R protection classes.





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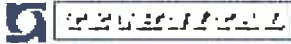
SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

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Stand-alone single drive main features



Features	Benefits	Notes
Compact and complete		
Compact size, everything integrated	Less space and installation work required.	No need to install extra components such as input chokes or EMC filter.
Inbuilt harmonic filter in all ACS800 drives	Low harmonics, meaning less interference and less heating in cables and transformers. Filter also protects the drive from line side transients.	For the lowest harmonic level, ACS800-17 offers almost a harmonic free solution.
Wide range of options available	Standard solutions available from ABB that meets most of the customer needs.	Custom made solutions are available in the ACS800-07/-17.
Versatile braking options	Always the optimal braking option available. No need for external braking chopper thus reducing size and installation cost.	Brake chopper inbuilt in all frame sizes (standard/optional). Regenerative braking with ACS800-17.
User Interface		
User friendly customer interface	Easy and fast commissioning and operation.	Clear, alphanumeric display with start-up assistant that guides through the start-up procedure. Easy to use PC tools available for commissioning, maintenance, monitoring and programming.
Versatile connections and communications	Standard I/O covers most requirements. Connectable to commonly used fieldbuses.	Extensive standard and optional I/O. I/O fulfills PELV (EN 50178).
Extensive programmability	Flexibility. Possible to replace relays or even PLC in some applications.	Two levels of programmability: 1. Parameter programming (standard) 2. Adaptive programming (free block programming) - standard feature - more blocks available as options - all I/Os are programmable
Industrial design		
Wide power and voltage range	One product series suits everywhere, meaning less training and spare parts and standardized interface to drives.	
Wide range of robust enclosures available	Suitable solutions available for different environments.	IP 21 - IP 55.
Robust main circuit design	Suitable for heavy industrial use. Reliable. Long motor cables can be used without extra output filters.	Components dimensioned for heavy duty and long lifetime. Advanced thermal model allows high overloadability.



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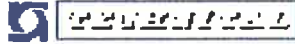
SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE,
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AUTOMAZIONE E POSIZIONAMENTO DINAMICO -
APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO
ELETTRICO

Pag. n. 157

Stand-alone single drive main features



Features	Benefits	Notes
Industrial design		
Extensive protections	Enhanced reliability, fewer process interruptions. Possibility also to protect motors and process.	Several adjustable limits to protect other equipment also.
Galvanic isolation of I/O	Safe and reliable operation without separate isolators and relays.	Isolated input signals and relay outputs as standard.
All terminals designed for industrial use	Sufficient size even for large aluminum cables. No need for special tools in I/O cabling.	
Worldwide approvals: CE, UL, eUL, CSA, C-Tick, GOST R	Safe products that can be used everywhere in the world.	
Right performance for every application		
DTC, accurate dynamic and static speed and torque control	Excellent process control even without pulse encoder - Improved product quality, productivity, reliability and lower investment cost.	
DTC - allows high overloadability and gives high starting torque	Reliable, smooth start without overdimensioning the drive.	
DTC, fast control	No unnecessary trips and process interruptions.	Fast reaction to load or voltage variations prevents tripping. Rides through power interruptions by using kinetic energy of the load.
DTC, flux optimization and sophisticated motor model	Excellent motor and drive efficiency - cost savings.	Optimal flux in the motor reduces losses.
DTC, mechanics friendly	Less stress for mechanics improves reliability.	No shock torques. No torque ripple - minimized risk for torsional vibration. Active oscillation damping.
DTC, line supply control	High performance and robust control in active supply unit.	Applies for ACS800-17.
Made in ABB		
Global market leader in AC drives. Long experience.	Well proven, safe and reliable solutions. Application know-how.	
World wide service and support network	Professional support available around the world.	



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Technical specification

ACS800 - 01 - XXXX - X + XXXX
 02
 07
 17

Mains connection	
Voltage and power range	3-phase, $U_{DN} = 208$ to 240 V, $\pm 10\%$, except -07, -17 3-phase, $U_{DN} = 380$ to 415 V, $\pm 10\%$ 3-phase, $U_{DN} = 390$ to 600 V, $\pm 10\%$ 3-phase, $U_{DN} = 525$ to 690 V, $\pm 10\%$
Frequency	48 to 63 Hz
Power factor	$\cos\phi_1 = 0.98$ (fundamental) $\cos\phi = 0.93 \dots 0.95$ (total)
Power factor (ACS800-17)	$\cos\phi_1 = 1$ (fundamental) $\cos\phi = 0.99$ (total)
Efficiency (at nominal power)	ACS800-0x 98% ACS800-17 97%

Motor connection	
Voltage for > 500 V units	3-phase output voltage $0 \dots U_{DN} / U_{3N} / U_{DN} / U_{3N}$ please see "Filter selection table for ACS800" under the du/dt filters on page 28
Frequency	$0 \dots \pm 300$ Hz $(0 \dots \pm 100$ Hz for 07 with du/dt filters)
Field weakening point	$8 \dots 300$ Hz
Motor control	ABB's Direct Torque Control (DTC)
Torque control: Open loop Closed loop	Torque step rise time: <5 ms with nominal torque <5 ms with nominal torque Non-linearity: $\pm 4\%$ with nominal torque $\pm 1\%$ with nominal torque
Speed control: Open loop Closed loop	Static accuracy: 10% of motor slip 0.01% of nominal speed Dynamic accuracy: 0.3...0.4% sec. with 100% torque step 0.1...0.2% sec. with 100% torque step

Environmental limits	
Ambient temperature Transport Storage Operation	-40...+70°C -40...+70°C -15...+50°C, no frost allowed 40...50°C at reduced output current (1% / 1°C)
Cooling method:	Dry clean air
Altitude 0...1000 m 1000...4000 m	without derating with derating $\sim (1\% / 100$ m) (690 V units: 1000...2000 m with derating)
Relative humidity	5 to 95%, no condensation allowed
Protection class IP 21 IP 22 IP 42 IP 54 IP 54R IP 55 R = outlet air duct connection	standard for -01, -02, -07, -17 option for -07, -17 option for -07, -17 option for -07 option for -07, -17 option for -01
Paint colour -07, -17: RAL 7035 -01, -02: NCS 1502-Y (RAL 90021, PMS 420 C)	
Contamination levels: Storage	No conductive dust allowed IEC60721-3-1, Class 1C2 (chemical gases), Class 1S2 (solid particles)
Transportation	IEC60721-3-2, Class 2C2 (chemical gases), Class 2S2 (solid particles)
Operation	IEC60721-3-3, Class 3C2 (chemical gases), Class 3S2 (solid particles without airtight filters)
Vibration	IEC60068-2-6, 10...58 Hz 0.075 mm displacement amplitude 58...150 Hz 10 m / s^2 (1 g)
	C = chemically active substances S = mechanically active substances

Product compliance	
CE	Low Voltage Directive 73/23/EEC with amendment 93/68/EEC Machinery Directive 98/37/EEC EMC Directive 89/336/EEC with amendment 93/68/EEC Quality assurance system ISO 9001 and Environmental system ISO 14001 UL, cUL 508A or 508C and CSA C22.2 NO.14-95, C-Tick, GOST R

EMC (according to EN 61800-3)	
2 nd environment, unrestricted distribution	- standard in -17 and in -07 (frame size rxB8), option in the others
1 st environment, restricted distribution as options up to 1000 A input current	
Available options are shown in the Summary of features and options table. Please see page 44-45.	

Wall-mounted drive ACS800-01, up to 110 kW



Compact and complete drive

The ACS800-01 offers all that you need in a single, extremely small, wall-mounted package making it a compact and complete drive. The standard degree of protection is IP 21. Optional IP 55 allows full performance without derating. Power ratings start from 0.55 kW heavy-duty rating and go up to 110 kW continuous load rating. There are five different mechanical frame sizes covering the power range. Each frame size is optimized in performance, size and weight.

Everything inside

From the smallest to the biggest ACS800-01 there is an extensive range of inbuilt features and options. Standard features include a choke for harmonic filtering and drive protection, extensive and flexible I/O, user-friendly control panel with Start-up Assistant feature and a silent, long lifetime cooling fan. Brake chopper is included as standard in the two smallest frame sizes R2 and R3 as well as in the 690 V R4 frame. In other frames the chopper is an inbuilt option. Inbuilt options include EMC filters and extension modules for additional I/O, fieldbus and pulse encoder.

Main standard hardware features

- Wall mounting
- IP 21 protection class
- Compact design
- Harmonic filtering choke inside
- Input rectifier protection
- Brake chopper (in frame sizes R2-R3; R4 only 690 V)
- Long lifetime cooling fan and capacitors
- Extensive, programmable I/O with galvanically isolated inputs
- Three I/O and fieldbus extension slots inside
- Alphanumeric, multilingual control panel with start-up assistant feature
- Large power terminals allowing use of a wide range of cable sizes

Options for ACS800-01

Inbuilt options:

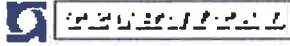
- IP 55 protection class
- Brake chopper (in frame sizes R4-R6)
- EMC filter for 1st environment, restricted distribution according to EN 61800-3
- EMC filter for 2nd environment, unrestricted distribution according to EN 61800-3
- Analog and digital I/O extension modules
- Fieldbus modules
- Pulse encoder interface module

External options:

- Brake resistor
- Output filters
- Ethernet module

Marine type approved design.





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Ratings and dimensions ACS800-01

ACS800 - 01 - OXXX - 2 + XXXX
3

Nominal ratings		No-overload use		Light-overload use		Heavy-duty use		Noise level	Heat dissipation	Air flow	Type code	Frame size
$I_{n, rms}$	$I_{n, av}$	$P_{n, rms}$	I_n	P_n	$I_{n, rms}$	$P_{n, rms}$	$I_{n, rms}$	dBSA	W	m ³ /h		
U_n = 230 V (Range 200-240 V). The power ratings are valid at nominal voltage 230 V.												
5.1	5.5	1.1	4.7	0.75	3.4	0.55	62	100	35	ACS800-01-0001-2	F2	
6.5	8.2	1.5	6	1.1	4.3	0.75	62	100	35	ACS800-01-0002-2	F2	
8.5	10.8	1.5	7.7	1.5	6.7	1.1	62	100	35	ACS800-01-0003-2	F2	
10.9	13.8	2.2	10.2	2.2	7.5	1.5	62	120	35	ACS800-01-0004-2	F2	
13.9	17.6	3	12.7	3	9.3	2.2	62	140	35	ACS800-01-0005-2	F2	
19	24	4	18	4	14	3	62	160	69	ACS800-01-0006-2	F3	
25	32	5.5	24	5.5	19	4	62	200	69	ACS800-01-0009-2	F3	
34	45	7.5	31	7.5	25	5.5	62	250	69	ACS800-01-0011-2	F3	
44	62	11	42	11	32	7.5	62	340	103	ACS800-01-0016-2	F4	
55	72	15	50	11	37	7.5	62	440	103	ACS800-01-0020-2	F4	
72	86	18.5	69	18.5	49	11	65	530	168	ACS800-01-0026-2	F5	
86	112	22	80	22	60	15	65	610	168	ACS800-01-0030-2	F5	
103	138	30	94	22	60	18.5	65	810	168	ACS800-01-0046-2	F6	
141	164	37	132	37	97	30	65	1190	405	ACS800-01-0060-2	F6	
166	202	45	155	45	115	30	65	1190	405	ACS800-01-0060-2	F6	
202	282	55	184	55	141	37	65	1440	405	ACS800-01-0070-2	F6	
U_n = 400 V (Range 380-415 V). The power ratings are valid at nominal voltage 400 V.												
5.1	5.5	1.5	4.7	1.5	3.4	1.1	62	100	35	ACS800-01-0003-3	F2	
6.5	8.2	2.2	6.9	2.2	4.3	1.5	62	120	35	ACS800-01-0004-3	F2	
8.5	10.8	3	7.7	3.0	6.7	2.2	62	140	35	ACS800-01-0005-3	F2	
10.9	13.8	4	10.2	4.0	7.5	3	62	160	35	ACS800-01-0006-3	F2	
13.9	17.6	5.5	12.7	5.5	9.3	4	62	200	35	ACS800-01-0009-3	F2	
19	24	7.5	18	7.5	14	5.5	62	250	69	ACS800-01-0011-3	F3	
25	32	11	24	11	19	7.5	62	340	69	ACS800-01-0016-3	F3	
34	45	15	31	15	23	11	62	440	69	ACS800-01-0026-3	F3	
44	62	22	41	18.5	32	15	62	530	103	ACS800-01-0026-3	F4	
55	72	30	50	22	37	18.5	62	610	103	ACS800-01-0030-3	F4	
72	86	37	69	30	49	22	65	810	168	ACS800-01-0046-3	F5	
86	112	45	80	37	60	30	65	990	168	ACS800-01-0060-3	F5	
103	138	55	94	45	69	37	65	1190	168	ACS800-01-0060-3	F5	
141	164	75	132	55	97	45	65	1440	405	ACS800-01-0070-3	F6	
166	202	90	155	75	115	55	65	1940	405	ACS800-01-0100-3	F6	
202	282	110	184	90	141	75	65	2310	405	ACS800-01-0120-3	F6	



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Ratings and dimensions ACS800-01



ACS800 - 01 - OXXX - 57 + XXXX

Nominal ratings		No-overload use		Light-overload use		Heavy-duty use		Noise level	Heat dissipation	Air flow	Type code	Frame size
I_{max}	I_n	$P_{cont,max}$	I_n	P_n	I_{hd}	P_{hd}		dBSA	W	m ³ /h		
A	A	MW	A	MW	A	MW						
U_n = 500 V (Range 380-500 V). The power ratings are valid at nominal voltage 500 V.												
4.9	6.5	2.2	4.5	2.9	3.4	1.5	62	120	35	ACS800-01-0004-5	R2	
6.2	8.2	3	6.6	3	4.2	2.2	62	140	35	ACS800-01-0005-5	R2	
8.1	10.5	4	7.7	4	5.6	3	62	160	35	ACS800-01-0006-5	R2	
10.5	13.5	5.5	10	5.5	7.5	4	62	200	35	ACS800-01-0009-5	R2	
13.2	17.5	7.5	12	7.5	9.2	5.5	62	250	35	ACS800-01-0011-5	R2	
19	24	11	15	11	12	7.5	62	340	69	ACS800-01-0014-5	R3	
25	32	15	22	15	18	11	62	440	69	ACS800-01-0020-5	R3	
34	45	18.5	31	18.5	22	15	62	530	69	ACS800-01-0025-5	R3	
42	62	22	39	22	32	18.5	62	610	103	ACS800-01-0030-5	R4	
48	72	30	44	30	36	22	62	810	103	ACS800-01-0040-5	R4	
55	86	37	61	37	50	30	65	990	168	ACS800-01-0050-5	R5	
79	112	45	75	45	60	37	65	1120	168	ACS800-01-0060-5	R5	
96	128	55	88	55	69	45	65	1440	168	ACS800-01-0070-5	R5	
124	164	75	115	75	88	55	65	1940	405	ACS800-01-0100-5	R6	
157	202	90	145	90	113	75	65	2310	405	ACS800-01-0120-5	R6	
180	282	110	163	110	141	90	65	2810	405	ACS800-01-0140-5	R6	
U_n = 690 V (Range 525-690 V). The power ratings are valid at nominal voltage 690 V.												
13	14	11	11.5	7.5	8.5	5.5	62	300	103	ACS800-01-0011-7	R4	
17	19	15	15	11	11	7.5	62	340	103	ACS800-01-0016-7	R4	
22	26	18.5	20	15	15	11	62	440	103	ACS800-01-0020-7	R4	
25	38	22	23	18.5	19	15	62	530	103	ACS800-01-0025-7	R4	
33	44	30	30	22	22	18.5	62	610	103	ACS800-01-0030-7	R4	
36	54	30	34	30	27	22	62	690	103	ACS800-01-0040-7	R4	
51	62	45	46	37	34	30	65	840	168	ACS800-01-0050-7	R5	
57	84	55	59	45	42	37	65	1010	168	ACS800-01-0060-7	R5	
79	104	75	73	55	54	45	65	1220	405	ACS800-01-0070-7	R6	
93	124	90	86	75	62	55	65	1650	405	ACS800-01-0100-7	R6	
113	172	110	108	90	86	75	65	1960	405	ACS800-01-0120-7	R6	

Enclosure

Degree of Protection:
IP 21 (Standard)
IP 55 (Option)
Paint color:
NCS 1502-Y (RAL 90021/PMS 420C)

Type	IP 21				IP 55				
	H1	H2	W1	Depth	Weight	H1	W1	Depth	Weight
	mm	mm	mm	mm	kg	mm	mm	mm	kg
R2	405	370	165	226	9	528	253	241	16
R3	471	420	173	255	14	528	253	273	18
R4	607	490	240	274	26	774	377	278	33
R5	730	602	255	285	34	775	377	308	51
R6	800	700	300	309	67	923	420	420	77

H1 = Height with cable connection box
H2 = Height without cable connection box
W1 = Width of the standard unit
N/A = not available

* ACS800-01 without cable connection box does not fulfill IP 21 requirements.

Nominal Ratings

$I_{cont,max}$: rated current available continuously without overloadability at 40°C.

I_{max} : maximum output current. Available for 10 s at start, otherwise as long as allowed by drive temperature. Note: max. motor shaft power is 150% P_n .

Typical Ratings:

No-overload use

$P_{cont,max}$: typical motor power in no-overload use.

Light-overload use

I_n : continuous current allowing 110% I_n for 1 min/5 min at 40°C.

P_n : typical motor power in light-overload use.

Heavy-duty use

I_{hd} : continuous current allowing 150% I_{hd} for 1 min/5 min at 40°C.

P_{hd} : typical motor power in heavy-duty use.

The current ratings are the same regardless of the supply voltage within one voltage range.

The ratings apply at 40°C ambient temperature.
At higher temperatures (up to 50°C) the derating is 1% / 1°C.

Free-standing drive ACS800-02, up to 560 kW



Compact and complete drive

The ACS800-02 single drive is a unique, extremely compact bookshelf-style unit with a new innovative free-standing enclosure. The power ratings start from 45 kW heavy duty rating and go up to 560 kW continuous load rating. It is available in IP 21 protection class.

Fits anywhere

The ACS800-02 drive is extremely compact without sacrificing user-friendliness. When using bookshelf mounting, even side-by-side installation is possible. In addition to bookshelf mounting, the ACS800-02 offers the possibility for flat type (sideways) mounting, making it possible to optimize depth instead of width.

Everything inside

The ACS800-02 has an extensive selection of inbuilt features and options. Standard features include a choke for harmonic filtering and drive protection, extensive and flexible I/O, user-friendly control panel with Start-up Assistant feature and a silent, long lifetime cooling fan.

Inbuilt options include EMC filters, brake chopper, common mode filter for motor protection and extension modules for additional I/O, fieldbus and pulse encoder. An enclosure extension is also available for incoming apparatus, further enhancing the versatility of the drive.



Main standard hardware features

- Free-standing
- IP 21 protection class
- Very narrow bookshelf design
- Two mounting directions as standard enabling optimization of depth
- Harmonic filtering choke inside
- Input rectifier protection
- Long lifetime cooling fan and capacitors
- Extensive, programmable I/O with galvanically isolated inputs
- Three I/O and fieldbus extension slots inside
- Alphanumeric, multilingual control panel with start-up assistant feature
- Large power terminals allowing the use of a wide range of cable sizes

Options for ACS800-02

Inbuilt options:

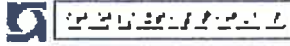
- Brake chopper
- EMC filter for 1st environment, restricted distribution according to EN 61800-3
- EMC filter for 2nd environment, unrestricted distribution according to EN 61800-3
- Analog and digital I/O extension modules
- Fieldbus modules
- Pulse encoder interface module
- Common mode filters for motor protection

Options available with enclosure extension:

- Fuse switch
- Contactor with emergency stop push button
- 1 or 2 thermistor relays
- 3 Pt100 relays
- Cable top entry and exit
- Customer terminal block

External options:

- Brake resistor
- Output filters
- Ethernet module



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Rev.

Data:

SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

Ratings and dimensions ACS800-02

ACS800 - 02 - OXXX - 2357 + XXXX

Nominal ratings		No-overload use		Light-overload use		Heavy-duty use		Noise level	Heat dissipation	Air flow	Type code	Frame size
$I_{n,cont}$	$I_{n,10s}$	$P_{cont,max}$	$I_{L,10s}$	$P_{L,10s}$	$I_{H,10s}$	$P_{H,10s}$		dBA	W	m ³ /h		
A	A	kW	A	kW	A	kW						
U_n = 230 V (Ranges 200-240 V). The power ratings are valid at nominal voltage 230 V.												
214	326	55	211	55	170	45	71	2900	540		ACS800-02-0080-2	R7
253	404	75	248	75	202	55	71	3450	540		ACS800-02-0100-2	R7
295	432	90	290	90	240 ¹⁾	55	71	4050	540		ACS800-02-0120-2	R7
405	538	110	396	110	316	90	72	5300	1220		ACS800-02-0140-2	R8
447	538	132	440	132	340	90	72	6100	1220		ACS800-02-0170-2	R8
528	538	160	516	160	370	110	72	6700	1220		ACS800-02-0210-2	R8
613	540	180	598	180	400	132	72	7600	1220		ACS800-02-0230-2	R8
693	1017	200	679	200	590 ²⁾	160	72	7850	1220		ACS800-02-0260-2	R8
720	1017	200	704	200	535 ³⁾	200	72	8300	1220		ACS800-02-0300-2	R8
U_n = 400 V (Ranges 380-415 V). The power ratings are valid at nominal voltage 400 V.												
206	326	110	202	110	163	90	71	3000	540		ACS800-02-0140-3	R7
248	404	132	243	132	202	110	71	3650	540		ACS800-02-0170-3	R7
289	432	150	284	150	240 ⁴⁾	132	71	4300	540		ACS800-02-0210-3	R7
445	538	200	440	200	340	160	72	5600	1220		ACS800-02-0260-3	R8
521	538	250	515	250	370	200	72	7150	1220		ACS800-02-0320-3	R8
602	540	315	590	315	477	250	72	8100	1220		ACS800-02-0400-3	R8
683	1017	355	679	355	590 ⁵⁾	315	72	8650	1220		ACS800-02-0440-3	R8
720	1017	400	704	400	535 ⁶⁾	355	72	9100	1220		ACS800-02-0490-3	R8
U_n = 500 V (Ranges 380-500 V). The power ratings are valid at nominal voltage 500 V.												
196	326	132	192	132	162	110	71	3000	540		ACS800-02-0170-5	R7
245	384	160	240	160	192	132	71	3800	540		ACS800-02-0210-5	R7
289	432	200	284	200	224	160	71	4500	540		ACS800-02-0260-5	R7
440	538	250	435	250	340	200	72	5850	1220		ACS800-02-0320-5	R8
515	538	315	510	315	370	250	72	7800	1220		ACS800-02-0400-5	R8
550	540	355	545	355	400	315	72	7600	1220		ACS800-02-0440-5	R8
602	540	400	590	400	515 ⁷⁾	355	72	8100	1220		ACS800-02-0490-5	R8
684	1017	450	670	450	590 ⁸⁾	400	72	9100	1220		ACS800-02-0550-5	R8
718	1017	500	704	500	635 ⁹⁾	450	72	9700	1220		ACS800-02-0610-5	R8
U_n = 690 V (Ranges 525-690 V). The power ratings are valid at nominal voltage 690 V.												
134	190	132	125	110	95	90	71	2800	540		ACS800-02-0140-7	R7
166	253	160	155	132	131	110	71	3550	540		ACS800-02-0170-7	R7
166/200 ¹⁾	294	160	166/195 ²⁾	160	147	132	71	4250	540		ACS800-02-0210-7	R7
175/230 ³⁾	326	160/200 ⁴⁾	175/212 ⁵⁾	160/200 ⁶⁾	163	160	71	4800	540		ACS800-02-0260-7	R7
315	431	315	290	250	216	200	72	5150	1220		ACS800-02-0320-7	R8
353	546	355	344	315	274	250	72	6650	1220		ACS800-02-0400-7	R8
395	556	400	387	355	328	315	72	7400	1220		ACS800-02-0440-7	R8
445	776	450	426	400	387	355	72	8450	1220		ACS800-02-0490-7	R8
488	853	500	482	450	406	400	72	8300	1220		ACS800-02-0550-7	R8
550	964	550	537	500	452	450	72	9750	1220		ACS800-02-0610-7	R8

Enclosure
 Degree of Protection: IP 21 (Standard)
 Paint color: NCS 1502-Y (RAL 9002/1/PMS 430C)

Type	IP 21					
	Height mm	W1 mm	W2 mm	Depth mm	Weight kg	Weight with enclosure extension 7 kg
R7	1607	250 ¹⁾	602	524 ²⁾	110	234
R8	2024	347 ³⁾	793	622 ⁴⁾	240	450

W1 = Width of the standard unit
 W2 = Width with enclosure extension

- ¹⁾ The dimensions apply to bookshelf mounting. In flat type mounting the width and depth change places.
- ²⁾ With enclosure extension the depth is increased by 25 mm due to the switch fuse handle.
- ³⁾ Weights are for the basic configuration with switch fuse, but without contactor and other options.

Nominal Ratings:
 $I_{cont,max}$: rated current available continuously without overloadability at 40°C.

$I_{out,max}$: maximum output current. Available for 10 s at start, otherwise as long as allowed by drive temperature. Note: max motor shaft power is 150% P_{out} .

Typical Ratings:
 No-overload use
 $P_{cont,max}$: typical motor power in no-overload use.

Light-overload use
 I_L : continuous current allowing 110% I_L for 1 min / 5 min at 40°C.

P_L : typical motor power in light-overload use.


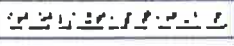
Heavy-duty use
 I_H : continuous current allowing 150% I_H for 1 min / 5 min at 40°C.

P_H : typical motor power in heavy-duty use.

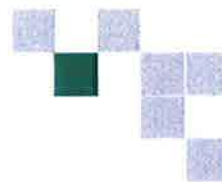
The current ratings are the same regardless of the supply voltage within one voltage range.

The ratings apply at 40°C ambient temperature. At higher temperatures (up to 50°C) the derating is 1% / 1°C.

- Notes:**
- ¹⁾ 50% overload available if $T_{amb} < 35^\circ\text{C}$. If $T_{amb} = 40^\circ\text{C}$, max overload is 45%.
 - ²⁾ 50% overload available if $T_{amb} < 30^\circ\text{C}$. If $T_{amb} = 40^\circ\text{C}$, max overload is 40%.
 - ³⁾ 50% overload available if $T_{amb} < 20^\circ\text{C}$. If $T_{amb} = 40^\circ\text{C}$, max overload is 30%.
 - ⁴⁾ 50% overload available if $T_{amb} < 25^\circ\text{C}$. If $T_{amb} = 40^\circ\text{C}$, max overload is 37%.
 - ⁵⁾ Higher value available if output frequency is above 41 Hz.

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Cabinet-built drive ACS800-07, up to 2800 kW



Customized solutions

The ACS800-07 is built in a robust cabinet designed for heavy industrial applications.

The ACS800-07 offers a wide variety of standardized configurations to adapt to different application requirements, from line contactor to prevention of unexpected motor start, or ATEX-approved motor protections.

If your application requires more, ABB's application engineering services can add special features to the standard product such as an additional cabinet for customer specific devices to ensure exact suitability for the application.

Smart module concept

The drives up to 560 kW are based on a compact single module including rectifier and inverter. Larger drives consist of separate rectifier and inverter modules, which have plug-in power connectors providing easy maintenance and redundancy with parallel connected units. If one module becomes defective, the drive can continue running with reduced power after disconnecting the faulty module. The rectifier module of the larger drives provides 6- or 12-pulse operation as standard.

Extensive range of features

The ACS800-07 has an extensive range of inbuilt features and options. Typical option choices include extended I/O and fieldbus options, line contactor, EMC filtering, common mode filtering and du/dt (voltage rise) filtering, all mountable within the single cabinet.

Main standard features

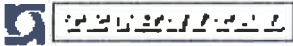
- Compact design
- IP 21 protection class
- Inbuilt harmonic filtering choke
- Du/dt filters (in frame sizes nxR8I)

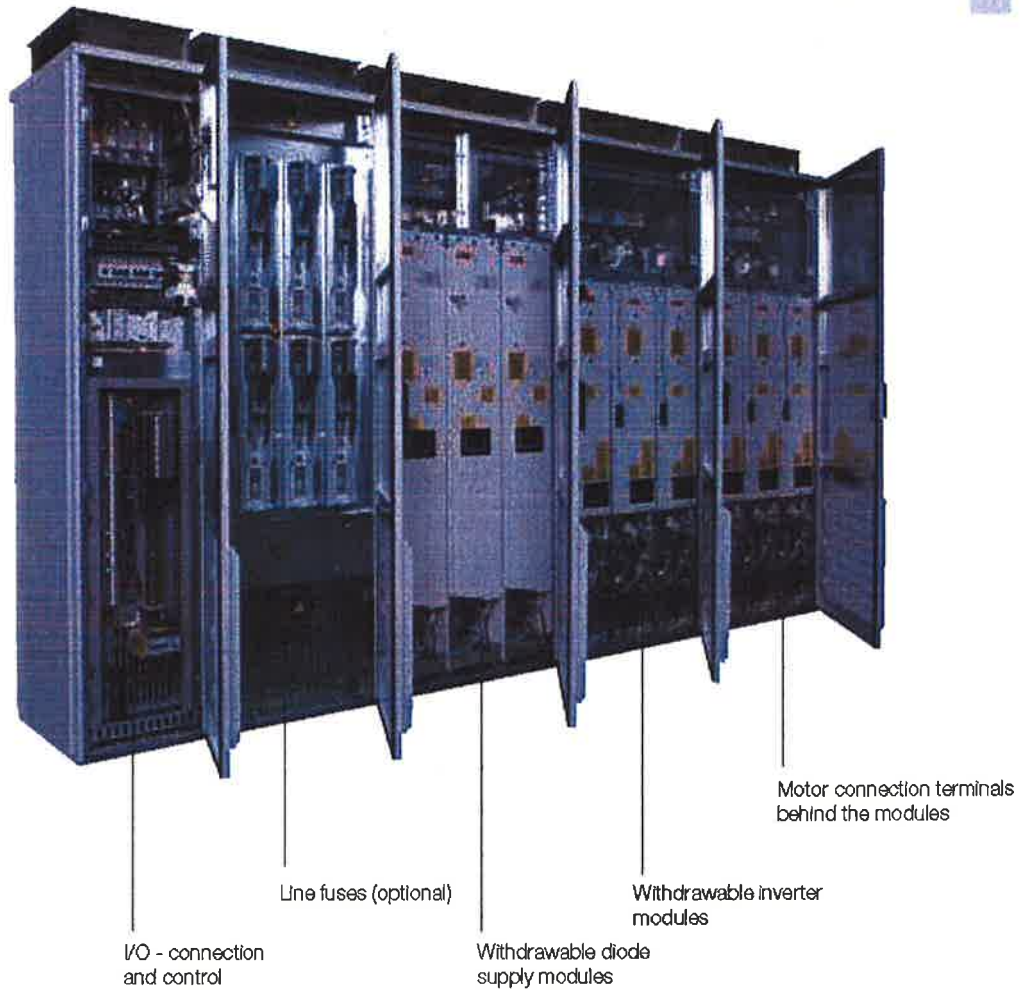
- Common mode filters for motor protection (in frame sizes R8I)
- Fuse switch (in frame sizes R6-R8)
- Main switch (in frame sizes nxR8I)
- Extensive, programmable I/O
- Inputs galvanically isolated
- 6- or 12-pulse operation (in frame sizes nxR8I)
- Long lifetime cooling fan and capacitors
- I/O and fieldbus extension slots inside
- Alphanumeric multilingual control panel with start-up assistant feature
- EMC filter for 2nd environment, unrestricted distribution according to EN 61800-3 (in frame sizes nxR8I)

Options for ACS800-07

- Analog and digital I/O extension modules
- ATEX approved motor protection
- Brake chopper and resistor
- Cabinet heater
- Common mode filters for motor protection (in frame sizes R7-R8)
- Customer terminal block
- Du/dt filters (in frame sizes R6-R8)
- Earth fault monitoring for unearthed network
- EMC filter for 1st environment, restricted distribution according to EN 61800-3
- EMC filter for 2nd environment, unrestricted distribution according to EN 61800-3 (in frame sizes R6-R8)
- Fieldbus modules
- IP 22, IP 42, IP 54 or IP 54R enclosure classes
- Line contactor with emergency stop push button
- Line fuse switch (frames nxR8I)
- Marine construction
- Output for fan motor
- Pulse encoder interface module
- Prevention of unexpected start up of motor
- Top entry and exit of cables
- 1 or 2 thermistor relays
- 3, 5 or 8 Pt100 relays

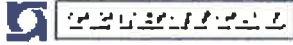
Plus tailor made options through ABB's application engineering.

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ACS800-07-3190-7 2600 kW drive

Diode supply and inverter units of nxR8i drives are on wheels providing quick and easy maintenance.



Rev. C0

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Rev.

Data:

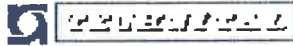
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Ratings and dimensions ACS800-07

ACS800 - 07 - XXXX - 3 5 + XXXX

Nominal ratings		No-overload use		Light-overload use		Heavy-duty use		Noise level		Heat dissipation		Air flow		Type code		Frame size	
$I_{n, max}$	$I_{n, cont}$	$P_{max, cont}$	I_L	P_L	I_H	P_H	dB(A)	kW	m^3/h								
A	A	kW	A	kW	A	kW											
U_n = 400 V (Range 300-415 V). The power ratings are valid at nominal voltage 400 V.																	
141	164	75	132	55	97	45	63	1.44	405	ACS800-07-0070-3							R6
155	202	90	155	75	115	55	63	1.94	405	ACS800-07-0100-3							R6
202	282	110	184	90	141	75	63	2.31	405	ACS800-07-0120-3							R6
306	326	110	202	110	163	90	71	3.00	540	ACS800-07-0140-3							R7
248	404	132	243	132	202	110	71	3.65	540	ACS800-07-0170-3							R7
289	432	150	284	150	240 ^h	132	71	4.30	540	ACS800-07-0210-3							R7
445	588	200	440	200	340	160	72	6.50	1220	ACS800-07-0250-3							R8
621	588	250	516	250	370	200	72	7.15	1220	ACS800-07-0320-3							R8
602	840	315	590	315	477	250	72	8.10	1220	ACS800-07-0400-3							R8
693	1017	355	679	355	590 ^a	315	72	8.65	1220	ACS800-07-0440-3							R8
720	1017	400	704	400	635 ^a	355	72	9.00	1220	ACS800-07-0490-3							R8
879	1315	500	844	500	667	400	73	13.0	3120	ACS800-07-0510-3							1xD4 + 2xR81
1111	1521	630	1067	630	831	450	74	17.2	3840	ACS800-07-0770-3							2xD4 + 2xR81
1255	1877	710	1205	710	939	500	74	18.5	3840	ACS800-07-0870-3							2xD4 + 2xR81
1452	1988	800	1394	800	1086	630	74	23.9	3840	ACS800-07-1030-3							2xD4 + 2xR81
1770	2548	1000	1899	1000	1324	710	75	27.5	5040	ACS800-07-1230-3							2xD4 + 3xR81
2156	2951	1200	2070	1200	1613	900	76	35.4	5760	ACS800-07-1540-3							3xD4 + 3xR81
2521	3394	1450	2556	1450	1992	1120	76	42.7	6960	ACS800-07-1850-3							3xD4 + 4xR81
U_n = 500 V (Range 300-500 V). The power ratings are valid at nominal voltage 500 V.																	
124	164	75	115	75	88	55	63	1.34	405	ACS800-07-0100-5							R6
157	202	90	145	90	113	75	63	2.31	405	ACS800-07-0120-5							R6
190	282	110	163	110	141	90	63	2.81	405	ACS800-07-0140-5							R6
196	326	132	192	132	152	110	71	3.00	540	ACS800-07-0170-5							R7
245	384	150	240	150	192	132	71	3.80	540	ACS800-07-0210-5							R7
289	432	200	284	200	224	160	71	4.50	540	ACS800-07-0250-5							R7
440	588	250	435	250	340	200	72	6.95	1220	ACS800-07-0320-5							R8
515	588	315	510	315	370	250	72	7.90	1220	ACS800-07-0400-5							R8
550	840	355	545	355	490	315	72	7.60	1220	ACS800-07-0440-5							R8
602	840	400	590	400	515 ^a	355	72	8.10	1220	ACS800-07-0490-5							R8
684	1017	450	670	450	590 ^a	400	72	9.10	1220	ACS800-07-0550-5							R8
718	1017	500	704	500	632 ^a	450	72	9.70	1220	ACS800-07-0610-5							R8
883	1321	630	848	630	660	500	73	14.0	3120	ACS800-07-0700-5							1xD4 + 2xR81
1050	1524	710	1008	710	785	560	74	17.2	3840	ACS800-07-0910-5							2xD4 + 2xR81
1258	1882	900	1208	900	941	630	74	19.9	3840	ACS800-07-1090-5							2xD4 + 2xR81
1372	1991	1000	1317	1000	1026	710	74	23.8	3840	ACS800-07-1210-5							2xD4 + 2xR81
1776	2555	1250	1704	1250	1328	900	75	29.4	5040	ACS800-07-1540-5							2xD4 + 3xR81
2037	2956	1450	1956	1400	1524	1120	76	35.0	5760	ACS800-07-1820-5							3xD4 + 3xR81
2570	3391	1900	2563	1850	1997	1400	76	45.4	6960	ACS800-07-2310-5							3xD4 + 4xR81



Ratings and dimensions

ACS800-07

ACS800 - 07 - XXXX - 7 + XXXX

Nominal ratings		No-overload use		Light-overload use		Heavy-duty use		Noise level	Heat dissipation	Air flow	Type code	Frame size
$I_{n,cont}$	$I_{n,10s}$	$P_{cont,10s}$	$I_{L,10s}$	$P_{L,10s}$	$I_{H,10s}$	$P_{H,10s}$	dBA					
A	A	MW	A	MW	A	MW						
U _n = 690 V (Range 525-690 V). The power ratings are valid at nominal voltage 690 V.												
79	104	75	73	55	54	45	63	1.22	405	405	ACS800-07-0070-7	F6
93	124	90	85	75	62	55	63	1.65	405	405	ACS800-07-0100-7	F6
113	172	110	108	90	86	75	65	1.96	405	405	ACS800-07-0120-7	F6
134	190	132	125	110	96	90	71	2.00	540	540	ACS800-07-0140-7	F7
165	263	160	155	132	131	110	71	3.55	540	540	ACS800-07-0170-7	F7
166/203*	204	160	165/195*	150	147	132	71	4.25	540	540	ACS800-07-0210-7	F7
175/200*	265	160/200*	175/212*	160/200*	163	160	71	4.80	540	540	ACS800-07-0250-7	F7
215	433	316	290	250	216	200	72	6.15	1220	1220	ACS800-07-0320-7	F8
253	548	355	344	315	274	250	72	6.65	1220	1220	ACS800-07-0400-7	F8
296	656	400	397	355	326	315	72	7.40	1220	1220	ACS800-07-0440-7	F8
445	775	450	426	400	387	355	72	8.45	1220	1220	ACS800-07-0490-7	F8
488	853	500	482	450	426	400	72	8.30	1220	1220	ACS800-07-0550-7	F8
560	954	550	537	500	482	450	72	9.75	1220	1220	ACS800-07-0610-7	F8
598	999	630	603	630	470	500	73	13.9	3120	3120	ACS800-07-0750-7	1xD4 + 2xP8
729	1091	710	700	710	545	560	73	17.1	3120	3120	ACS800-07-0870-7	1xD4 + 2xP8
885	1324	800	850	800	682	630	73	18.4	3120	3120	ACS800-07-1050-7	1xD4 + 2xP8
953	1426	900	915	900	713	710	74	20.8	3840	3840	ACS800-07-1160-7	2xD4 + 2xP8
1253	1792	1200	1208	1200	941	900	75	27.0	5040	5040	ACS800-07-1600-7	2xD4 + 3xP8
1414	2115	1400	1357	1400	1050	1000	75	32.5	5940	5940	ACS800-07-1740-7	2xD4 + 3xP8
1774	2554	1700	1703	1700	1327	1250	76	40.1	6240	6240	ACS800-07-2120-7	2xD4 + 4xP8
1856	2752	1900	1791	1900	1395	1400	76	43.3	6950	6950	ACS800-07-2320-7	3xD4 + 4xP8
2321	3472	2300	2228	2200	1736	1600	77	51.5	8160	8160	ACS800-07-2900-7	3xD4 + 5xP8
2655	3887	2500	2555	2500	1993	1900	78	58.0	9360	9360	ACS800-07-3190-7	3xD4 + 6xP8
2770	4144	2800	2650	2700	2072	2100	78	63.6	10080	10080	ACS800-07-3490-7	4xD4 + 6xP8

Enclosure
 Degree of Protection:
 IP 21 (Standard)
 IP 22, IP 42, IP 54, IP 54R (Optional)
 Paint color:
 Light beige RAL 7035 semi-gloss

Frame size	Width	Width with line fuse switch	Height IP 21/22/42	Height IP 54	Depth ¹⁾	Depth top entry/exit ²⁾	Weight	Weight with line fuse switch
	mm	mm	mm	mm	mm	mm	kg	kg
F6	-	430 ^{a)}	2130	2315	645	645	-	300
F7	-	530 ^{b)}	2130	2315	645	645	-	400
F8	-	630 ^{c)}	2130	2315	645	645	-	500
1xD4 + 2xP8	1330	1730	2130	2315	645	775	800	1100
2xD4 + 2xP8	1630	2030	2130	2315	645	775	1200	1410
2xD4 + 3xP8	1830	2230	2130	2315	645	775	1350	1550
2xD4 + 4xP8	2230	2630	2130	2315	645	775	1600	1800
3xD4 + 3xP8	2030	2630	2130	2315	645	775	1540	1800
3xD4 + 4xP8	2430	3030	2130	2315	645	775	1670	2130
3xD4 + 5xP8	2630	3230	2130	2315	645	775	2020	2200
3xD4 + 6xP8	2830	3430	2130	2315	645	775	2170	2430
4xD4 + 6xP8	3230	4030	2130	2315	645	775	2620	2940

^{a)} 630 mm for types ACS800-07-0120-3 and 0140-5 if equipped with du/dt filter.
^{b)} 1030 mm if equipped with 1st environment EMC filter.
^{c)} 1230 mm if equipped with 1st environment EMC filter.
^{d)} The depth without the handle.

Heavy-duty use
 $I_{H,10s}$: continuous current allowing 150% $I_{n,cont}$ for 1 min / 5 min at 40°C.

$P_{H,10s}$: typical motor power in heavy-duty use.

The current ratings are the same regardless of the supply voltage within one voltage range.
 The ratings apply at 40°C ambient temperature. At higher temperatures (up to 50°C) the derating is 1% / 1°C.

- Notes:**
- 1) 50% overload available if $T_{amb} < 25°C$. If $T_{amb} = 40°C$, max overload is 37%.
 - 2) 50% overload available if $T_{amb} < 30°C$. If $T_{amb} = 40°C$, max overload is 40%.
 - 3) 50% overload available if $T_{amb} < 20°C$. If $T_{amb} = 40°C$, max overload is 30%.
 - 4) Higher value available if output frequency is above 41 Hz.

Nominal Ratings:
 $I_{cont,max}$: rated current available continuously without overloadability at 40°C.

$I_{n,10s}$: maximum output current. Available for 10 s at start, otherwise as long as allowed by drive temperature.
 Note: max. motor shaft power is 150% P_{cont} .

Typical Ratings:
No-overload use
 $P_{cont,max}$: typical motor power in no-overload use.

Light-overload use
 $I_{L,10s}$: continuous current allowing 110% I_n for 1 min / 5 min at 40°C.
 $P_{L,10s}$: typical motor power in light-overload use.

3AFE 08375126 REV A EN 1.11.2004

Cabinet-built regenerative drive

ACS800-17, up to 1120 kW



Complete regenerative drive

The ACS800-17 offers you a complete regenerative drive in a single, compact cabinet-built package. The inbuilt active supply unit allows full power flow both in motoring and generating modes. Transition between modes is fast due to the ultra-fast DTC control method. Stepping from Pn to -Pn or vice versa takes just a few milliseconds. The drive gives full output voltage and even more. Output voltage can be boosted, which means that 100% output voltage is available even when the input voltage is 90%.

Friendly but robust power line

Power companies set limits for the permissible harmonic content of current and voltage in order to prevent damage to equipment in the same environment. The ACS800-17 removes low order harmonics with line converter DTC control and high order harmonics with an LCL filter. The result is very clean power for 6-, 12-, 18- and 24-pulse rectifier solutions. The ultra-fast DTC can even compensate for fast variations in line voltage. ACS800-17 recovers quickly after line interrupts minimizing process down time.

Energy savings

Most of the motor drive costs are energy costs. Often the investment is only a small fraction of total costs. Compared with the other braking methods such as mechanical and resistor braking, the energy savings can be significant with the ACS800-17. Brake resistors also take up installation space, and the handling of waste heat can be a problem.

Extensive range of features

The ACS800-17 has an extensive range of inbuilt features and options. Standard features include active supply unit, low harmonic line filter, line contactor or breaker and flexible I/O. Typical option choices include extended I/O and fieldbus options, common mode filtering and du/dt (voltage rise) filtering, all mountable within the single cabinet.

If your application requires more, ABB's application engineering services can add special features to the standard product such as an additional cabinet for customer specific devices to ensure exact suitability for the application.

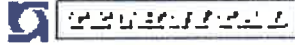
Main standard features

- Compact design
- IP 21 protection class
- LCL type of line filter together with DTC control results in extremely low network harmonic content
- EMC filter for 2nd environment, unrestricted distribution according to EN 61800-3
- Fuse switch and contactor (in frame sizes R6-R9)
- Air circuit breaker (in frame sizes R11-R12)
- Emergency stop category 0 with push button
- Extensive, programmable I/O
- Inputs galvanically isolated
- I/O and fieldbus extension slots inside
- Alphanumeric multilingual control panel with Start-up Assistant feature

Options for ACS800-17

- Analog and digital I/O extension modules
- Cabinet heater
- Common mode filters for motor protection
- Customer terminal block
- Du/dt filters
- Earth fault monitoring for unearthed network
- Emergency stop category 1 with push button
- Fieldbus modules
- IP 22, IP 42, or IP 54R enclosure classes
- Output for fan motor
- Pulse encoder interface module
- Prevention of unexpected start up of motor
- Top entry and exit of cables
- 1 or 2 thermistor relays
- 3, 5 or 8 Pt100 relays

Plus tailor made options through ABB's application engineering.



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Ratings and dimensions ACS800-17

ACS800 - 17 - XXXX - 357 + XXXX

Nominal ratings		150% duty cycle		200% duty cycle		Notes level	Heat dissipation kW	Air flow m ³ /h	Type code	Frame size
I _{nom} A	P _{nom} kW	I _{150%} A (AC)	I _{150%} A (AC)	I _{200%} A (AC)	I _{200%} A (AC)					
U_n = 400 V (Range 380-415 V). The power ratings are valid at nominal voltage 400 V.										
178	90	147	221	147	294	63	4.1	1920	ACS800-17-0120-3	R7I
269	132	194	291	178	356	63	6.0	3650	ACS800-17-0185-3	R8I
312	150	234	351	216	432	63	7.3	3650	ACS800-17-0225-3	R8I
372	200	294	435	260	520	63	8.9	3650	ACS800-17-0265-3	R8I
474	250	356	533	316	632	63	11.2	3650	ACS800-17-0335-3	R9I
576	315	432	648	395	790	63	13.9	3650	ACS800-17-0405-3	R9I
907	500	680	1020	600	1200	68	22.0	7280	ACS800-17-0630-3	R11I
1094	630	821	1231	751	1502	68	27.2	7280	ACS800-17-0765-3	R11I
1335	710	1002	1503	901	1802	71	31.7	10330	ACS800-17-0935-3	R12I
1624	900	1218	1827	1125	2252	71	39.3	10330	ACS800-17-1125-3	R12I
U_n = 500 V (Range 380-500 V). The power ratings are valid at nominal voltage 500 V.										
112	75	84	126	84	168	63	3.4	1920	ACS800-17-0100-5	R6I
164	110	135	203	135	270	63	4.9	1920	ACS800-17-0140-5	R7I
246	150	185	277	184	368	63	7.2	3650	ACS800-17-0215-5	R8I
295	200	221	332	200	400	63	8.8	3650	ACS800-17-0255-5	R8I
368	250	276	414	240	480	63	11.1	3650	ACS800-17-0325-5	R8I
442	315	336	504	300	600	63	13.7	3650	ACS800-17-0395-5	R9I
555	450	424	636	365	730	63	17.4	3650	ACS800-17-0455-5	R9I
887	630	655	990	570	1140	68	27.3	7280	ACS800-17-0770-5	R11I
1073	710	805	1208	694	1388	68	31.7	7280	ACS800-17-0935-5	R11I
1263	900	947	1421	856	1710	71	38.9	10330	ACS800-17-1090-5	R12I
1550	1120	1195	1783	1040	2080	71	48.7	10330	ACS800-17-1385-5	R12I
U_n = 690 V (Range 525-690 V). The power ratings are valid at nominal voltage 690 V.										
176	160	132	198	127	254	63	7.2	3650	ACS800-17-0205-7	R8I
210	200	158	235	150	300	63	8.8	3650	ACS800-17-0255-7	R8I
264	250	198	297	179	358	63	10.9	3650	ACS800-17-0315-7	R8I
310	315	233	349	225	450	63	13.4	3650	ACS800-17-0375-7	R9I
410	400	308	461	265	530	63	17.2	3650	ACS800-17-0485-7	R9I
630	630	473	709	428	856	68	27.0	7280	ACS800-17-0750-7	R11I
755	710	565	849	504	1008	68	31.3	7280	ACS800-17-0900-7	R11I
874	900	655	983	641	1282	71	38.1	10330	ACS800-17-1045-7	R12I
1155	1120	867	1301	755	1510	71	48.7	10330	ACS800-17-1385-7	R12I

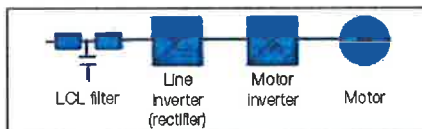
Enclosure

Degree of Protection:
IP 21 (Standard)
IP 22, IP 42, IP 54R (Optional)
Paint color:
Light beige RAL 7035 semi-gloss

Type	Height ¹⁾ mm	Width ²⁾ mm	Weight kg
R7I	2130	730	305
R8I	2130	1230	625
R9I	2130	1230	655
R11I	2130	3630	1490
R12I	2130	4630	2530

- Notes:
- Cabinet height is 2130 mm, 2072 mm for IP 54R.
 - An additional 400 mm is required in frame size R11 with top exdts. An additional 600 mm is required in frame size R12 with top exdts. Cabinet depth is 731 mm. Dimensions limit the number of options in frames R6/R7/R8/R9.

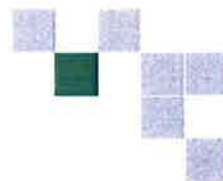
ACS800 main modules



Alternatives in reducing line harmonics

6 pulse rectifier	12 pulse rectifier	18 pulse rectifier	ACS800-17
Transformer and cabling simple	Transformer and cabling complicated	Transformer and cabling complicated	Transformer and cabling simple
Current very distorted >Ithd 30%	Current distorted >Ithd 12%	Current wave form good >Ithd 6%	Current wave form best Ithd 4%

Brake options



Brake chopper

The ACS800 series has inbuilt brake choppers for all types. Therefore, no additional space or installation time is needed. The brake chopper is part of the standard delivery for the frame sizes R2 - R3; R4 only 690 V. For the other frames a brake chopper is a selectable option.

Braking control is integrated into the ACS800 series. It controls the braking, supervises the system status and detects failures such as brake resistor and resistor cable short circuits, chopper short circuit, and calculated resistor overtemperature.

U_N = 230 V (Range 208-240 V)

ACS800 type	Brake chopper power Continuous P _{max} [kW]	Brake resistor(s)			
		Type	R _i [Ohm]	E [kJ]	P _{max} [kW]
ACS800-01-0001-2	0,5	SACE08RE44	44	248	1
ACS800-01-0002-2	0,9	SACE08RE44	44	248	1
ACS800-01-0003-2	1,1	SACE08RE44	44	248	1
ACS800-01-0004-2	1,5	SACE08RE44	44	248	1
ACS800-01-0005-2	2,2	SACE15RE22	22	496	2
ACS800-01-0006-2	3	SACE15RE22	22	496	2
ACS800-01-0009-2	4	SACE15RE22	22	496	2
ACS800-01-0011-2	5,5	SACE15RE13	13	496	2
ACS800-01-0012-2	11	SAFLR00F675	8	1800	4,5
ACS800-01-0020-2	17	SAFLR00F675	8	1800	4,5
ACS800-01-0025-2	23	SAFLR00F500	6	2400	6
ACS800-01-0030-2	28	SAFLR125F500	4	3600	9
ACS800-01-0040-2	33	SAFLR125F500	4	3600	9
ACS800-01-0050-2	45	2x SAFLR125F500	2	7200	18
ACS800-01-0060-2	56	2x SAFLR125F500	2	7200	18
ACS800-01-0070-2	68	2x SAFLR125F500	2	7200	18

Brake resistor

The SACE/SAFLR brake resistors are separately available for all ACS800 types. Resistors other than the standard resistors may be used providing the specified resistance value is not decreased, and the heat dissipation capacity of the resistor is sufficient for the drive application.

For ACS800 units, no separate fuses in the brake circuit are required if the following conditions are met:

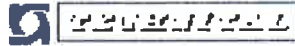
- The ACS800 mains cable is protected with fuses
- No mains cable/fuse overrating takes place

ACS800 type	Brake chopper power				Brake resistor(s)			
	5 / 60 s P _{max} [kW]	10 / 60 s P _{max} [kW]	30 / 60 s P _{max} [kW]	Continuous P _{max} [kW]	Type	R _i [Ohm]	E [kJ]	P _{max} [kW]
ACS800-02-0080-2	68	68	68	54	SAFLR160F380	1,78	3600	9
ACS800-02-0100-2	83	83	83	54	SAFLR160F380	1,78	3600	9
ACS800-02-0120-2	105	57	56	40	2xSAFLR200F500	1,35	10800	27
ACS800-02-0140-2	135	135	135	84	2xSAFLR160F380	0,99	7200	18
ACS800-02-0170-2	135	135	135	84	2xSAFLR160F380	0,99	7200	18
ACS800-02-0210-2	165	165	165	80	2xSAFLR160F380	0,99	7200	18
ACS800-02-0250-2	165	165	165	113	2xSAFLR160F380	0,99	7200	18
ACS800-02-0250-2	223	170	126	54	4xSAFLR160F380	0,45	14400	36
ACS800-02-0350-2	223	170	126	54	4xSAFLR160F380	0,45	14400	36

U_N = 400 V (Range 380-415 V)

ACS800 type	Brake chopper power Continuous P _{max} [kW]	Brake resistor(s)			
		Type	R _i [Ohm]	E [kJ]	P _{max} [kW]
ACS800-01-0003-3	1,1	SACE08RE44	44	248	1
ACS800-01-0004-3	1,5	SACE08RE44	44	248	1
ACS800-01-0005-3	2,2	SACE08RE44	44	248	1
ACS800-01-0006-3	3	SACE08RE44	44	248	1
ACS800-01-0009-3	4	SACE08RE44	44	248	1
ACS800-01-0011-3	5,5	SACE15RE22	22	496	2
ACS800-01-0015-3	7,5	SACE15RE22	22	496	2
ACS800-01-0020-3	11	SACE15RE22	22	496	2
ACS800-01-0025-3	23	SACE15RE13	13	496	2
ACS800-01-0030-3	28	SACE15RE13	13	496	2
ACS800-01-0040-3	33	SAFLR00F675	8	1800	4,5
ACS800-01-0050-3	45	SAFLR00F675	8	1800	4,5
ACS800-01-0060-3	56	SAFLR00F675	8	1800	4,5
ACS800-01-0070-3	68	SAFLR00F675	8	1800	4,5
ACS800-01-0070-3	68	SAFLR00F675	8	1800	4,5
ACS800-01-0100-3	83	SAFLR125F500	4	3600	9
ACS800-01-0120-3	113	SAFLR125F500	4	3600	9

ACS800 type	Brake chopper power				Brake resistor(s)			
	5 / 60 s P _{max} [kW]	10 / 60 s P _{max} [kW]	30 / 60 s P _{max} [kW]	Continuous P _{max} [kW]	Type	R _i [Ohm]	E [kJ]	P _{max} [kW]
ACS800-02/07-0140-3	135	135	100	80	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0170-3	165	150	100	80	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0210-3	165	150	100	80	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0250-3	240	240	210	173	2xSAFLR210F575	1,70	8400	21
ACS800-02/07-0320-3	300	300	300	143	2xSAFLR200F500	1,35	10800	27
ACS800-02/07-0400-3	375	375	273	130	4xSAFLR125F500	1,00	14400	36
ACS800-02/07-0440-3	473	355	237	120	4xSAFLR210F575	0,85	16800	42
ACS800-02/07-0490-3	500	355	237	120	4xSAFLR210F575	0,85	16800	42



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Brake options

U_N = 500 V (Range 380-500 V)

ACS800 type	Brake chopper power Continuous P _{chop} [kW]	Brake resistor(s)			
		Type	R (Ohm)	E (kJ)	P _{max} (kW)
ACS800-01-0004-5	1,5	SACE08RE44	44	248	1
ACS800-01-0005-5	2,2	SACE08RE44	44	248	1
ACS800-01-0006-5	3	SACE08RE44	44	248	1
ACS800-01-0009-5	4	SACE08RE44	44	248	1
ACS800-01-0011-5	5,5	SACE08RE44	44	248	1
ACS800-01-0015-5	7,5	SACE15RE22	22	496	2
ACS800-01-0020-5	11	SACE15RE22	22	496	2
ACS800-01-0025-5	16	SACE15RE22	22	496	2
ACS800-01-0030-5	20	SACE15RE13	13	496	2
ACS800-01-0040-5	33	SACE15RE13	13	496	2
ACS800-01-0050-5	45	SAFLR90F575	8	1800	4,5
ACS800-01-0060-5	55	SAFLR90F575	8	1800	4,5
ACS800-01-0070-5	58	SAFLR125F500	4	3600	9
ACS800-01-0100-5	83	SAFLR125F500	4	3600	9
ACS800-01-0120-5	113	SAFLR125F500	4	3600	9
ACS800-01-0140-5	135	SAFLR125F500	4	3600	9

ACS800 type	Brake chopper power				Brake resistor(s)			
	5 / 50 s P _{chop} [kW]	10 / 50 s P _{chop} [kW]	30 / 50 s P _{chop} [kW]	Continuous P _{chop} [kW]	Type	R (Ohm)	E (kJ)	P _{max} (kW)
ACS800-02/07-0170-5	155	132 *	120	90	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0210-5	190	132 *	120	90	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0250-5	199 *	132 *	120	90	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0320-5	300	300	300	300	2xSAFLR125F500	2,00	7200	18
ACS800-02/07-0400-5	375	375	375	234	2xSAFLR210F575	1,70	8400	21
ACS800-02/07-0440-5	473	473	450	195	2xSAFLR200F500	1,35	10800	27
ACS800-02/07-0490-5	480	480	470	210	2xSAFLR200F500	1,35	10800	27
ACS800-02/07-0550-5	500	400 *	300	170	4xSAFLR125F500	1,00	14400	36
ACS800-02/07-0510-5	600 *	400 *	300	170	4xSAFLR125F500	1,00	14400	36

U_N = 690 V (Range 525-690 V)

ACS800 type	Brake chopper power Continuous P _{chop} [kW]	Brake resistor(s)			
		Type	R (Ohm)	E (kJ)	P _{max} (kW)
ACS800-01-0011-7	8	SACE08RE44	44	248	1
ACS800-01-0015-7	11	SACE08RE44	44	248	1
ACS800-01-0020-7	15	SACE08RE44	44	248	1
ACS800-01-0025-7	22	SACE15RE22	22	496	2
ACS800-01-0030-7	29	SACE15RE13	13	496	2
ACS800-01-0040-7	33	SACE15RE13	13	496	2
ACS800-01-0050-7	45	SACE15RE13	13	496	2
ACS800-01-0060-7	55	SACE15RE13	13	496	2
ACS800-01-0070-7	60	SAFLR90F575	8	1800	4,5
ACS800-01-0100-7	83	SAFLR90F575	8	1800	4,5
ACS800-01-0120-7	113	SAFLR90F575	8	1800	4,5

ACS800 type	Brake chopper power				Brake resistor(s)			
	5 / 50 s P _{chop} [kW]	10 / 50 s P _{chop} [kW]	30 / 50 s P _{chop} [kW]	Continuous P _{chop} [kW]	Type	R (Ohm)	E (kJ)	P _{max} (kW)
ACS800-02/07-0140-7	125 *	110	90	75	SAFLR300F500	5,00	2400	5
ACS800-02/07-0170-7	125 *	110	90	75	SAFLR300F500	5,00	2400	5
ACS800-02/07-0210-7	125 *	110	90	75	SAFLR300F500	5,00	2400	5
ACS800-02/07-0250-7	135 *	120	100	90	SAFLR300F500	5,00	2400	5
ACS800-02/07-0320-7	300	300	300	260	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0400-7	375	375	375	375	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0440-7	430	430	430	385	SAFLR200F500	2,70	5400	13,5
ACS800-02/07-0490-7	550	400	315	225	2xSAFLR125F500	2,00	7200	18
ACS800-02/07-0550-7	550	400	315	225	2xSAFLR125F500	2,00	7200	18
ACS800-02/07-0510-7	550	400	315	225	2xSAFLR125F500	2,00	7200	18

Additional width for ACS800-07

Brake resistor	Height mm	Width mm	Depth mm	Weight kg
SACE08RE44	365	290	131	5,1
SACE15RE22	365	290	131	5,1
SACE15RE13	365	290	131	5,8
SAFLR90F575	500	300	345	14
SAFLR90F575	500	300	345	12
SAFLR125F500	1320	300	345	32
SAFLR125F500	1320	300	345	25
SAFLR200F500	1320	300	345	30
SAFLR210F575	1320	300	345	27

Resistor quantity	mm
1 x SAFUR	400
2 x SAFUR	500
4 x SAFUR	1000

Maximum braking power of the ACS800 equipped with the standard chopper and the standard resistor.

P_{br5} = 5 s / 1 min.

P_{br10} = 10 s / 1 min.

P_{br30} = 30 s / 1 min.

The drive and the chopper will withstand this braking power for 5/10/30 seconds every one minute. Note: The braking energy transmitted to the resistor during any period shorter than 400 seconds may not exceed E_r (E_r varies depending on the resistor).

P_{br cont} = Continuous brake chopper power. The value applies to the minimum resistance value. With a higher resistance value the P_{br cont} may increase in some ACS800-02/07 units.

R = Resistance value for the listed resistor type. Note: This is also the minimum allowable resistance value for the brake resistor.

E_r = Energy pulse that the resistor assembly will withstand (400 s duty cycle). This energy will heat the resistor element from 40°C to the maximum allowable temperature.

P_{brant} = Continuous power (heat) dissipation of the resistor when placed correctly. Energy E_r dissipates in 400 seconds.

¹⁾ 240 kW possible if ambient below 33°C.

²⁾ 160 kW possible if ambient below 33°C.

³⁾ 630 kW possible if ambient below 33°C.

⁴⁾ 450 kW possible if ambient below 33°C.

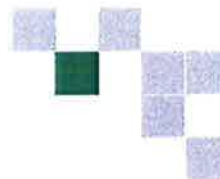
⁵⁾ 135 kW possible if ambient below 33°C.

⁶⁾ 148 kW possible if ambient below 33°C.

⁷⁾ 160 kW possible if ambient below 33°C.

All brake resistors are to be installed outside the converter module. The SACE brake resistors are inbuilt an IP 21 metal housing. The SAFUR brake resistors are inbuilt an IP 00 metal frame.

Brake options



Brake chopper and resistor options for ACS800-07 in frame sizes 2xR8I and 3xR8I.

Type	Nominal ratings					Duty cycle (1 min / 5 min)		Duty cycle (10 s / 60 s)		E _v kJ	Brake chopper type	Resistor type
	P _{brmax} kW	R ohm	I _{br} A	I _{br} A	P _{brcont} kW	P _{br} kW	I _{br} A	P _{br} kW	I _{br} A			
U_n = 400 V												
ACS800-07-0610-3+D150	706	2x1.2	1090	298	192	606	936	706	1090	-	2xNBRAGE9	-
ACS800-07-0770-3+D150	706	2x1.2	1090	298	192	606	936	706	1090	-	2xNBRAGE9	-
ACS800-07-0870-3+D150	1063	3x1.2	1636	447	288	909	1404	1063	1636	-	3xNBRAGE9	-
ACS800-07-1020-3+D150	1063	3x1.2	1636	447	288	909	1404	1063	1636	-	3xNBRAGE9	-
ACS800-07-0610-3+D150+D151	706	2x1.2	1090	168	108	333	514	576	888	24000	2xNBRAGE9	2x2xSAFUR180F460
ACS800-07-0770-3+D150+D151	706	2x1.2	1090	168	108	333	514	576	888	24000	2xNBRAGE9	2x2xSAFUR180F460
ACS800-07-0870-3+D150+D151	1063	3x1.2	1636	263	162	500	771	862	1332	36000	3xNBRAGE9	3x2xSAFUR180F460
ACS800-07-1020-3+D150+D151	1063	3x1.2	1636	263	162	500	771	862	1332	36000	3xNBRAGE9	3x2xSAFUR180F460
U_n = 500 V												
ACS800-07-0750-5+D150	806	2x1.43	1142	272	218	634	782	806	996	-	2xNBRAGE9	-
ACS800-07-0910-5+D150	806	2x1.43	1142	272	218	634	782	806	996	-	2xNBRAGE9	-
ACS800-07-1090-5+D150	1203	3x1.43	1713	408	327	951	1173	1203	1494	-	3xNBRAGE9	-
ACS800-07-1210-5+D150	1203	3x1.43	1713	408	327	951	1173	1203	1494	-	3xNBRAGE9	-
ACS800-07-0750-5+D150+D151	806	2x1.35	1210	134	108	333	412	576	710	21600	2xNBRAGE9	2x2xSAFUR200F500
ACS800-07-0910-5+D150+D151	806	2x1.35	1210	134	108	333	412	576	710	21600	2xNBRAGE9	2x2xSAFUR200F500
ACS800-07-1090-5+D150+D151	1203	3x1.35	1815	201	162	500	618	862	1065	22400	3xNBRAGE9	3x2xSAFUR200F500
ACS800-07-1210-5+D150+D151	1203	3x1.35	1815	201	162	500	618	862	1065	22400	3xNBRAGE9	3x2xSAFUR200F500
U_n = 690 V												
ACS800-07-0750-7+D150	807	2x2.72	828	214	238	696	634	809	722	-	2xNBRAGE9	-
ACS800-07-0870-7+D150	807	2x2.72	828	214	238	696	634	809	722	-	2xNBRAGE9	-
ACS800-07-1060-7+D150	1211	3x2.72	1242	321	357	994	801	1212	1083	-	3xNBRAGE9	-
ACS800-07-1160-7+D150	1211	3x2.72	1242	321	357	994	801	1212	1083	-	3xNBRAGE9	-
ACS800-07-0750-7+D150+D151	807	2x1.35	1670	194	108	333	298	576	514	21600	2xNBRAGE9	2x2xSAFUR200F500
ACS800-07-0870-7+D150+D151	807	2x1.35	1670	194	108	333	298	576	514	21600	2xNBRAGE9	2x2xSAFUR200F500
ACS800-07-1060-7+D150+D151	1211	3x1.35	2096	291	162	500	447	862	771	32400	3xNBRAGE9	3x2xSAFUR200F500
ACS800-07-1160-7+D150+D151	1211	3x1.35	2096	291	162	500	447	862	771	32400	3xNBRAGE9	3x2xSAFUR200F500

Brake choppers and resistors for larger types are available as customised option.

- P_{brmax} = Maximum short time braking power.
- R = Recommended braking resistor resistance.
Also nominal resistance of corresponding SAFUR resistor.
- I_{br} = Maximum peak current during braking.
Current is achieved with recommended resistor resistance.
- P_{brcont} = Maximum continuous braking power.
- E_v = SAFUR resistor nominal braking capacity without forced cooling.
- P_{br} = Braking power during corresponding cycle load:
1 min / 5 min = 1 minute braking with power P_{br} and 4 minutes unbraked.
10 s / 60 s = 10 second braking with power P_{br} and 50 seconds unbraked.
- I_{rms} = Corresponding rms current per chopper during load cycle.

Additional width

	With brake chopper mm	With brake chopper + resistor mm
U_n = 400 V		
ACS800-07-0610-3	800	2400
ACS800-07-0770-3	800	2400
ACS800-07-0870-3	1200	3600
ACS800-07-1020-3	1200	3600
U_n = 500 V		
ACS800-07-0750-5	800	2400
ACS800-07-0910-5	800	2400
ACS800-07-1090-5	1200	3600
ACS800-07-1210-5	1200	3600
U_n = 690 V		
ACS800-07-0750-7	800	2400
ACS800-07-0870-7	800	2400
ACS800-07-1060-7	1200	3600
ACS800-07-1160-7	1200	3600

EMC filters



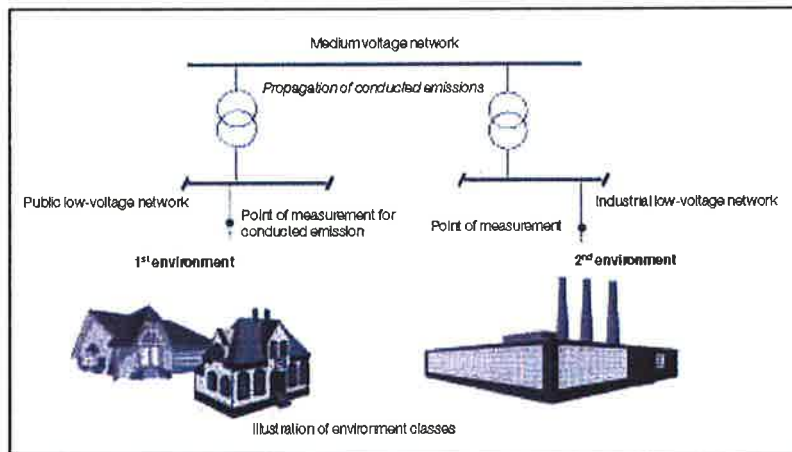
1st environment vs 2nd environment

1st environment

"1st environment includes domestic premises. It also includes establishments directly connected without intermediate transformer to a low-voltage power supply network which supplies buildings used for domestic purposes."

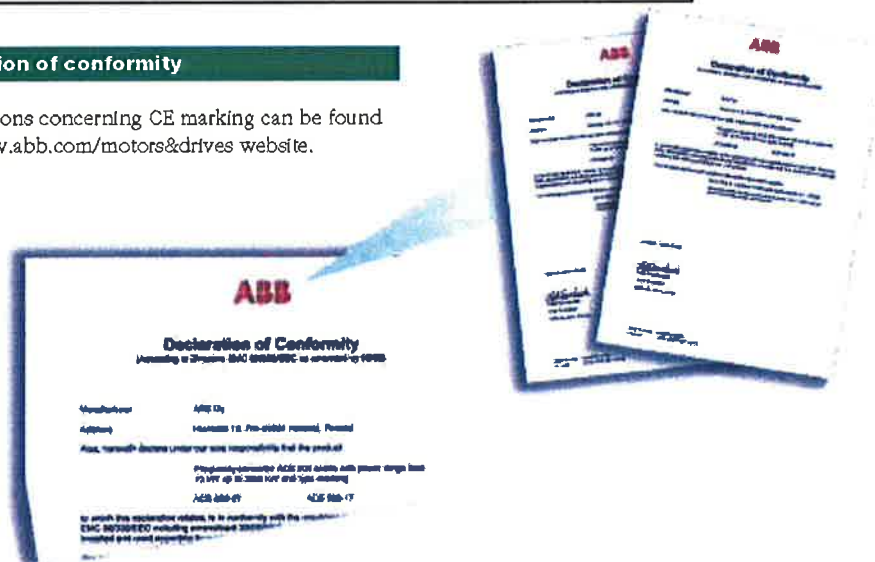
2nd environment

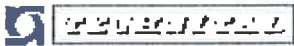
"2nd environment includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes."



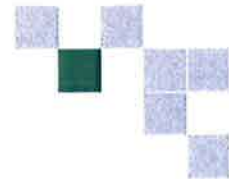
Declaration of conformity

All declarations concerning CE marking can be found on the www.abb.com/motors&drives website.



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EMC filters



EMC - Electromagnetic Compatibility and ACS800

The electrical/electronic equipment must be able to operate without problems within an electromagnetic environment. This is called immunity. The ACS800 is designed to have adequate immunity against interference from other equipment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality. This is called emission. Each ACS800 model can be equipped with an inbuilt filter to reduce high frequency emission.

EMC standards

The EMC product standard [EN 61800-3 + Amendment A11 (2000)] covers requirements stated for drives within the EU. In some cases other standards may be applicable. The emission limits are comparable according to table EMC standards.

Selecting an EMC filter

The following table gives the correct filter selection.

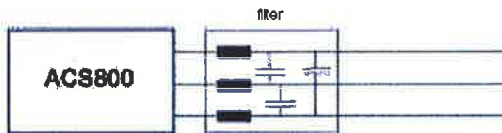
EMC standards			
EN 61800/A11, product standard	EN 55011, standard for ISM equipment	EN 61000-6-4, generic standard	EN 61000-6-3, generic standard
1 st environment, unrestricted distribution	Class B	-	Class B
1 st environment, restricted distribution	Class A	Class A	-
2 nd environment, unrestricted distribution	-	-	-
2 nd environment, restricted distribution	-	-	-

Type	Voltage	Frame sizes	1 st environment, restricted distribution, grounded network (TN)	2 nd environment, grounded network (TN)	2 nd environment, floating network (IT)
800-01	400-500	R1-R6	+E202	+E200	-
	690	R1-R6	-	+E200	-
800-02	400-500	R7-R8	+E202	+E210	+E210
	690	R7-R8	-	+E210	+E210
800-07	400-500	R6	+E202	+E200	-
		R7-R8	+E202	+E210	+E210
		nxR8i	+E202 (up to 1000A)	standard	standard
	690	R6	-	+E200	-
		R7-R8	-	+E210	+E210
		nxR8i	-	standard	standard
800-17	400-500	R6i-R12i	-	standard	standard
	690	R8i-R12i	-	standard	standard

Sine filters

ABB sine filter solution

The ACS800 sine filter solution is an ACS800 industrial drive equipped with a sine filter. It enjoys most of the premium features of the standard ACS800 industrial drive. The LC filter suppresses the high frequency components of the output voltage.

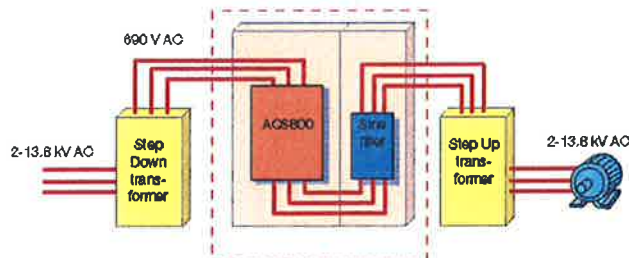


This means that the output voltage waveform is almost sinusoidal without high voltage peaks.

Filters are available in IP 00 degree of protection over the whole power range. The ACS800-01 power range has also IP 23 filters available. The ACS800-07 sine filter drives are complete cabinet-built units.

The ABB sine filter solution can be used in a variety of applications:

- Motor does not have adequate insulation for VSD duty
- Total motor cable length is long e.g. there are a number of parallel motors
- Step-up applications e.g. medium voltage motor needs to be driven
- Step-down applications
- There are industry specific requirements for peak voltage level and voltage rise time
- Motor noise needs to be reduced
- Maximum safety and reliability is needed in e.g. EX applications
- Submersible pumps with long motor cables e.g. in the oil industry



3AFE 86375126 REV A EN 1.11.2004

Main features

- Optimized LC design that takes into account switching frequency, voltage drop and filtering characteristics
- Proven technology as ABB has delivered hundreds of sine filter solutions over the last 20 years
- Cost effective solution
- Standard software has all the parameters that need to be set

Feature	Benefit	Note
Sinusoidal output voltage	No additional stress on the motor insulation: non-VSD compliant motors can be used, motor reliability and lifetime are maximized.	
	Allows the use of transformers in the drive output to match any required motor voltage.	Voltage drop at motor cable can be compensated with transformer i.e. there are no restrictions to motor cable length.
	Standard distribution transformer can be used in step-up solutions.	High starting torque is available with special transformer design.
	Less motor noise.	Usually the motor fan is the biggest noise source with sine filter solutions.
AP programming, advanced I _f -compensation and flux control	The effects of load changes to motor voltage can be compensated i.e. the motor always has the optimum voltage.	Scalar control is required with sine filters.

Sine filters

Types and ratings for ACS800-01 and ACS800-02

I _{cont,max} A	P _{cont,max} kW	Noise level (dB)	Heat dissipation W	Air flow m ³ /h	Type code	Filter size	IP class	Filter height mm	Filter width mm	Filter depth mm	Filter weight kg
U_n = 400 V (Range 380-415 V). The power ratings are valid at nominal voltage 400 V.											
8.5	3	67	180	35 ¹⁾	ACS800-01-0005-3	NSIN 0008-5	IP00/IP23	160/234	155/230	120/170	67 ²⁾
19	7.5	68	350	69 ¹⁾	ACS800-01-0011-3	NSIN 0016-5	IP00/IP23	200/460	240/470	190/270	167/26
25	11	68	450	69 ¹⁾	ACS800-01-0016-3	NSIN 0020-5	IP00/IP23	280/460	240/470	200/270	19/30
33	15	68	560	69 ¹⁾	ACS800-01-0020-3	NSIN 0025-5	IP00/IP23	280/460	240/470	210/270	21/32
44	22	69	630	103 ¹⁾	ACS800-01-0025-3	NSIN 0030-5	IP00/IP23	280/460	240/470	220/270	26/37
54	26	69	730	103 ¹⁾	ACS800-01-0030-3	NSIN 0040-5	IP00/IP23	315/460	300/470	228/270	34/45
72	35	73	950	168 ¹⁾	ACS800-01-0040-3	NSIN 0050-5	IP00/IP23	315/510	300/500	240/325	37/53
86	47	73	1100	168 ¹⁾	ACS800-01-0050-3	NSIN 0060-5	IP00/IP23	320/510	300/500	270/325	53/69
102	52	73	1500	168 ¹⁾	ACS800-01-0060-3	NSIN 0070-5	IP00/IP23	415/510	360/500	210/325	66/82
141	71	75	1800	405 ¹⁾	ACS800-01-0070-3	NSIN 0100-5	IP00/IP23	415/510	360/500	225/325	69/85
164	84	75	2200	405 ¹⁾	ACS800-01-0100-3	NSIN 0120-5	IP00/IP23	415/520	360/700	240/425	75/105
199	102	75	2700	405 ¹⁾	ACS800-01-0120-3	NSIN 0140-5	IP00/IP23	450/620	400/700	500/525	120/165
206	106	79	4100	1240 ³⁾	ACS800-02-0140-3	NSIN 0315-6 ³⁾	IP00	2060	400	600	230
248	120	79	4900	1240 ³⁾	ACS800-02-0170-3	NSIN 0315-6 ³⁾	IP00	2060	400	600	230
266	130	79	5800	1240 ³⁾	ACS800-02-0210-3	NSIN 0315-6 ³⁾	IP00	2060	400	600	230
445	215	80	8800	1920 ³⁾	ACS800-02-0260-3	NSIN 0485-6 ³⁾	IP00	2060	400	600	250
521	250	80	9700	3220 ³⁾	ACS800-02-0320-3	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
602	295	80	11100	3220 ³⁾	ACS800-02-0400-3	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
693	340	80	12100	3220 ³⁾	ACS800-02-0440-3	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
720	350	80	12600	3220 ³⁾	ACS800-02-0490-3	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
U_n = 500 V (Range 380-500 V). The power ratings are valid at nominal voltage 500 V.											
8.1	4.4	67	300	35 ¹⁾	ACS800-01-0008-5	NSIN 0006-5	IP00/IP23	160/234	155/230	120/170	67 ²⁾
19	11	68	590	69 ¹⁾	ACS800-01-0016-5	NSIN 0016-5	IP00/IP23	200/460	240/470	190/270	167/26
25	15	68	780	69 ¹⁾	ACS800-01-0020-5	NSIN 0020-5	IP00/IP23	280/460	240/470	200/270	19/30
33	20	68	1000	69 ¹⁾	ACS800-01-0025-5	NSIN 0025-5	IP00/IP23	280/460	240/470	210/270	21/32
42	26	69	1100	103 ¹⁾	ACS800-01-0030-5	NSIN 0030-5	IP00/IP23	280/460	240/470	220/270	26/37
47	29	69	1400	103 ¹⁾	ACS800-01-0040-5	NSIN 0040-5	IP00/IP23	315/460	300/470	228/270	34/45
65	40	73	1800	168 ¹⁾	ACS800-01-0050-5	NSIN 0050-5	IP00/IP23	315/510	300/500	240/325	37/53
79	48	73	2200	168 ¹⁾	ACS800-01-0060-5	NSIN 0060-5	IP00/IP23	320/510	300/500	270/325	53/69
94	60	73	2600	168 ¹⁾	ACS800-01-0070-5	NSIN 0070-5	IP00/IP23	415/510	360/500	210/325	66/82
124	78	75	3400	405 ¹⁾	ACS800-01-0100-5	NSIN 0100-5	IP00/IP23	415/510	360/500	225/325	69/85
155	90	75	4300	405 ¹⁾	ACS800-01-0120-5	NSIN 0120-5	IP00/IP23	415/620	360/700	240/425	75/105
177	114	75	5400	405 ¹⁾	ACS800-01-0140-5	NSIN 0140-5	IP00/IP23	450/620	400/700	500/525	120/165
196	125	79	4300	1240 ³⁾	ACS800-02-0170-5	NSIN 0315-6 ³⁾	IP00	2060	400	600	230
245	150	79	5400	1240 ³⁾	ACS800-02-0210-5	NSIN 0315-6 ³⁾	IP00	2060	400	600	230
258	160	79	6200	1240 ³⁾	ACS800-02-0260-5	NSIN 0315-6 ³⁾	IP00	2060	400	600	230
440	275	80	9600	1920 ³⁾	ACS800-02-0320-5	NSIN 0485-6 ³⁾	IP00	2060	400	600	250
515	320	80	11100	3220 ³⁾	ACS800-02-0400-5	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
550	345	80	11100	3220 ³⁾	ACS800-02-0440-5	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
602	375	80	11900	3220 ³⁾	ACS800-02-0490-5	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
684	430	80	13400	3220 ³⁾	ACS800-02-0550-5	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
700	440	80	14100	3220 ³⁾	ACS800-02-0610-5	NSIN 0900-6 ³⁾	IP00	2120	1000	600	690
U_n = 690 V (Range 525-690 V). The power ratings are valid at nominal voltage 690 V.											
13	10.6	67	400	103 ¹⁾	ACS800-01-0011-7	NSIN 0011-7	IP00/IP23	280/460	240/470	190/270	20/31
17	14	67	460	103 ¹⁾	ACS800-01-0016-7	NSIN 0020-7	IP00/IP23	280/460	240/470	220/270	26/37
22	18	68	560	103 ¹⁾	ACS800-01-0020-7	NSIN 0020-7	IP00/IP23	280/460	240/470	220/270	26/37
25	21	68	650	103 ¹⁾	ACS800-01-0025-7	NSIN 0025-7	IP00/IP23	320/510	300/500	222/325	35/51
31	26	69	740	103 ¹⁾	ACS800-01-0030-7	NSIN 0040-7	IP00/IP23	320/510	300/500	235/325	40/56
34	29	70	820	103 ¹⁾	ACS800-01-0040-7	NSIN 0040-7	IP00/IP23	320/510	300/500	235/325	40/56
48	40	73	1000	168 ¹⁾	ACS800-01-0050-7	NSIN 0060-7	IP00/IP23	330/510	300/500	275/325	57/73
52	45	73	1200	168 ¹⁾	ACS800-01-0060-7	NSIN 0060-7	IP00/IP23	330/510	300/500	275/325	57/73
79	69	75	1500	405 ¹⁾	ACS800-01-0070-7	NSIN 0070-7	IP00/IP23	415/510	360/500	240/325	75/91
93	82	75	1900	405 ¹⁾	ACS800-01-0100-7	NSIN 0120-7	IP00/IP23	500/510	420/580	290/325	126/142
104	92	75	2300	405 ¹⁾	ACS800-01-0120-7	NSIN 0120-7	IP00/IP23	500/510	420/580	290/325	126/142
130	115	78	4000	1240 ³⁾	ACS800-02-0140-7	NSIN 0210-6 ³⁾	IP00	2060	400	600	250
142	125	79	4600	1240 ³⁾	ACS800-02-0170-7	NSIN 0210-6 ³⁾	IP00	2060	400	600	250
169	150	79	6000	1240 ³⁾	ACS800-02-0210-7	NSIN 0210-6 ³⁾	IP00	2060	400	600	250
315	280	80	9000	1920 ³⁾	ACS800-02-0320-7	NSIN 0485-6 ³⁾	IP00	2060	400	600	250
336	300	80	9700	1920 ³⁾	ACS800-02-0400-7	NSIN 0485-6 ³⁾	IP00	2060	400	600	250
367	330	80	10700	1920 ³⁾	ACS800-02-0440-7	NSIN 0485-6 ³⁾	IP00	2060	400	600	250
444	395	80	12300	1920 ³⁾	ACS800-02-0550-7	NSIN 0485-6 ³⁾	IP00	2060	400	600	250

Nominal Ratings:

I_{cont,max}: rated current of the drive-filter combination available continuously without overload at 40 °C.

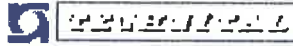
Typical Ratings:

P_{cont,max}: typical motor power.

Notes:

Noise level is a combined value for the drive and the filter. Heat dissipation is a combined value for the drive and the filter.

- 1) Air flow of the drive.
- 2) Combined air flow of the drive and the filter.
- 3) Dimensions are approximations for a cabinet that can house the filter. Weight is approximately the total weight of the cabinet and the filter. The filter assembly is supplied as loose items, which include choke modules, capacitors and cooling fan.



Rev. C0

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Rev.

Data:

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Sine filter drives

Types and ratings for cabinet-built ACS800-07

Line current A	Power kW	Noise level dB	Heat dissipation kW	Air flow m³/h	Typecode	Filter size	Total height mm	Total width mm	Total depth mm	Total weight kg
U_N = 400 V (Range 380-415 V). The power ratings are valid at nominal voltage 400 V.										
206	100	79	4	1240	ACS800-07-0140-3	NSIN 0315-6	2130	1230	646	650
248	120	79	5	1240	ACS800-07-0170-3	NSIN 0315-6	2130	1230	646	650
266	130	79	6	1240	ACS800-07-0210-3	NSIN 0315-6	2130	1230	646	650
445	215	80	9	1920	ACS800-07-0260-3	NSIN 0485-6	2130	1230	646	800
521	250	80	10	3220	ACS800-07-0320-3	NSIN 0900-6	2130	1830	646	1200
502	255	80	11	3220	ACS800-07-0400-3	NSIN 0900-6	2130	1830	646	1200
593	240	80	12	3220	ACS800-07-0440-3	NSIN 0900-6	2130	1830	646	1200
730	350	80	13	3220	ACS800-07-0400-3	NSIN 0900-6	2130	1830	646	1200
870	430	81	17	5120	ACS800-07-0610-3	NSIN 1380-6	2130	2330	646	1700
1111	555	81	23	5840	ACS800-07-0770-3	NSIN 1380-6	2130	2830	646	2000
1255	630	81	25	5840	ACS800-07-0870-3	NSIN 1380-6	2130	2830	646	2000
1452	725	82	31	7840	ACS800-07-1030-3	2xNSIN 0900-6	2130	3830	646	2800
1770	885	82	36	9040	ACS800-07-1230-3	2xNSIN 1380-6	2130	4030	646	2600
2156	1040	82	46	9760	ACS800-07-1540-3	2xNSIN 1380-6	2130	4230	646	3100
2663	1330	83	56	12960	ACS800-07-1850-3	3xNSIN 1380-6	2130	5630	646	4200
U_N = 500 V (Range 380-500 V). The power ratings are valid at nominal voltage 500 V.										
196	125	79	4	1240	ACS800-07-0170-5	NSIN 0315-6	2130	1230	646	650
245	150	79	5	1240	ACS800-07-0210-5	NSIN 0315-6	2130	1230	646	650
258	160	79	6	1240	ACS800-07-0260-5	NSIN 0315-6	2130	1230	646	650
440	275	80	10	1920	ACS800-07-0320-5	NSIN 0485-6	2130	1230	646	800
515	320	80	11	3220	ACS800-07-0400-5	NSIN 0900-6	2130	1830	646	1200
550	345	80	11	3220	ACS800-07-0440-5	NSIN 0900-6	2130	1830	646	1200
692	375	80	12	3220	ACS800-07-0400-5	NSIN 0900-6	2130	1830	646	1200
684	430	80	13	3220	ACS800-07-0550-5	NSIN 0900-6	2130	1830	646	1200
700	440	80	14	3220	ACS800-07-0610-5	NSIN 0900-6	2130	1830	646	1200
883	565	81	20	5120	ACS800-07-0760-5	NSIN 1380-6	2130	2330	646	1700
1060	675	81	24	5840	ACS800-07-0910-5	NSIN 1380-6	2130	2830	646	2000
1254	805	81	28	5840	ACS800-07-1090-5	NSIN 1380-6	2130	2830	646	2000
1372	880	82	33	7840	ACS800-07-1210-5	2xNSIN 0900-6	2130	3830	646	2800
1775	1135	82	41	9040	ACS800-07-1540-5	2xNSIN 1380-6	2130	4030	646	2600
2037	1305	82	46	9760	ACS800-07-1820-5	2xNSIN 1380-6	2130	4230	646	3100
2670	1710	83	63	12960	ACS800-07-2310-5	3xNSIN 1380-6	2130	5630	646	4200
U_N = 690 V (Range 525-690 V). The power ratings are valid at nominal voltage 690 V.										
130	115	78	4	1240	ACS800-07-0140-7	NSIN 0210-6	2130	1230	646	650
142	125	79	5	1240	ACS800-07-0170-7	NSIN 0210-6	2130	1230	646	650
169	150	79	6	1240	ACS800-07-0210-7	NSIN 0210-6	2130	1230	646	650
315	280	80	9	1920	ACS800-07-0320-7	NSIN 0485-6	2130	1230	646	800
336	300	80	10	1920	ACS800-07-0400-7	NSIN 0485-6	2130	1230	646	800
367	330	80	11	1920	ACS800-07-0440-7	NSIN 0485-6	2130	1230	646	800
444	395	80	12	1920	ACS800-07-0550-7	NSIN 0485-6	2130	1230	646	800
628	575	81	20	5120	ACS800-07-0760-7	NSIN 0900-6	2130	2330	646	1600
720	665	81	24	5120	ACS800-07-0870-7	NSIN 0900-6	2130	2330	646	1600
885	810	81	27	5120	ACS800-07-1060-7	NSIN 1380-6	2130	2330	646	1700
953	870	81	30	5840	ACS800-07-1160-7	NSIN 1380-6	2130	2830	646	2000
1258	1150	82	39	9040	ACS800-07-1500-7	2xNSIN 0900-6	2130	4030	646	2800
1414	1299	82	45	9040	ACS800-07-1740-7	2xNSIN 0900-6	2130	4030	646	2800
1774	1620	82	56	10240	ACS800-07-2120-7	2xNSIN 1380-6	2130	4430	646	3200
1856	1765	82	60	10960	ACS800-07-2320-7	2xNSIN 1380-6	2130	4630	646	3400
2321	2070	83	72	14160	ACS800-07-2900-7	3xNSIN 1380-6	2130	5830	646	4300
2666	2430	83	82	15360	ACS800-07-3190-7	3xNSIN 1380-6	2130	6030	646	4500
2770	2530	83	89	16080	ACS800-07-3490-7	3xNSIN 1380-6	2130	6430	646	4800

Nominal Ratings:
I_{continuous}: rated current of the drive-filter combination available continuously without overload at 40 °C.

Notes:
Dimensions apply to IP 21 and bottom entry / exit.

Typical Ratings:
P_{continuous}: typical motor power.

du/dt filters

Du/dt filtering suppresses inverter output voltage spikes and rapid voltage changes that stress motor insulation. Additionally, du/dt filtering reduces capacitive leakage currents and high frequency emission of the motor cable as well as high frequency losses and bearing currents in the motor.

The need for du/dt filtering depends on the motor insulation. For information on the construction of the motor insulation, consult the manufacturer.

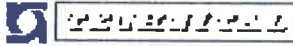
If the motor does not fulfil the following requirements, the lifetime of the motor might decrease.

Insulated N-end (non-driven end) bearings and / or common mode filters are also required for motor bearing currents with motors bigger than 100 kW. For more information please see the ACS800 hardware manuals.

Filter selection table for ACS800

Motor type	Nominal mains voltage (U_N)	Motor insulation requirement
ABB M2 and M3 motors	$U_N \leq 500$ V	Standard insulation system.
	500 V < $U_N \leq 600$ V	Standard insulation system in conjunction with du/dt filtering or reinforced insulation.
	600 V < $U_N \leq 690$ V	Reinforced insulation system in conjunction with du/dt filtering.
ABB form-wound HXR and AM motors	380 V < $U_N \leq 690$ V	Standard insulation system.
ABB random-wound HXR and AM motors	380 V < $U_N \leq 690$ V	Check motor insulation system with the motor manufacturer. du/dt filtering with voltages over 500 V.
Non-ABB Random-wound and Form-wound	$U_N \leq 420$ V	Insulation system must withstand $U_{LL}=1300$ V.
	420 V < $U_N \leq 500$ V	If the insulation system withstands $U_{LL}=1600$ V and $\Delta t=0.2$ μ s, du/dt filtering is not required. With du/dt filtering, the insulation system must withstand $U_{LL}=1300$ V.
	500 V < $U_N \leq 600$ V	If the insulation system withstands $U_{LL}=1800$ V, du/dt filtering is not required. With du/dt filtering, the insulation system must withstand $U_{LL}=1600$ V.
	600 V < $U_N \leq 690$ V	If the motor insulation system withstands $U_{LL}=2000$ V and $\Delta t=0.3$ μ s, du/dt filtering is not required. With du/dt filtering, the insulation system must withstand $U_{LL}=1800$ V.

Symbol	Explanation
U_N	Nominal mains voltage.
U_{LL}	Peak line to line voltage at motor terminals.
Δt	Rise time, i.e. interval during which line to line voltage at motor terminals changes from 10% to 90% of full voltage range.



du/dt filters



External du/dt filters for ACS800-01 and ACS800-02

Applicability

ACS800			du/dt filter type (3 filters included in kits marked *)											
			Unprotected (IP 00)				Protected to IP 22		Protected to IP 54					
			NOCH0016-60	NOCH0030-60	NOCH0070-60	*NOCH0120-60	*NOCH0260-60	*AOCH0260-70	*AOCH0400-70	NOCH0016-62	NOCH0030-62	NOCH0120-62	NOCH0016-65	NOCH0030-65
400 V	500 V	690 V												
-0003-3														
-0004-3	-0004-5													
-0005-3	-0005-5													
-0006-3	-0006-5		1											
-0009-3	-0009-5													
-0011-3	-0011-5	-0011-7												
	-0016-5													
-0016-3	-0020-5	-0016-7												
-0020-3		-0020-7	1					1				1		
		-0025-7												
-0025-3	-0025-5	-0030-7												
-0030-3	-0030-5	-0040-7												
-0040-3	-0040-5	-0050-7		1					1				1	
-0050-3	-0050-5	-0060-7												
	-0060-5													
-0060-3	-0070-5	-0070-7												
-0070-3	-0100-5	-0100-7			1									1
		-0120-7												
-0100-3	-0120-5				1									
-0120-3	-0140-5													
-0140-3	-0170-5	-0140-7												
-0170-3	-0210-5	-0170-7												
-0210-3	-0260-5	-0210-7												
-0260-3	-0320-5	-0260-7												
-0320-3	-0400-5	-0320-7												
		-0400-7												
-0400-3	-0440-5	-0440-7												
-0440-3	-0490-5	-0490-7												
-0490-3	-0550-5	-0550-7												
	-0610-5	-0610-7												

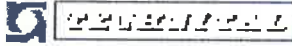
Factory-installed du/dt filters are available for the ACS800-07/-17. They are installed inside the drive cabinet. The filters are also separately available for other ACS800 types.

Separate filters need to be mounted separately. Unprotected IP 00 filters must be placed into an enclosure of adequate degree of protection.

Dimensions and Weights of the du/dt filters

du/dt filter	Height mm	Width mm	Depth mm	Weight kg
NOCH0016-60	195	140	115	2.4
NOCH0016-62/65	323	199	154	6
NOCH0030-60	215	165	130	4.7
NOCH0030-62/65	348	249	172	9
NOCH0070-60	261	180	150	9.5
NOCH0070-62/65	433	279	202	15.5
NOCH0120-60**	200	154	106	7
NOCH0120-62/65	765	308	256	45
NOCH0260-60**	383	185	111	12
AOCH0260-70**	340	190	242	15.9
AOCH0400-70**	340	190	257	20.7

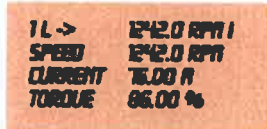
** 3 filters included, dimensions apply for one filter.



Standard user interface Control panel

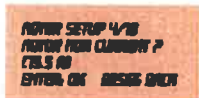
The industrial drive control panel has a multilingual alphanumeric display (4 lines x 20 characters) with plain text messages in 14 languages.

The control panel is removable and can be mounted on the drive enclosure or remotely.



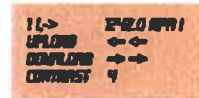
Start-up assistant

Easy commissioning with the start-up assistant. The start-up assistant actively guides you through the commissioning procedure step by step. It also has a unique on-line help function.



Parameter copying

Parameter copy feature allows all drive parameters to be copied from one frequency converter to another to simplify commissioning.



Actual value display

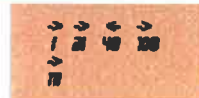
The control panel can display three separate actual values simultaneously.

Examples of these are:

- Motor speed
- Frequency
- Current
- Torque
- Power
- References
- DC bus voltage
- Output voltage
- Heatsink temperature
- Operating hours
- Kilowatt hours

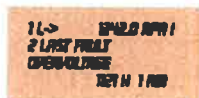
Centralised control

One panel can control up to 31 drives.



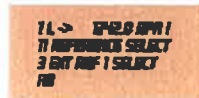
Fault memory

An inbuilt fault memory stores information relating to the latest 64 faults, each with a time stamp.



Easy programming

Parameters are organised into groups for easy programming.



Standard user interface

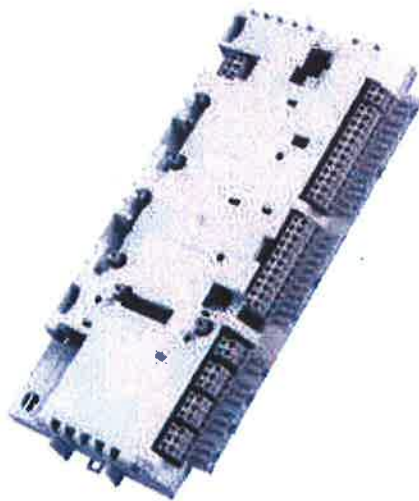
Standard I/O

Analog and digital I/O channels are used for different functions such as control, monitoring and measurement purposes (e.g. motor temperature). In addition, optional I/O extension modules are available providing additional analog or digital I/O connections.

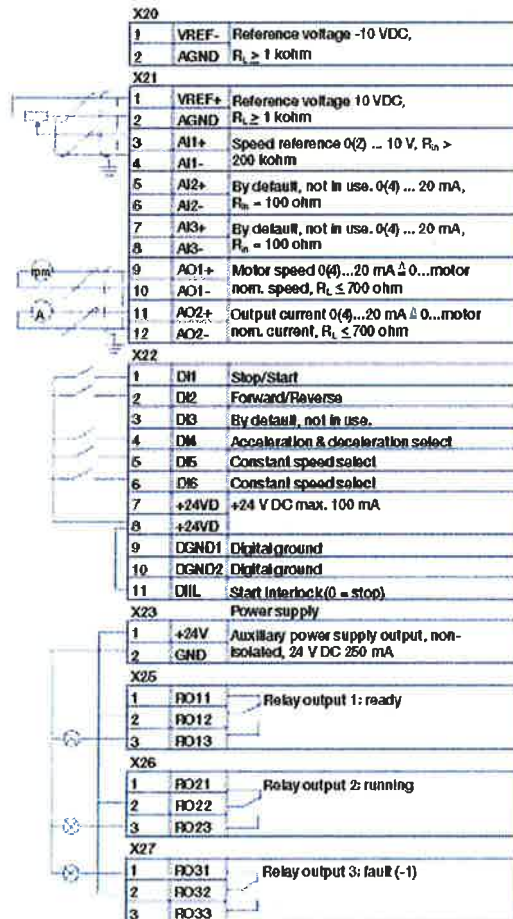
Below are the standard drive control I/O of the ABB industrial drive with Factory Macro. For other ACS800 application macros the functions may be different.

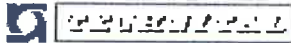
Standard I/O on RMIO-01 Board

- **3 analog inputs:** differential, common mode voltage ± 15 V, galvanically isolated as a group.
 - One $\pm 0(2) \dots 10$ V, resolution 12 bit
 - Two $0(4) \dots 20$ mA, resolution 11 bit
- **2 analog outputs:**
 - $0(4) \dots 20$ mA, resolution 10 bit
- **7 digital inputs:** galvanically isolated as a group (can be split in two groups)
 - Input voltage 24 V DC
 - Filtering (HW) time 1 ms
- **3 digital (relay) outputs:**
 - Changeover contact
 - 24 V DC or 115/230 V AC
 - Max. continuous current 2 A
- **Reference voltage output:**
 - ± 10 V $\pm 0.5\%$, max. 10 mA
- **Auxiliary power supply output:**
 - +24 V $\pm 10\%$, max. 250 mA



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Options

Optional I/O

Standard I/O can be extended by using analog and digital extension modules or pulse encoder interface modules which are mounted in the slots on the ACS800 control board. The control board has two slots available for extension modules. More extension

modules can be added with the I/O extension adapter which has three slots. The available number and combination of I/O's depends on the control software used. The standard application software supports 2 analog and 2 digital extension modules.

Optional I/O

Analog I/O extension module RAIO-01 (+L500)

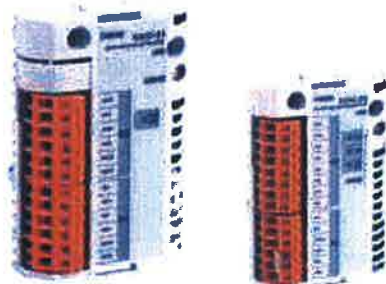
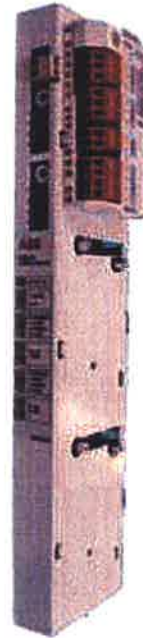
- **2 analog inputs:** galvanically isolated from 24 V supply and ground
 - $\pm 0(2)...10$ V, $0(4)... 20$ mA or $\pm 0...2$ V, resolution 12 bits
- **2 analog outputs:** galvanically isolated from 24 V supply and ground
 - $0(4)...20$ mA, resolution 12 bit

Digital I/O extension module RDIO-01 (+L501)

- **3 digital inputs:** individually galvanically isolated
 - Signal level 24 to 250 V or 115/230 V AC
- **2 relay (digital) outputs:**
 - Switchover contact
 - 24 V or 115/230 V AC
 - Max. 2 A

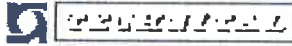
Pulse encoder interface module RTAC-01 (+L502)

- **1 incremental encoder input:**
 - Channels A, B and Z (zero pulse)
 - Signal level and power supply for the encoder is 24 or 15 V
 - Single ended or differential inputs
 - Maximum input frequency 200 kHz



I/O extension adapter AIMA-01

- Three slots for I/O extension modules
- Connection to the ACS800 control board through optic link
- Dimensions: $78 \times 325 \times 28$ mm
- Mounting: onto 35×7.5 mm DIN rail
- External power supply connection
- Supply voltage: 24 V DC $\pm 10\%$
- Current consumption: depends on connected I/O extension modules



Options

Fieldbus control

ABB industrial drives have connectivity to major automation systems. This is achieved with a dedicated gateway concept between the fieldbus systems and ABB drives.

The fieldbus gateway module can easily be mounted inside the drive. Because of the wide range of fieldbus gateways, your choice of automation system is independent of your decision to use first-class ABB AC drives.

Manufacturing flexibility

Drive control

The drive control word (16 bit) provides a wide variety of functions from start, stop and reset to ramp generator control. Typical setpoint values such as speed, torque and position can be transmitted to the drive with 15 bit accuracy.

Drive monitoring

A set of drive parameters and/or actual signals, such as torque, speed, position, current etc., can be selected for cyclic data transfer providing fast data for operators and the manufacturing process.

Drive diagnostics

Accurate and reliable diagnostic information can be obtained via the alarm, limit and fault words, reducing the drive downtime and therefore also the downtime of the manufacturing process.

Drive parameter handling

Total integration of the drives in the production process is achieved by single parameter read/write up to complete parameter set-up or download.



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Reduced installation and engineering effort

Cabling

Substituting the large amount of conventional drive control cabling with a single twisted pair reduces costs and increases system reliability.

Design

The use of fieldbus control reduces engineering time at installation due to the modular structure of the hardware and software.


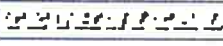
Commissioning and assembly

The modular machine configuration allows pre-commissioning of single machine sections and provides easy and fast assembly of the complete installation.

Currently available gateways

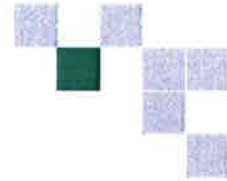
Fieldbus	Protocol	Device profile	Baud rate
PROFIBUS (+K454)	DP, DPV1	PROFdrive ABB Drives *)	9.6 kbit/s - 12 Mbit/s
DeviceNet (+K451)	-	AC/DC drive ABB Drives *)	125 kbit/s - 500 kbit/s
CANopen (+K457)	-	Drives and motion control ABB Drives *)	10 kbit/s - 1 Mbit/s
ControlNet (+K462)	-	AC/DC drive ABB Drives *)	5 Mbit/s
Modbus (+K459)	RTU	ABB Drives *)	600 bit/s - 19.2 kbit/s
Ethernet (+K454)	Modbus/TCP	ABB Drives *)	10 Mbit/s / 100 Mbit/s
InterBUS-S (+K453)	I/O, PCP	ABB Drives *)	500 kbit/s
LowWorks® (+K452)	LowTALK®	Variable speed motor drive	75 kbit/s

*) Vendor specific profile

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Options

Remote monitoring and diagnostics tool



Browser-based, user-friendly

The intelligent ethernet NETA-01 module gives simple access to the drive via the internet, communicating via a standard web browser. The user can set up a virtual monitoring room wherever there is a PC with an internet connection or via a simple dial-up modem connection. This enables remote monitoring, configuration, diagnostics and, when needed, control. The drive can also provide process related information, such as load level, run time, energy consumption and I/O data, the bearing temperature of the driven machine, for instance.

This opens up new possibilities for the monitoring and maintenance of unmanned applications across a range of industries, for instance water, wind power, building services and oil & gas, as well as any application where the user needs access to the drives from more than one location. It also provides an opportunity for OEMs and system integrators to support their installed base globally.

No PC needed at local end

The intelligent ethernet module has an embedded server with the necessary software for the user interface, communication and data storage. This gives ease of access, realtime information and the possibility for two-way communication with the drive, enabling immediate response and actions, saving time and money. This is possible without using a PC at the local end, as required by other remote solutions.

Powerful and versatile

Up to nine drives can be connected to the intelligent ethernet module via fiber optic links. It is available as an option for new drives, as well as an upgrade for existing systems. Access to the module is secured by user ID and passwords.



It connects to the drive with fiber optic cables. The size of the module is 93 (h) x 35 (w) x 76.5 (d) mm.

The web page of the module is opened like any other web address. The home page shows a general overview of the system with traffic lights and action buttons to guide the user through the different sections.

Features

- Virtual monitoring room for
 - Monitoring
 - Configuration of parameters
 - Diagnostics
 - Control, if needed
- Browser-based access via
 - Intra-/extra-/internet or
 - Simple dial-up modem connection
- No PC needed at the local end
- Can be used as a Modbus/TCP bridge for process control



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	Rev.	Data:	SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO	

Standard application software



Standard application software

Based on Direct Torque Control technology, the ACS800 offers highly advanced features as standard. The ACS800 standard application software provides solutions to virtually all AC drives applications.

Adaptive programming

In addition to parameters, industrial drives have the possibility for function block programming as standard. Adaptive programming with 15 programmable function blocks makes it possible to replace e.g. relays or even a PLC in some applications. Adaptive programming can be done either by standard control panel or DriveAP, a user-friendly PC tool.

The standard application macros

The ACS800 features inbuilt, pre-programmed application macros for configuration of such parameters as inputs, outputs and signal processing.

- FACTORY SETTINGS for basic industrial applications
- HAND/AUTO CONTROL for local and remote operation
- PID CONTROL for closed loop processes
- SEQUENTIAL CONTROL for repetitive cycles
- TORQUE CONTROL for processes where torque control is required
- USER MACRO 1 & 2 for user's own parameter settings

Software features

A complete set of standard software features offers premium functionality and flexibility.

- Accurate speed control
- Accurate torque control without speed feedback
- Adaptive programming
- Automatic reset
- Automatic start
- Constant speeds
- Controlled torque at zero speed
- DC hold
- DC magnetizing
- Diagnostics

- Flux braking
- Flux optimization
- IR compensation
- Master/follower control
- Mechanical brake control
- Motor identification
- Parameter lock
- Power loss ride-through
- Process PID control
- Programmable I/O
- Scalar control
- Speed controller tuning
- Start-up assistant
- Support for sine filter in the drive output
- Trim function
- User-selectable acceleration and deceleration ramps
- User adjustable load supervision/limitation

Pre-programmed protection functions

A wide range of features provides protection for the drive, motor and the process.

- Ambient temperature
- DC overvoltage
- DC undervoltage
- Drive temperature
- Input phase loss
- Overcurrent
- Power limits
- Short circuit

Programmable protection functions

- Adjustable power limits
- Control signal supervision
- Critical frequencies lock-out
- Current and torque limits
- Earth fault protection
- External fault
- Motor phase loss
- Motor stall protection
- Motor thermal protection
- Motor underload protection
- Panel loss



Optional application software

Control solutions for different applications

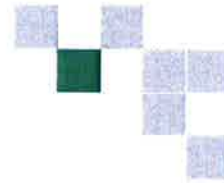


ABB provides a set of ready-made control solutions for specific industrial drive applications. Such software adds application-dedicated features and protection without an external PLC - improving productivity and reducing costs.

Main advantages of ABB's control solutions

- Application-dedicated features
- Improved production
- No external PLC
- User-friendly
- Easy to use
- Energy savings
- Smooth power loss ride-through
- Reduced costs
- Adaptive protection

Multiblock programming

The multiblock programming application has been specially designed for system integrators and local engineering because of its flexibility, easy programming, large number of I/O, master-follower link and fieldbus interfaces. Integrated into the drive control board are over 200 function blocks on 3 time levels: 20 ms, 100 ms and 500 ms. These benefits mean that it is not always necessary to have separate PLC for drive and process control.

Extended I/O

An analog and digital I/O extension is typically installed on the AIMA-01 I/O extension adapters. Three extension modules can be installed on each I/O extension adapter and an optical link connects the I/O extension adapters to the drive control board. There are 62 extension modules in total.

Programming

Function blocks are easy to program using the DriveAP 2 PC tool. For example, there are PROFIBUS fieldbus blocks available to help users to understand the block program connections between the drive and Profibus master. Block program information, as well as text comments, symbolic names of block outputs and page

header information is saved in the flash memory of the control board of the drive.

Pump control

Intelligent pump control software is a combination of traditional PFC which is specially designed for multi-motor pumping (or compressor, etc.) stations. While directly controlling one motor, the drive is able to start additional, direct-on-line motors whenever a higher capacity is needed.

Multipump function

Additional features such as the multipump function are designed for pumping stations that consist of multiple pumps, each controlled by a separate drive. The drives can be connected so that in the case of pump failure or maintenance action on one drive, the remaining drives continue operation - having 100% redundancy. There is an autochange function to alternate between the pumps so all pumps have an equal duty time.

Level control function

The liquid level of a container can be used as a process variable for a pumping station either filling or emptying the container when the level control function is activated. Three drives can be used in a master/follower configuration.

Flow calculation


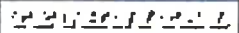
The flow calculation contains a function that enables reasonably accurate calculation of flow without the installation of a separate flow meter.

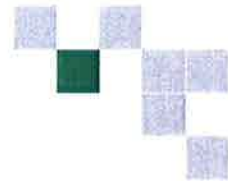
Anti-jam function

The anti-jam function can be used for preventing solids from building up on pump impellers. The anti-jam procedure consists of a programmable sequence of forward and reverse runs of the pump, effectively shaking off any residue on the impeller.

Adaptive programming

Adaptive programming using 15 function blocks is possible with the pump control. The adaptive programming makes customizing possible without the need for a special programming tool or language.

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Centrifuge control

Practical programmable sequences for conventional centrifuges. Integrated decanter control for the accurate speed difference control of two shafts, where direct communication via the fiber optic link between bowl and scroll is used.

Crane drive control

Crane drive control with optimal operational safety and performance built into the drive.

- Easy installation and start-up reduces the total project costs
- Ready to use with proven crane functionality
- Accurate and fast response increases the operational productivity
- Multiple drives can be synchronized with internal optic link, reducing the need for separate controllers. Everything needed is inbuilt
- Smooth crane operation reduces maintenance costs
- Available as single drive or multi-drive with dynamic and regenerative braking

Standard ready-to-use crane solution.

Extruder control

High starting torque, accurate speed/torque control without an encoder for demanding extruder applications. The extruder screw and other delicate mechanical parts can be protected against overload.

Master/follower control

Reliable control via the fiber optic link of several drives when they are controlled by one master. This is needed e.g. if the motor shafts are coupled together. The master/follower function enables the load to be evenly distributed between the drives.

Spinning control & traverse control

Spinning control and traverse control make a perfect pair for the precise control of spinning and traverse drives in textile machines.

System application

This application software is targeted for multi-motor machines producing or processing metal, paper, plastics, textile, rubber and cement, and for numerous other demanding applications. The basic control modes are speed control and torque control. Fast communication with the overriding controller can exchange operative data (references, command words) and support data (configuration data, diagnostics). Proprietary (DDCS, Drive bus) and generic (PROFIBUS, InterBUS-S, DeviceNet) protocols enable linking of drives to controllers, PLC and PCs.

Main features and benefits:

- Motor fan control with diagnostics
- Soft changeover between the speed and torque control modes
- Speed control gain as a function of output on low speed or as a function of motor frequency
- Thermal model for motor cable protection
- Torsional oscillation damping function to damp mechanical oscillations.





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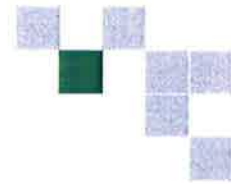
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DriveSize



Quality dimensioning

DriveSize is a PC program for helping the user to select the optimal motor, frequency converter and transformer, especially in those cases where a straightforward selection from a catalogue is not possible. Additionally it can be used to compute currents, network harmonics and to create documents about the dimensioning based on actual load. DriveSize contains the current versions of the ABB motor and frequency converter catalogues.

The default values make DriveSize simple to use, but the user is provided with ample options for drive selection. The shortcut keys make drive selection easy while giving the optimal dimensioning result. A manual selection mode is also supported.

DriveSize is currently used by more than 1,000 engineers globally.

DriveSize is for drive system components

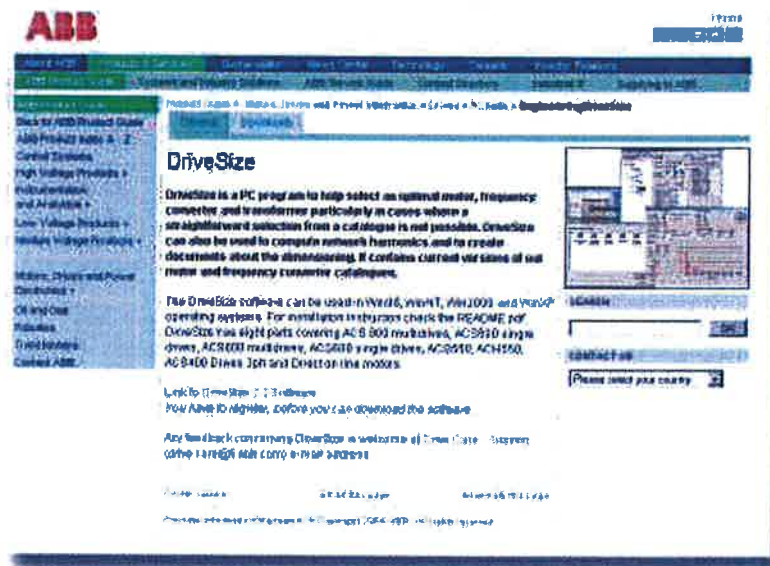
- 3-phase standard, customized, Ex and user defined motors
- ABB low voltage AC drives
- Transformers


DriveSize features

- Selects the optimal motor, drive unit, supply unit and transformer
- Calculates network harmonics for a single supply unit or for the whole system
- Allows importation of own motor database
- Supplies dimensioning results in graphical and numerical format
- Prints and saves the results

The DriveSize PC program can be downloaded from www.abb.com/motors&drives

- ➔ Drives
- ➔ Drive PC Tools
- ➔ DriveSize



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DriveAP



Programming tool

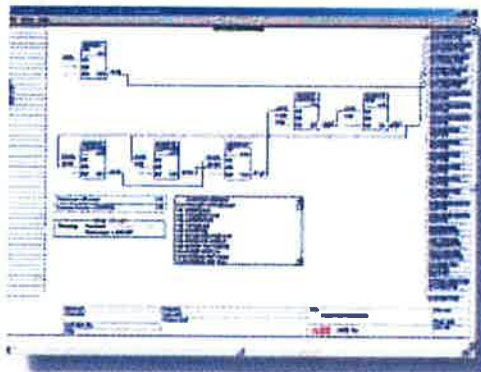
DriveAP is a PC software tool for creating, documenting, editing and downloading adaptive programs and multiblock programming programs. DriveAP 1.1 supports adaptive programming, whereas DriveAP 2 supports both adaptive programming and multiblock programming applications. The adaptive programming contains 15 function blocks and is available in a standard application. The multiblock programming application contains over 200 function blocks, and also includes PROFIBUS fieldbus and drive I/O blocks. DriveAP offers a clear and easy way to develop, test and document these programs with a PC.

It is a user-friendly tool for modifying function blocks and their connections. No special programming skills are required, a basic knowledge about block programming is enough. DriveAP supports IEC61131.

The adaptive programs are easy to document as hard copies or store as PC files. The multiblock programming with all related information is saved directly to the drive.

Upload or download

Both program types can be uploaded from connected drives and displayed graphically on a PC screen for



DriveAP with adaptive program of standard application.

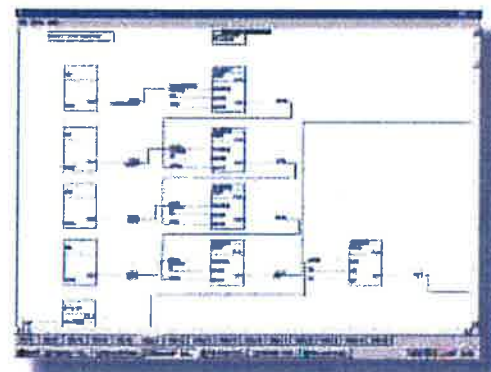
service or documentation purposes, for example. The adaptive programs and multiblock programming programs made off-line can be downloaded to any of the connected drives that support corresponding programs.

Three operating modes



- Stand-alone mode - DriveAP is not connected to a drive. The adaptive programming and multiblock programming can be carried out in the office, for example, and later downloaded to a drive.
- Off-line mode - DriveAP is connected to a drive. The adaptive programming and multiblock programming can be carried out in batch mode.
- On-line mode - DriveAP is connected to a drive. Changes to the adaptive programs and multiblock programs are written immediately to the drive and actual values are shown on the screen in real-time.

DriveAP features

- Easy-to-use tool, no special skills required
- Create and download new programs
- Document programs
- Upload existing programs from the drive
- Operating modes
 - Stand-alone
 - Off-Line
 - On-Line



DriveAP with multiblock programming application.

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DriveWindow 2



Start-up and maintenance tool

ABB's DriveWindow is an advanced, easy-to-use PC software tool for the start-up and maintenance of ABB industrial drives. Its host of features and clear, graphical presentation of the operation make it a valuable addition to your system, providing information necessary for troubleshooting, maintenance and service, as well as training.

With DriveWindow the user is able to follow the operation of several drives simultaneously by collecting the actual values from the drives onto a single screen or printout.

Additionally, the client part of DriveWindow may reside on one intranet PC, and the server on another PC closer to the drives. This enables easy plant-wide monitoring with two PCs.

High speed communication

DriveWindow uses a high-speed fibre optic cable network with DDCS communication protocol. This enables very fast communication between PC and drives. The fibre optic network is safe and highly immune to external disturbance. A fibre optic communication card inside the computer is needed.

Monitoring drives

With DriveWindow you can monitor several drives simultaneously. The history buffer makes it possible to record a large amount of data in the PC's memory. The drive's data logger can be accessed with DriveWindow and viewed in graphical form. The fault logger inside the drive automatically documents every fault, warning and event which occurs. The fault history stored in the drive can be uploaded to your computer.


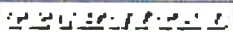
Versatile back-up functions

Drive parameters can be saved to the PC with DriveWindow, and can easily be downloaded back to the drive whenever needed. The same goes for the software. DriveWindow allows the entire control board software to be saved and restored later, if needed. This makes it possible to use one control board as a spare part for many different sizes of drives.

DriveWindow 2 features

- Easy-to-use tool for commissioning and maintenance
- Several drives connected and monitored at the same time
- Monitor, edit or save signals and parameters, clear graphical presentation
- High speed communication between PC and drive
- Versatile back-up functions
- View data collected and stored in the drive
- Fault diagnostics; DriveWindow indicates the status of drives, and also reads fault history data from the drive



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DriveWindow Light 2



Start-up and maintenance tool

DriveWindow Light 2 is an easy-to-use start-up and maintenance tool for ACS800 drives. It supports the following software: standard application, pump control and spinning and traverse control.

DriveWindow Light uses the drive's panel connector for communication, which makes communication setup very easy.

Light software with heavy features

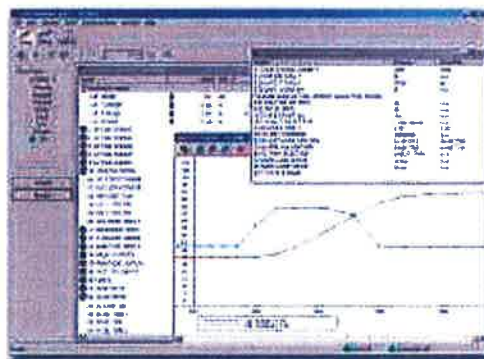
DriveWindow Light offers many functions in an easy-to-use package. It can be used in an offline mode, which enables parameter setting at the office even before going to the actual site. The parameter browser enables viewing, editing and saving of parameters. The parameter comparison feature makes it possible to compare parameter values between the drive and the file. With the parameter subset you can create your own parameter sets. Controlling of the drive is naturally one of the features in DriveWindow Light. With DriveWindow Light, you can monitor up to four signals simultaneously. This can be done in both graphical and numerical format. Any signal can be set to stop the monitoring from a predefined level.


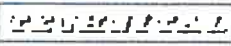
Highlights

- Viewing and setting parameters in offline mode
- Editing, saving and downloading parameters
- Comparing parameters
- Graphical and numerical signal monitoring
- Drive control

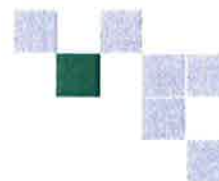
DriveWindow Light requirements

- Windows 98/NT/2000/XP
- Free serial port from a PC
- Free control panel connector
- NPCU-01 PC connection unit



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DriveOPC



Integration tool

DriveOPC is a software package which allows OLE for Process Control (OPC) communication between Windows applications and ABB industrial drives. It allows Object Linking and Embedding (OLE) for Process Control (OPC) communication. This OPC server is an ideal tool for integrating ABB industrial drives and commercial PC software, and creating PC based control and monitoring systems.

Remote monitoring

DriveOPC enables remote connection over LAN (local area networks). The remote PC can be connected through its IP address (e.g. "164.12.43.33") or by the DNS name (e.g. "Gitas213").

OPC based software

OPC is an industry standard created in cooperation with Microsoft. It is an open architecture interface design, managed by the international OPC foundation. OPC is meant for different kinds of factory automation. DriveOPC is based on the OPC foundation data access standard 1.0A and Microsoft COM/DCOM technology. DriveOPC has full access to all drives, even when remote connection over LAN is used.



High speed communication

DriveOPC uses a high-speed fibre optic cable network with DDCS communication protocol. This makes communication between PC and drives very fast. The fibre optic network is safe and highly immune to external disturbance. A fibre optic communication card inside the computer is needed.

DriveOPC features

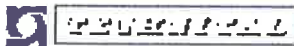
DriveOPC supports OPC's data access 1.0A.

Read access to:

- Drive status: local, running, direction, fault, warning, reference
- Signals and parameters
- Fault logger contents
- Event logger contents
- General drive information
- Data logger settings, status and contents

Write access to:

- Drive control: local, start, stop, forward, reverse, coast stop, reset fault, home, teach-in, contactor on/off, reference
- Parameters
- Fault logger clear
- Data logger init, start, trig, clear



Services and support



Global service network

ABB provides professional spare part, maintenance and repair services using its own authorized and certified service personnel as well as the personnel of the ABB channel partners all over the world.

Note: Though all services are available globally, local services may vary.

For more information on our ACS800 services and service network, please contact your local ABB representative or visit our website: <http://www.abb.com/motors&drives>.

Productized services

ABB's drive lifecycle management model provides customers with the maximum profit for the purchased assets by maintaining high availability, eliminating unplanned repair costs and extending drive lifetime. The lifecycle management model comprises a palette of dedicated services for the entire lifecycle of ACS800 drives.

Start-up services

Using ABB's start-up services you can trust that your drives are correctly commissioned and tuned to their application. ABB global service network personnel are authorized professionals who are thoroughly trained for their job.

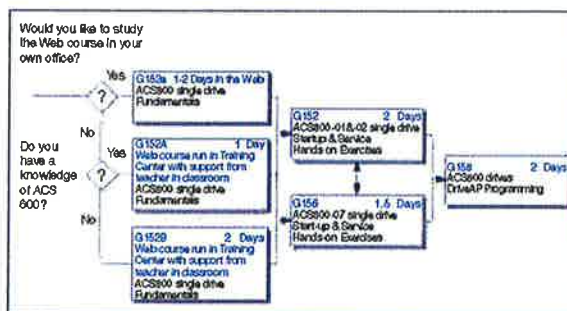
Service product code	Service type	Description
68281873	ACS800, (R1 - R6), Distance 1*	Professional Start-up service
68281881	ACS800, (R1 - R6), Distance 2*	Professional Start-up service
68281890	ACS800, (R7 - R9), Distance 1*	Professional Start-up service
68281903	ACS800, (R7 - R9), Distance 2*	Professional Start-up service

* Distance defined locally

Training services

ABB offers dedicated training on ACS800 drives for your service and operating personnel for acquiring the required skills to use your ABB drives correctly and safely and to run the application in the most effective way.

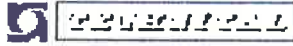
ACS800 single drive training courses



For more information on our training services, please contact your local ABB representative or visit the ABB University website: <http://www.abb.com/abbuniversity>.

On-site spares kits

ACS800 drive on-site spares kits contain the most critical spare parts. You can choose your ACS800 drive spares kits from a separate table. If you do not have a copy, please contact your local ABB representative.



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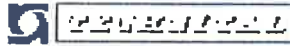
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Summary of features and options



	Ordering Code	01	02	07	07	17
				RS-RS	rsRS	
Power & voltage range		230 V 0.56 - 66 kW 400 V 1.1 - 110 kW 500 V 1.6 - 110 kW 690 V 6.5 - 110 kW	230 V 45 - 200 kW 400 V 90 - 400 kW 500 V 110 - 500 kW 690 V 90 - 540 kW	400 V 45 - 400 kW 500 V 55 - 500 kW 690 V 45 - 540 kW	400 V 400 - 1400 kW 500 V 500 - 1500 kW 690 V 600 - 2300 kW	400 V 90 - 900 kW 500 V 75 - 1120 kW 690 V 160 - 1120 kW
Mounting						
Wall mounting		•	-	-	-	-
Free-standing		-	•	•	•	•
Two mounting directions: bookshelf / flat (=sideways)		-	•	-	-	-
Cabling						
Bottom entry & exit		•	•	•	•	•
Top entry & exit	H351+H353	-	□	□	□ 1)	□ 2)
Enclosure class						
IP21 (UL type 1)		•	•	•	•	•
IP22 (UL type 1)	E053	-	-	□	□	□
IP42 (UL type 1)	E054	-	-	□	□	□
IP54 (UL type 12)	E055	-	-	□	□	□
IP54R	E059	-	-	□	□	□
IP56 (UL type 12)	E056	□	-	-	-	-
DTC motor control						
DTC		•	•	•	•	•
Software 3)						
Start-up assistant		• 4)	• 4)	• 4)	• 4)	• 4)
Adaptive programming		• 4)	• 4)	• 4)	• 4)	• 4)
Optional software optimized for different applications or for enhanced programmability: for more details see section "Application software and programming"		□	□	□	□	□
Control panel						
Alphanumeric 4*20 character control panel		•	•	•	•	•
Control connections (I/O) and communications						
3 pcs analog inputs, programmable, galvanically isolated		•	•	•	•	•
2 pcs analog outputs, programmable		•	•	•	•	•
7 pcs digital inputs, programmable, galvanically isolated - can be divided into two groups		•	•	•	•	•
3 pcs relay outputs, programmable		•	•	•	•	•
Thermistor relay (1 or 2 pcs)	L505	-	□	□	□	□
PT100 relays	L506	-	□ 5)	□	□	□
Possibility for external control voltage		•	•	•	•	•
Inbuilt I/O extension and speed feedback modules: for more details see section "Control connections and communications"		□	□	□	□	□
Inbuilt adapters for several fieldbuses: for more details see section "Control connections and communications"		□	□	□	□	□
EMC filters						
EMC 1 st environment	E202	□ 6)	□ 6)	□ 6)	□ 7)	-
EMC 2 nd environment, earthed networks only	E200	□ 6)	-	□ 8)	•	•
EMC 2 nd environment, earthed and unearthed networks	E210	-	□	□ 9)	•	•
Line filter						
AC or DC choke		•	•	•	•	-
LCL		-	-	-	-	•
Output filters						
Common mode filter	E208	-	□	□ 9)	•	□
du/dt filters	E205	X	X	□	•	□



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Summary of features and options

	Ordering Code	01	02	07	07	17
		R6-R8		R6-R8		R6-R8
		330 V, 0.65 - 56 kW 400 V, 1.1 - 110 kW 500 V, 1.5 - 110 kW 690 V, 6.5 - 110 kW	230 V, 45 - 200 kW 400 V, 90 - 400 kW 500 V, 110 - 500 kW 690 V, 50 - 550 kW	400 V, 45 - 400 kW 500 V, 55 - 500 kW 690 V, 45 - 550 kW	400 V, 400 - 1400 kW 500 V, 500 - 1900 kW 690 V, 600 - 2800 kW	400 V, 90 - 900 kW 500 V, 75 - 1120 kW 690 V, 180 - 1120 kW
Braking						
Brake chopper	D150	<input type="checkbox"/> 10)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-
Brake resistor	D151	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> 11)	<input type="checkbox"/> 11)	-
Regenerative braking	-	-	-	-	-	•
Rectifier bridge						
12-pulse (can be connected as a 6-pulse one also)	-	-	-	-	•	-
Line fuses						
eR line fuses	F260	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	•
gG line fuses	F251	-	<input type="checkbox"/> 12)	•	<input type="checkbox"/>	-
Line side apparatus						
Main switch	O111 or O127	-	<input type="checkbox"/> 12)	•	•	•
Line contactor + emergency stop, category 0	F250+Q951	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	•
Line contactor + emergency stop, category 1	F250+Q952	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air circuit breaker	F255+Q951	-	-	-	<input type="checkbox"/>	• 13)
Cabinet options						
Control voltage 115 VAC	G304	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Control voltage 230 VAC	G320	-	<input type="checkbox"/> 12)	•	•	•
Cabinet heater (ext. supply)	G300	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Output for motor heater (ext. supply)	G313	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customized options	P902	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety options						
Prevention of unexpected start-up	Q950	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>
Earth fault monitoring, earthed mains	-	•	•	•	•	•
Earth fault monitoring, unearthed mains	-	•	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency stop (see Line side apparatus)	-	-	-	-	-	-
Approvals						
CE	-	•	•	•	•	•
UL, cUL, CSA	-	• 14)	• 15)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (UL, cUL pending)
GOST R	-	•	•	•	•	• pending
C-Tick	-	•	•	pending	pending	pending
Marine design	-	<input type="checkbox"/> 16)	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Standard
- Selectable option, inbuilt
- Selectable option, inbuilt, no plus code
- X Selectable option, external, no plus code
- ACS800-02 Enclosure extension option (requires also +C111 or +C127 code)
- Not available

- 1) IP 54 or IP 54R require line fuse field F251 or F260.
- 2) Top exit requires common motor terminal cubicle in frame sizes R11 and R12.
- 3) Software compatibility with different option modules must be checked from ACS800 software compatibility (doc no. 64638211) in ABB Library.
- 4) Only in standard software.
- 5) Always 3 pos.
- 6) Not for 690 V.
- 7) Only 0610-3 and 0760-5.
- 8) Available for R8 only.
- 9) Not available for R8.
- 10) Standard in ACS800-01 frame sizes R2 and R3 and at 690 V also in R4.
- 11) Not available as IP 54 or IP 54R, or with C129 (UL approved version of the frame sizes R6 - R8 ACS800-07).
- 12) ACS800-02: standard in enclosure extension.
- 13) Line contactor is standard for frame sizes R6-R9.
Air circuit breaker is standard in frame sizes R11-R12.
- 14) UL-type 1 only.
- 15) Option if enclosure extension is used.
- 16) Type approval (ABS, DNV, Lloyd's) with option +C132.



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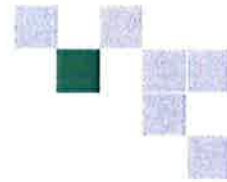
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Contact and web information

www.abb.com/motors&drives



ABB's worldwide presence is built on strong local companies working together with the local distributor and channel partner network across borders to achieve a uniform level of services for all our customers. By combining the experience and know-how gained in local and global markets, we ensure that our customers in all industries can gain the full benefit from our products.

For further details about all our variable speed drive products and services please contact your nearest ABB office or visit the ABB website www.abb.com/motors&drives.

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Notes




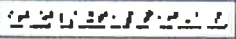
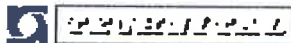
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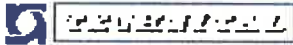
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4. AVVIATORI

Avviatori progressivi
per motori asincroni
Altistart 01 e Altistart 48

Catalogo
2006
2007



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Altistart 01

Il più compatto della sua categoria!

Basta con i colpi sulla meccanica che possono danneggiare le vostre macchine, nuocere alle vostre produzioni, creare incidenti!

Scegliete avviamenti e arresti progressivi per i vostri motori asincroni in condizioni ottimali per:

- la macchina azionata,
- la rete di alimentazione,
- il motore.


Massima semplicità!

- Facile da installare e mettere in servizio:
 - cablaggio e collegamenti facilitati (stessi componenti di un avviatore elettromeccanico).
- Regolazioni rapide:
 - tempi di avviamento e di decelerazione regolabili: 5 o 10 s.
 - coppia acceleratrice regolabile.
- Semplice diagnostica tramite 2 LED.
- Segnalazione fine avviamento.
- Alimentazione 24 V integrata (ATS01N2....).

EMC ... sotto controllo!

- Contattore di by-pass integrato.

Per eliminare i colpi di coppia all'avviamento (arresto ruota libera).



Altistart 01N1
da 3 a 25 A

Dimensioni:
(fino a 6 A)
larghezza: 22,5 mm
altezza: 100 mm
profondità: 100 mm

Ingombri minimi per ridurre la dimensione dei vostri armadi.

Per eliminare i colpi di coppia all'avviamento e decelerare progressivamente.

- Limitazione delle punte di corrente e conseguenti cadute di tensione.




Altistart 01N2
da 6 a 32 A

Dimensioni:
(fino a 12 A)
larghezza: 45 mm
altezza: 124 mm
profondità: 113 mm

Avviamenti sicuri grazie alla funzione "boost" (per gli avviamenti difficili).

- Morsetteria di controllo estraibile.

Per eliminare i colpi di coppia all'avviamento e decelerare progressivamente, per controllare in ogni momento la vostra applicazione.






Altistart 01 modello U
da 6 a 32 A

funzioni di controllo e di comunicazione con TeSys[®] modello U.



Norme e certificazioni
IEC/EN 60947-4-2, C-TICK



Soluzioni all'altezza...

Avviamenti-motori completi

Aumentate le vostre performances, semplificate la progettazione e l'installazione delle vostre macchine associando l'avviatore Altistart 01 a componenti Telemecanique.

Associazioni garantite!

- Guide alla scelta che aiutano nella definizione dei diversi componenti.

Installazione facilitata negli armadi

- Perfetta associazione meccanica per un montaggio facilitato.
- Ingombri minimi.

Sicurezza ottimale

- Protezione magnetica in caso di cortocircuito.
- Protezione termica in caso di sovraccarico...

Un investimento ridotto per grandi vantaggi

1° avviatore motore:
TeSys® modello U.

Con TeSys® modello U, approfittate di una soluzione unica di avviamento-motore:

- Perfetta integrazione negli automatismi
 - Informazioni relative allo stato del motore.
 - Accesso a queste informazioni a distanza tramite bus o localmente tramite il terminale di controllo multifunzionale e il software di regolazione PowerSuite.
- Apertura alle applicazioni grazie ai moduli funzionali.

Kit di montaggio per un assemblaggio facilitato e ingombri ottimizzati.

...delle vostre applicazioni

■ Potenza: da 0,37 a 11 kW



Piccoli compressori (motori monofase).
 Ventilatori (motori monofase).
 Piccoli nastri trasportatori.
 Porte scorrevoli...

Riduzione dei colpi di coppia all'avviamento:

- eliminazione dell'usura meccanica eliminando lo slittamento delle cinghie.
- aumento della durata di vita delle macchine.
- riduzione degli choc meccanici.

■ Potenza: da 0,75 a 15 kW



Pompe.
 Ventilatori.
 Nastri trasportatori, tapis roulant.
 Tunnel di lavaggio...

- Decelerazione controllata:
 - colpi d'ariete eliminati,
 - protezione dei carichi trasportati,
 - arresto progressivo.
- Limitazione delle punte di corrente all'avviamento:
 - riduzione della potenza installata,
 - cadute di tensione limitate.
- "boost" all'avviamento
 - avviamento sicuro in qualsiasi condizione.

■ Potenza: da 0,75 a 15 kW

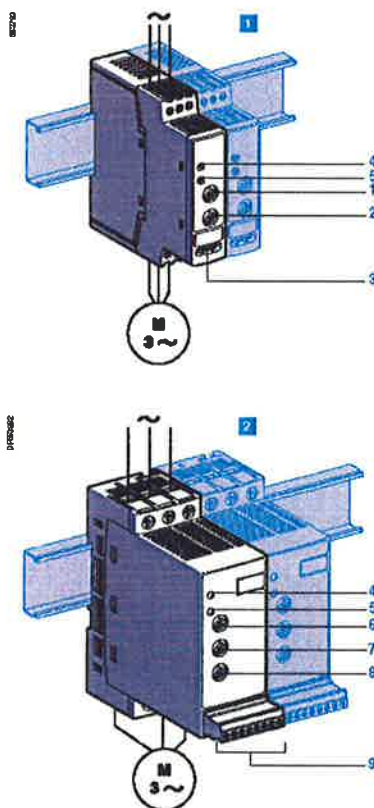


Sistemi evoluti.
 Architetture decentralizzate.
 Pompe.
 Ventilatori.
 Nastri trasportatori.
 Tunnel di lavaggio...

- Apertura a tutti i protocolli di comunicazione.
- Conoscenza dei diversi stati della macchina:
 - sovraccarico, sottocarico,
 - usura della macchina (numero di operazioni, tempo di funzionamento...).
- Protezione dei motori.

Presentazione

Avviatori progressivi per motori asincroni Altistart 01



Presentazione

L'avviatore progressivo Altistart 01 può essere sia un limitatore di coppia all'avviamento che un avviatore progressivo rallentatore per i motori asincroni.

L'utilizzo dell'Altistart 01 migliora le prestazioni di avviamento dei motori asincroni permettendo un avviamento progressivo senza sbalzi e controllato. Il suo impiego consente di eliminare i colpi sulla meccanica causa di usura, di interventi di manutenzione e di arresti della produzione.

L'Altistart 01 limita la coppia acceleratrice e i picchi di corrente all'avviamento sulle macchine che non richiedono una coppia di avviamento elevata.

Sono adatti alle seguenti applicazioni semplici:

- b nastri trasportatori,
- b convogliatori,
- b pompe,
- b ventilatori,
- b compressori,
- b porte automatiche,
- b piccole gru,
- b macchine a cinghie, ecc.

L'Altistart 01 è poco ingombrante e facile da installare, può essere montato affiancato ad altri prodotti ed è conforme alle norme IEC/EN 60947-4-2, omologazioni UL, CSA, C-Tick, CCC, GOST.

L'offerta di avviatori progressivi Altistart 01 comprende 3 gamme:

b 1 Avviatori progressivi ATS 01N1pppp

v Controllo di una fase di alimentazione del motore (monofase o trifase) per la limitazione di coppia all'avviamento

v Le potenze motore sono comprese tra 0,37 kW e 11 kW.

v Le tensioni di alimentazione motore sono comprese tra 110 V e 490 V, 50/60 Hz.

Per il comando dell'avviatore è necessaria un'alimentazione esterna.

Contattore di linea obbligatorio per isolamento galvanico da rete.

b 2 Avviatori rallentatori progressivi ATS 01N2pppp

v Controllo di due fasi di alimentazione del motore per la limitazione di corrente all'avviamento e per il rallentamento.

v Le potenze motore sono comprese tra 0,75 kW e 75 kW.

v Le tensioni di alimentazione motore sono le seguenti: 230 V, 400 V, 480 V e 690 V, 50/60 Hz.

Contattore di linea obbligatorio per isolamento galvanico da rete.

b Avviatori rallentatori progressivi ATSU 01N2pppp

Vedere pagina da 22 a 31.

Descrizione

b Gli avviatori progressivi Altistart 01 (ATS 01N1pppp) sono dotati:

v di un potenziometro di regolazione 1 del tempo di avviamento,

v di un potenziometro 2 per la regolazione della soglia della tensione di avviamento in funzione del carico del motore,

v 1 LED verde 4 di segnalazione: prodotto sotto tensione,

v 1 LED giallo 5 di segnalazione: motore alimentato alla tensione nominale (fine avviamento),

v di 2 ingressi 3:

- 1 ingresso z 24 V o 1 ingresso a 110...240 V per l'alimentazione del controllo che permetta il comando del motore.

b Gli avviatori rallentatori progressivi Altistart 01 (ATS 01N2pppp) sono dotati:

v di un potenziometro di regolazione 6 del tempo di avviamento,

v di un potenziometro di regolazione 8 del tempo di rallentamento,

v di un potenziometro 7 per la regolazione della soglia della tensione di avviamento in funzione del carico del motore,

v 1 LED verde 4 di segnalazione: prodotto sotto tensione,

v 1 LED giallo 5 di segnalazione: motore alimentato alla tensione nominale (fine avviamento),

v e di un connettore 9:

- 2 ingressi logici per i comandi Marcia/Arresto,

- 1 ingresso logico per la funzione BOOST,

- 1 uscita logica per segnalare la fine dell'avviamento,

- 1 uscita a relè per segnalare un guasto di alimentazione dell'avviatore o l'arresto del motore a fine rallentamento.



Presentazione (segue)

Avviatori progressivi per motori asincroniAltistart 01
Funzioni**Descrizione (segue)****Tabella di equivalenza dei contatti**

Funzioni	ATS 01N2ppLU/QN/RT	ATS 01N2ppLY	ATS 01N2ppQ
Uscite relè	R1A R1C	04 05	04 05
0 V alimentazione esterna	COM	-	-
Comando di arresto	LI1	02	02
Comando di marcia	LI2	03	03
Alimentazione controllo	LI + (+24 V logica positiva)	01 (0 V logica negativa)	01 (0 V logica negativa)
BOOST	BOOST	-	-
Fine avviamento	LO1	-	-
Alimentazione esterna 115 V	-	06 07	-

Funzioni

b. Comando 2 fili:

ATS 01N2ppLU/QN/RT

Schema di cablaggio in comando 2 fili

ATS 01N2ppLY/Q

Schema di cablaggio in comando 2 fili

La marcia e l'arresto sono comandati da un solo ingresso logico. L'ingresso logico LI2 a 1 comanda la marcia e a 0 l'arresto.

b. Comando 3 fili:



Schema di cablaggio in comando 3 fili



Schema di cablaggio in comando 3 fili

La marcia e l'arresto sono comandati da 2 ingressi logici diversi. L'arresto si ottiene all'apertura dell'ingresso LI1 (a 0). L'impulso sull'ingresso LI2 viene memorizzato fino all'apertura dell'ingresso LI1.

b. Tempo di avviamento.

La regolazione del tempo di avviamento permette di adattare il tempo della rampa di tensione applicata al motore ottenendo un tempo di avviamento progressivo in funzione del livello di carico del motore.

b. Funzione BOOST in tensione tramite ingresso logico:

L'attivazione dell'ingresso logico BOOST valida la funzione che permette di fornire un impulso di tensione piena utile ad annullare gli attriti meccanici (es. incollaggio slitte). Quando l'ingresso è a 1, la funzione è attiva (ingresso collegato al +24 V), l'avviatore applica al motore una tensione fissa per un tempo limitato prima dell'avviamento.

b. By-pass avviatore a fine avviamento

Tutti gli avviatori elettronici Altistart 01 integrano la funzione di by-pass a fine avviamento. Nei modelli ATS01N1pppp e da ATS01N206pp a ATS01N232pp è realizzata mediante relè mentre nei modelli ATS01N2ppLY/Q è realizzata mediante contattore serie TeSys.

b. Fine avviamento

v. Segnalazione forritta attraverso l'uscita logica LO1

Gli avviatori rallentatori progressivi da ATS 01N206pp a ATS 01N232pp sono dotati di un'uscita logica LO a collettore aperto che segnala la fine dell'avviamento quando il motore raggiunge la velocità nominale.

v. Segnalazione tramite elemento aggiuntivo

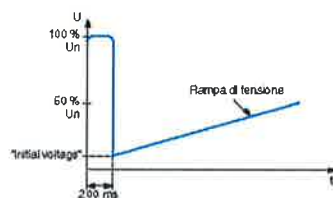
Per gli avviatori rallentatori progressivi ATS 01N2ppLY/Q l'informazione di fine avviamento è ottenibile aggiungendo un blocco LAD 9N11 a contatti "NC+NO".

Il blocco si collega semplicemente al contattore di messa in cortocircuito dell'elettronica senza dover smontare il prodotto.

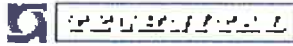
b. Relè di difetto

Gli avviatori rallentatori progressivi da ATS 01N206pp a ATS 01N232pp possiedono un relè che interviene in caso di rilevamento di un guasto.

Il contatto R1A-R1C (04-05 per ATS 01N2ppLY/Q) del relè si chiude con l'ordine di comando LI2 (02-03 per ATS 01N2ppLY/Q) e si apre vicino allo 0 di tensione motore in caso di arresto decelerato o istantaneamente in caso di rilevamento di un guasto. Questa informazione può essere utilizzata per comandare il contattore di linea ottenendo il rallentamento (mantenimento del contattore di linea fino all'arresto del motore).



Applicazione di un BOOST di tensione uguale al 100% della tensione nominale motore



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Caratteristiche

Avviatori progressivi per motori asincroni Altistart 01

Caratteristiche generali		ATS 01N1ppFT, ATS 01N2ppLU, ATS 01N2ppQN, ATS 01N2ppRT		ATS 01N2ppLY e ATS 01N2ppQ	
Tipo di avviatori		Gli avviatori elettronici Altistart 01 sono stati sviluppati in conformità con i livelli più severi della norma internazionale ed i regolamenti relativi alle apparecchiature elettriche di controllo industriale (IEC, EN), in particolare con la norma IEC/EN 60947-4-2			
Conformità alle norme					
Compatibilità elettromagnetica EMC					
Emissioni condotte ed irradiate		CISPR 11 livello B, IEC 90247-4-2, livello B			
Armoniche		IEC 1000-3-2, IEC 1000-3-4			
Immunità EMC		EN 50082-2, EN 50082-1			
Scariche elettrostatiche		IEC 61000-4-2 livello 3			
Tenuta ai disturbi radioelettrici irradiati		IEC 61000-4-3 livello 3			
Immunità ai transitori elettrici		IEC 61000-4-4 livello 4			
Onda d'impulso tensione/corrente		IEC 61000-4-5 livello 3			
Immunità ai disturbi condotti indotti dai campi radioelettrici		IEC 61000-4-8 livello 3			
Microinteruzioni e fluttuazione di tensione		IEC 61000-4-11			
Onda oscillatore ammortizzata		IEC 61000-4-12 livello 3			
Marcatura		Gli avviatori sono marcati a titolo della direttiva europea bassa tensione IEC/EN 60947-4-2			
Omologazione dei prodotti		UL e CSA, C-Tick, CCC, GOST			
Grado di protezione		IP 20		IP 20 sul fronte	
Grado di inquinamento		2 secondo IEC/EN 60947-4-2		3 secondo IEC 60664-1 e UL 508	
Tenuta alle vibrazioni		1,5 mm cresta cresta da 3 a 13 Hz, 1 gn da 13 a 150 Hz, secondo IEC/EN 60068-2-6		2 gn	
Tenuta agli impulsi		15 gn per 11 ms, secondo IEC/EN 60068-2-27		8 gn per 11 ms, secondo IEC/EN 60068-2-27	
Umidità relativa		5...95% senza condensa né ghiocciamento, secondo IEC/EN 60068-2-3			
Temperatura ambiente vicino all'apparecchio		Per immagazzinaggio		Per funzionamento	
		°C		°C	
		-25...+70 secondo IEC/EN 60947-4-2		-25...+70 secondo IEC/EN 60947-4-2	
		-10...+40 senza declassamento, fino a 50 °C declassando la corrente del 2% ogni °C oltre i 40 °C		0...+55	
Altitudine massima d'impiego		1000 senza declassamento (oltre i 1000 m declassare la corrente del 2,2% ogni 100 m supplementari)		2000 senza declassamento (oltre i 1000 m declassare la corrente del 0,5% ogni 100 m supplementari)	
Posizione di funzionamento					
Inclinazione massima permanente rispetto alla posizione verticale normale di montaggio					
Caratteristiche elettriche					
Tipo di avviatori		ATS			
Categoria d'impiego		Secondo IEC 60947-4-2			
Tensione nominale d'impiego		Tensione trifase			
		V		V	
		da 110 - 15% a 480 + 10%		da 200 - 15% a 240 + 10% da 380 - 15% a 415 + 10% da 440 - 15% a 480 + 10% da 230 - 15% a 600 + 10% 400 -15...+10%	
Frequenza		Hz			
		da 50 - 5% a 60 + 5%			
Tensione di uscita		Tensione trifase max uguale alla tensione della rete di alimentazione			
Tensione dell'alimentazione del controllo		V		V	
		a 110...240 ± 10% z 24 ± 10%		Interna all'avviatore a 110 ± 10% Interna all'avviatore	
Corrente nominale d'impiego		A		A	
		3...25 0...32		32...65	
Tempo di avviamento regolabile		s		s	
		1...5 1...10		1...25	
Tempo di rallentamento regolabile		s		s	
		-		1...10 1...25	
Coppia di avviamento		%			
		30...80% della coppia di avviamento del motore direttamente sulla rete			
Tipo di avviatori		ATS			
Utilizzo		01N1ppFT		01N2ppLU, 01N2ppQN, 01N2ppRT	
		Da 01N20pp e 01N222pp		01N232pp 01N2ppLY/01N2ppQ	
Tempo di avviamento		s		s	
		1 5		1 5 10 1 12	
Numero max di cicli/ora		n		n	
		100 20		50 10 5 300 30	

Presentazione pagine 6 e 7

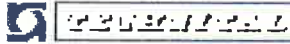
Riferimenti pagina 10

Dimensioni d'ingombro pagina 11

Schema pagine da 12 a 19

8





Caratteristiche elettriche (segue)

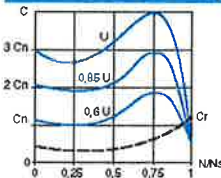
Tipo di avviatori		ATS 01N1	03FT	08FT	08FT	12FT	25FT
Assorbimento dell'alimentazione del controllo			z 24 V, 25 mA a 110 V, 30 mA e 240 V, 65 mA		z 24 V, 30 mA a 110 V, 35 mA e 240 V, 80 mA		
Potenza dissipata	A pieno carico a fine avviamento	W	4	1	1	1	1
	In regime transitorio	W	19	31	46	61	126
Corrente di avviamento a carico nominale (I)		A	16	30	45	60	125
Tipo di avviatori		ATS 01N2	06LU/QN/RT	06LU/QN/RT	12LU/QN/RT	26LU/QN/RT	32LU/QN/RT
Potenza dissipata	A pieno carico a fine avviamento	W	4	4	4	4,5	4,5
	In regime transitorio	W	84	84	124	224,5	324,5
Corrente di avviamento a carico nominale (I)		A	30	45	60	110	160
Tipo di avviatori		ATS 01N2	30LY/Q	44LY/Q	72LY/Q	88LY/Q	
Potenza dissipata	A pieno carico a fine avviamento	W	22	22	23	23	
	In regime transitorio	W	184	268	438	514	
Corrente di avviamento a carico nominale (I)		A	90	132	216	255	
Tipo di avviatori		ATS 01N2	ppLU/QN/RT			ppLY/Q	
Alimentazione degli ingressi logici. Solo per LI1, LI2 e BOOST (isolati galvanicamente tra potenza e controllo) LI e, COM			Alimentazione 24 V Corrente max disponibile 10 mA. Non protetta contro i cortocircuiti e i sovraccarichi			-	
Ingressi logici LI1, LI2, BOOST (01, 02, 03 per ATS 01N2pp LY/Q) Funzioni di marcia, arresto e boost all'avviamento			Ingressi logici d'impedenza 27 kohms Alimentazione 24 V (U max 40 V) Corrente max assorbita 8 mA A 0 se U < 5 V e I < 0,2 mA A 1 se U > 13 V e I > 0,5 mA			Ingresso con relè interno di comando, aliment. 24 V interna Corrente max 8 mA A 0 se I < 3 mA A 1 se I > 10 mA	
Uscita logica LO1 Segnalazione di fine avviamento			Uscita logica a collettore aperto Alimentazione esterna 24 V (min 6 V max 30 V) Corrente max 200 mA			-	
Uscita a relè R1A R1C (04, 05 per ATS 01N2pp LY/Q)			Contatto a chiusura NO (contatto aperto di guasto) Potere di commutazione minimo: 10 mA per < 8 V Potere di commutazione massimo su carico induttivo (cos φ = 0,5 e L/R = 20 ms): 2 A per < 250 V o < 30 V (AC-15) Tensione d'impiego max 440 V			Categoria d'impiego AC-15: Ia 3 A, Ue 250 V, DC-13: Ia 2 A, Ue 24 V, Potere di commutazione min: 10 mA per < 17 V Tensione d'impiego max 250 V	
Segnalazione tramite LED LED verde LED giallo			Avviatore alimentato Tensione nominale raggiunta (fine avviamento)			-	

(1) Corrente di accelerazione rispettando le condizioni d'impiego max (vedere pagina 8).

Collegamenti (Capacità massima di collegamento e coppia di serraggio)

Tipo di avviatori		ATS	01N103FT, 01N106FT	01N106FT, 01N112FT, 01N125FT da 01N206pp a 01N232pp	01N2ppLY e 01N2ppQ
Circuito di potenza			Connettore a gabbia		Connettore a vite
Cavo flessibile senza terminale		1 conduttore	mm² 2,5 14 AWG	1,5...10 8 AWG	6...25
		2 conduttori	mm² 1 17 AWG	1,5...6 10 AWG	6...25
Cavo flessibile con terminale		1 conduttore	mm² 2,5 14 AWG	1...8 10 AWG	4...25
		2 conduttori	mm² 0,75 18 AWG	1...8 10 AWG	4...16
Cavo rigido		1 conduttore	mm² 2,5 14 AWG	1...10 8 AWG	6...35
		2 conduttori	mm² 1 17 AWG	1...6 10 AWG	6...25
Coppia di serraggio		N.m	0,8	1,9...2,5	5
Circuito di controllo			Connettore a gabbia		Connettore a vite
Cavo flessibile senza terminale		1 conduttore	mm² 2,5 14 AWG	0,5...2,5 14 AWG	0,75...1,5
		2 conduttori	mm² 1 17 AWG	0,5...1,5 16 AWG	0,75...1,5
Cavo flessibile con terminale		1 conduttore	mm² 2,5 14 AWG	0,5...1,5 18 AWG	0,75...1,5
		2 conduttori	mm² 0,75 18 AWG	0,5...1,5 18 AWG	0,75...1,5
Cavo rigido		1 conduttore	mm² 2,5 14 AWG	0,5...2,5 14 AWG	0,75...1,5
		2 conduttori	mm² 1 17 AWG	0,5...1 17 AWG	0,75...1,5
Presenza di terra			-	-	Capocorda intagnato. Fissaggio con vit. diam. 8
Coppia di serraggio		N.m	0,8	0,5	0,7

Caratteristiche della coppia (curve tipiche)



Il disegno a lato illustra la caratteristica coppia/velocità di un motore a gabbia in funzione della tensione di alimentazione. La coppia varia con il quadrato della tensione a frequenza fissa. L'aumento progressivo della tensione elimina il picco di corrente istantanea alla messa sotto tensione.

Riferimenti

Avviatori progressivi per motori asincroni Altistart 01



ATS 01N103FT



ATS 01N212QN



ATS 01N230LY

Avviatore progressivo per motori da 0,37 a 5,5 kW

Motore		Avviatore					Riferimento	Peso
Potenza motore (1)		Corrente nominale		A				
Monofase	Trifase	230 V	210 V	230 V	230 V	400 V	400 V	
kW	HP	kW	HP	kW	HP	A	kg	
Tensione d'alimentazione monofase o trifase 110...480 V 50/60 Hz								
0,37	-	0,37	0,5	1,1	0,5	3	ATS 01N103FT	0,160
-	-	0,55	-	-	1,5	-	-	-
0,75	0,5	0,75	1	2,2	2	6	ATS 01N106FT	0,160
-	-	1,1	1,5	-	3	-	-	-
1,1	1	1,5	2	4	5	9	ATS 01N109FT	0,280
1,5	1,5	2,2	3	5,5	7,5	12	ATS 01N112FT	0,280
2,2	2	3	5	7,5	10	25	ATS 01N125FT	0,350
-	-	3	4	7,5	9	15	-	-
-	-	5,5	-	11	-	-	-	-

Avviatore rallentatore progressivo per motori da 0,75 a 15 kW

Motore		Avviatore		Riferimento	Peso
Potenza motore (1)		Corrente nominale			
kW	HP	A	A		
Tensione d'alimentazione trifase: 200...240 V 50/60 Hz					
0,75/1,1	1/1,5	6	6	ATS 01N206LU	0,420
1,5	2	9	9	ATS 01N209LU	0,420
2,2/3	3/-	12	12	ATS 01N212LU	0,420
4/5,5	5/7,5	22	22	ATS 01N222LU	0,580
7,5	10	32	32	ATS 01N232LU	0,580
Tensione d'alimentazione trifase: 380...415 V 50/60 Hz					
1,5/2,2	-	6	6	ATS 01N206QN	0,420
3/4	-	9	9	ATS 01N209QN	0,420
5,5	-	12	12	ATS 01N212QN	0,420
7,5/11	-	22	22	ATS 01N222QN	0,580
15	-	32	32	ATS 01N232QN	0,580

Tensione d'alimentazione trifase: 440...480 V 50/60 Hz

-	2/3	6	6	ATS 01N206RT	0,420
-	5	9	9	ATS 01N209RT	0,420
-	7,5	12	12	ATS 01N212RT	0,420
-	10/15	22	22	ATS 01N222RT	0,580
-	20	32	32	ATS 01N232RT	0,580

Avviatore rallentatore progressivo per motori da 15 a 75 kW

Motore		Avviatore		Riferimento	Peso				
Potenza motore (1)		Corrente nominale							
kW	HP	A	A						
Tensione d'alimentazione trifase: 230...690 V 50/60 Hz									
7,5	10	15	15	20	30	30	32	ATS 01N230LY	2,400
11	15	22	25	30	40	37	44	ATS 01N244LY	2,400
18,5	25	37	40	50	60	55	72	ATS 01N272LY	3,800
22	30	45	50	60	75	75	85	ATS 01N285LY	3,800

Tensione d'alimentazione trifase: 400 V 50/60 Hz

Motore		Avviatore		Riferimento	Peso
Potenza motore (1)		Corrente nominale			
kW	HP	A	A		
22	25	44	44	ATS 01N244Q	2,400
37	40	72	72	ATS 01N272Q	3,800
45	50	85	85	ATS 01N285Q	3,800

(1) Potenza normalizzata dei motori, potenza HP indicate in base alla norma UL 508.

Proseguimento:
pagine 8 e 7

Caratteristiche:
pagine 8 e 9

Dimensioni d'ingombro:
pagina 11

Schema:
pagine da 12 a 19

Riferimenti (segue),
dimensioni d'ingombro

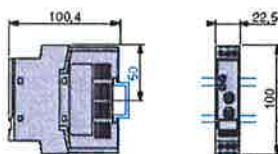
Avviatori progressivi per motori asincroni Altistart 01

Riferimenti (segue)

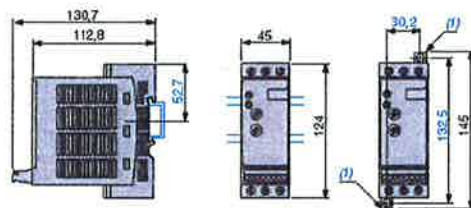
Accessori	Descrizione	Impiego per avviatore	Riferimento	Peso kg
	Piastra per montaggio rapido su profilato DIN	ATS 01N230LY, ATS 01N244pp	VY1 H4101	-
	Elemento adattatore per montaggio su profilato 4 DZS MB	ATS 01N103FT, ATS 01N108FT	RHZ 66	0,005
	Contatto ausiliario: permette di avere l'informazione "motore a piena tensione" (fine avviamento)	ATS 01N2ppLY, ATS 01N2ppQ	LAD 8N11	-

Dimensioni d'ingombro

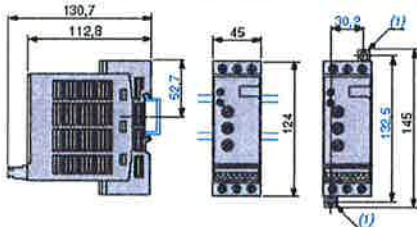
ATS 01N103FT, ATS 01N106FT
Montaggio su profilato 5 (35 mm)
o su profilato 4 con l'adattatore RHZ 66



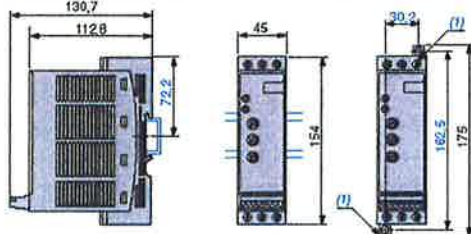
ATS 01N109FT, ATS 01N112FT, ATS 01N125FT
Montaggio su profilato 5 (35 mm)



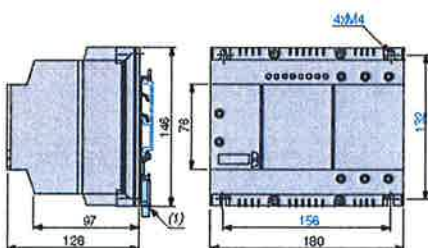
Da ATS 01N206pp a ATS 01N212pp
Montaggio su profilato 5 (35 mm)



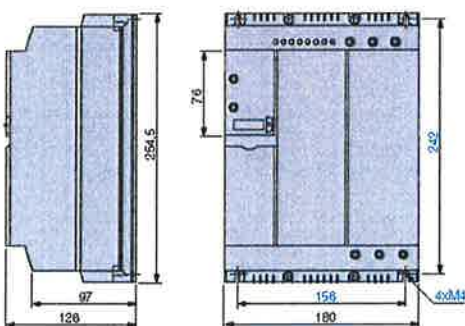
Da ATS 01N222pp a ATS 01N282pp
Montaggio su profilato 5 (35 mm)



ATS 01N230LY, ATS 01N244LY, ATS 01N244Q
Montaggio rapido su profilato 5 (35 o 76 mm) tramite piastra VY1 H4101 (1)



ATS 01N272LY, ATS 01N285LY, ATS 01N272Q, ATS 01N285Q



Presentazione
pagine 6 e 7

Caratteristiche
pagine 8 e 9

Riferimenti
pagina 10

Schemi
pagine da 12 a 19

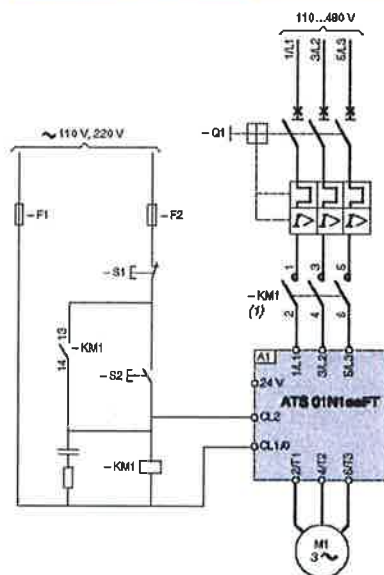
Schemi

Avviatori progressivi per motori asincroni

Altistart 01

Per motori da 0,37 a 11 kW

Avviatori progressivi ATS 01N1ppFT Alimentazione monofase o trifase

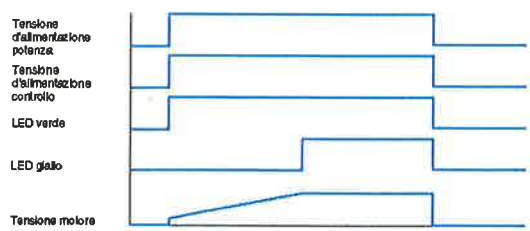


Note: Per motori monofase utilizzare l'ATS 01N1ppFT senza collegare la 2^a fase 3/L2, 4/T2.
 Attendere 5 secondi tra una messa fuori tensione ed una messa sotto tensione dall'avviatore progressivo.
 (*) Contattore di linea obbligatorio nella sequenza.

Componenti da associare

Sigla	Descrizione
A1	Avviatore progressivo
Q1	Interruttore automatico GV2 ME
KM1	LC1 ppp + LA4 DA2U
F1, F2	Fusibili di protezione comando
S1, S2	Pulsanti XB4 B o XB5 B

Diagramma funzionale



Schemi (segue)

Avviatori progressivi per motori asincroni

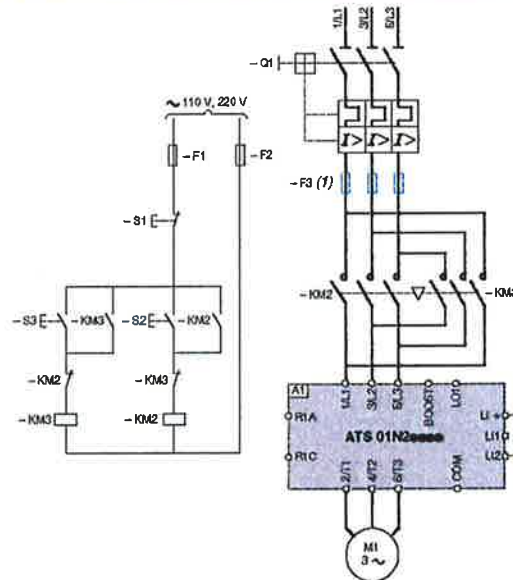
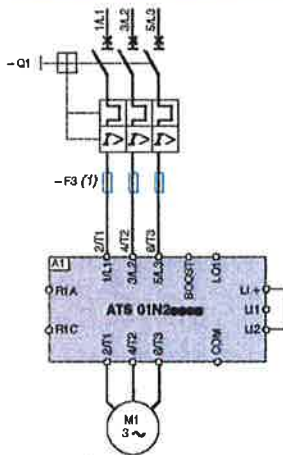
Altistart 01

Per motori da 0,75 a 15 kW

Avviatori rallentatori progressivi ATS 01N2ppLU/CN/RT

Comando manuale senza rallentamento con
interuttore automatico magneto-termico GV2 e GV3
Da ATS 01N200pp a ATS 01N232pp

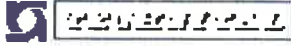
Comando automatico con inversione del senso di marcia senza
rallentamento
Da ATS 01N200pp a ATS 01N232pp



(1) Per coordinamento tipo 2.

Componenti da associare

Sigla	Descrizione
A1	Avviatore progressivo rallentatore
Q1	Interuttore automatico GV2 ME
KM1, KM2, KM3	LC1 ppp + LA4 DA2U
F1, F2	Fusibili di protezione comando
F3	3 fusibili UR
S1, S2, S3	Pulsanti XB4 B o XB5 B



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Data:

SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

Schemi (segue)

Avviatori progressivi per motori asincroni

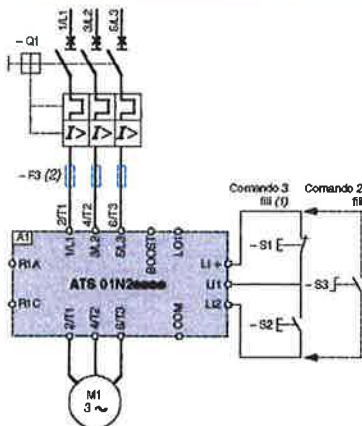
Altistart 01

Per motori da 0,75 a 15 kW

Avviatori rallentatori progressivi ATS 01N2ppLU/QN/RT

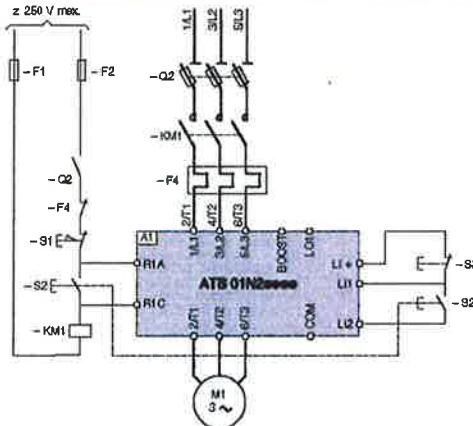
Comando automatico con o senza rallentamento, senza contattore

Da ATS 01N205pp a ATS 01N222pp



Comando automatico con o senza rallentamento, con contattore

Da ATS 01N205pp a ATS 01N222pp



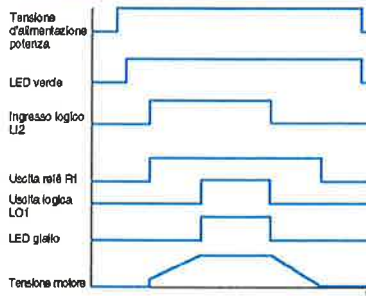
(1) Per distanze superiori a 1 m, utilizzare dei cavi schermati.
(2) Per coordinamento tipo 2.

Componenti da associare

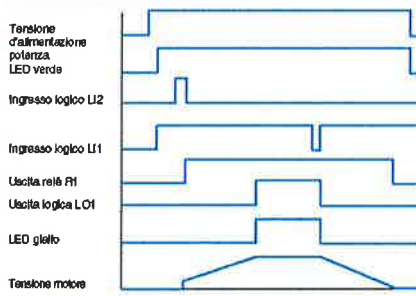
Sigla	Descrizione
A1	Avviatore progressivo rallentatore
Q1	Interruttore automatico GV2 ME
Q2	Interruttori a fusibili
F4	Relè termico
KM1	LC1 ppp + LA4 DA2U
F1, F2	Fusibili di protezione comando
F3	3 fusibili UF
S1, S2, S3	Pulsanti XB4 B o XB5 B

Diagrammi funzionali

Comando 2 fili con rallentamento



Comando 3 fili con rallentamento



Presentazione pagine 6 e 7

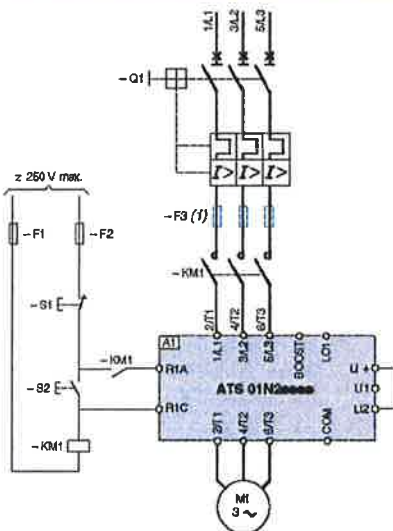
Caratteristiche pagine 8 e 9

Installazioni pagina 10

Dimensioni d'ingombro pagina 11



Avviatori rallentatori progressivi ATS 01N2ppLU/QNRT

 Comando automatico senza rallentamento, con auto-alimentazione di sicurezza
 Da ATS 01N200pp a ATS 01N232pp


(1) Per coordinamento lipo 2.

Componenti da associare

Sigla	Descrizione
A1	Avviatore progressivo rallentatore
Q1	Interruttore automatico GV2 ME
KM1	LC1 ppp + LA4 DA2J
F1, F2	Fusibili di protezione comando
F3	3 fusibili UR
S1, S2	Pulsanti XB4 B o XB5 B

Schemi

Avviatori progressivi per motori asincroni

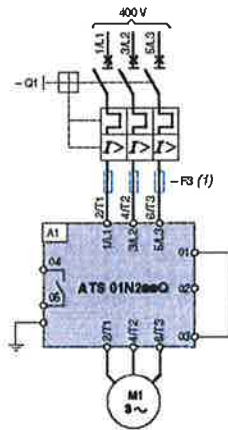
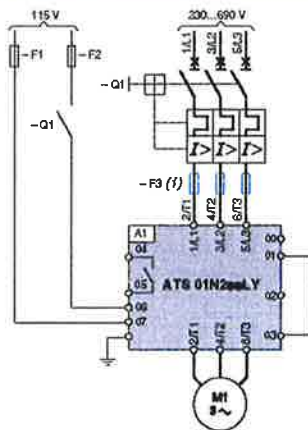
Altistart 01

Per motori da 15 a 75 kW

Avviatori rallentatori progressivi ATS 01N2ppLY e ATS 01N2ppQ (componenti da associare, vedere pagina 17)
Comando manuale senza rallentamento con interruttore automatico-motore GV3 e GV7

Da ATS 01N230LY e ATS 01N285LY

Da ATS 01N244Q e ATS 01N285Q



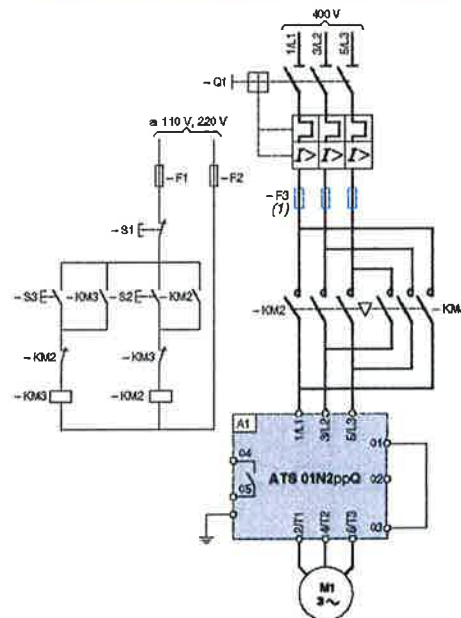
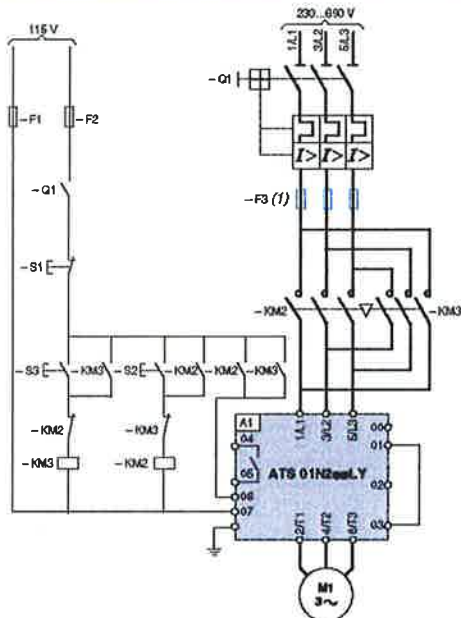
(1) Per coordinamento tipo 2.

(1) Per coordinamento tipo 2.

Comando automatico con inversione del senso di marcia senza rallentamento

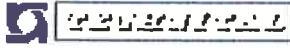
Da ATS 01N230LY e ATS 01N285LY

Da ATS 01N244Q e ATS 01N285Q



(1) Per coordinamento tipo 2.

(1) Per coordinamento tipo 2.



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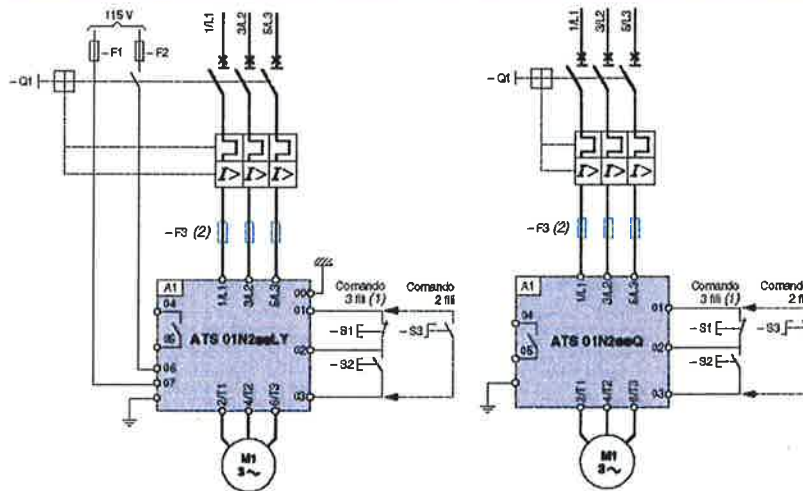
SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

Avviatori rallentatori progressivi ATS 01N2ppLY e ATS 01N2ppQ

Comando automatico con o senza rallentamento, senza contattore

Da ATS 01N230LY a ATS 01N285LY

Da ATS 01N244Q a ATS 01N285Q



(1) Per distanze superiori a 1 m, utilizzare cavi schermati.
(2) Per coordinamento tipo 2.

(1) Per distanze superiori a 1 m, utilizzare cavi schermati.
(2) Per coordinamento tipo 2.

Componenti da associare

Sigla	Descrizione
A1	Avviatore rallentatore progressivo
Q1	Interruttore automatico GV3 o GV7
KM2, KM3	LC1 ppp + LA4 DA2U
F1, F2	Fusibili di protezione comando
F3	3 fusibili UFR
S1, S2, S3	Pulsanti XB4 B o XB5 B

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pagina 10Dimensioni d'ingombro
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Schemi (segue)

Avviatori progressivi per motori asincroni

Altistart 01

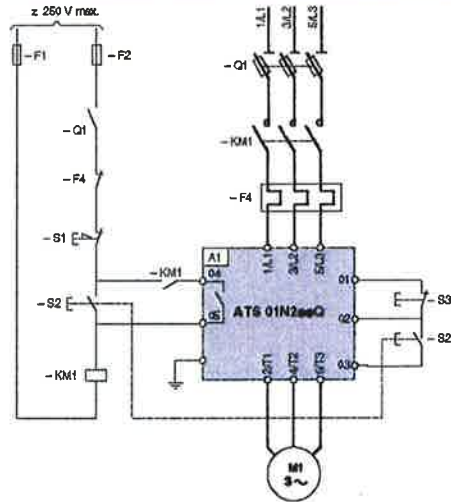
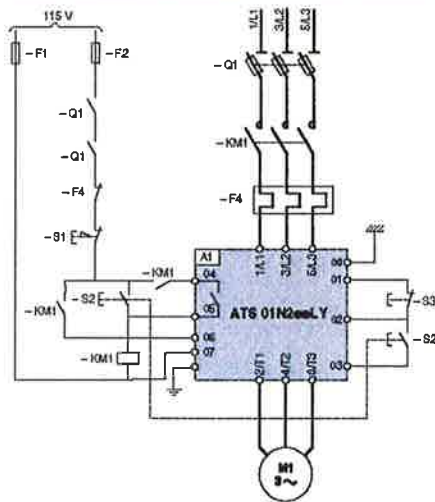
Per motori da 15 a 75 kW

Avviatori rallentatori progressivi ATS 01N2ppLY e ATS 01N2ppQ (segue)

Comando automatico con o senza rallentamento, con contattore

Da ATS 01N230LY a ATS 01N265LY

Da ATS 01N244Q a ATS 01N265Q



Componenti da associare

Sigla	Descrizione
A1	Avviatore rallentatore progressivo
Q1	Sezionatore GK1
KM1	LC1 ppp + LA4 DA2U
F1, F2	Fusibili di protezione comando
F4	Relè termico LR2 D
S1, S2, S3	Pulsanti XB4 B o XB6 B



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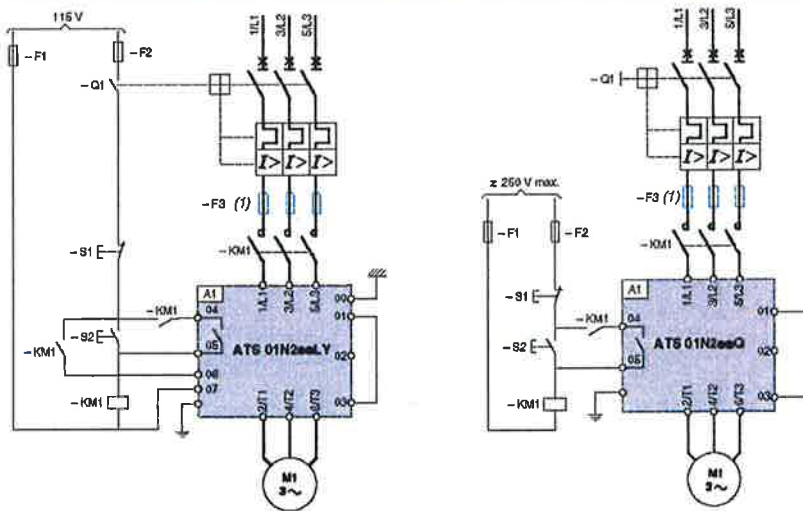
SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

Avviatori rallentatori progressivi ATS 01N2ppLY e ATS 01N2ppQ (segue)

Comando automatico senza rallentamento, con auto-alimentazione di sicurezza

Da ATS 01N230LY e ATS 01N285LY

Da ATS 01N244Q e ATS 01N285Q



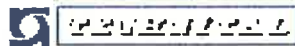
(1) Per coordinamento tipo 2.

Componenti da associare

Sigla	Descrizione
A1	Avviatore progressivo
Q1	Interruttore automatico GV3
KM1	LC1 ppp + LA4 DA2U
F1, F2	Fusibili di protezione comando
F3	3 fusibili UR
S1, S2	Pulsanti XB4 B o XB5 B

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Associazioni


Avviatori progressivi
per motori asincroni

Altistart 01

Alimentazione 400 V, coordinamento tipo 1

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2										
Associare alla Interruttore automatico (colonna azzurro), contattore, avviatore, che interruttore/ fusibili (colonna blu scuro), contattore, avviatore										
Motore	Avviatore Classe 10	Tipo di interruttore automatico Telemecanique	Calibro	Tipo di contattore	Tipo d'interruttore o interruttore-azionatore (solo Meeco)	Fusibili Am Ritardamento	Calibro	Fusibili Protezione potenza	Calibro	Relè termico
kW	A	A1	A	KM1, KM2, KM3	Q2	F3	A	F3	A	F4
0,37	0,98	ATS 01N103FT	GV2 ME05	1	LC1 K06 o LC1 D09	L51 D2531	DF2 CA02	2	—	LR2 K0306 LRD 05
0,55	1,5	ATS 01N103FT	GV2 ME08	1,6	LC1 K06 o LC1 D09	L51 D2531	DF2 CA02	2	—	LR2 K0307 LRD 06
0,75	2	ATS 01N103FT	GV2 ME07	2,5	LC1 K08 o LC1 D09	L51 D2531	DF2 CA02	2	DF3 EF02001 20	LR2 K0308 LRD 07
1,1	2,5	ATS 01N103FT	GV2 ME08	4	LC1 K08 o LC1 D09	L51 D2531	DF2 CA04	4	DF3 EF02001 20	LR2 K0308 LRD 08
		ATS 01N206QN	GV2 ME08	4	LC1 K08 o LC1 D09	L51 D2531	DF2 CA04	4	DF3 EF02001 20	LR2 K0308 LRD 08
1,5	3,5	ATS 01N106FT	GV2 ME08	4	LC1 K08 o LC1 D09	L51 D2531	DF2 CA08	8	DF3 EF02001 20	LR2 K0310 LRD 08
		ATS 01N206QN	GV2 ME08	4	LC1 K08 o LC1 D09	L51 D2531	DF2 CA08	8	DF3 EF02001 20	LR2 K0310 LRD 08
2,2	5	ATS 01N106FT	GV2 ME10	6,3	LC1 K08 o LC1 D09	L51 D2531	DF2 CA08	8	DF3 EF02001 20	LR2 K0312 LRD 10
		ATS 01N206QN	GV2 ME10	6,3	LC1 K09 o LC1 D09	L51 D2531	DF2 CA08	8	DF3 EF02001 20	LR2 K0312 LRD 10
3	6,5	ATS 01N106FT	GV2 ME14	9	LC1 K09 o LC1 D09	L51 D2531	DF2 CA12	12	DF3 EF04001 40	LR2 K0314 LRD 12
		ATS 01N206QN	GV2 ME14	9	LC1 K09 o LC1 D09	L51 D2531	DF2 CA12	12	DF3 EF04001 40	LR2 K0314 LRD 12
4	8,4	ATS 01N106FT	GV2 ME14	9	LC1 K09 o LC1 D09	L51 D2531	DF2 CA12	12	DF3 EF04001 40	LR2 K0316 LRD 14
		ATS 01N209QN	GV2 ME14	9	LC1 K09 o LC1 D09	L51 D2531	DF2 CA12	12	DF3 EF04001 40	LR2 K0316 LRD 14
5,5	11	ATS 01N112FT	GV2 ME16	13	LC1 K12 o LC1 D12	L51 D2531	DF2 CA16	16	DF3 EF04001 40	LR2 K0321 LRD 16
		ATS 01N212QN	GV2 ME16	13	LC1 K12 o LC1 D12	L51 D2531	DF2 CA16	16	DF3 EF04001 40	LR2 K0321 LRD 16
7,5	14,8	ATS 01N222QN	GV2 ME20	17	LC1 D18	L51 D2531	DF2 CA20	20	DF3 FF05001 50	LRD 21
9	18,1	ATS 01N222QN	GV2 ME21	21	LC1 D25	L51 D2531	DF2 CA25	25	DF3 FF05001 50	LRD 21
11	21	ATS 01N222QN	GV2 ME22	23	LC1 D25	L51 D2531	DF2 CA25	25	DF3 FF05001 50	LRD 22
15	28,5	ATS 01N232QN	GV2 ME32	32	LC1 D32	GK1 EM	DF2 EA40	40	DF3 FF10001 100	LR2 D3353
18,5	35	ATS 01N244Q	GV3 ME40	40	LC1 D38	GK1 EM	DF2 EA40	40	DF3 FF10001 100	LR2 D3355
22	42	ATS 01N244Q	GV3 ME63	63	LC1 D50	GK1 FM	DF2 FA63	63	DF3 FF10001 100	LR2 D3357
30	57	ATS 01N272Q	GV3 ME63	63	LC1 D65	GK1 FM	DF2 FA63	63	DF3 FA80 80	LR2 D3359
37	69	ATS 01N272Q	GV3 ME80	80	LC1 D80	GK1 FM	DF2 FA80	80	DF3 FA100 100	LR2 D3363
45	81	ATS 01N285Q	GV7 RE100	100	LC1 D95	GK1 FM	DF2 FA100	100	DF3 FA100 100	LR2 D3365

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Associazioni (segue)

Avviatori progressivi per motori asincroni

Altistart 01

Alimentazione 690 V, coordinamento tipo 1

Componenti da associare in base alle norme IEC 60847-4-1 e IEC 60947-4-2											
Associare alla Interruttore automatico (colonna azzurro), contattore, avviatore, che Interruttori fusibili (colonna blu scuro), contattore, avviatore											
Motore	Avviatore Classe 10	Tipo di Interruttore automatico Telemeccanico	Calibro	Tipo di contattore	Tipo d'interruttore o interruttore- sezionatore (solo blocco)	Fusibili Am Riferimento	Calibro	Fusibile Protezione potenza	Calibro	Relè termico	
KW	A	A1	A	KM1	O2	A	A	F3	A	F4	
30	33	ATS 01N230LY	GV3 ME40 + GV3 A01	2540	LC1 D50	GK1 EM	DF2 EA40	40	DF3 FF10001	100	LR2 D3355
37	40	ATS 01N244LY	GV3 ME63 + GV3 A01	4063	LC1 D63	GK1 FM	DF2 FA63	63	DF3 FA80	80	LR2 D3359
55	58	ATS 01N272LY	GV3 ME80 + GV3 A01	5880	LC1 D115	GK1 FM	DF2 FA80	80	DF3 FA100	100	LR2 D3363
75	75.7	ATS 01N285LY	GV7 RE100 + GV7 A11	80100	LC1 D190	GK1 FM	DF2 FA100	100	DF3 FA100	100	LR2 D3365

Presentazione
pagine 6 e 7

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Presentazione

Avviatori progressivi per motori asincroni Altistart U01 e TeSys modello U

Presentazione

L'Altistart U01 è un avviatore rallentatore progressivo per motori asincroni, destinato principalmente alle associazioni con gli avviatori controllori **TeSys modello U**.

Associato ad un controllore **TeSys modello U 1** tramite un connettore **2**, l'Altistart U01 **3** è un'opzione potenza che assicura la funzione Avviatore rallentatore progressivo.

Questa associazione offre una partenza motore unica ed innovativa.

L'utilizzo dell'Altistart U01 migliora le prestazioni di avviamento dei motori asincroni permettendo un avviamento progressivo controllato e senza sbalzi. Il suo utilizzo consente di eliminare gli choc meccanici causa di usura, riducendo la manutenzione e i tempi di arresto della produzione.

L'Altistart U01 limita la coppia acceleratrice e i picchi di corrente all'avviamento sulle macchine che non richiedono una coppia di avviamento elevata.

L'Altistart U01 è adatto alle applicazioni semplici, quali ad esempio:

- b** nastri trasportatori,
- b** pompe,
- b** ventilatori,
- b** compressori,
- b** porte automatiche,
- b** piccole gru a cavalletto,
- b** macchine a cinghie.

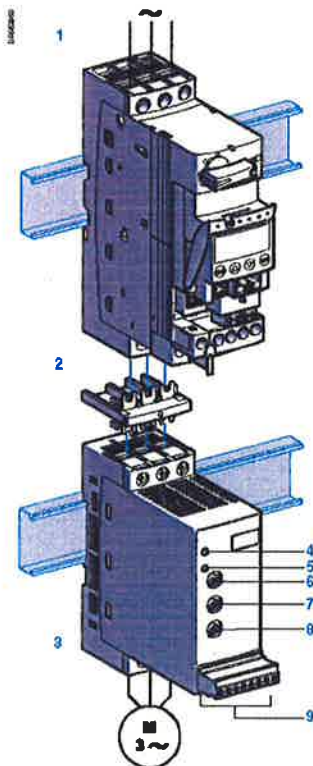
L'Altistart U01 ha dimensioni ridotte, è facile da installare ed è conforme alle norme IEC/EN 60947-4-2, omologazioni UL, CSA, C-Tick e marcatura e.


b Avviatori rallentatori progressivi ATSU 01N2ppLT

- v Controllo di due fasi di alimentazione del motore per la limitazione della corrente all'avviamento e per il rallentamento.
- v Le potenze motore sono comprese tra 0,75 kW e 15 kW.
- v Le tensioni di alimentazione motore sono comprese tra 200 V e 400 V, 50/60 Hz. Per il comando dell'avviatore è necessaria un'alimentazione esterna.

Descrizione

- b** Gli avviatori rallentatori progressivi Altistart U01 integrano:
 - v un potenziometro di regolazione del tempo di avviamento **6**,
 - v un potenziometro di regolazione del tempo di rallentamento **8**,
 - v un potenziometro per la regolazione della soglia della tensione di avviamento in funzione del carico del motore **7**,
 - v 1 LED verde di segnalazione **4**: prodotto sotto tensione,
 - v 1 LED giallo di segnalazione **5**: motore alimentato alla tensione nominale (fine avviamento),
 - v e un connettore **9**:
 - 2 ingressi logici per i comandi di Mardia/Arresto,
 - 1 ingresso logico per la funzione BOOST,
 - 1 uscita logica per segnalare la fine dell'avviamento,
 - 1 uscita relè per segnalare un guasto di alimentazione dell'avviatore o l'arresto del motore a fine rallentamento.



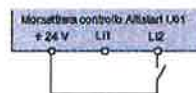
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Descrizione di un avviatore-ctrllore TeSys modello U

Consultare il nostro catalogo Avviatori e apparecchiature a giorno TeSys modello U:

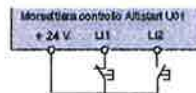
Funzioni del blocco avviatore progressivo ATSU 01N2ppLT

b Comando 2 fili:
La marcia e l'arresto sono comandati da un solo ingresso logico. L'ingresso logico LI2 a 1 comanda la marcia e a 0 l'arresto.



Schema di cableggio in comando 2 fili

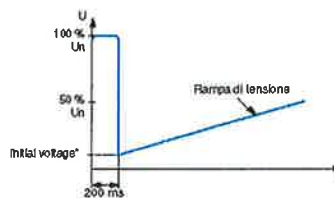
b Comando 3 fili:
La marcia e l'arresto sono comandati da 2 ingressi logici diversi. L'arresto si ottiene all'apertura dell'ingresso LI1 (stato 0). L'impulso sull'ingresso LI2 viene tenuto in memoria fino all'apertura dell'ingresso LI1.



Schema di cableggio in comando 3 fili

b Tempo di avviamento.
La regolazione del tempo di avviamento permette di impostare la durata della rampa di tensione applicata al motore, ottenendo un tempo di avviamento progressivo che dipende dal livello di carico del motore.

b Funzione BOOST in tensione mediante ingresso logico:
L'attivazione dell'ingresso logico BOOST valida la funzione che permetta di fornire un impulso di tensione piena utile ad evitare gli attriti meccanici (es. incollaggio slitte).
Quando l'ingresso è a 1 la funzione è attiva (ingresso collegato a + 24 V), l'avviatore applica al motore una tensione fissa per un tempo limitato prima dell'avviamento.

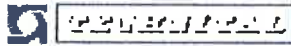


Applicazione di un BOOST di tensione pari al 100 % della tensione nominale motore

b By-pass avviatore a fine avviamento
Tutti gli avviatori elettronici Alistart 01 integrano la funzione di by-pass a fine avviamento. Nei modelli ATS01N1pppp e da ATS01N200pp a ATS01N232pp è realizzata mediante relè mentre nei modelli ATS01N2ppLY/Q è realizzata mediante contattore serie TeSys.

b Fine avviamento
v Segnalazione fornita attraverso l'uscita logica LO1
Gli avviatori progressivi rallentatori ATSU 01N2ppLT integrano un'uscita logica LO a collettore aperto che segnala la fine dell'avviamento quando il motore ha raggiunto la velocità nominale.

b Relè di difetto
Gli avviatori progressivi rallentatori ATSU 01N2ppLT integrano un relè che si apre al rilevamento di un guasto.
Il contatto R1A-R1C del relè si chiude con il comando LI2 e si apre vicino allo 0 della tensione motore in caso di arresto decelerato o istantaneamente in caso di guasto. Questa informazione può essere utilizzata per comandare il contattore di linea ed ottenere il rallentamento del motore (mantenimento del contattore di linea fino all'arresto del motore).



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Caratteristiche

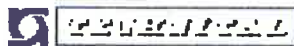
Avviatori progressivi
per motori asincroni
Altistart U01 e TeSys modello U

Caratteristiche generali		ATSU 01N2ppLT					
Tipo di avviatori		Altistart U01					
Conformità alle norme		Gli avviatori elettronici Altistart U01 sono stati sviluppati in conformità con i livelli più severi delle norme internazionali e con le normative relative alle apparecchiature elettriche di controllo industriale (IEC, EN), in particolare con la norma IEC/EN 60947-4-2					
Competibilità elettromagnetica EMC							
Emissioni condotte e irradiate		CISPR 11 livello B, IEC 60947-4-2, livello B					
Armoniche		IEC 1000-3-2, IEC 1000-3-4					
Immunità EMC		EN 50082-2, EN 50082-1					
Scariche elettrostatiche		IEC 61000-4-2 livello 3					
Tenuta ai disturbi radioelettrici irradiati		IEC 61000-4-3 livello 3					
Immunità ai transitori elettrici		IEC 61000-4-4 livello 4					
Onda d'urto tensione/corrente		IEC 61000-4-5 livello 3					
Emissioni condotte e irradiate		IEC 61000-4-6 livello 3					
Immunità ai disturbi condotti indotti dai campi radioelettrici		IEC 61000-4-11					
Onda oscillatorie ammortizzate		IEC 61000-4-12 livello 3					
Marcatura		Gli avviatori elettronici sono marcati ● in base alle direttive europee bassa tensione IEC/EN 60947-4-2					
Omologazione prodotti		UL, CSA e C-Tick					
Grado di protezione		IP 20					
Grado di inquinamento		2 secondo IEC/EN 60947-4-2					
Tenuta alle vibrazioni		1,5 mm cresta-cresta da 3 a 13 Hz, 1 gn da 13 a 150 Hz, secondo IEC/EN 60068-2-6					
Tenuta agli choc		15 gn per 11 ms, secondo IEC/EN 60068-2-27					
Umidità relativa		50% senza condensa né congelamento, secondo IEC/EN 60068-2-3					
Temperatura ambiente vicino all'apparecchio		Per immagazzinaggio	°C - 25 a 70 secondo IEC/EN 60947-4-2				
		Per funzionamento	°C - 10 a 40 senza declassamento, fino a 50 C declassando la corrente del 2 % per C oltre i 40 C				
Altitudine massima d'impiego		m	1000 senza declassamento (oltre declassare la corrente del 2,2 % ogni 100 m supplementari)				
Posizione di funzionamento		Inclinazione massima permanente rispetto alla posizione verticale normale di montaggio					
Caratteristiche elettriche		ATSU 01N2ppLT					
Tipo di avviatori		Altistart U01					
Categoria d'impiego		Secondo IEC 60947-4-2					
Tensione nominale d'impiego		Tensione a trifase	V 200 - 15 % a 480 + 10 %				
Frequenza		Hz	50 - 5 % a 60 + 5 %				
Tensione di uscita		Tensione trifase massima uguale alla tensione della rete di alimentazione					
Tensione di alimentazione del controllo		□ 24 V, 100 mA ± 10 %					
Corrente nominale d'impiego		A	6,32				
Tempo di avviamento regolabile		s	1...10				
Tempo di rallentamento regolabile		s	1...10				
Coppie di decollo		%	30...80 % della coppia di avviamento del motore direttamente sulla rete				
Tipo di avviatori		ATSU					
Consumo dell'alimentazione del controllo		01N200LT		01N209LT	01N212LT	01N222LT	01N232LT
		□ 24 V, 85 mA		□ 24 V, 100 mA		□ 24 V, 100 mA	
Potenza dissipata		A pieno carico a fine avviamento	W 1,5	1,5	1,5	2,5	2,5
		In regime transitorio a 5 volte la corrente nominale d'impiego	W 61,5	91,5	121,5	222,5	322,5
Tipo di avviatori		Da ATSU 01N200LY a ATSU 01N232LT		ATSU 01N232LT			
Utilizzo							
Tempo di avviamento		s	1	5	1	5	
Numero massimo di cicli all'ora			310	20	180	10	

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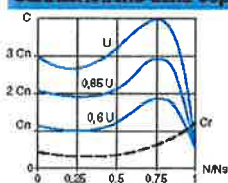
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Caratteristiche elettriche (segue)

Alimentazione degli Ingressi logici (isolati galvanicamente tra potenza e controllo) + 24 V, COM	24 V ± 10 % Isolata Corrente max 100mA
Ingressi logici LI1, LI2, BOOST Funzioni di arresto, marcia e boost all'avviamento	Ingressi logici impedenza 27 kohm Alimentazione 24 V (U max 40 V) Corrente max 8 mA Stato 0 se $U < 5 V$ e $I < 0,2 mA$ Stato 1 se $U > 13 V$ e $I > 0,5 mA$
Uscita logica LO1 Segnalazione di fine avviamento	Uscita logica a collettore aperto Alimentazione esterno 24 V (minimo 6 V massimo 30 V) Corrente max 200 mA
Uscita a relè RTA RTC	Contatto a chiusura NO (contatto aperto in difetto) Potere di commutazione minimo: 10 mA par. a 9 V Potere di commutazione massimo su carico induttivo ($\cos \varphi = 0,5$ a $L/R = 20 ms$): 2 A per $\approx 250 V$ o $\approx 30 V$ (AC-15) Tensione d'impiego massima 440 V
Segnalazione tramite LED LED verde LED giallo	Avvitatore alimentato Tensione nominale raggiunta (fine avviamento)

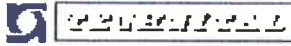
Collegamenti (Capacità massima di collegamento e coppia di serraggio)

Circuito di potenza			Collegamento a vite serrafilo 6 mm	
Cavo flessibile senza terminale	1 conduttore	mm ²	1,510	8 AWG
	2 conduttori	mm ²	1,56	10 AWG
Cavo flessibile con terminale	1 conduttore	mm ²	18	10 AWG
	2 conduttori	mm ²	18	10 AWG
Cavo rigido	1 conduttore	mm ²	110	8 AWG
	2 conduttori	mm ²	16	10 AWG
Coppia di serraggio		N.m	1,92,5	
Circuito di controllo			Connettore a vite	
Cavo flessibile senza terminale	1 conduttore	mm ²	0,52,5	14 AWG
	2 conduttori	mm ²	0,51,5	16 AWG
Cavo flessibile con terminale	1 conduttore	mm ²	0,51,5	16 AWG
	2 conduttori	mm ²	0,51,5	16 AWG
Cavo rigido	1 conduttore	mm ²	0,52,5	14 AWG
	2 conduttori	mm ²	0,51	17 AWG
Coppia di serraggio		N.m	0,5	

Caratteristiche della coppia (curve tipiche)

Il disegno a lato mostra la caratteristica coppia/velocità di un motore in funzione della tensione di alimentazione.

La coppia varia con il quadrato della tensione a frequenza fissa. L'aumento progressivo della tensione elimina il picco di corrente istantaneo alla messa in tensione.



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SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

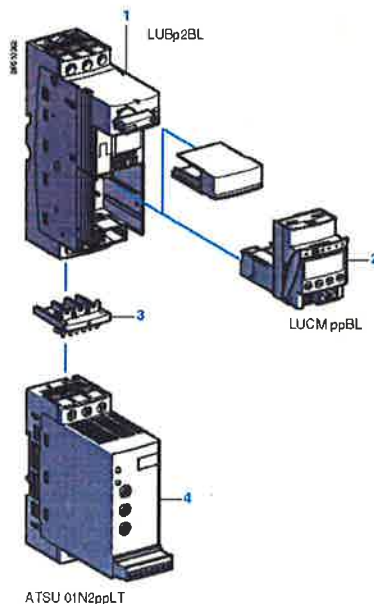
Riferimenti

Avviatori progressivi per motori asincroni

Altistart U01 e TeSys modello U



ATSU 01N222LT



ATSU 01N2ppLT

Avviatore rallentatore progressivo per motori da 0,75 a 15 kW (possibile associazione con l'avviatore TeSys modello U)

Motore				Avviatore		Peso kg
Potenza motore (1)				Corrente nominale	Riferimento	
230 V 230 V		400 V	440 V	A		
kW	HP	kW	HP			
Tensione d'alimentazione trifase: 200...480 V 50/60 Hz						
0,75	1	1,5	2	8	ATSU 01N206LT	0,340
1,1	1,5	2,2	3			
1,5	2	3	5	9	ATSU 01N206LT	0,340
-	-	4	-			
2,2	3	5,5	7,5	12	ATSU 01N212LT	0,340
3	-	-	-			
4	5	7,5	10	22	ATSU 01N222LT	0,490
5,5	7,5	11	15			
7,5	10	15	20	32	ATSU 01N232LT	0,490

Accessori

Descrizione	Impiego per avviatore	Riferimento	Peso kg
Connettore potenza tra ATSU 01N2ppLT e TeSys modello U	ATSU 01N2ppLT	VW3 G4104	0,020

Associazioni avviatore TeSys modello U e blocco avviatore progressivo

Sono disponibili numerose possibilità di associazioni e opzioni. Consultare il catalogo Avviatori e apparecchiature a giorno TeSys® modello U*

Potenza motore			Avviatore progressivo	TeSys modello U	
Tensione				Base potenza	Unità di controllo (2)
230 V		400 V	440 V		
kW/HP	kW	HP			
0,75/1	1,5	2	ATSU 01N206LT	LUB 12	LUCp 05BL
1,1/1,5	2,2	3	ATSU 01N206LT	LUB 12	LUCp 12BL
1,5/2	3	-	ATSU 01N206LT	LUB 12	LUCp 12BL
-	4	5	ATSU 01N206LT	LUB 12	LUCp 12BL
2,2/3	-	-	ATSU 01N212LT	LUB 12	LUCp 12BL
3/-	5,5	7,5	ATSU 01N212LT	LUB 32	LUCp 18BL
4/5	7,5	10	ATSU 01N222LT	LUB 32	LUCp 18BL
5,5/7,5	11	15	ATSU 01N222LT	LUB 32	LUCp 32BL
7,5/10	15	20	ATSU 01N232LT	LUB 32	LUCp 32BL

Esempio di un'associazione partenza-motore con:

- 1 base potenza per avviamento diretto 1 senso di marcia (LUBp2BL),
- 2 unità di controllo (LUCM ppBL),
- 3 connettore potenza (VW3 G4104),
- 4 blocco avviatore progressivo rallentatore Altistart U01 (ATSU 01N2ppLT).

(1) Potenza normalizzata dai motori, potenza HP indicata secondo la norma UL 508.

(2) In base alla configurazione dell'avviatore TeSys modello U scelta, sostituire la lettera p con A per standard, B per evoluto e M per multifunzione.



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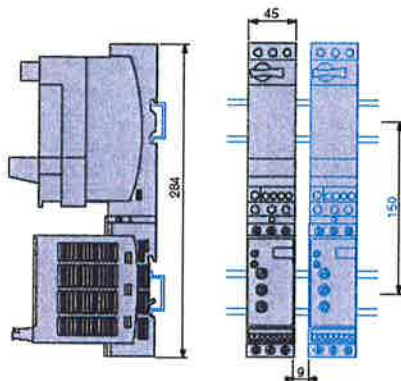
SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE,
DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA,
AUTOMAZIONE E POSIZIONAMENTO DINAMICO -
APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO
ELETTRICO

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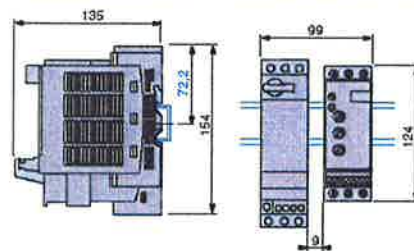
Dimensioni d'ingombro

Avviatori progressivi per motori asincroni Altistart U01 e TeSys modello U

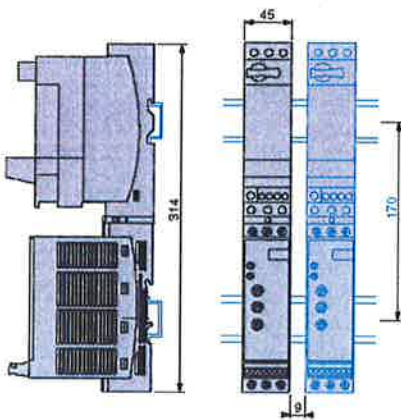
Associazione TeSys modello U (base potenza 1 senso di marcia)
e da ATSU 01N206LT a ATSU 01N212LT
Montaggio su profilato S (35 mm) con connettore VW3 G4104



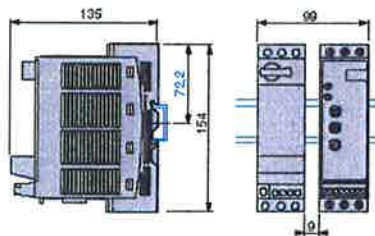
Associazione TeSys modello U (base potenza 1 o 2 sensi di marcia)
e da ATSU 01N206LT a ATSU 01N212LT
Montaggio affiancato



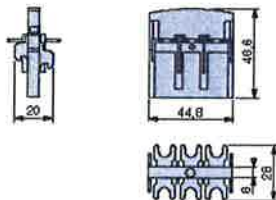
Associazione TeSys modello U (base potenza 1 senso di marcia)
e da ATSU 01N222LT a ATSU 01N232LT
Montaggio su profilato S (35 mm) con connettore VW3 G4104



Associazione TeSys modello U (base potenza 1 o 2 sensi di marcia)
e da ATSU 01N222LT a ATSU 01N232LT
Montaggio affiancato



Connettore VW3 G4104



Presentazione:
pagine 22 e 23

Caratteristiche:
pagine 24 e 25

Filetamenti:
pagina 26

Schema:
pagine da 28 a 31



Schemi

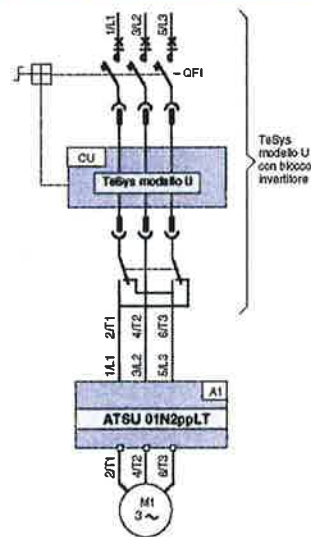
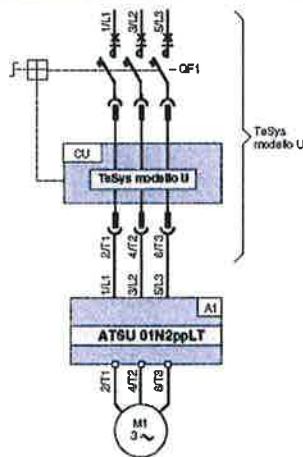
Avviatori progressivi per motori asincroni

Altistart U01 e TeSys modello U
 Per motori da 0,75 a 15 kW

Avviatori rallentatori progressivi ATSU 01N2ppLT

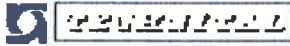
Cablaggio potenza

Cablaggio potenza con blocco invertitore



Componenti da associare (per i riferimenti completi, vedere pagine 20 e 21 o consultare il catalogo Avviatori e apparecchiature a giorno TeSys modelli U).

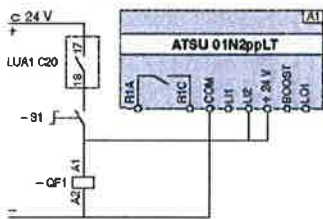
Sigla	Descrizione
A1	Avviatore rallentatore progressivo
OF1	Avviatore-controllore TeSys modello U
CU	Unità di controllo TeSys modello U



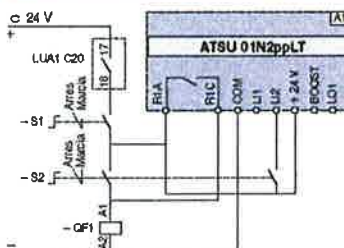
Avviatori rallentatori progressivi ATSU 01N2ppLT (segue)

Comando automatico 2 fili

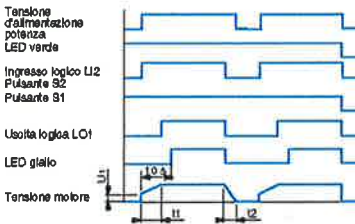
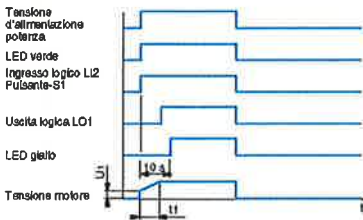
Senza rallentamento



Con e senza rallentamento

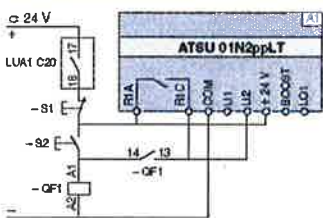


Diagrammi funzionali

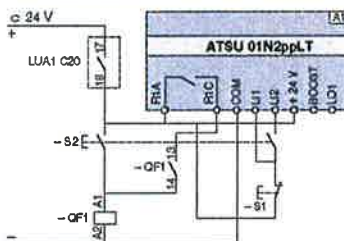


Comando automatico 3 fili

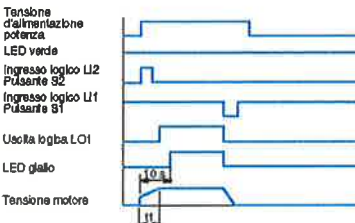
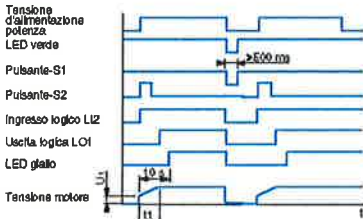
Senza rallentamento



Con rallentamento



Diagrammi funzionali



A1: Avvitatore progressivo rallentatore
S1, S2: Pulsanti XB4 B o XB5 B
QF1: Avvitatore-controllore TeSys modello U
t1: Tempo di accelerazione regolabile mediante potenziometro
t2: Tempo di rallentamento regolabile mediante potenziometro
U_c: Tensione di avviamento regolabile mediante potenziometro

Schemi

Avviatori progressivi per motori asincroni

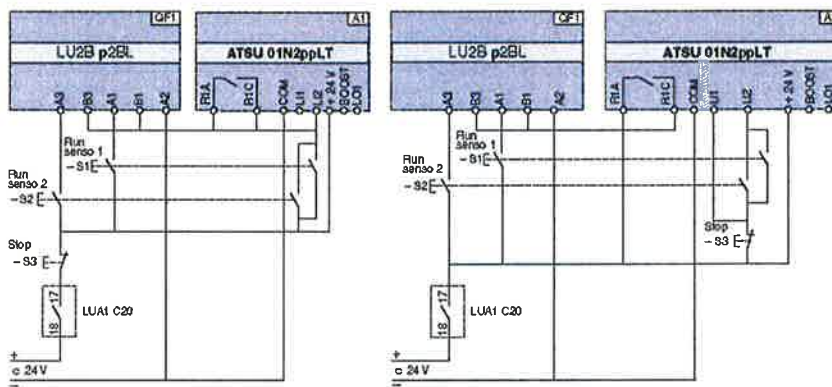
Altistart U01 e TeSys modello U
 Per motori da 0,75 a 15 kW

Avviatori rallentatori progressivi ATSU 01N2ppLT (segue)

Comando automatico 3 fili, con blocco invertitore

Senza rallentamento

Con rallentamento



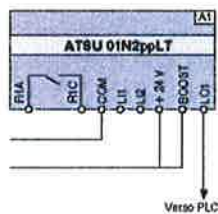
QF1: Avviatore-controllora TeSys modello U con blocco invertitore

A1: Avviatore progressivo rallentatore
 S1, S2, S3: Pulsanti XB4 B o XB5 B
 S3: tempo minimo di pressione 500 ms

QF1: Avviatore-controllora TeSys modello U con blocco invertitore

A1: Avviatore progressivo rallentatore
 S1, S2, S3: Pulsanti XB4 B o XB5 B

Boost all'avviamento e segnalazione fine avviamento



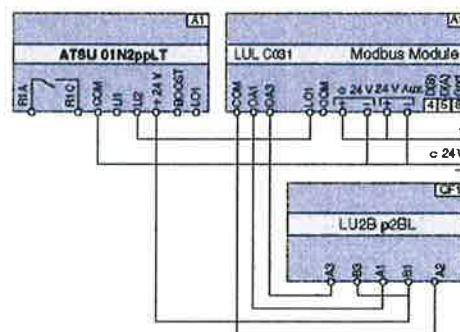
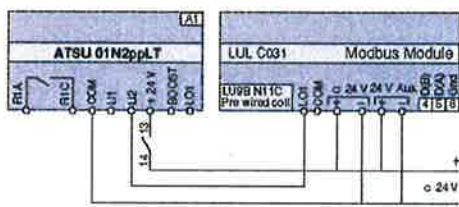
A1: Avviatore progressivo rallentatore

Avviatori rallentatori progressivi ATSU 01N2ppLT (segue)

Comande automatici con modulo di comunicazione Modbus, con e senza rallentamento

Senza blocco invertitore

Con blocco invertitore



Funzione	Registro	Bit	Valore
Messa fuori tensione TeSys U e ATSU	704	0	0
Comando automatico senza rallentamento			
Marcia	700	0	1
Arresto	704	0	0
Comando automatico con rallentamento			
Marcia	700	0	1
Arresto rallentato	700	0	0

Funzione	Registro	Bit	Valore
Messa sotto tensione TeSys U e ATSU	704	0	1
Senso diretto	704	1	1
Senso inverso	704	1	0
Comando automatico senza rallentamento			
Marcia	700	0	1
Arresto senso diretto	704	0	0
Arresto senso inverso	704	1	0
Comando automatico con rallentamento (senso diretto o inverso)			
Marcia	700	0	1
Arresto rallentato	700	0	0

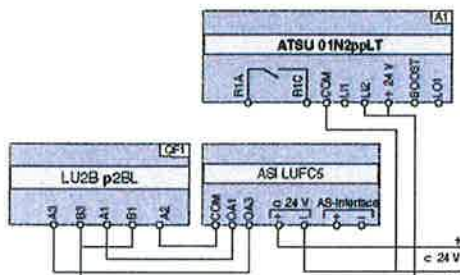
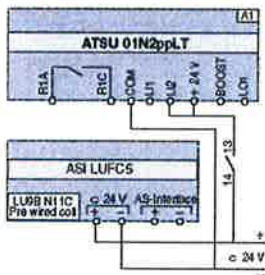
A1: Avviatore progressivo rallentatore

A1: Avviatore progressivo rallentatore
QF1: Avviatore-controllore TeSys modello U con blocco invertitore

Comando automatico con modulo di comunicazione AS-interface, senza rallentamento

Senza blocco invertitore

Con blocco invertitore



Funzione	Bit	Valore
Messa sotto tensione e comando automatico senza rallentamento		
Marcia	D0	1
Arresto	D0	0

Funzione	Bit	Valore
Messa sotto tensione e comando automatico senza rallentamento		
Marcia senso diretto	D0	1
Arresto	D0	0
Marcia senso inverso	D1	1
Arresto	D1	0

A1: Avviatore progressivo rallentatore

A1: Avviatore progressivo rallentatore
QF1: Avviatore-controllore TeSys modello U con blocco invertitore



Altistart 48: per avviamenti *ottimali*

Due gamme di tensione:

- da 230 a 415V.
- da 208 a 690V.

Frequenza 50/60 Hz

- Larga tolleranza per lavorare con i gruppi elettrogeni

Per potenze motore da 4 a 1200 kW

Norme e certificazioni

UL/CSA/IEC 60947-4-2
 EMC: classe A e B
 DNV (marina, off shore)
 C-TICK/GOST/CCC/
 NOM.

Marcatura CE

secondo la norma IEC 60947-4-2.



La famiglia di avviatori Altistart 48 è stata concepita per ottimizzare sempre più il avviamento delle vostre macchine:

- limitando gli shock meccanici e idraulici.
- riducendo le sollecitazioni sulla rete di distribuzione elettrica (picchi di tensione, sovraccarichi).
- limitando le perdite d'energia e i surriscaldamenti.

Esplorate, alimentate... avviatori!

Preregolato in fabbrica, l'Altistart 48 è immediatamente operativo.

Personalizzate le regolazioni

Un menù semplice e intuitivo permette di regolare i parametri del vostro motore.

Lasciatevi guidare dal software Power Suite

Per preparare, memorizzare, stampare le configurazioni, fare comparazioni tra i file...

I valori regolati si possono trasferire, facilmente, dal PC verso il Pocket PC e viceversa.



Pocket PC





Integrazione facilitata...

...negli armadi...



Cablaggio semplificato con il collegamento verticale su tutti i modelli

Ritraggio del contattore di by-pass dell'avviatore al termine dell'avviamento con il mantenimento delle protezioni (termica, sottocarico, sovraccarico, ...)



Comando del contattore di linea con l'Altistart 48



Contattore di by-pass per eliminare la dissipazione termica negli armadi.



Terminale remotato in opzione.



...e nei sistemi d'automazione

Le funzioni che facilitano lo sviluppo delle vostre applicazioni:

Avviamento e decelerazione in cascata di più motori.

Configurazione di un secondo motore, con parametrizzazioni differenti.

Visualizzazione delle grandezze elettriche (corrente, potenza...), e dello stato di carico e dei tempi di funzionamento.

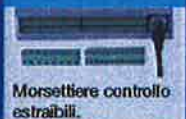
Mantenimento del dialogo operatore grazie all'alimentazione del controllo separata.

Numerosi ingressi / uscite configurabili (4 ingressi logici, 2 uscite logiche, 3 uscite a relè e 1 uscita analogica).

Funzioni di comunicazione estese per l'accesso a distanza alle funzioni di comando, sorveglianza e regolazione:

Modbus integrato e passerelle di comunicazione: Fipio, Profibus DP, DeviceNet.

Ethernet TCP/IP garantisce l'integrazione in Transparent Factory: piattaforma d'automazione aperta basata su tecnologia Internet.



Morsettiere controllo estraibili.



**Transparent
FACTORY**
Open for Automation



XXXXXXXXXXXX

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SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

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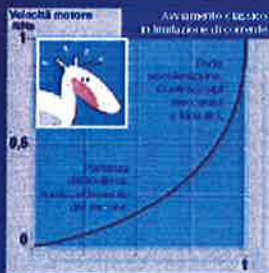
Le performances grazie a un *concetto esclusivo*

Sistema di controllo di coppia brevettato (sistema "TCS")

Perfetto controllo della coppia motore durante tutto il periodo di accelerazione e decelerazione semplicemente regolando le rampe



Controllo della coppia motore su tutto il periodo di accelerazione e decelerazione.



Coppia motore non controllata: accelerazione e decelerazione non lineari.

Per limitare gli stress meccanici.

Un avviamento in dolcezza si ottiene con il controllo della coppia acceleratrice. Con un avviamento classico (in limitazione di corrente), la coppia è imposta dal motore e aumenta fortemente con la velocità.

Solo il sistema "TCS" dell'Abistart 48 permette:

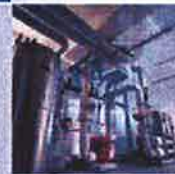
- di mantenere una accelerazione progressiva fino alla velocità nominale, anche in caso di coppia acceleratrice elevata,
- di aumentare la vita degli organi di trasmissione e della meccanica.

Per ridurre i transitori idraulici.

La potenza idraulica in una pompa varia con il cubo della velocità: è dunque nell'ultima fase dell'accelerazione e nella prima fase della decelerazione che diventa fondamentale controllare perfettamente la coppia motore.

Solo il sistema "TCS" dell'Abistart 48 permette:

- di ottenere l'effetto voluto indipendentemente dal carico,
- di ridurre efficacemente i colpi d'arieta nella valvole.



Una *protezione* a tutti i livelli

del motore

- Protezione termica:
 - tramite calcolo dell' I^2t secondo IEC 60947-4-2.
 - tramite gestione delle sonde PTC.
- Funzione preriscaldamento per evitare la condensa.

della macchina

- Sotto carico e sovraccarico con regolazione dei tempi e della soglia,
- Motore bloccato,
- Controllo del senso di rotazione,
- Rilevamento della mancanza fase,
- Robustezza su reti perturbate.



Robustezza su reti perturbate

L'Altistart 48 nel cuore delle vostre *applicazioni*



Con il *controllo di coppia*
e le *funzioni* dell'Altistart 48



Pompe

Standard*



Migliore gestione dei transitori idraulici:

- Messa in pressione progressiva del fluido nelle condutture,
- Riduzione dei colpi d'ariete e della valvole (in presenza della rete elettrica),
- Eliminazione dell'usura dei filtri e degli ugelli (irrigazione) e dell'usura oramai delle condutture...
- Minor stress sulle lubrificazioni grazie alla diminuzione dei fenomeni di pressione-sovrapressione

Rivoluzione indipendente dallo stato di carico.

Protezione contro il sotto carico (disinnescio), la perdita o l'inversione di fase e in caso di rotore bloccato.

Ventilatori e macchine a forte inerzia

(centrifughe, frantoi, molini...)



Standard* o severo* (>30s)



Avviamento in dolcezza eliminando le sollecitazioni sulla catena cinematica e lo slittamento delle cinghie.

Limitazione della corrente e delle cadute di tensione all'avviamento.

Protezione al volo di un ventilatore che gira in senso inverso.

Rilevamento del sovraccarico per ostruzione (o intasamento) e del sotto-carico (guasto alla trasmissione motore del ventilatore).

Coop o di frenatura all'arresto.

Compressori

Standard* o severo* (>30s)



Eliminazione dello slittamento delle cinghie di trasmissione.

Riduzione delle punte di corrente.

Protezione, anche per i motori speciali.

Rilevamento dell'inversione del senso di rotazione delle fasi.

Contatto per lo svuotamento automatico dell'arresto.

Nastri trasportatori

Standard*



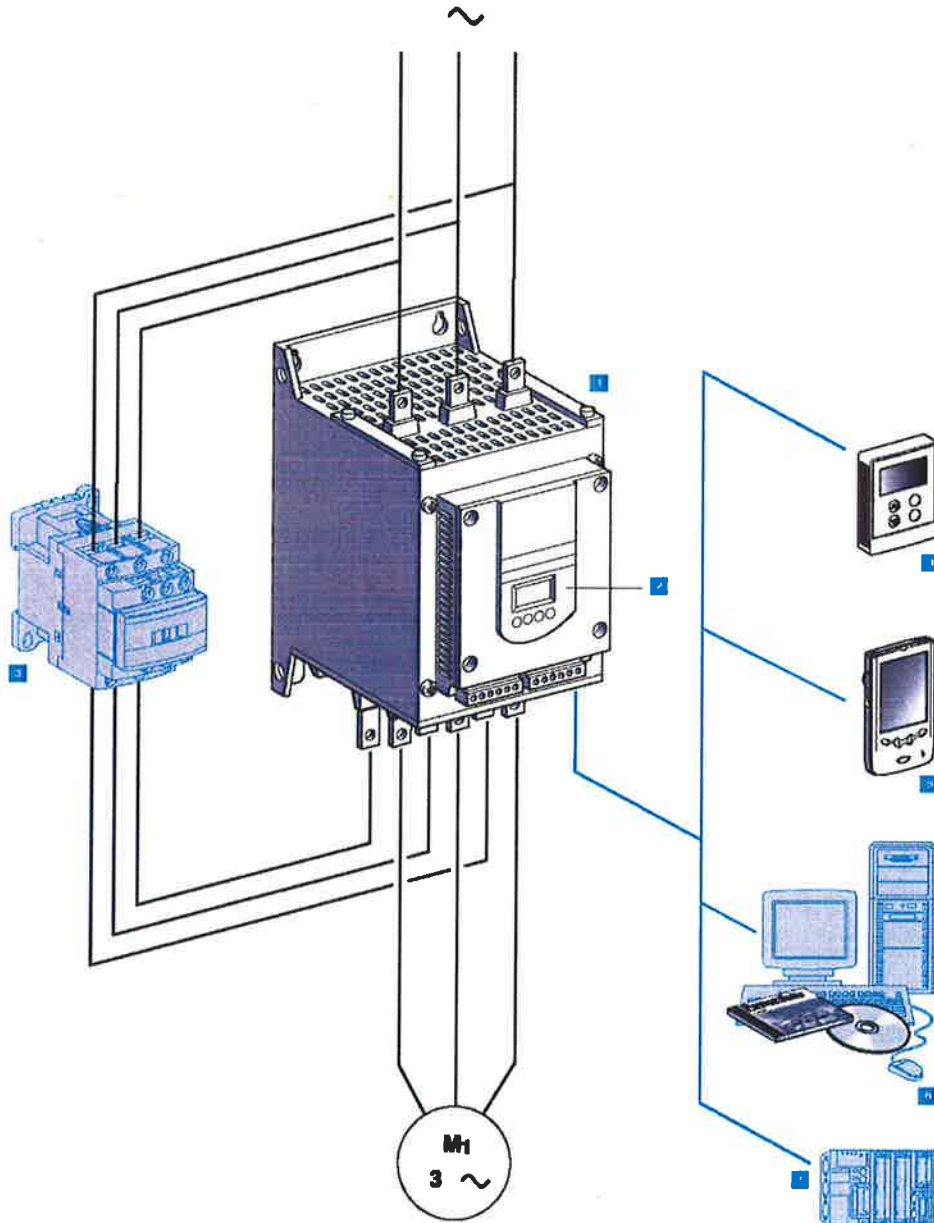
Avviamento progressivo riducendo i contraccolpi e lo slittamento delle cinghie di trasmissione.


Controllo del sovraccarico per il rilevamento di incidente, di duro meccanico, di sovraccarico o del sotto-carico per il rilevamento di rotture.

* Standard* o severo* definisce il tipo di applicazione consentendo di selezionare l'avviatore sulla guida alla scelta.

Presentazione

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48



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Applicazioni

L'avviatore-rallentatore Altistart 48 è un gradatore a 6 trisitori che consente l'avviamento e l'arresto controllato dei motori asincroni trifase a gabbia per potenze comprese tra 4 e 1200 kW.

Integra le funzioni di avviamento e rallentamento progressivo, di protezione delle macchine e dei motori e le funzioni di comunicazione con i sistemi di controllo e automazione.

Queste funzioni sono adatte alle applicazioni più comuni di macchine centrifughe, pompe, ventilatori, compressori e convogliatori, utilizza soprattutto nell'edilizia, nell'industria agro-alimentare e chimica. Le prestazioni degli algoritmi dell'Altistart 48 sono stati messi al servizio della robustezza, della sicurezza e della facilità di messa in opera.

L'avviatore-rallentatore Altistart 48 rappresenta una soluzione economica e consente di ridurre i costi di gestione delle macchine limitando i problemi meccanici e migliorandone la continuità di servizio.

diminuire le sollecitazioni sulla distribuzione elettrica riducendo i picchi di corrente e le cadute di tensione in linea legate agli avviamenti dei motori.

Gli avviatori-rallentatori Altistart 48 sono disponibili in 2 gamme:

b tensioni trifase da 230 a 415 V, 50/60 Hz.

b tensioni trifase da 208 a 690 V, 50/60 Hz.

Per ogni gamma di tensione, gli avviatori-rallentatori Altistart 48 sono dimensionati in funzione delle applicazioni in servizio standard e severo.

Funzioni

L'avviatore-rallentatore Altistart 48 (1) è fornito pronto all'impiego per applicazioni standard con una protezione motore classe 10 (vedere pagina 77).

È composto da un terminale integrato (2) che consente la modifica delle funzioni di programmazione, di regolazione o di controllo per personalizzare l'applicazione in base alle esigenze specifiche del cliente.

b Funzioni di comando e controllo con:

- v Il comando in coppia esclusiva dell'Altistart (brevetto Schneider Electric).
- v Il controllo della coppia motore durante tutta la fase di accelerazione e di decelerazione (riduzione significativa dei colpi di ariete).
- v La facilità di regolazione della rampa e della coppia di avviamento.
- v La possibilità di bypassare l'avviatore con un contattore (3) a fine avviamento con mantenimento delle protezioni elettroniche (funzione by-pass).
- v L'ampia tolleranza di frequenza per le alimentazioni mediante gruppo elettrogeno.
- v La possibilità di collegare l'avviatore nel collegamento a triangolo del motore, in serie con ogni avvolgimento.

b Funzioni di protezione del motore e della macchina con:

- v L'integrazione di una protezione termica motore.
- v L'elaborazione delle informazioni delle sonde termiche PTC.
- v Il controllo del tempo di avviamento.
- v La funzione di preriscaldamento motore.
- v La protezione contro i sovraccarichi e le sovracorrenti in regime permanente.

b Facilità d'integrazione nei sistemi di controllo e automazione:

- v 4 ingressi logici, 2 uscite logiche, 3 uscite relè e 1 uscita analogica.
- v Connettori degli ingressi/uscite estraibili.
- v Funzione di configurazione di un secondo motore e facile adattamento delle regolazioni.
- v Visualizzazione delle grandezze elettriche, dello stato di carico e del tempo di funzionamento.
- v Collegamento seriale RS 485 mediante connessione su protocollo Modbus.

Opzioni

In opzione è possibile ordinare:

Un terminale remotato (4) installabile sulla porta di una cassetta o di un armadio.


Soluzioni di dialogo avanzato PowerSuite:

b Pack assistant universale PowerSuite con terminale tipo PPC (5).

b atelier software PowerSuite (6).


Un'ampia gamma di accessori di cablaggio che semplifica il collegamento dell'avviatore con i controllori programmabili mediante connessione su bus Modbus (7).

Opzioni di comunicazione per bus e reti Ethernet, Fipio, DeviceNet, Profibus DP.

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Caratteristiche

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

Caratteristiche generali		
Conformità alle norme		Gli avviatori elettronici sono sviluppati e qualificati in conformità con le norme internazionali e in particolare con la norma prodotto avviatore EN / IEC 60947-4-2
Marcatura		I prodotti sono marcati CE in base alla norma armonizzata EN / IEC 60947-4-2
Omologazione dei prodotti		UL, CSA In corso: DNV, C-Tick, Ghost, CCIB
Grado di protezione	Avviatori da ATS 48D17p a 48C11p Avviatori da ATS 48C14p a 48M12p (1)	IP20 (IP 00 senza connessioni) IP00
Tenuta alle vibrazioni	Secondo IEC 60088-2-6	1,5 mm da 2 a 13 Hz 1gn da 13 a 200 Hz
Tenuta agli urti	Secondo IEC 60088-2-27	15 gn per 1 ms
Livello di rumore dell'avviatore (2)	Avviatori da ATS 48D32p a D47p Avviatori da ATS 48D82p a C11p Avviatori da ATS 48C14p a C17p Avviatori da ATS 48C21p a C32p Avviatori da ATS 48C41p a C69p Avviatori da ATS 48C70p a M12p	52 58 50 54 55 60
Ventilatori	Avviatori da ATS 48D17p a D22p Avviatori da ATS 48D32p a M12p	Convezione naturale Convezione forzata. Azionamento automatico dai ventilatori alla soglia di temperatura regolata. Portata vedere pagina 57
Temperatura ambiente vicino all'apparecchio	Per funzionamento Per immagazzinaggio, secondo IEC 60947-4-2	°C -10...+40 senza declassamento (tra +40 e +80, declassare la corrente nominale dell'Altistart del 2% per °C) °C -25...+70
Umidità relativa massima	Secondo IEC 60088-2-3	95% senza condensa e inglobamento
Inquinamento ambiente max	Secondo IEC 60664-1	Grado 3
Altitudine massima d'impiego		m 1000 senza declassamento (oltre i 1000 m declassare la corrente dell'Altistart del 2,2% ogni 100 m). Non superare i 2000 m.
Posizioni di funzionamento Inclinazione massima permanente rispetto alla posizione verticale normale di montaggio		
Caratteristiche elettriche		
Categoria d'impiego	Secondo IEC 60947-4-2	AC-63a
Tensione d'alimentazione trifase	Avviatori ATS 48pppQ Avviatori ATS 48pppY	V 230 -15%...415 +10% V 208 -15%...690 +10%
Frequenza		Hz 50 / 60 ± 5% (automatico) 50 o 60 ± 20% (tramite regolazione)
Corrente nominale dell'avviatore	Avviatori ATS 48pppQ Avviatori ATS 48pppY	A 17...1200 A 17...1200
Potenza motore	Avviatori ATS 48pppQ Avviatori ATS 48pppY	kW 4...830 kWHP 5,5...900 / 5...1200
Tensione indicata sulla targa motore	Avviatori ATS 48pppQ Avviatori ATS 48pppY	V 230...415 V 208...690
Tensione d'alimentazione del controllo avviatore	Avviatori ATS 48pppQ Avviatori ATS 48pppY	V 220 -15% a 415 +10%, 50 / 60 Hz V 110 -15% a 230 +10%, 50 / 60 Hz
Consumo massimo del controllo (con ventilatori in funzione)	Avviatori da ATS 48D17p a C17p Avviatori da ATS 48C21p a C32p Avviatori da ATS 48C41p a M12p	W 30 W 50 W 80
Uscita a relè (2 uscite configurabili)		3 uscite relè (R1, R2, R3), cortili a chiusura 1"NO" Potere di commutazione max 10 mA per c. 8 V. Potere di commutazione max su carico induttivo: 1,8 A per a 230 V e c 30 V (cos φ=0,6 a L/R=20ms) Tensione d'impiego max a 400 V. Regolazione di base: R1 assegnato a "relè di fine avviamento" (configurabile), R2 assegnato a "relè di fine avviamento" per comando dei relè di by-pass dell'avviatore, R3 assegnato a "motore alimentato" (configurabile).

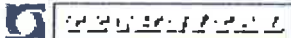
(1) Gli avviatori da ATS 48C14p a C32p possono essere dotati di carote di protezione sui morsetti potenza, mentre gli avviatori da ATS 48C41p a 48M12p sono protetti sul lato anteriore e sulla parati laterali.
(2) Avviatori installati a 1 m. I livelli di rumore sono suscettibili di evoluzioni in funzione delle caratteristiche dei ventilatori.

Presentazione:
pagine 36 e 37

Riferimenti:
pagine da 46 a 49

Dimensioni d'ingombro:
pagine da 54 a 57

Schemi:
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Caratteristiche elettriche (seguono)	
Ingressi logici LI (2 ingressi configurabili)	4 ingressi logici impedenza 4,3 k Ω isolati: Stop, Run, LI3, LI4 Alimentazione +24 V (massimo 30 V) I max 8 mA Stato 0 se U < 5 V e I < 2 mA Stato 1 se U > 11 V e I > 5 mA
Alimentazione interna disponibile	1 uscita +24 V isolata e protetta contro i cortocircuiti e i sovraccarichi. Precisione \pm 25 %. Portata massima 200 mA.
Uscite logiche LO (configurabili)	2 uscite logiche LO1 e LO2 con 0V comune, compatibile controllera livello 1, in base alla norma IEC 95A-08. Alimentazione +24 V (min. +12 V, max. +30 V). Corrente di uscita max: 200 mA con alimentazione esterna.
Uscite analogica AO (configurabile)	Uscita corrente 0-20 mA o 4-20mA. Impedenza di carico max: 500 Ω . Precisione \pm 5 % del valore max.
Ingresso per sonda PTC	Resistenza totale del circuito di sonda 750 Ω \pm 25%, secondo IEC 60 738-A.
Capacità massima di collegamento degli ingressi/Uscite	2,5 mm ² (AWG 12)
Comunicazione	Collegamento seriale multipunto RS 485 integrata all'avviatore, per protocollo Modbus, con connettore tipo RJ45. Velocità di trasmissione 4800, 9600 o 19 200 bits. Numero max di Altistart 48 collegati: 18. Altri impieghi: - collegamento a un terminale remoto o - collegamento di un PC o - collegamento su altri bus e reti tramite opzioni di comunicazione.
Protezione	Termica Protezione rete
Regolazione delle correnti	Integrata, avviatore e motore (calcolata s/o trattamento sonda PTC) Assenza fasi, segnalazione mediante relè di uscita.
Modo di avviamento	La corrente nominale motore In è regolabile da 0,4 a 1,3 volte il valore di corrente dell'avviatore. Regolazione della corrente max di avviamento da 1,5 a 7 In motore con una limitazione a 5 volte la corrente nominale dell'avviatore.
Modo di arresto	Arresto libero Arresto controllato in rampa di coppia Arresto frenato
	Mediante controllo di coppia, con la corrente dell'avviatore limitata a 5 In max. Preregolazione di base: 4 In in servizio standard su rampa di coppia di 15 s. Arresto a "ruota libera" (preregolazione di base). Regolazione mediante programmazione da 0,5 a 80 s (per applicazioni pompe). Comandato dinamicamente dal flusso.

Compatibilità elettromagnetica EMC (1)			
Sintesi delle prove d'immunità realizzate con l'Altistart 48	Norme	Livelli di prova	Esempi (elementi di disturbo)
Sintesi delle prove d'immunità realizzate con l'Altistart 48	IEC 61000-4-2 livello 3 Scariche elettrostatiche: - per contatto - nell'aria	6 kV 8 kV	Contatto di un individuo caricato elettricamente
	IEC 61000-4-3 livello 3 Campi elettromagnetici irradiati	10 V/m	Apparecchi emettitori di radiofrequenze
	IEC 61000-4-4 livello 4 Transitori elettrici rapidi: - cavi di alimentazione - cavi di comando	4 kV 2 kV	Apertura/chiusura di un contattore
	IEC 61000-4-6 livello 3 Onda d'urto: - fase/fase - fase/terra	1 kV 2 kV	-
Emissione condotta e irradiata	Secondo IEC 60947-4-2, classe A, su tutti gli avviatori. Secondo IEC 60947-4-2, classe B, sugli avviatori fino a 170 A; da ATS 48D17p a 48C17p, è necessario bypassare a fine avviamento.	1 kV - 1 M Hz	Circolo oscillante sulla rete di alimentazione

(3) Gli avviatori sono conformi alla norma prodotto IEC 60947-4-2, in particolare per l'EMC. Questa norma garantisce un livello d'immunità dei prodotti a un livello di disturbi emessi. In regime stabile i disturbi emessi sono inferiori a quanto previsto dalla norma. Durante le fasi di accelerazione e di decelerazione i disturbi a bassa frequenza (armoniche) possono disturbare i ricevitori basso livello.
Per ridurre questi disturbi utilizzare delle induttanze da collegare tra la rete e l'Altistart 48 (vedere pagina 51).

Nota:

b Le compensazioni del cos ϕ possono essere effettuate solo a monte dell'Altistart, con messa sotto tensione solo a fine avviamento.
b L'avviatore deve essere obbligatoriamente collegato alla terra per poter essere conforme alle normative riguardanti le correnti di fuga (y 30 mA). Quando le norme d'installazione impongono una protezione a monte mediante "dispositivo differenziale residuo" è necessario utilizzare un dispositivo tipo A-Si. Verificare la compatibilità con gli altri dispositivi di protezione. Se l'installazione comprende più avviatori sulla stessa linea di alimentazione collegare separatamente ogni avviatore alla terra.

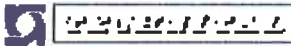
Presentazione
pagine da 36 a 37

Dimensioni
pagine da 46 a 49

Dimensioni d'ingombro
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Caratteristiche (segue)

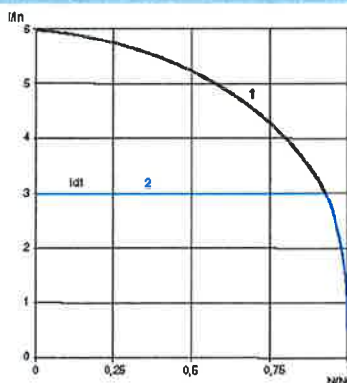
Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

Caratteristiche di coppia

Curve di evoluzione della coppia in funzione della corrente di avviamento di un motore asincrono trifase.
 Curve 1: avviamento diretto da rete.
 Curve 2: avviamento in limitazione di corrente.
 La curva di coppia $Cd1$ indica la coppia disponibile in funzione della corrente di limitazione $Id1$.
 La limitazione della corrente di avviamento Id ad un valore prestabilito $Id1$, provoca una riduzione della coppia di avviamento $Cd1$ praticamente uguale al rapporto del quadrato delle correnti $Id1 / Id$.
 Esempio:
 su un motore le cui caratteristiche sono: $Cd = 3 Cn$ per $Id = 6 In$,
 limitando la corrente a $Id1 = 3 In (0,5 Id)$
 avremo una coppia di avviamento $Cd1 = Cd \times (0,5)^2 = 3 Cn \times 0,25 = 0,75 Cn$.

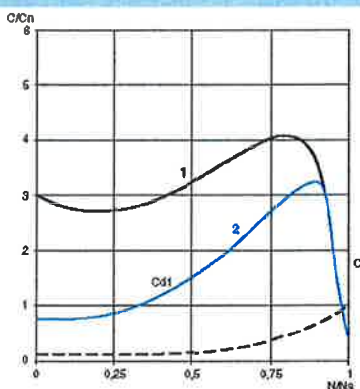
Corrente di avviamento

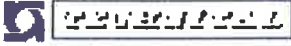
- 1 Corrente di avviamento diretto da rete
- 2 Corrente di avviamento limitata a $Id1$



Coppia di avviamento

- 1 Coppia di avviamento diretto da rete
- 2 Coppia di avviamento con limitazione di corrente a $Id1$

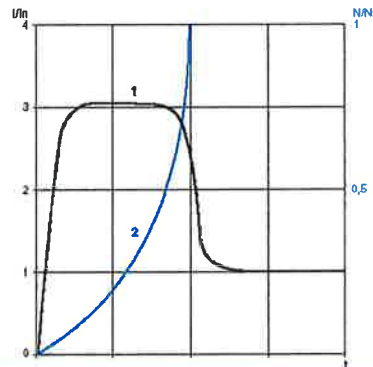


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Avviamento classico in limitazione di corrente o rampa di tensione

In limitazione di corrente, la coppia acceleratrice applicata al motore è uguale alla coppia motore $Cd1$ meno la coppia resistente Cr . La coppia acceleratrice aumenta progressivamente durante la fase di avviamento con l'evolvere della velocità, diventando molto forte a fine accelerazione (curva 2). Questa caratteristica crea una massa sotto carico brusca, sconsigliata per le applicazioni del tipo pompe.

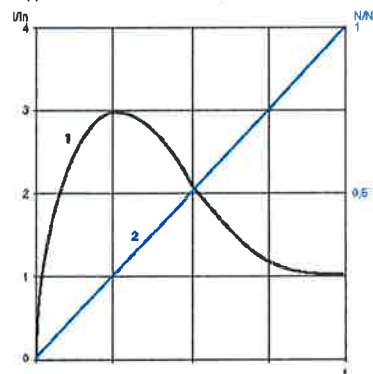
Esempio di curva di velocità di un avviamento in limitazione di corrente
 1 Corrente applicata al motore (I/I_n)
 2 Velocità motore N/N_s



Avviamento con l'Altistart 48

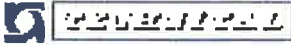
Il comando in coppia dell'Altistart 48 impone la coppia al motore durante tutta la fase di avviamento, se la corrente necessaria (curva 1) non supera la corrente di limitazione. La coppia acceleratrice può essere quasi costante su tutta la gamma di velocità (curva 2). Mediante regolazione è possibile ottenere una forte coppia all'avviamento per una massa in velocità rapida del motore limitandone il riscaldamento e una coppia acceleratrice più bassa a fine avviamento per una massa sotto carico progressiva. Questo comando è ideale per le pompe centrifughe o per le macchine con una forte coppia resistente all'avviamento.

Esempio di curva di velocità di un avviamento con controllo della coppia
 1 Corrente applicata al motore (I/I_n)
 2 Velocità motore N/N_s



Arresto con l'Altistart 48

Arresto ruota libera: il motore si arresta a ruota libera.
 Arresto decelerato: questo tipo di arresto è ideale per le pompe e permette di ridurre efficacemente i colpi di ariete. Il comando in coppia dell'Altistart 48 permette di ridurre l'effetto dei transitori idraulici anche con l'evoluzione del carico. Questo tipo di comando facilita la regolazione.
 Arresto frenato: questo tipo di arresto è adatto alle applicazioni a forte inerzia per ridurre i tempi di arresto della macchina.

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Criteria di scelta

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

Criteria di scelta di un avviatore-rallentatore progressivo Altistart 48

L'Altistart 48 deve essere scelto in base a 3 criteri fondamentali:

- b La tensione di alimentazione della rete elettrica da scegliere tra 2 gamme:
 - v Tensione alternata trifase: 230 – 415V.
 - v Tensione alternata trifase: 209 – 690V.
- b La potenza e la corrente nominale della larga motore.
- b Il tipo di applicazione ed il ciclo di funzionamento:
 - Per semplificare la scelta le applicazioni sono suddivise in 2 tipi,
 - v applicazioni standard,
 - v applicazioni severe.
 - I tipi di applicazioni, standard o severe, stabiliscono i valori limite di corrente e di ciclo per i servizi S1 e S4.

Applicazione in servizio standard

In applicazione standard l'Altistart 48 è dimensionato per rispondere a:

- b un avviamento a 4 In per 23 secondi o a 3 In per 46 secondi, partendo dallo stato a freddo (corrisponde a un servizio motore S1).
- b un avviamento a 3 In per 23 secondi o a 4 In per 12 secondi, un fattore di marcia del 50 % e 10 avviamenti all'ora o un ciclo termico equivalente (corrisponde a un servizio motore S4).
La protezione termica motore deve essere impostata in classe 10 (vedere pagina 76).
Esempio: pompa centrifuga.

Applicazione in servizio severo

In applicazione severa l'Altistart 48 è dimensionato per rispondere a:

- b un avviamento a 4 In per 49 secondi o a 3 In per 90 secondi, partendo dallo stato a freddo (corrisponde a un servizio motore S1).
- b un avviamento a 4 In per 25 secondi, con un fattore di marcia del 50 % e 5 avviamenti all'ora, o un ciclo termico equivalente (corrisponde a un servizio motore S4).
La protezione termica motore deve essere posizionata in classe 20 (vedere pagina 76).
Esempio: frantoio.

Servizi motore

Un servizio motore S1 corrisponde ad un avviamento seguito da un funzionamento a carico costante che permette di raggiungere l'equilibrio termico.
Un servizio motore S4 corrisponde ad un ciclo comprendente un avviamento, un funzionamento a carico costante e un periodo di riposo.
Questo ciclo è caratterizzato da un fattore di marcia del 50 %.

Scelta dell'avviatore

Dopo aver scelto il tipo di applicazione nella pagina seguente scegliere l'avviatore nelle pagine da 48 a 49 in funzione della tensione di alimentazione, della potenza del motore.

Attenzione:

Se l'Altistart 48 è installato all'interno di un armadio rispettare i consigli di montaggio e di declassamento (vedere pagina 57).



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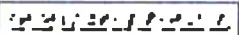
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Campi di applicazione

A seconda del tipo di macchina, le applicazioni sono suddivise in applicazioni standard o severa in funzione delle caratteristiche di avviamento, fornite a titolo indicativo nella tabella qui di seguito riportata.

Tipo di macchina	Applicazione	Funzioni realizzate dall'Altestat 44	Corrente di avviamento (in % In)	Tempo di avviamento (in s)
Pompa centrifuga	Standard	Rallentamento (riduzione dei colpi di ariete) Protezione contro i sottocarichi o l'inversione del senso di rotazione delle fasi	300	da 5 a 15
Pompa a pistoni	Standard	Controllo del disinnescio e del senso di rotazione della pompa	350	da 5 a 10
Ventilatori	Standard Severa se > 30 s	Rilevamento sovraccarico o sottocarico (trasmissione motore ventilatore giusta) Coppia di frenatura all'arresto	300	da 10 a 40
Compressore a freddo	Standard	Protezione, anche per motori speciali	300	da 5 a 10
Compressore a vite	Standard	Protezione contro l'inversione del senso di rotazione delle fasi Contatto per svuotamento automatico all'arresto	300	da 3 a 20
Compressore centrifugo	Standard Severa se > 30 s	Protezione contro l'inversione del senso di rotazione delle fasi Contatto per svuotamento automatico all'arresto	350	da 10 a 40
Compressore a pistoni	Standard	Protezione contro l'inversione del senso di rotazione delle fasi Contatto per svuotamento automatico all'arresto	350	da 5 a 10
Convogliatore, trasportatore	Standard	Controllo sovraccarico per rilevamento incidente e sottocarico per rilevamento rottura	300	da 3 a 10
Vite di sollevamento	Standard	Controllo sovraccarico per rilevamento duro meccanico e sottocarico per rilevamento rottura	300	da 3 a 10
Skidif	Standard	Controllo sovraccarico per rilevamento allungamento e sottocarico per rilevamento rottura	400	da 2 a 10
Sega circolare, sega a nastro	Standard Severa se > 30 s	Frenatura per arresto rapido	300	da 10 a 60
Spolpatore, coltello da macelleria	Severa	Controllo coppia all'avviamento	400	da 3 a 10
Aggitatore	Standard	La visualizzazione della corrente è immagine della densità del materiale	350	da 5 a 20
Mescolatore	Standard	La visualizzazione della corrente è immagine della densità del materiale	350	da 5 a 10
Frantoio	Severa	Frenatura per limitare le vibrazioni durante l'arresto, controllo sovraccarico per rilevamento blocco	450	da 5 a 60
Frantumatore	Severa	Frenatura per limitare le vibrazioni durante l'arresto, controllo sovraccarico per rilevamento blocco	400	da 10 a 40
Raffinatore	Standard	Controllo della coppia all'avviamento e all'arresto	300	da 5 a 30
Pressa	Severa	Frenatura per aumentare il numero di cicli	400	da 20 a 60

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Criteria di scelta (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Impieghi particolari

Altri criteri possono influenzare la scelta del calibro dell'Altistart 48:

Avviatore collegato a triangolo

(vedere schema consigliato a pagina 60)

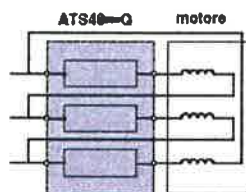
Oltre alle installazioni più comuni, con l'avviatore installato sulla linea di alimentazione del motore e il motore collegato a stella o a triangolo, l'Altistart 48 ATS48***Q può essere collegato nel triangolo motore in serie con ogni avvolgimento (vedere schema sotto riportato). La corrente dell'avviatore è inferiore di un fattore 3 della corrente di linea assorbita dal motore. Questo tipo di collegamento permette di utilizzare un avviatore di calibro ridotto.

Esempio: Per un motore 400 V da 110 kW con una corrente di linea di 195 A (corrente indicata sulla targa per il collegamento a triangolo), la corrente in ogni avvolgimento è uguale a $195/3$ ovvero 114 A.

Scegliere il calibro dell'avviatore con corrente nominale massima permanente appena al di sopra di questo valore di corrente, ovvero il calibro 140 A (ATS48C14Q per un'applicazione standard).

La tabella di pagina 47 permette di evitare questo calcolo.

Questo tipo di collegamento consente solamente l'arresto a ruota libera, e non è compatibile con le funzioni cascata e preriscaldamento.



Avviatore collegato in serie con gli avvolgimenti del motore (collegamento nel triangolo motore)

Nota: le regolazioni della corrente nominale e della corrente di limitazione così come la corrente visualizzata in funzionamento sono i valori in linea (evita i calcoli per l'utilizzatore).

Attenzione: per questo tipo di collegamento si consiglia di rispettare lo schema di cablaggio e i consigli riportati a pagina 60.

Avviatore con by-pass mediante contattore


(vedere schema consigliato a pagina 59)

L'avviatore può essere by-passato con un contattore a fine avviamento (limitazione della dissipazione termica dell'avviatore). Il contattore di by-pass è comandato dall'avviatore; le misure di corrente e le protezioni restano attive anche quando l'avviatore è by-passato.

La scelta dell'avviatore viene effettuata in funzione dei 3 criteri fondamentali e di uno dei seguenti criteri:

a Se l'avviatore è by-passato a fine avviamento e l'avviamento del motore viene quindi sempre effettuato a freddo è possibile surclassare l'avviatore di un calibro. Esempio: scegliere un ATS 48D17Q per un motore 11 kW in applicazione standard 400 V.

b Se l'avviatore deve essere in grado di funzionare senza il contattore di by-pass a fine avviamento, non è necessario declassare l'avviatore. Esempio: scegliere un ATS 48D17Q per un motore 7,5 kW in applicazione standard 400 V.

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Impieghi particolari (58/2,18)

Motori in parallelo

La messa in parallelo di più motori è consentita nel limite di potenza dell'avviatore (la somma delle correnti dei motori deve essere inferiore alla corrente nominale dell'avviatore scelto in funzione del tipo di applicazione). Prevedere una protezione termica per ogni motore.

Motore ad anelli

L'Altistart 48 può funzionare con un motore ad anelli cortocircuitati o con una resistenza. La coppia di decollo è modificata in funzione della resistenza del rotore. Se necessario conservare una resistenza di valore ridotto per ottenere la coppia necessaria a vincere la coppia resistente all'avviamento. Un motore ad anelli cortocircuitato possiede una coppia di avviamento molto debole; per ottenere una coppia di avviamento sufficiente è necessaria una corrente statorica importante. Sovradimensionare l'avviatore in modo da disporre di una corrente di limitazione al 700% della corrente nominale.

Nota: accertarsi che la coppia di avviamento del motore, pari a 7 volte la corrente nominale, sia superiore alla coppia resistente.

Nota: Il comando in coppia dell'Altistart 48 permette di mantenere una buona progressione di avviamento malgrado una limitazione di corrente a 7 volte la corrente nominale necessaria all'avviamento del motore.

Motore Dahlander o motore 2 velocità

L'Altistart 48 può funzionare con un motore 2 velocità. Il passaggio piccola velocità / grande velocità deve avvenire al termine di un periodo di smagnetizzazione del motore per evitare di essere in opposizione di fase tra la rete e il motore con la conseguente generazione di correnti molto importanti. Scegliere l'avviatore in base ai 3 criteri fondamentali.

Grande lunghezza del cavo di collegamento

I cavi motore di lunghezza rilevante generano cadute di tensione dovute alla resistenza del cavo. Se la caduta di tensione è importante può incidere sulla corrente assorbita e la coppia disponibile; in questo caso è necessario tenerne conto nella scelta del motore e dell'avviatore.

Avviatori in parallelo sulla stessa rete

Quando sulla stessa rete elettrica sono installati più avviatori è consigliabile installare delle induttanze di linea tra il trasformatore e l'avviatore (vedere pagina 51).

Consigli d'impiego

Attenzione: Non utilizzare l'Altistart 48 a monte di utenze diverse dai motori (ad esempio non utilizzare mai trasformatori o resistenze).

Non collegare dei condensatori di compensazione del fattore di potenza ai morsetti di un motore comandato da un Altistart 48.

Riferimenti

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Tensione rete 230 / 415 V

Collegamento sulla linea di alimentazione del motore



ATS 48D17Q



ATS 48C14Q



ATS 48M12Q

Per applicazioni in servizio standard

Motore		Avviatore 230 / 415 V - 50 / 60 Hz				
Potenza motore (1)	230 V 400 V	Corrente nominale (IcL)	Corrente prerogol. di base (2)	Potenza dissipata a carico nominale (4)	Riferimento	Peso
4	7,5	17	14,8	59	ATS 48D17Q	4,900
5,5	11	22	21	74	ATS 48D22Q	4,900
7,5	15	32	28,5	104	ATS 48D32Q	4,900
9	18,5	38	35	118	ATS 48D38Q	4,900
11	22	47	42	142	ATS 48D47Q	4,900
15	30	62	57	201	ATS 48D62Q	8,300
18,5	37	75	69	245	ATS 48D75Q	8,300
22	45	88	81	290	ATS 48D88Q	8,300
30	55	110	100	322	ATS 48C11Q	8,300
37	75	140	131	391	ATS 48C14Q	12,400
45	90	170	162	479	ATS 48C17Q	12,400
55	110	210	195	580	ATS 48C21Q	18,200
75	132	250	233	695	ATS 48C25Q	18,200
90	160	320	285	902	ATS 48C32Q	18,200
110	220	410	388	1339	ATS 48C41Q	51,400
132	250	480	437	1386	ATS 48C48Q	51,400
160	315	590	560	1731	ATS 48C59Q	51,400
-	355	680	605	1958	ATS 48C68Q	51,400
220	400	790	675	2537	ATS 48C79Q	115,000
250	500	1000	855	2865	ATS 48M10Q	115,000
355	630	1200	1045	3497	ATS 48M12Q	115,000

Per applicazioni in servizio severo

Motore		Avviatore 230 / 415 V - 50 / 60 Hz				
Potenza motore (1)	230 V 400 V	Corrente nominale (3)	Corrente prerogol. di base (4)	Potenza dissipata a carico nominale	Riferimento	Peso
3	5,5	12	14,8	46	ATS 48D17Q	4,900
4	7,5	17	21	59	ATS 48D22Q	4,900
5,5	11	22	28,5	74	ATS 48D32Q	4,900
7,5	15	32	35	99	ATS 48D38Q	4,900
9	18,5	38	42	118	ATS 48D47Q	4,900
11	22	47	57	153	ATS 48D62Q	8,300
15	30	62	69	201	ATS 48D75Q	8,300
18,5	37	75	81	245	ATS 48D88Q	8,300
22	45	88	100	252	ATS 48C11Q	8,300
30	55	110	131	308	ATS 48C14Q	12,400
37	75	140	162	391	ATS 48C17Q	12,400
45	90	170	195	468	ATS 48C21Q	18,200
55	110	210	233	580	ATS 48C25Q	18,200
75	132	250	285	695	ATS 48C32Q	18,200
90	160	320	388	1017	ATS 48C41Q	51,400
110	220	410	437	1172	ATS 48C48Q	51,400
132	250	480	560	1386	ATS 48C59Q	51,400
160	315	590	605	1731	ATS 48C68Q	51,400
-	355	680	675	2073	ATS 48C79Q	115,000
220	400	790	855	2225	ATS 48M10Q	115,000
250	500	1000	1045	2865	ATS 48M12Q	115,000

(1) Valore indicato sulla targua motore.

(2) Corrisponde alla corrente massima permanente in classe 10. Qui corrisponde al calibro dell'avviatore.

(3) Corrisponde alla corrente massima permanente in classe 20.

(4) La corrente prerogolata di base corrisponde al valore della corrente nominale di un motore normalizzato 4 poli, 400V, classe 10 (applicazione standard). Regolare in base alla corrente indicata sulla targua motore.



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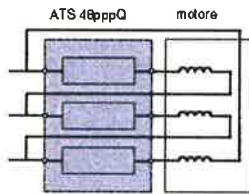
Riferimenti (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Tensione rete 230 / 415 V

Collegamento nella connessione a triangolo del motore



Schema 1
Utilizzo particolare:
avviatore collegato nel triangolo
motore, in serie con ogni avvolgimento.

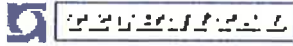
Per applicazioni in servizio standard in base allo schema 1

Motore Potenza motore (1)	Avviatore 230 / 415 V - 50 / 60 Hz						
	230 V kW	400 V kW	Corrente nominale (2) A	Corrente prerogol. di base (4) A	Potenza dissipata a carico nominale W	Riferimento	Peso kg
7,5	15		29	14,8	59	ATS 48D17Q	4,900
9	18,5		38	21	74	ATS 48D22Q	4,900
15	22		55	28,5	104	ATS 48D32Q	4,900
18,5	30		66	35	118	ATS 48D38Q	4,900
22	45		81	42	142	ATS 48D47Q	4,900
30	55		107	57	201	ATS 48D62Q	8,300
37	55		130	69	245	ATS 48D75Q	8,300
45	75		152	81	290	ATS 48D88Q	8,300
55	90		191	100	322	ATS 48C11Q	8,300
75	110		242	131	391	ATS 48C14Q	12,400
90	132		294	162	479	ATS 48C17Q	12,400
110	160		364	195	580	ATS 48C21Q	18,200
132	220		433	233	695	ATS 48C25Q	18,200
160	250		554	285	902	ATS 48C32Q	18,200
220	315		710	388	1339	ATS 48C41Q	51,400
250	355		831	437	1388	ATS 48C48Q	51,400
-	400		1022	580	1731	ATS 48C59Q	51,400
315	500		1143	605	1958	ATS 48C68Q	51,400
355	630		1368	875	2537	ATS 48C70Q	115,000
-	710		1732	855	2865	ATS 48M10Q	115,000
500	-		2078	1045	3497	ATS 48M12Q	115,000

Per applicazioni in servizio severo in base allo schema 1

Motore Potenza motore (1)	Avviatore 230 / 415 V - 50 / 60 Hz						
	230 V kW	400 V kW	Corrente nominale (3) A	Corrente prerogol. di base (4) A	Potenza dissipata a carico nominale W	Riferimento	Peso kg
5,5	11		22	14,8	48	ATS 48D17Q	4,900
7,5	15		29	21	59	ATS 48D22Q	4,900
9	18,5		38	28,5	74	ATS 48D32Q	4,900
15	22		55	35	99	ATS 48D38Q	4,900
18,5	30		66	42	116	ATS 48D47Q	4,900
22	45		81	57	153	ATS 48D62Q	8,300
30	55		107	69	201	ATS 48D75Q	8,300
37	55		130	81	245	ATS 48D88Q	8,300
45	75		152	100	252	ATS 48C11Q	8,300
55	90		191	131	306	ATS 48C14Q	12,400
75	110		242	162	391	ATS 48C17Q	12,400
90	132		294	195	468	ATS 48C21Q	18,200
110	160		364	233	590	ATS 48C25Q	18,200
132	220		433	285	695	ATS 48C32Q	18,200
160	250		554	388	1017	ATS 48C41Q	51,400
220	315		710	437	1172	ATS 48C48Q	51,400
250	355		831	580	1388	ATS 48C59Q	51,400
-	400		1022	605	1731	ATS 48C68Q	51,400
315	500		1143	875	2073	ATS 48C70Q	115,000
355	630		1368	855	2225	ATS 48M10Q	115,000
-	710		1732	1045	2865	ATS 48M12Q	115,000

(1) Valore indicato sulla targa motore.
 (2) Corrisponde alla corrente massima permanente in classe 10.
 (3) Corrisponde alla corrente massima permanente in classe 20.
 (4) Per questo tipo di collegamento la corrente prerogolata di base deve essere impostata in base alla corrente indicata sulla targa motore.



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Riferimenti (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Alistart 48

Tensione rete 208 / 690 V

Potenza motore indicata in HP



ATS 48D17Y



ATS 48C14Y



ATS 48M12Y

Per applicazioni in servizio standard

Motore					Avviatore 208 / 690 V - 50 / 60 Hz				
Potenza motore (1)					Corrente nominale (3)	Corrente prerogol. di base (4)	Potenza dissipata a carico nominale	Riferimento	Peso
208 V	230 V	460 V	575 V		A	A	W		kg
HP	HP	HP	HP						
3	5	10	15		17	14	59	ATS 48D17Y	4,900
5	7,5	15	20		22	21	74	ATS 48D22Y	4,900
7,5	10	20	25		32	27	104	ATS 48D32Y	4,900
10	-	25	30		38	34	118	ATS 48D38Y	4,900
-	15	30	40		47	40	142	ATS 48D47Y	4,900
15	20	40	50		62	52	201	ATS 48D62Y	8,300
20	25	50	60		75	65	245	ATS 48D75Y	8,300
25	30	60	75		88	77	290	ATS 48D88Y	8,300
30	40	75	100		110	96	322	ATS 48C11Y	8,300
40	50	100	125		140	124	391	ATS 48C14Y	12,400
50	60	125	150		170	156	479	ATS 48C17Y	12,400
60	75	150	200		210	190	590	ATS 48C21Y	18,200
75	100	200	250		250	240	895	ATS 48C25Y	18,200
100	125	250	300		320	302	902	ATS 48C32Y	18,200
125	150	300	350		410	381	1339	ATS 48C41Y	51,400
150	-	350	400		480	414	1388	ATS 48C48Y	51,400
-	200	400	500		590	477	1731	ATS 48C59Y	51,400
200	250	500	600		690	590	1958	ATS 48C69Y	51,400
250	300	600	800		790	720	2537	ATS 48C79Y	115,000
350	350	800	1000		1000	954	2865	ATS 48M10Y	115,000
400	450	1000	1200		1200	1170	3497	ATS 48M12Y	115,000

Per applicazioni in servizio severo

Motore					Avviatore 208 / 690 V - 50 / 60 Hz				
Potenza motore (1)					Corrente nominale (3)	Corrente prerogol. di base (4)	Potenza dissipata a carico nominale	Riferimento	Peso
208 V	230 V	460 V	575 V		A	A	W		kg
HP	HP	HP	HP						
2	3	7,5	10		12	14	46	ATS 48D17Y	4,900
3	5	10	15		17	21	59	ATS 48D22Y	4,900
5	7,5	15	20		22	27	74	ATS 48D32Y	4,900
7,5	10	20	25		32	34	99	ATS 48D38Y	4,900
10	-	25	30		38	40	118	ATS 48D47Y	4,900
-	15	30	40		47	52	153	ATS 48D62Y	8,300
15	20	40	50		62	65	201	ATS 48D75Y	8,300
20	25	50	60		75	77	245	ATS 48D88Y	8,300
25	30	60	75		88	96	292	ATS 48C11Y	8,300
30	40	75	100		110	124	308	ATS 48C14Y	12,400
40	50	100	125		140	158	391	ATS 48C17Y	12,400
50	60	125	150		170	180	468	ATS 48C21Y	18,200
60	75	150	200		210	240	580	ATS 48C25Y	18,200
75	100	200	250		250	302	695	ATS 48C32Y	18,200
100	125	250	300		320	381	1017	ATS 48C41Y	51,400
125	150	300	350		410	414	1172	ATS 48C48Y	51,400
150	-	350	400		480	477	1388	ATS 48C59Y	51,400
-	200	400	500		590	590	1731	ATS 48C69Y	51,400
200	250	500	600		690	720	2073	ATS 48C79Y	115,000
250	300	600	800		790	954	2225	ATS 48M10Y	115,000
350	350	800	1000		1000	1170	2865	ATS 48M12Y	115,000

(1) Valore indicato sulla targa motore.

(2) Corrisponde alla corrente massima permanente in classe 10. Qui corrisponde al calibro dell'avviatore.

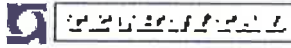
(3) Corrisponde alla corrente massima permanente in classe 20.

(4) La corrente prerogolata di base corrisponde al valore della corrente nominale di un motore normalizzato NEC, 460V, classe 10 (applicazione standard). Regolare in base alla corrente indicata sulla targa motore.

Presentazione:
pagine 36 e 37Caratteristiche:
pagine da 38 a 41Dimensioni d'ingombro:
pagine da 54 e 55Schemi:
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Riferimenti (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Tensione rete 208 / 690 V

Potenza motore indicata in kW

Per applicazioni in servizio standard							Avviatore 208 / 690 V - 50 / 60 Hz				
Motore							Corrente nominale (cL) (2)	Corrente prerogolata di base (4)	Potenza dissipata a carico nominale	Riferimento	Peso
Potenza motore (1)											
230 V	400 V	440 V	500 V	525 V	660 V	690 V	A	A	W	kg	
4	7,5	7,5	9	9	11	15	17	14	59	ATS 48D17Y	4,900
5,5	11	11	11	11	15	18,5	22	21	74	ATS 48D22Y	4,900
7,5	15	15	18,5	18,5	22	22	32	27	104	ATS 48D32Y	4,900
9	18,5	18,5	22	22	30	30	38	34	118	ATS 48D38Y	4,900
11	22	22	30	30	37	37	47	40	142	ATS 48D47Y	4,900
15	30	30	37	37	45	45	62	52	201	ATS 48D62Y	8,300
18,5	37	37	45	45	55	55	75	65	245	ATS 48D75Y	8,300
22	45	45	55	55	75	75	88	77	260	ATS 48D88Y	8,300
30	55	55	75	75	90	90	110	96	322	ATS 48C11Y	8,300
37	75	75	90	90	110	110	140	124	361	ATS 48C14Y	12,400
45	90	90	110	110	132	160	170	156	470	ATS 48C17Y	12,400
55	110	110	132	132	160	200	210	180	560	ATS 48C21Y	18,200
75	132	132	160	160	220	250	250	240	695	ATS 48C25Y	18,200
90	160	160	220	220	250	315	320	302	902	ATS 48C32Y	18,200
110	220	220	250	250	355	400	410	381	1309	ATS 48C41Y	51,400
132	250	250	315	315	400	500	480	414	1386	ATS 48C49Y	51,400
160	315	355	400	400	560	590	590	477	1731	ATS 48C59Y	51,400
-	355	400	-	-	630	630	660	590	1958	ATS 48C66Y	51,400
220	400	500	500	500	710	710	790	720	2537	ATS 48C79Y	115,000
250	500	630	630	630	900	900	1000	954	2865	ATS 48M10Y	115,000
355	630	710	800	800	-	-	1200	1170	3497	ATS 48M12Y	115,000

Per applicazioni in servizio severo							Avviatore 208 / 690 V - 50 / 60 Hz				
Motore							Corrente nominale (3)	Corrente prerogolata di base (4)	Potenza dissipata a carico nominale	Riferimento	Peso
Potenza motore (1)											
230 V	400 V	440 V	500 V	525 V	660 V	690 V	A	A	W	kg	
3	5,5	5,5	7,5	7,5	9	11	12	14	48	ATS 48D17Y	4,900
4	7,5	7,5	9	9	11	15	17	21	59	ATS 48D22Y	4,900
5,5	11	11	11	11	15	18,5	22	27	74	ATS 48D32Y	4,900
7,5	15	15	18,5	18,5	22	22	32	34	99	ATS 48D38Y	4,900
9	18,5	18,5	22	22	30	30	38	40	116	ATS 48D47Y	4,900
11	22	22	30	30	37	37	47	52	153	ATS 48D62Y	8,300
15	30	30	37	37	45	45	62	65	201	ATS 48D75Y	8,300
18,5	37	37	45	45	55	55	75	77	245	ATS 48D88Y	8,300
22	45	45	55	55	75	75	88	98	252	ATS 48C11Y	8,300
30	55	55	75	75	90	90	110	124	308	ATS 48C14Y	12,400
37	75	75	90	90	110	110	140	156	391	ATS 48C17Y	12,400
45	90	90	110	110	132	160	170	180	468	ATS 48C21Y	18,200
55	110	110	132	132	160	200	210	240	560	ATS 48C25Y	18,200
75	132	132	160	160	220	250	250	302	695	ATS 48C32Y	18,200
90	160	160	220	220	250	315	320	381	1017	ATS 48C41Y	51,400
110	220	220	250	250	355	400	410	414	1172	ATS 48C49Y	51,400
132	250	250	315	315	400	500	480	477	1386	ATS 48C59Y	51,400
160	315	355	400	400	560	590	590	477	1731	ATS 48C66Y	51,400
-	355	400	-	-	630	630	660	720	2073	ATS 48C79Y	115,000
220	400	500	500	500	710	710	790	954	2225	ATS 48M10Y	115,000
250	500	630	630	630	900	900	1000	1170	2865	ATS 48M12Y	115,000

(1) Valore indicato sulla targua motore.

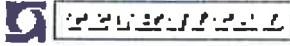
(2) Corrisponde alla corrente massima permanente in classe 10. Qui corrisponde al calibro dell'avviatore.

(3) Corrisponde alla corrente massima permanente in classe 20.

(4) La corrente prerogolata di base corrisponde al valore della corrente nominale di un motore normalizzato NEC, 460V, classe 10 (applicazioni standard). Regolare in base alla corrente indicata sulla targua motore.

Presentazione:
pagine 36 e 37Caratteristiche:
pagine da 38 a 41Dimensioni d'ingombro:
pagine da 54 e 55Schemi:
pagine da 58 a 63

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Presentazione, riferimenti

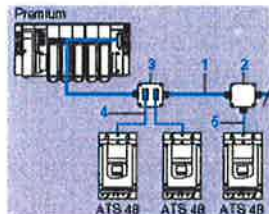
Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Opzioni: moduli di comunicazione

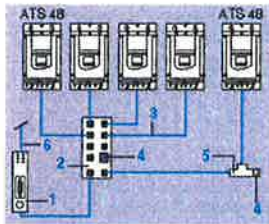
Presentazione

L'Altistart 48 si collega direttamente in rete, mediante protocollo Modbus con un connettore tipo RJ45 e comunica tramite collegamento seriale RS 485 (2 fili) e protocollo Modbus RTU. La comunicazione consente di accedere alle funzioni di configurazione, regolazione, comando e segnalazione dell'avviatore.



- 1 Cavo Modbus TSX SCA p00
- 2 Scatola di derivazione TSX SCA 50
- 3 Presa TSX SCA 62
- 4 Cavo di derivazione Modbus VW3 A8 306
- 5 Cavo di derivazione Modbus VW3 A8 306 D30

L'Altistart 48 può essere collegato ad altri bus o reti utilizzando i moduli di comunicazione e gli accessori qui di seguito indicati



- 1 Modulo di comunicazione
- 2 Hub Modbus LU9 GC3
- 3 Cavo di derivazione Modbus VW3 A8 306 Rpp
- 4 Terminazioni di linea VW3 A8 306 RC
- 5 Derivazione Modbus VW3 A8 306 TF3
- 6 Verso altri bus e reti



174 CEV 300 10



LUF P1

Riferimenti

Moduli di comunicazione	Cavi da associare	Riferimento	Peso kg.	
Bridge Ethernet /Modbus con 1 porta Ethernet (base T (tipo RJ45))	Da collegare con il cavo VW3 P10 306 R10	174 CEV 300 10	0,500	
Passerella FIPIO/Modbus	Da collegare con i cavi VW3 A8 306 R03, VW3 A8 306 R10 o VW3 A8 306 R30	LUF P1	0,240	
Passerella DeviceNet/Modbus	Da collegare con i cavi VW3 A8 306 R03, VW3 A8 306 R10 o VW3 A8 306 R30	LUF P9	0,240	
Passerella Profibus DP/Modbus	Da collegare con il cavo VW3 P07 306 R10	LA9 P307	0,240	
Accessori di collegamento	Connettori	Riferimento	Peso kg.	
Scatola di derivazione (da collegare con il cavo VW3 A8 306 D30)	3 morsaletti a vite	TSX SCA 50	0,520	
Presi 2 vie (da collegare con il cavo VW3 A8 306)	2 connettori femmina tipo SUB-D 15 contatti o 2 morsaletti a vite	TSX SCA 62	0,570	
Hub Modbus	8 connettori tipo RJ45	LU9 GC3	0,500	
Terminati di linea	--	VW3 A8 306 RC	--	
Derivazione Modbus	--	VW3 A8 306 TF3	--	
Cavi di collegamento	Connettori	Riferimento	Peso kg.	
Per bus e reti	Lunghezza m			
Modbus	3	1 connettore tipo RJ45 e un'estremità libera	VW3 A8 306 D30	0,150
	3	1 connettore tipo RJ45 e 1 connettore maschio tipo SUB-D 15 contatti	VW3 A8 306	0,150
FIPIO, DeviceNet Modbus	0,3	2 connettori tipo RJ45	VW3 A8 306 R03	0,050
	1	2 connettori tipo RJ45	VW3 A8 306 R10	0,050
	3	2 connettori tipo RJ45	VW3 A8 306 R30	0,150
Profibus DP	1	2 connettori tipo RJ45	VW3 P07 306 R10	0,050

Presentazione, riferimenti

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48
Opzioni: terminale remotato, induttanze di linea, calotte di protezione, documentazione



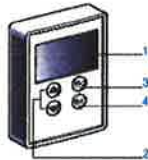
VV3 G48101

Terminale remotato

Il terminale può essere montato sulla porta di una cassetta o di un armadio. Presenta lo stesso display di visualizzazione per la segnalazione e gli stessi pulsanti di configurazione del terminale integrato nell'avviatore. Sul retro del terminale è posto un commutatore di blocco di accesso al menu.

Il prodotto è composto:

- dal terminale deportato,
- da un kit di montaggio comprendente un coperchio, delle viti e una guarnizione a tenuta stagna IP54 sul fronte,
- da un cavo di collegamento da 3 m con un connettore tipo SUB D 9 contatti lato terminale ed un connettore tipo RJ45 lato Altistart 48.



- 1 3 display "7 segmenti" visualizzano i messaggi sotto forma di codici o valori.
- 2 Tasti di scorrimento del menu o di modifica dei valori.
- 3 "ESC": Tasto di uscita dai menu (nessuna azione di validazione).
- 4 "ENT": Tasto di validazione per entrare in un menu o validare il nuovo valore scelto.

Riferimento

Descrizione	Riferimento	Peso kg
Terminale remotato	VV3 G48101	0,200

Induttanze di linea

L'utilizzo delle induttanze di linea è particolarmente consigliato in caso di installazione di avviatori elettronici sulla stessa linea di alimentazione. I valori delle induttanze sono definiti per una caduta di tensione compresa tra il 3 e il 5 % della tensione nominale della rete.

Installare l'induttanza di linea tra il contatore di linea e l'avviatore.

Riferimenti

Per avviatori	Valore induttanza mH	Corrente nominale A	Grado di protezione	Riferimento	Peso kg
ATS 48D17p	1,7	15	IP20	VZ1 L015UM17T	2,100
ATS 48D22p	0,8	30	IP20	VZ1 L030U400T	4,100
ATS 48D32p e 48D38p	0,8	40	IP20	VZ1 L040U800T	5,100
ATS 48D47p e 48D62p	0,35	70	IP20	VZ1 L070U350T	8,000
Da ATS 48D75p a 48C14p	0,17	150	IP00	VZ1 L150U170T	14,900
Da ATS 48C17p a 48C25p	0,1	250	IP00	VZ1 L250U100T	24,300
ATS 48C32p	0,075	325	IP00	VZ1 L325U075T	28,900
ATS 48C41p e 48C48p	0,045	530	IP00	VZ1 L530U045T	37,000
Da ATS 48C59p a 48M10p	0,024	1025	IP00	VZ1 LM10U024T	88,000
ATS 48M12p	0,016	1435	IP00	VZ1 LM14U016T	80,000

Note: la induttanza di linea con grado di protezione IP00 devono essere dotata di una barriera di protezione per garantire la sicurezza del personale contro i contatti elettrici.

Calotte di protezione dei morsetti potenza

Da utilizzare con cospicue chiusi

Riferimenti

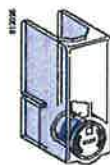
Per avviatori	Numero di calotte per kit	Riferimento	Peso kg
ATS 48C14p e ATS 48C17p	6 (1)	LA9 F702	0,250
ATS 48C21p, ATS 48C25p e ATS 48C32p	6 (1)	LA9 F703	0,250

(1) Gli avviatori hanno 9 morsetti potenza non protetti.

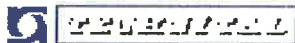
Note:

Documentazione

Descrizione	Formato	Riferimento	Peso kg
Guida all'impiego Altistart 48	A5	VVD ED 301066	0,150
Guida all'impiego Modbus	A5	VVD ED 302023	0,150
Guida all'impiego Ethernet, RFIQ, DeviceNet, Profibus DP	CD ROM	DCI CD 398111	0,150

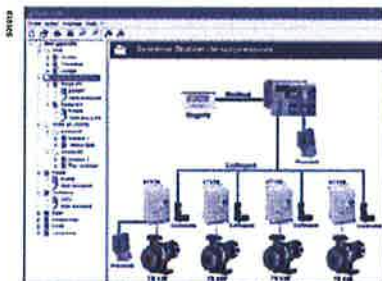


LA9 F702



Presentazione

Avviatori progressivi Ambiente software PowerSuite



Videata PowerSuite sur PC



Videata PowerSuite su PC



Videata PowerSuite su Pocket PC

Presentazione

L'ambiente software PowerSuite, per PC o per Pocket PC, è utilizzato per la messa in servizio degli avviatori e variatori di velocità Telemecanique.

Un unico software permette di configurare gli avviatori delle gamme A'listart e Tesys modello U e tutti i variatori di velocità della gamma Altivar, semplicemente, in ambiente Microsoft Windows® in cinque lingue (tedesco, inglese, spagnolo, francese e italiano).

Funzioni

L'ambiente software PowerSuite può essere utilizzato durante la fase di preparazione, di programmazione, d'installazione e di manutenzione degli avviatori e dei variatori di velocità.

Può essere utilizzato:

- b solo per preparare e memorizzare i file di configurazione dell'avviatore o del variatore di velocità,
- b collegato all'avviatore o al variatore di velocità per:
 - v configurare,
 - v regolare,
 - v controllare (tranne per l'Altivar 11),
 - v comandare (tranne per l'Altivar 11),
 - v trasferire e confrontare file di configurazione tra PowerSuite e l'avviatore o il variatore di velocità.

Le configurazioni generate con l'ambiente PowerSuite possono essere:

- b salvate su disco fisso, CD, floppy...
- b stampate,
- b inviate mezzo posta elettronica,
- b scambiate tra un PC e un Pocket PC tramite un software di sincronizzazione standard, i file di configurazione PowerSuite e Pocket PC hanno lo stesso formato, b accessibili attraverso password.

A partire dalla versione V 2.0.0, il software è arricchito di nuove funzioni: funzione oscilloscopio, personalizzazione dei nomi dei parametri, creazione di un menu utente...

L'ambiente software è dotato di un aiuto in linea contestuale.

Collegamenti

L'ambiente software PowerSuite può essere utilizzato mediante collegamento diretto alla porta seriale del terminale sia esso PC o Pocket PC.

Due tipi di collegamento sono possibili:

- sia con un avviatore o variatore di velocità unico (collegamento punto a punto)
- sia con un insieme di avviatori o variatori di velocità (collegamento multipunto).

L'ambiente software PowerSuite per PC può essere utilizzato su una rete Ethernet. In questo caso gli avviatori e variatori di velocità sono accessibili:

- sia con un bridge Ethernet-Modbus 174 CEV 300 20,
- sia con una scheda opzione di comunicazione VW3 A58310 (solo per i variatori di velocità Altivar 39, 59 ed 58F).

Elementi minimi per il funzionamento

L'ambiente software PowerSuite per PC funziona con i sistemi operativi e le configurazioni PC seguenti:

- v Microsoft Windows® 95 OSR2, Microsoft Windows® 99 SE, Microsoft Windows® NT4.X SP5, Microsoft Windows® Me, Microsoft Windows® 2000, Microsoft Windows® XP,
 - v Pentium III, 800 MHz, disco fisso 300 Mb disponibili, 128 Mo RAM,
 - v Monitor SVGA o di qualità equivalente.
 - b L'ambiente software PowerSuite per Pocket PC, versione V2.0.0, è compatibile con i Pocket PC equipaggiati dal sistema operativo Windows per Pocket PC 2002 o 2003 e da un processore di tipo ARM o XSCALE.
- I test di qualificazione dell'ambiente software PowerSuite, versione V2.0.0, sono stati realizzati con i seguenti Pocket PC:
- v Hewlett Packard® IPAQ 2210,
 - v Compaq® IPAQ serie 3800 e 3900,
 - v Hewlett Packard® Jornada serie 560.

Riferimenti, compatibilità

Avviatori progressivi Ambiente software PowerSuite

Riferimenti



VW3 A8104



VW3 A8104

Ambiente software PowerSuite per PC o Pocket PC (1)

Descrizione	Composizione	Riferimento	Peso, kg
CD PowerSuite	b 1 software per PC e per Pocket PC in francese, inglese, tedesco, spagnolo, italiano, b la documentazione tecnica e il software ABC configurator.	VW3 A8104	0,100
CD di aggiornamento PowerSuite	b 1 software per PC e per Pocket PC in francese, inglese, tedesco, spagnolo, italiano, b la documentazione tecnica e il software ABC configurator.	VW3 A8105	0,100
Kit di connessione per PC	b 2 cavi di collegamento (lunghezza 3 m), con 2 connettori di tipo RJ 45, b 1 adattatore RJ 45/SUB-D9 contatti che permette il collegamento dei variatori ATV 58/58F/88, b 1 adattatore RJ 45/SUB-D9 contatti che permette il collegamento del variatore ATV 68, b 1 convertitore RS 232/RS 485 PPC con 1 connettore di tipo SUB-D femmina 9 contatti e 1 connettore di tipo RJ 45, b 1 convertitore per ATV 11, con 1 connettore maschio 4 contatti e 1 connettore di tipo RJ 45.	VW3 A8106	0,350
Kit di connessione per Pocket PC	b 2 cavi di collegamento (lunghezza 0,6 m) con 2 connettori di tipo RJ 45, b 1 adattatore RJ 45/SUB-D9 contatti che permette il collegamento dei variatori ATV 58/58F/88, b 1 convertitore RS 232/RS 485 PPC con 1 connettore di tipo SUB-D maschio 9 contatti e 1 connettore di tipo RJ 45, b 1 convertitore per ATV 11, con 1 connettore maschio 4 contatti e 1 connettore di tipo RJ 45.	VW3 A8111	0,300

(1) Per conoscere l'ultima versione commercializzata, contattare la nostra organizzazione commerciale.

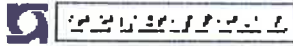
Compatibilità

Compatibilità dell'ambiente software PowerSuite con gli avviatori e variatori di velocità	Avviatore							
	TeSys modello U	ATS 48	ATV 11	ATV 28	ATV 31	ATV 38	ATV 58 / ATV 58F	ATV 68
Ambiente software PowerSuite con collegamento seriale per PC	si V 1.40	si V 1.30	si V 1.40	si V 1.0	si V 2.00	si V 1.40	si V 1.0	si V 1.50
Ambiente software PowerSuite con collegamento Ethernet per PC		si V 1.50 si bridge Ethernet-Modbus		si V 1.50 si bridge Ethernet-Modbus	si V 2.00 si bridge Ethernet-Modbus	si V 1.50 si scheda di connessione Ethernet V2 o bridge		
Ambiente software PowerSuite per Pocket PC	si V 1.50	si V 1.30	si V 1.40	si V 1.20	si V 2.00	si V 1.40	si V 1.20	

 Prodotti e versioni software compatibili.
 Prodotti non compatibili.

Compatibilità dell'ambiente software PowerSuite con i Pocket PC

Sistema operativo	Funzionamento su:	Versione software PowerSuite			
		V 1.30	V 1.40	V 1.50	V 2.0.0
Windows per Pocket PC 2003	Hewlett Packard® IPAQ 2210	no	no	no	si
Windows per Pocket PC 2002	Compaq® IPAQ serie 3800, 3900	no	no	si	si
	Hewlett Packard® Jornada serie 560	no	si	si	si
Windows per Pocket PC 2000	Hewlett Packard® Jornada 525, 545, 548	si	si	si	no
Windows CE	Hewlett Packard® Jornada 420	si	no	no	no



Rev. C0

Data: 31/10/08

EI. MV146P-PE-GES-2004-C0

Rev.

Data:

SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE,
DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA,
AUTOMAZIONE E POSIZIONAMENTO DINAMICO -
APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO
ELETTRICO

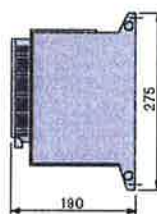
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Dimensioni d'ingombro

Avviatori progressivi

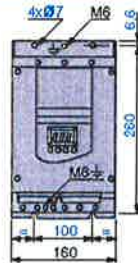
Avviatori-rallentatori progressivi Altistart 48

Da ATS 48D17p a ATS 48D47p

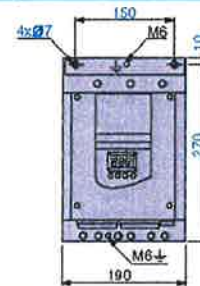
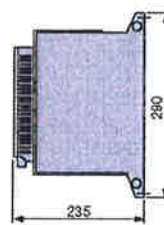


Capacità massima di collegamento:
Prese di terra: 10 mm² (AWG 8)
Morselli potenza: 16 mm² (AWG 8)

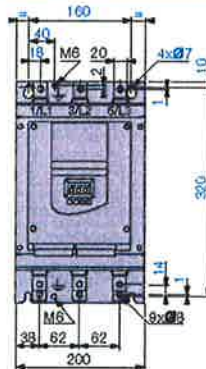
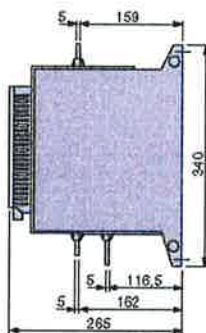
Da ATS 48D62p a ATS 48C11p



Capacità massima di collegamento:
Prese di terra: 16 mm² (AWG 4)
Morselli potenza: 50 mm² (AWG 2/0)

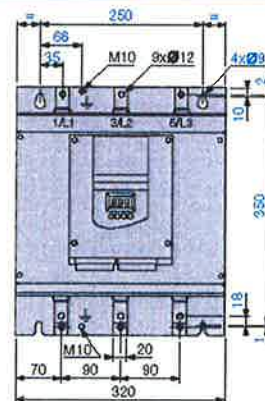
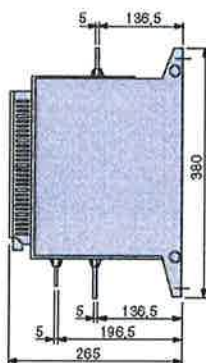


Da ATS 48C14p a ATS 48C17p



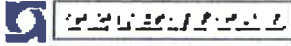
Capacità massima di collegamento:
Prese di terra: 120 mm² (Bus Bar)
Morselli potenza: 95 mm² (AWG 2/0)

Da ATS 48C21p a ATS 48C32p



Capacità massima di collegamento:
Prese di terra: 120 mm² (Bus Bar)
Morselli potenza: 240 mm² (Bus Bar)

Presentazione
pagine 36 e 37Caratteristiche
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pagine da 46 a 49Schema
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Data:

SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

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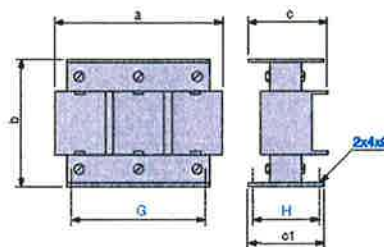
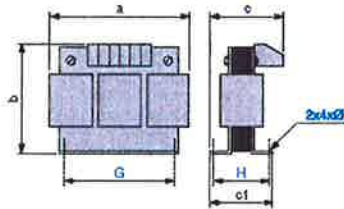
Dimensioni d'ingombro (segue)

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

Induttanza

Da VZ1-L015UM17T a L070U350T

Da VZ1-L150U170T a LM14U016T

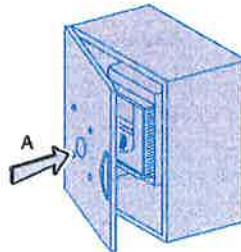
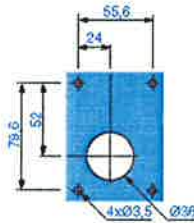


VZ1-	a	b	c	c1	G	H	Ø
L015UM17T	120	150	80	75	60/80,5	52	6
L030U800T	150	180	120	100	75/106,5	76	7
L040U800T	180	215	130	100	85/122	76	7
L070U350T	180	215	150	130	85/122	97	7

VZ1-	a	b	c	c1	G	H	Ø
L150U170T	270	240	170	140	105/181	96	11,5
L250U100T	270	240	220	180	105/181	125	11,5
L325U075T	270	240	240	175	105/181	139	11,5
L330U045T	380	410	225	140	310	65	9
LM10U024T	400	410	310	170	310	125	9
LM14U016T	420	490	340	170	310	125	9

Montaggio del terminale remoto

VW3 Q48101



Preaffidazione
pagine 36 e 37

Caratteristiche
pagine da 36 a 41

Accessori
pagine da 49 a 49

Schema
pagine da 58 a 63

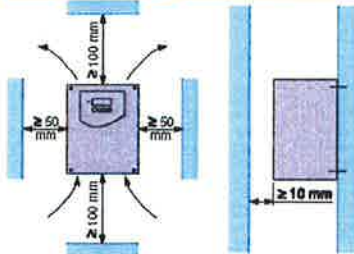
56



Montaggio

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

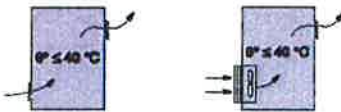
Consigli di montaggio



- b** Installare l'Altistart in posizione verticale, a $\pm 10^\circ$.
- b** Evitare di posizionare l'Altistart in prossimità o al di sopra di elementi riscaldanti.
- b** Lasciare uno spazio libero attorno all'Altistart sufficiente ad assicurare la libera circolazione dell'aria necessaria al raffreddamento che avviene mediante ventilazione dal basso verso l'alto.

Attenzione: L'Altistart 48, nella versione IP00, deve essere dotato di una protezione in grado di garantire la sicurezza delle persone contro i contatti elettrici. Per gli avviatori da ATS 48C14p a ATS 48C32p, sono disponibili calotte di protezione da ordinare a parte.

Montaggio in cassetta o in armadio metallico con grado di protezione IP23 o IP54



- b** Rispettare i consigli di montaggio indicati sopra.
- b** Per assicurare la libera circolazione dell'aria nell'avvitatore:
 - v prevedere delle bocchette di ventilazione,
 - v assicurarsi che la ventilazione sia sufficiente, altrimenti installare un sistema di ventilazione forzata con filtro; le aperture e/o gli eventuali ventilatori devono permettere una portata almeno pari a quella dei ventilatori degli avviatori come indicato dalla tabella qui di seguito riportata,
- b** Utilizzare dei filtri speciali IP54.

Portata dei ventilatori in funzione del calibro dell'avvitatore

Avvitatore ATS 48	Portata m ³ /ora
Da ATS48 D32p a D38p	14
ATS48 D47p	28
Da ATS48 D62p a C11p	88
Da ATS48 C14p a C17p	138
Da ATS48 C21p a C32p	280
Da ATS48 C41p a C68p	800
Da ATS48 C29p a M12p	1200

Cassetta o armadio metallico con grado di protezione IP54

Per gli avviatori Altistart non ventilati (ATS 48D17p e 48D22p), montare un ventilatore al di sotto dell'avvitatore ad una distanza $y \geq 50$ mm, in modo da consentire la circolazione dell'aria all'interno della cassetta per evitare il formarsi di punti caldi.

Calcolo della dimensione della cassetta o dell'armadio

Resistenza termica massima R_{th} (°C/W)

$$R_{th} = \frac{\theta - \theta_e}{P}$$

θ = temperatura massima all'interno della cassetta in °C,
 θ_e = temperatura esterna massima in °C,
 P = potenza totale dissipata all'interno della cassetta in W.

Le associazioni avvitatore/motore illustrate nelle pagine 46 e 47 possono essere applicate solo con temperature ambiente $y \leq 40^\circ\text{C}$.

Per temperature comprese tra 40°C e 60°C , declassare la corrente massima permanente dell'avvitatore del 2% per grado al di sopra dei 40°C .

Potenza dissipata dall'avvitatore: vedere pagine 46 e 47.

Quando la frequenza degli avviamenti è ridotta, si consiglia di bypassare l'Altistart a fine avviamento per ridurre la dissipazione termica.

La potenza dissipata è quindi compresa tra 15 e 30 W.

Aggiungere la potenza dissipata dagli altri componenti dell'apparecchio.

Superficie di scambio utile della cassetta S (m²)

(parti laterali + parte superiore + parte frontale in caso di fissaggio a muro)

$$S = \frac{k}{R_{th}} \quad K = \text{resistenza termica al m}^2 \text{ dell'involucro.}$$

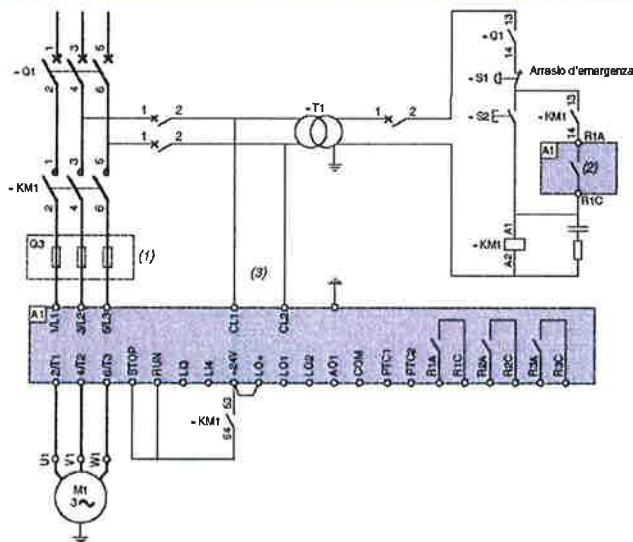
Per cassetta in metallo tipo ACM: $K = 0,12$ con ventilatore interno, $K = 0,15$ senza ventilatore.

Attenzione: Non utilizzare cassette isolanti a causa della loro bassa conducibilità.

Schemi

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

Schema d'applicazione consigliato per 1 senso di marcia con contattore di linea in coordinamento tipo 1 e tipo 2



Scegliere i componenti da associare in base alle sigle riportate a pagina 59, nelle tabelle di associazione delle pagine da 64 a 73.

(1) Per coordinamento tipo 2 (secondo IEC 60947-4-2), aggiungere dei fusibili ad intervento ultra rapido per garantire la protezione dell'avviatore in caso di cortocircuito.

(2) Assegnare il relè R1 a "relè d'isolamento". Attenzione ai limiti d'impiego dei contatti (vedere caratteristiche pagina 38), utilizzare un relè di appoggio per i contatti di forte calibro.

(3) Inserire un trasformatore se la tensione di rete è diversa dalla tensione di alimentazione definita per il controllo (vedere pagina 38).

Tipo di coordinamento

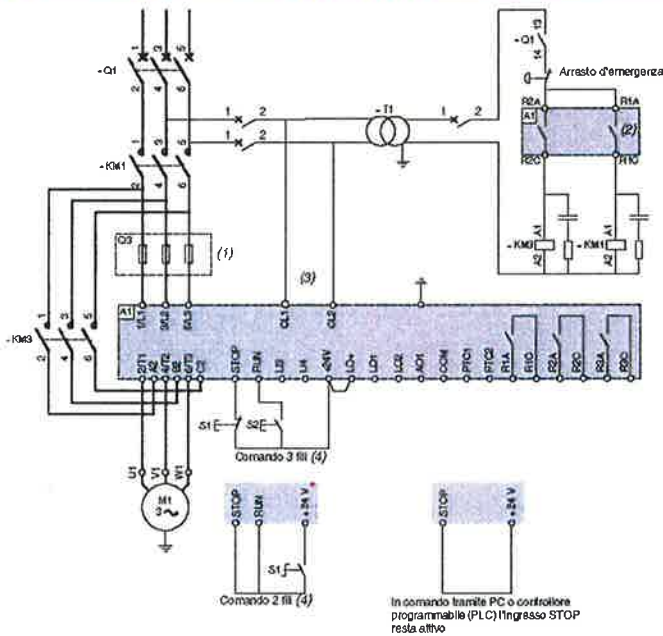
La norma definisce delle prove a diversi livelli d'intensità, prove che hanno lo scopo di testare l'apparacchio in condizioni estreme. In base allo stato dei componenti dopo una prova di cortocircuito la norma definisce 2 tipi di coordinamento.

b Coordinamento tipo 1: è accettabile un deterioramento del contattore e dell'avviatore a 2 condizioni:

- ✓ nessun rischio per l'operatore,
 - ✓ gli elementi diversi dal contattore e dall'avviatore non devono essere danneggiati.
- La manutenzione dopo il cortocircuito è obbligatoria.

b Coordinamento tipo 2: è ammessa solamente una leggera saldatura dei contatti del contattore se risultano facilmente separabili senza distruzione dell'avviatore. Dopo la prova di coordinamento tipo 2, le funzioni dei dispositivi di protezione e di comando sono operative. Effettuata la sostituzione dei fusibili verificare il contattore.

Note: L'avviatore assicura la protezione del motore e dei cavi contro i sovraccarichi. Se questa protezione viene eliminata è necessario prevedere una protezione termica esterna.

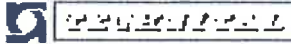
Schema d'applicazione consigliato per 1 senso di marcia con contattore di linea e di bypass dell'avviatore, in coordinamento tipo 1 e tipo 2


Scegliere i componenti da associare in base alle sigle riportate qui di seguito, nelle tabelle di associazione delle pagine da 64 a 73.

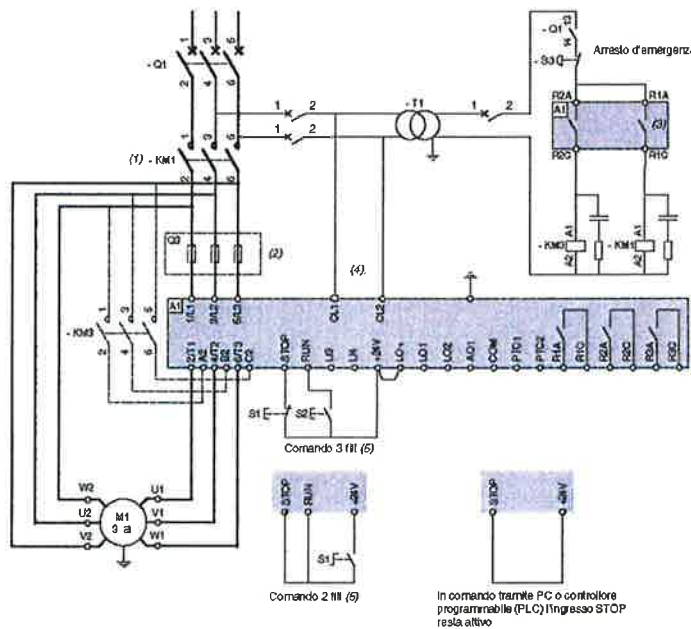
- (1) Per coordinamento tipo 2 (secondo IEC 60947-4-2), aggiungere dei fusibili ad intervento ultra rapido per garantire la protezione dell'avviatore in caso di cortocircuito.
 (2) Assegnare il relè RT1 a "relè d'isolamento". Attenzione ai limiti d'impiego dei contatti (vedere caratteristiche pagina 38), utilizzare relè di appoggio per i contattori di forte calibro.
 (3) Inserire un trasformatore se la tensione di rete è diversa dalla tensione di alimentazione definita per il controllo (vedere pagina 38).
 (4) Comando 2 fili e 3 fili (vedere pagine 80).

Componenti da associare in funzione dei tipi di coordinamento e delle tensioni

Sigla	Descrizione
M1	Motore
A1	Avviatore (applicazioni standard e applicazioni severe)
Q1	Interruttore Automatico o Interruttore / Fusibili
Q3	3 fusibili LH
KM1, KM3	Contattore
S1, S2	Comando (elementi sciolti XB2 o XB2 M)

*Schemi (segue)***Avviatori progressivi**
Avviatori-rallentatori progressivi Altistart 48**Schema d'applicazione consigliato per collegamento dell'avviatore nel triangolo del motore, 1 senso di marcia, arresto a ruota libera, con contattore di linea e di bypass dell'avviatore, in coordinamento tipo 1 e tipo 2**

Questo tipo di cablaggio consente di ridurre il calibro dell'avviatore.
ATS 48pppQ



Scaglieri i componenti da associare in base alle sigle riportate a pagina 61, nelle tabelle di associazione nelle pagine da 64 a 73

- (1) Contattore di linea obbligatorio nella sequenza.
- (2) Per coordinamento tipo 2 (secondo IEC 60947-4-2), aggiungere dei fusibili ad intervento ultra rapido per garantire la protezione dell'avviatore in caso di cortocircuito.
- (3) Assegnare obbligatoriamente R1 a "relè d'isolamento" per controllare il contattore KM1. Attenzione ai limiti d'impiego dai contatti (vedere caratteristiche a pagina 38), utilizzare un relè di appoggio per i contattori di forte calibro.
- (4) Inserire un trasformatore se la tensione di rete è diversa dalla tensione di alimentazione dell'unità per il controllo (vedere pagina 38).
- (5) Comando 2 fili e 3 fili (vedere pagina 80).

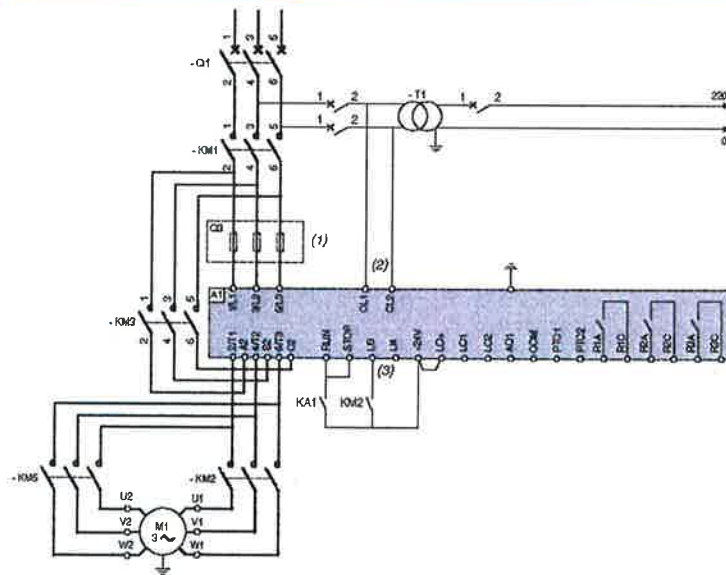
Tipo di coordinamento

La norma definisce delle prove a diversi livelli d'intensità, prove che hanno lo scopo di testare l'apparecchio in condizioni estreme. In base allo stato dei componenti dopo una prova di cortocircuito la norma definisce 2 tipi di coordinamento.

- b Coordinamento tipo 1: è accettabile un deterioramento del contattore e dell'avviatore a 2 condizioni.
- v nessun rischio per l'operatore,
 - v gli elementi diversi dal contattore e dall'avviatore non devono essere danneggiati.
- La manutenzione dopo il cortocircuito è obbligatoria.

- b Coordinamento tipo 2: è ammessa solamente una leggera saldatura dei contatti del contattore se risultano facilmente separabili senza distruzione dell'avviatore. Dopo le prove di coordinamento tipo 2, le funzioni dei dispositivi di protezione e di comando sono operative. Effettuata la sostituzione dei fusibili verificare il contattore.

Nota: L'avviatore assicura la protezione del motore e dei cavi contro i sovraccarichi. Se questa protezione viene eliminata è necessario prevedere una protezione termica esterna.

Schema d'applicazione consigliato per motore piccola velocità/grande velocità 1 senso di marcia con contattore di linea e di bypass dall'avviatore


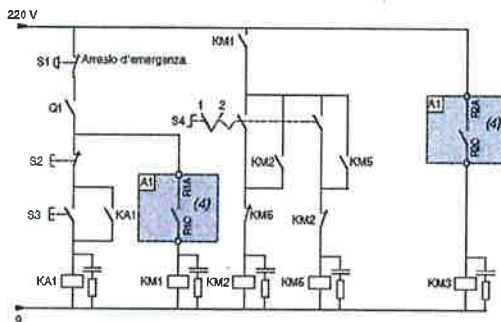
Scegliere i componenti da associare in base alle sigle riportate qui di seguito, nelle tabelle di associazione delle pagine da 64 a 73.

(1) Per coordinamento tipo 2 (secondo IEC 60047-4-2), aggiungere dei fusibili ad intervento ultra rapido per garantire la protezione dell'avviatore in caso di cortocircuito.

(2) Inserire un trasformatore se la tensione di rete è diversa dalla tensione di alimentazione definita per il controllo (vedere pagina 38).

(3) Assegnare l'ingresso logico LI3 a "attivazione delle funzioni di regolazione del 2° motore".

(4) Assegnare il relè R1 a "relè d'isolamento". Attenzione ai limiti d'impiego dei contatti (vedere caratteristica pagina 38), utilizzare un relè di appoggio per i contattori di forte calore.



S4 = 1: piccola velocità
 = 2: grande velocità

Componenti da associare in funzione dei tipi di coordinamento e delle tensioni

Sigla	Descrizione
M1	Motore
A1	Avviatore (applicazioni standard e applicazioni severe)
Q1	Interruttore Automatico o Interruttore / Fusibili
Q3	3 fusibili LFR
KM1, KM2, KM3, KM4, KM5	Contattori a relè
S1, S2, S3	Comando (elementi sciolti XB2 o XB2 M)

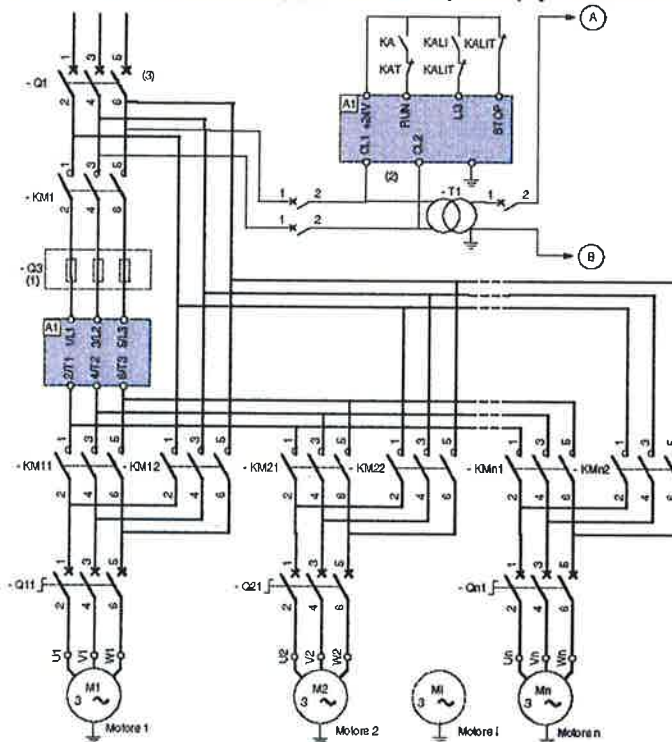
Schemi (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Schema d'applicazione consigliato per l'avviamento e il rallentamento di motori in cascata con un solo Altistart 48, 1 senso di marcia e contattore di linea

Schema fornito a titolo indicativo, per dettagli precisi consultare la guida all'impiego Altistart 48.



Scegliere i componenti da associare in base alle sigle riportate qui di seguito, nelle tabelle di associazione delle pagine da 64 a 73.

(1) Per coordinamento tipo 2 (secondo IEC 60947-4-2), aggiungere dei fusibili ad intervento ultra rapido per garantire la protezione dell'avviatore in caso di cortocircuito.

(2) Inserire un trasformatore se la tensione di rete è diversa dalla tensione di alimentazione definita per il controllo (vedere pagina 38).

(3) Dimensionare tenendo conto delle correnti di tutti i motori.

Importante:

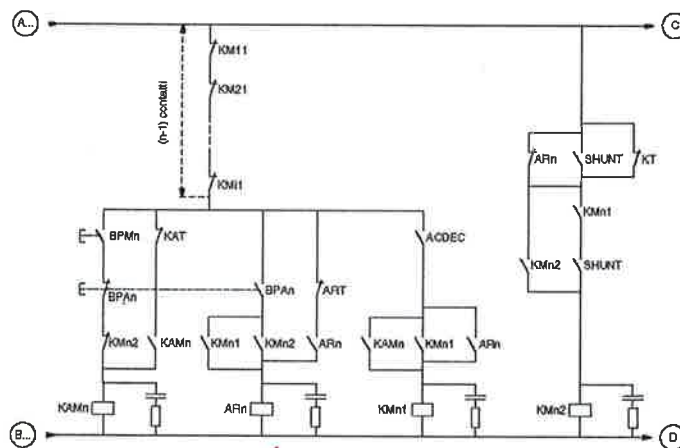
- a Occorre configurare un ingresso logico dell'Altistart 48 in funzione cascata.
- b In caso di difetto non è possibile decelerare o frenare i motori in funzione.
- c Regolare la protezione termica di ogni interruttore automatico Q_{n1} in base alla corrente nominale motore corrispondente.

Componenti da associare in funzione dei tipi di coordinamento e delle tensioni

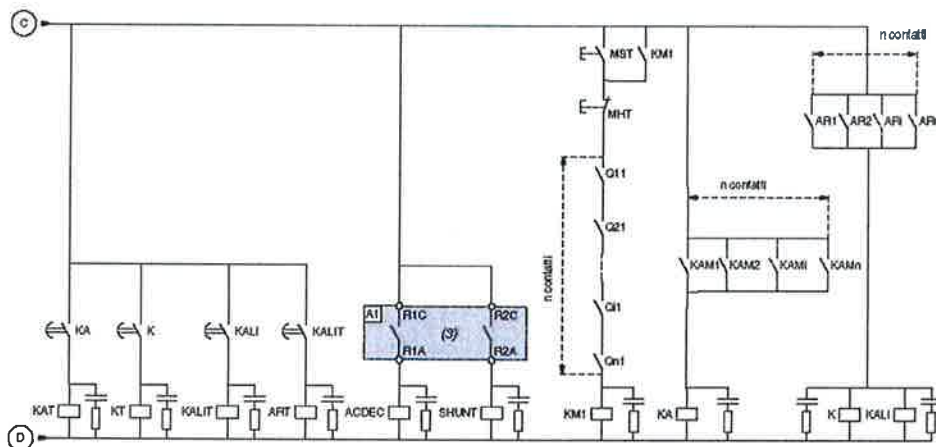
Sigla	Descrizione
M1, M2, Mi, Mn	Motore
A1	Avviatore (applicazioni standard o applicazioni severe)
KM1, KM2, ..., KM1, KMn	Contattore
Q1	Interruttore Automatico o Interruttore / Fusibili
Q3	3 fusibili LFI
Q11, Q21, ..., Qnt	Interruttori magnetotermici
KA, KAT, KALI, KALIT	Comando (elementi sciolti XB2 o XB2 M)

Schema d'applicazione consigliato per l'avviamento e il rallentamento di motori in cascata con un solo Altistart 48, 1 senso di marcia e contattore di linea (segue)

Comando motore n



Comando cascata



(4) Assegnare il relè R1 a "relè d'isolamento". Attenzione ai limiti d'impiego dei contatti (vedere caratteristiche pagina 38), utilizzare un relè di appoggio pari i contatti di forte calibro.

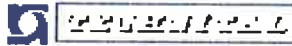
BPMn: Pulsante "Marcia" Motore n
 BPA n: Pulsante "Arresto" Motore n
 MST: Pulsante "Marcia" generale
 MHT: Pulsante "Arresto" generale

Presentazione:
 pagine 36 e 37

Caratteristiche:
 pagine da 38 a 41

Interferenze:
 pagine da 46 a 49

Dimensioni d'ingombro:
 pagine da 54 a 57



Associazioni

Avviatori progressivi
 Avviatori-rallentatori progressivi Altistar 48
 Alimentazione 230 V
 Coordinamento tipo 1

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 58 a 63)											
Associare o interruttore automatico (colonne azzurre), contattore, avviatore, o interruttore fusibili (colonne blu scuro), contattore, avviatore											
Motore kW	Avviatore (1) Classe 10 Applicazioni standard		Classe 20 Applicazioni severe	Tipo di interruttore automatico Telemeccanica Merlin Gerin		Tipo di contattore	Tipo d'interruttore o interruttore sensore (blocco a giorno)	Fusibili Am Riferimento Senza percussore		Dimensioni	Calibro
	A	A1		A	Calibro			A	Con percussore		
3	11,5	-	ATS 48D17p	GV2 L20	18	LC1 D18	LS1 D32	DF2 CA18	-	10 x 38	18
				NS80H MA	12,5	LC1 D18	LS1 D32	DF2 CA18	-	10 x 38	18
4	14,5	ATS 48D17p	ATS 48D22p	GV2 L20	18	LC1 D18	LS1 D32	DF2 CA18	-	10 x 38	18
				NS80H MA	25	LC1 D18	LS1 D32	DF2 CA18	-	10 x 38	18
5,5	20	ATS 48D22p	ATS 48D32p	GV2 L22	25	LC1 D25	LS1 D32	DF2 CA25	-	10 x 38	25
				NS80H MA	25	LC1 D25	LS1 D32	DF2 CA25	-	10 x 38	25
7,5	27	ATS 48D32p	ATS 48D38p	GV2 L32	32	LC1 D32	GK1 EK	DF2 EA32	DF3 EA32	14 x 51	32
				NS80H MA	50	LC1 D32	GK1 EK	DF2 EA32	DF3 EA32	14 x 51	32
9	32	ATS 48D38p	ATS 48D47p	GK3 EF40	40	LC1 D38	GK1 EK	DF2 EA40	DF3 EA40	14 x 51	40
				NS80H MA	50	LC1 D38	GK1 EK	DF2 EA40	DF3 EA40	14 x 51	40
11	39	ATS 48D47p	ATS 48D62p	GK3 EF65	65	LC1 D50	GK1 FK	DF2 FA50	DF3 FA50	22 x 58	50
				NS80H MA	50	LC1 D50	GK1 FK	DF2 FA50	DF3 FA50	22 x 58	50
15	52	ATS 48D62p	ATS 48D75p	GK3 EF85	85	LC1 D65	GK1 FK	DF2 FA60	DF3 FA60	22 x 58	60
				NS80H MA	80	LC1 D65	GK1 FK	DF2 FA60	DF3 FA60	22 x 58	60
18,5	64	ATS 48D75p	ATS 48D88p	GK3 EF80	80	LC1 D60	GK1 FK	DF2 FA60	DF3 FA60	22 x 58	60
				NS80H MA	80	LC1 D60	GK1 FK	DF2 FA60	DF3 FA60	22 x 58	60
22	75	ATS 48D88p	ATS 48C11p	NS100p MA (2)	100	LC1 D115	GK1 FK	DF2 FA100	DF3 FA100	22 x 58	100
30	103	ATS 48C11p	ATS 48C14p	NS160p MA (2)	150	LC1 D115	GK1 FK	DF2 FA125	DF4 FA125	22 x 58	125
37	128	ATS 48C14p	ATS 48C17p	NS160p MA (2)	150	LC1 D150	Q81 L	DF2 QA1181	DF4 QA1181	ø	180
45	150	ATS 48C17p	ATS 48C21p	NS250p MA (2)	220	LC1 F185	Q81 N	DF2 HA1201	DF4 HA1201	1	200
55	182	ATS 48C21p	ATS 48C25p	NS250p MA (2)	220	LC1 F225	Q81 N	DF2 HA1201	DF4 HA1201	1	200
75	240	ATS 48C25p	ATS 48C32p	NS400p MA (2)	320	LC1 F265	Q81 QO	DF2 JA1251	DF4 JA1251	2	250
90	295	ATS 48C32p	ATS 48C41p	NS400p MA (2)	320	LC1 F330	Q81 QO	DF2 JA1311	DF4 JA1311	2	315
110	359	ATS 48C41p	ATS 48C49p	NS630p MA (2)	500	LC1 F400	Q81 S	DF2 KA1401	DF4 KA1401	3	400
132	425	ATS 48C49p	ATS 48C59p	NS630p MA (2)	500	LC1 F500	Q81 S	DF2 KA1501	DF4 KA1501	3	500
160	520	ATS 48C59p	ATS 48C68p	NS800p (2) Micrologia 3.0	630	LC1 F630	Q81 S	DF2 KA1631	DF4 KA1631	3	630
				C801p (2) STR33 ME	800	LC1 F630	Q81 S	DF2 KA1631	DF4 KA1631	3	630
		ATS 48C68p	ATS 48C79p	NS800p (2) Micrologia 3.0	800	LC1 F800	Q81 S	DF2 KA1631	DF4 KA1631	3	630
				C801p (2) STR33 ME	800	LC1 F800	Q81 S	DF2 KA1631	DF4 KA1631	3	630
220	700	ATS 48C79p	ATS 48M10p	NS800p (2) Micrologia 3.0	800	LC1 F800	Q81 V	DF2 LA1801	DF4 LA1801	4	800
				C801p (2) STR33 ME	800	LC1 F800	Q81 V	DF2 LA1801	DF4 LA1801	4	800
250	800	ATS 48M10p	ATS 48M12p	NS1000p (2) Micrologia 3.0	1000	LC1 BM33	Q81 V	DF2 LA1101	DF4 LA1101	4	1000
				C1001p (2) STR33 ME	1000	LC1 BM33	Q81 V	DF2 LA1101	DF4 LA1101	4	1000
355	1115	ATS 48M12p	-	NS1250p (2) Micrologia 3.0	1250	LC1BP33	-	DF2 LA1251	DF4 LA1251	4	1250
				C1251p (2) STR33 ME	1250	LC1BP33	-	DF2 LA1251	DF4 LA1251	4	1250

(1) Sostituire p con Q o Y in base alla gamma di tensione dell'avviatore.
 (2) Sostituire p con N, H o L, in funzione del potere d'interruzione, vedere tabella qui di seguito riportata.

Potere d'interruzione dagli interruttori automatici in base alla norma IEC 60947-2

230 V	Icu (kA)
GV2 L20, GK3 EF40, NS80	100
GV2 L22, GV2 L32, GK3 EF65, GK3 EF80	50
230 V	Icu (kA)
	N H L
NS100, NS160, NS250, NS400, NS630	85 100 150
NS800, NS1000	50 70 150
NS1250	50 70 -
CA01, C1001	85 100 150
C1251	85 100 -
Corrente di cortocircuito massima presunta dell'avviatore in base alla norma IEC 60947-4-2	
Avviatore	Iq (kA)
Da ATS 48D17p a ATS 48C32p	50
Da ATS 48C41p a ATS 48M12p	70



Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

 Alimentazione 230 V
 Coordinamento tipo 2

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 58 a 63)
interruttori automatici, contattori, fusibili ultra rapidi, avviatori

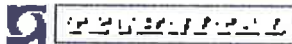
Associazioni: interruttore automatico, contattore, avviatore						
Motore	Avviatore (1)		Tipo di Interruttore automatico		Calibro	Tipo di contattore
kW	A	Classe 10 Applicazioni standard	Classe 20 Applicazioni speciale	Telemeccanica Merlin Gerin	A	
M1		A1		O1		KM1, KM2, KM3
3	11,5	-	ATS 48D17p	GV2 L20 NS40H MA	18 12,5	LC1 D40 LC1 D40
4	14,5	ATS 48D17p	ATS 48D22p	GV2 L20 NS40H MA	19 25	LC1 D40 LC1 D40
5,5	20	ATS 48-D22p	ATS 48D32p	GV2 L22 NS40H MA	25 25	LC1 D40 LC1 D40
7,5	27	ATS 48D32p	ATS 48D39p	GV2 L32 NS40H MA	32 50	LC1 D40 LC1 D80
9	32	ATS 48D39p	ATS 48D47p	GK3 EF40 NS40H MA	40 50	LC1 D80 LC1 D80
11	39	ATS 48D47p	ATS 48D52p	GK3 EF65 NS40H MA	65 50	LC1 D80 LC1 D80
15	52	ATS 48D52p	ATS 48D75p	GK3 EF80 NS40H MA	80 80	LC1 D80 LC1 D80
18,5	64	ATS 48D75p	ATS 48D89p	GK3 EF80 NS40H MA	80 80	LC1 D80 LC1 D80
22	75	ATS 48D89p	ATS 48C11p	NS100p MA (2)	100	LC1 D115
30	103	ATS 48C11p	ATS 48C14p	NS100p MA (2)	150	LC1 D115
37	126	ATS 48C14p	ATS 48C17p	NS100p MA (2)	150	LC1 D150
45	150	ATS 48C17p	ATS 48C21p	NS200p MA (2)	220	LC1 F165
55	182	ATS 48C21p	ATS 48C25p	NS200p MA (2)	220	LC1 F225
75	240	ATS 48C25p	ATS 48C32p	NS400p MA (2)	320	LC1 F265
90	295	ATS 48C32p	ATS 48C41p	NS400p MA (2)	320	LC1 F330
110	358	ATS 48C41p	ATS 48C49p	NS630p MA (2)	500	LC1 F400
132	425	ATS 48C49p	ATS 48C59p	NS630p MA (2)	500	LC1 F500
160	520	ATS 48C59p	ATS 48C66p	NS630L Micrologie 5.0	630	LC1 F630
200	626	ATS 48C66p	ATS 48C79p	NS800L Micrologie 5.0	800	LC1 F800
220	700	ATS 48C79p	ATS 48M10p	NS800L Micrologie 5.0	800	LC1 F800
250	800	ATS 48M10p	ATS 48M12p	NS1000L Micrologie 5.0	1000	LC1 B803
355	1115	ATS 48M12p	-	NS1250p (2) Micrologie 5.0 (3)	1250	LC1 B933

- (1) Sostituire p con Q o Y in base alla gamma di tensione dell'avviatore.
 (2) Sostituire p con N, H o L, in funzione del potere d'interruzione, vedere tabella potere d'interruzione nella pagina precedente.
 (3) Il coordinamento di tipo 2 è ottenuto solamente se i fusibili ultra rapidi restano nel circuito di alimentazione del motore e non vengono cortocircuitati a fine avviamento.

Associazioni fusibili ultra rapidi (obbligatorio in coordinamento tipo 2), avviatore				
Avviatore	Fusibili ultra rapidi			
Riferimento	Riferimento	Dimensione	Calibro A	Pt kA ^{2.s}
A1	Q3			
ATS 48D17p	DF3 ER50	14 x 51	50	2,3
ATS 48D22p e ATS 48D32p	DF3 FR80	22 x 58	80	5,6
ATS 48D39p e ATS 48D47p	DF3 FR100	22 x 58	100	12
ATS 48D52p e ATS 48D75p	DF4 00125	00	125	45
ATS 48D89p e ATS 48C11p	DF4 00160	00	160	82
ATS 48C14p e ATS 48C17p	DF4 30400	30	400	120
ATS 48C21p e ATS 48C32p	DF4 31700	31	700	490
ATS 48C41p	DF4 33800	33	800	490
ATS 48C49p e ATS 48C59p	DF4 331000	33	1000	900
ATS 48C66p	DF4 2331400	2 x 33	1400	1200
ATS 48C79p	DF4 441600	44	1800	1800
ATS 48M10p e ATS 48M12p	DF4 442200	44	2200	4100

Corrente di cortocircuito massima passante dell'avviatore in base alle norme IEC 60947-4-2

Avviatore	I _q (kA)
Da ATS 48D17p a ATS 48C79p	50
ATS 48M10p e ATS 48M12p	85



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Associazioni (segue)

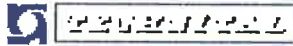
Avviatori progressivi
Avviatori-rallentatori progressivi Altistart 48
Alimentazione 380 V, 400 V, 415 V
Coordinamento tipo 1

Table with columns: Motore (KW, A), Avviatore (1) (Classe 10, Classe 20), Tipo di interruttore automatico (Calibro, Tipo di contattore), Tipo d'interruttore o interruttore-azionatore, Fusibili Am (Riferimento Senza percussore, Con percussore), Dimensione, Calibro. Includes a sub-table for short-circuit current.

Table with columns: Avviatore, Iq (kA), Icu (kA). Includes a sub-table for short-circuit current with columns N, H, L.

Preparazione pagine 36 e 37, Correttura pagine da 38 a 41, Riferimenti pagine da 46 a 49, Dimensione d'ingombro pagine da 54 a 57, Schermi pagine da 58 a 63





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Associazioni (segue)

Avviatori progressiviAvviatori-rallentatori progressivi Altistart 48
Alimentazione 380 V, 400 V, 415 V
Coordinamento tipo 2**Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 54 a 63):
interruttori automatici, contattori, fusibili ultra rapidi, avviatori**

Associazione: Interruttore automatico, contattore, avviatore

Motore KW	A	Avviatore (1)		Tipo di interruttore automatico		Calibro A	Tipo di contattore
		Classe 10 Applicazioni standard	Classe 20 Applicazioni sovraccarico	Telemeccaniche Merlin Gerin			
5,5	11	-	ATS 48D17p	GV2 L20	Q1	18	KM1, KM2, KM3 LC1 D40
7,5	14,8	ATS 48D17p	ATS 48D22p	NS40H MA		12,5	LC1 D40
				GV2 L20		18	LC1 D40
11	21	ATS 48D22p	ATS 48D32p	NS40H MA		25	LC1 D40
				GV2 L22		25	LC1 D40
15	28,5	ATS 48D32p	ATS 48D39p	NS40H MA		25	LC1 D40
				GV2 L32		32	LC1 D40
18,5	35	ATS 48D39p	ATS 48D47p	NS40H MA		50	LC1 D80
				NS40H MA		50	LC1 D80
22	42	ATS 48D47p	ATS 48D62p	NS40H MA		50	LC1 D80
30	57	ATS 48D62p	ATS 48D75p	NS40H MA		60	LC1 D80
37	69	ATS 48D75p	ATS 48D89p	NS40H MA		80	LC1 D80
45	81	ATS 48D89p	ATS 48C11p	NS100p MA (2)		100	LC1 D115
55	100	ATS 48C11p	ATS 48C14p	NS180p MA (2)		150	LC1 D115
75	131	ATS 48C14p	ATS 48C17p	NS180p MA (2)		150	LC1 D150
90	162	ATS 48C17p	ATS 48C21p	NS 230p MA (2)		220	LC1 F165
110	195	ATS 48C21p	ATS 48C25p	NS 230p MA (2)		220	LC1 F225
132	233	ATS 48C25p	ATS 48C32p	NS400p MA (2)		320	LC1 F265
160	285	ATS 48C32p	ATS 48C41p	NS400p MA (2)		320	LC1 F330
220	388	ATS 48C41p	ATS 48C49p	NS430p MA (2)		500	LC1 F500
250	437	ATS 48C49p	ATS 48C59p	NS430p MA (2)		500	LC1 F500
315	580	ATS 48C59p	ATS 48C66p	NS430p MA (2)		630	LC1 F630
355	605	ATS 48C66p	ATS 48C79p	NS400L Micrologie 3.0		600	LC1 F800
400	675	ATS 48C79p	ATS 48M10p	NS400L Micrologie 3.0		600	LC1 F800
500	855	ATS 48M10p	ATS 48M12p	NS1000L Micrologie 3.0		1000	LC1 BM33
630	1045	ATS 48M12p	-	NS1250p (2) Micrologie 3.0 (3)		1250	LC1 BP33

(1) Sostituire p con Q o Y in base alla gamma di tensione dell'avviatore.

(2) Sostituire p con M, H o L, in funzione del potere d'interruzione, vedere tabella potere d'interruzione nella pagina precedente.

(3) Il coordinamento di tipo 2 è ottenuto solamente se i fusibili ultra rapidi restano nel circuito di alimentazione del motore a non vengono cortocircuitati a fine avviamento.

Associazione fusibili ultra rapidi (obbligatoria in coordinamento tipo 2), avviatore

Avviatore Riferimento	Fusibili ultra rapidi Riferimento	Dimens. A	Calibro A	Pt kA ² .s
A1	Q3			
ATS 48D17p	DF3 ER50	14 x 51	50	2,3
ATS 48D22p e ATS 48D32p	DF3 FR80	22 x 58	80	5,6
ATS 48D39p e ATS 48D47p	DF3 FR100	22 x 58	100	12
ATS 48D62p e ATS 48D75p	DF4 00125	00	125	45
ATS 48D89p e ATS 48C11p	DF4 00160	00	160	82
ATS 48C14p e ATS 48C17p	DF4 30400	30	400	120
ATS 48C21p e ATS 48C32p	DF4 31700	31	700	490
ATS 48C41p	DF4 33800	33	800	490
ATS 48C49p e ATS 48C59p	DF4 331000	33	1000	900
ATS 48C66p	DF4 2331400	2 x 33	1400	1200
ATS 48C79p	DF4 441600	44	1600	1600
ATS 48M10p e ATS 48M12p	DF4 442200	44	2200	4100
Corrente di cortocircuito massima presente all'avviatore in base alla norma IEC 60947-4-2				
Avviatore	Iq (kA)			
ATS 48D17p	50			
Da ATS 48D22p e ATS 48D47p	40			
Da ATS 48D62p e ATS 48C79p	50			
ATS 48M10p e ATS 48M12p	65			

Presentazione:
pagine 36 e 37Caratteristiche:
pagine da 38 a 41Riferimenti:
pagine da 46 a 49Dimensioni d'ingombro:
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Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Alimentazione 440 V

Coordinamento tipo 1

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 52 a 53)											
Associare o interruttore automatico (colonne azzurro), contattore, avviatore, o interruttore/fusibili (colonne blu scuro), contattore, avviatore											
Motore kW	Avviatore Classe 10 Applicazioni standard	Classe 20 Applicazioni severe	Tipo di interruttore automatico Telemeccanica Merlin Gerin		Tipo di contattore	Tipo d'interruttore o interruttore- azionatore (blocco)	Fusibili Am Riferimento Senza percussore		Dimensioni	Calibro	
			Calibro	A			Senza percussore	Con percussore			
MI	A1		Q1		KM1, KM2, KM3					A	
55	10.4	-	ATS 48D17Y	NS100p MA (1) NS80H MA	12.5	LC1 D12	LS1 D32	DP2 CA16	-	10 x 38	18
75	13.7	ATS 48D17Y	ATS 48D22Y	NS100p MA (1) NS80H MA	25	LC1 D18	LS1 D32	DP2 CA16	-	10 x 38	18
11	20.1	ATS 48D22Y	ATS 48D32Y	NS100p MA (1) NS80H MA	25	LC1 D25	GK1 EK	DP2 EA25	DF3 EA25	14 x 51	25
15	26.5	ATS 48D32Y	ATS 48D39Y	NS100p MA (1) NS80H MA	50	LC1 D32	GK1 EK	DP2 EA32	DF3 EA32	14 x 51	32
18.5	32.8	ATS 48D39Y	ATS 48D47Y	NS100p MA (1) NS80H MA	50	LC1 D40	GK1 EK	DP2 EA40	DF3 EA40	14 x 51	40
22	39	ATS 48D47Y	ATS 48D62Y	NS100p MA (1) NS80H MA	50	LC1 D40	GK1 FK	DP2 FA50	DF3 FA50	22 x 58	50
30	52	ATS 48D62Y	ATS 48D75Y	NS80H MA	80	LC1 D65	GK1 FK	DP2 FA80	DF3 FA80	22 x 58	80
37	84	ATS 48D75Y	ATS 48D89Y	NS80H MA	80	LC1 D85	GK1 FK	DP2 FA80	DF3 FA80	22 x 58	80
45	76	ATS 48D89Y	ATS 48C11Y	NS100p MA (1)	100	LC1 D115	GK1 FK	DP2 FA100	DF3 FA100	22 x 58	100
55	90	ATS 48C11Y	ATS 48C14Y	NS100p MA (1)	100	LC1 D115	G81 L	DP2 GA1121	DF4 GA1121	5	125
75	125	ATS 48C14Y	ATS 48C17Y	NS100p MA (1)	150	LC1 D150	G81 L	DP2 GA1181	DF4 GA1181	1	180
90	150	ATS 48C17Y	ATS 48C21Y	NS200p MA (1)	220	LC1 F185	G81 N	DP2 HA1201	DF4 HA1201	1	200
110	178	ATS 48C21Y	ATS 48C25Y	NS200p MA (1)	220	LC1 F225	G81 N	DP2 HA1251	DF4 HA1251	1	250
132	215	ATS 48C25Y	ATS 48C32Y	NS200p MA (1)	220	LC1 F265	G81 QQ	DP2 JA1311	DF4 JA1311	2	315
160	258	ATS 48C32Y	ATS 48C41Y	NS400p MA (1)	320	LC1 F265	G81 QQ	DP2 JA1401	DF4 JA1401	2	315
220	353	ATS 48C41Y	ATS 48C49Y	NS600p MA (1)	500	LC1 F400	G81 S	DP2 KA1501	DF4 KA1501	3	500
250	401	ATS 48C49Y	ATS 48C59Y	NS600p MA (1)	500	LC1 F400	G81 S	DP2 KA1501	DF4 KA1501	3	500
355	549	ATS 48C59Y	ATS 48C65Y	NS600p (1) Micrologia 3.0	830	LC1 F630	G81 V	DP2 LA1801	DF4 LA1801	4	800
400	611	ATS 48C65Y	ATS 48C79Y	NS600p (1) Micrologia 3.0	830	LC1 F630	G81 V	DP2 LA1801	DF4 LA1801	4	800
500	780	ATS 48C79Y	ATS 48M10Y	NS800p (1) Micrologia 3.0	800	LC1 BM33	G81 V	DP2 LA1801	DF4 LA1801	4	800
630	985	ATS 48M10Y	ATS 48M12Y	NS1000p (1) Micrologia 3.0	1000	LC1 BP33	G81 V	DP2 LA1101	DF4 LA1101	4	1000
				C1001L STR35ME	1000	LC1 BP33	G81 V	DP2 LA1101	DF4 LA1101	4	1000
				C1281p (1) STR35ME	1250	LC1 BP33	-	DP2 LA1251	-	4	1250
710	1075	ATS 48M12Y	-	C1281p (1) STR35ME	1250	LC1 BP33	-	DP2 LA1251	-	4	1250

(1) Sostituire p con N, H o L, in funzione del potere d'interruzione, vedere tabella qui di seguito riportata.

Potere d'interruzione degli interruttori automatici in base alle norme IEC 60947-2

440 V	Icu (kA)
GV2 L20, GV2 L22, GV2 L32	20
GK3 EF40	30
GK3 EF65, GK3 EF90	25
NS80	85
440 V	Icu (kA)
	N H L
NS100	25 85 130
NS160, NS250	35 85 130
NS400, NS630	42 85 130
NS800, NS1000	50 85 130
NS1250	50 85 -
C801, C1001	42 85 150
C1251	42 85 -

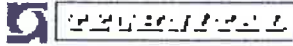
Corrente di cortocircuito massima presente dall'avviatore in base alle norme IEC 60947-2

Avviatore	Iq (kA)
ATS 48D17Y e ATS 48C32Y	50
Da ATS 48C41Y e ATS 48M12Y	70

Presentazione
pagine 36 e 37Caratteristiche
pagine da 38 a 41Riferimenti
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Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Alimentazione 440 V

Coordinamento tipo 2

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 53 a 63)
Interruttori automatici, contattori, fusibili ultra rapidi, avviatori

Associazione: Interruttore automatico, contattore, avviatore

Motore kW	A	Avviatore		Tipo di Interruttore automatico		Calibro A	Tipo di contattore
		Classe 10 Applicazioni standard A1	Classe 30 Applicazioni severa	Telemeccanico Merlin Gerin			
5,5	10,4	-	ATS 48D17Y	NS80H-MA NS100p MA (1)	Q1	12,5	KM1, KM2, KM3 LC1 D40
7,5	13,7	ATS 48D17Y	ATS 48D22Y	NS80H-MA NS100p MA (1)		12,5	LC1 D40
11	20,1	ATS 48D22Y	ATS 48D32Y	NS80H-MA NS100p MA (1)		25	LC1 D40
15	26,5	ATS 48D32Y	ATS 48D38Y	NS100p MA (1) NS80H-MA		25	LC1 D40
18,5	32,8	ATS 48D38Y	ATS 48D47Y	NS100p MA (1) NS80H-MA		50	LC1 D80
22	39	ATS 48D47Y	ATS 48D62Y	NS100p MA (1) NS80H-MA		50	LC1 D80
30	52	ATS 48D62Y	ATS 48D75Y	NS100p MA (1) NS80H-MA		100	LC1 D80
37	64	ATS 48D75Y	ATS 48D89Y	NS100p MA (1) NS80H-MA		80	LC1 D80
45	78	ATS 48D89Y	ATS 48C11Y	NS100p MA (1)		100	LC1 D115
55	90	ATS 48C11Y	ATS 48C14Y	NS100p MA (1)		100	LC1 D115
75	125	ATS 48C14Y	ATS 48C17Y	NS100p MA (1)		150	LC1 D150
90	150	ATS 48C17Y	ATS 48C21Y	NS100p MA (1)		150	LC1 D150
110	178	ATS 48C21Y	ATS 48C25Y	NS250p MA (1)		220	LC1 F185
132	215	ATS 48C25Y	ATS 48C32Y	NS400p MA (1)		320	LC1 F265
180	258	ATS 48C32Y	ATS 48C41Y	NS400p MA (1)		320	LC1 F265
220	353	ATS 48C41Y	ATS 48C49Y	NS630p MA (1)		500	LC1 F400
250	401	ATS 48C49Y	ATS 48C59Y	NS630p MA (1)		500	LC1 F500
355	549	ATS 48C59Y	ATS 48C66Y	NS630pL Micrologie 5.0		630	LC1 F630
400	611	ATS 48C66Y	ATS 48C79Y	NS800L Micrologie 5.0		800	LC1 F800
500	780	ATS 48C79Y	ATS 48M10Y	NS800L Micrologie 5.0		800	LC1 F800
630	965	ATS 48M10Y	ATS 48M12Y	NS1000L Micrologie 5.0		1000	LC1 BP33
710	1075	ATS 48M12Y	-	NS1250p (1) Micrologie 5.0 (2)		1250	LC1 BP33

(1) Sostituito con N, H o L, in funzione della potenza d'interruzione, vedere tabella della potenza d'interruzione nella pagina precedente.

(2) Il coordinamento di tipo 2 è ottenuto solamente se i fusibili ultra rapidi restano nel circuito di alimentazione del motore e non vengono cortocircuitati a fine avviamento.

Associazione fusibili ultra rapidi (obbligatoria in coordinamento tipo 2), avviatore

Avviatore Riferimento	Fusibili ultra rapidi Riferimento	Dimens. A	Calibro A	PI kA ² s
A1	Q3			
ATS 48D17Y	DF3 ER50	14 x 51	50	2,3
ATS 48D22Y e ATS 48D32Y	DF3 FR80	22 x 58	80	5,6
ATS 48D38Y e ATS 48D47Y	DF3 FR100	22 x 58	100	12
ATS 48D62Y e ATS 48D75Y	DF4 00125	00	125	45
ATS 48D89Y e ATS 48C11Y	DF4 00180	00	180	82
ATS 48C14Y e ATS 48C17Y	DF4 30400	30	400	120
ATS 48C21Y e ATS 48C32Y	DF4 31700	31	700	490
ATS 48C41Y	DF4 33800	33	800	490
ATS 48C49Y e ATS 48C59Y	DF4 331000	33	1000	900
ATS 48C66Y	DF4 2331400	2 x 33	1400	1200
ATS 48C79Y	DF4 441600	44	1600	1600
ATS 48M10Y e ATS 48M12Y	DF4 442200	44	2200	4100

Corrente di cortocircuito massima presunta da l'avviatore in base alle norme IEC 60947-4-2

Avviatore	Iq (kA)
ATS 48D17Y	50
Da ATS 48D22Y a ATS 48D47Y	20
ATS 48D62Y e ATS 48D75Y	50
ATS 48D89Y	40
Da ATS 48C11Y a ATS 48C32Y	50
ATS 48C41Y	40
Da ATS 48C49Y a ATS 48C79Y	50
ATS 48M10Y e ATS 48M12Y	85

Presentazione
pagine 36 e 37Caratteristiche
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Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Alimentazione 500 V

Coordinamento tipo 1

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 54 a 63)											
Associare o interruttore automatico (colonna azzurro), contattore, avviatore, o sezionatore/ fusibili (colonna blu scuro), contattore, avviatore											
Motore kW	Avviatore Classe 10 Applicazioni standard	Classe 20 Applicazioni severo	Tipo di interruttore automatico Telemecanique Merlin Gerin	Calibro A	Tipo di contattore	Tipo d'interruttore o sezionatore (libro ma)	Fusibili Am		Dimens. A	Calibro A	
							Riferimento Senza percussore	Con percussore			
M1	A1		Q1		KM1, KM2, KM3						
7,5	12	-	ATS 48D17Y	NS100p MA (1) NS80H MA	12,5	LC1 D12	LS1 D32	DF2 CA16	-	10 x 38	16
9	14	ATS 48D17Y	ATS 48D22Y	NS100p MA (1) NS80H MA	25	LC1 D18	LS1 D32	DF2 CA16	-	10 x 38	16
11	18,4	ATS 48D22Y	ATS 48D32Y	NS100p MA (1) NS80H MA	25	LC1 D25	GK1 EK	DF2 EA25	DF3 EA25	14 x 51	25
18,5	28,5	ATS 48D32Y	ATS 48D38Y	NS100p MA (1) NS80H MA	50	LC1 D32	GK1 EK	DF2EA32	DF3 EA32	14 x 51	32
22	33	ATS 48D38Y	ATS 48D47Y	NS100p MA (1) NS80H MA	50	LC1 D40	GK1 EK	DF2 EA40	DF3 EA40	14 x 51	40
30	45	ATS 48D47Y	ATS 48D62Y	NS100p MA (1) NS80H MA	50	LC1 D50	GK1 FK	DF2 FA50	DF3 FA50	22 x 58	50
37	55	ATS 48D62Y	ATS 48D75Y	NS100p MA (1)	100	LC1 D65	GK1 FK	DF2 FA60	DF3 FA60	22 x 58	60
45	95	ATS 48D75Y	ATS 48D98Y	NS100p MA (1)	100	LC1 D80	GK1 FK	DF2 FA60	DF3 FA60	22 x 58	60
55	80	ATS 48D98Y	ATS 48C11Y	NS100p MA (1)	100	LC1 D80	GK1 FK	DF2 FA100	DF3 FA100	22 x 58	100
75	105	ATS 48C11Y	ATS 48C14Y	NS180p MA (1)	150	LC1 D115	GS1 L	DF2 QA1121	DF4 QA1121	0	125
90	130	ATS 48C14Y	ATS 48C17Y	NS180p MA (1)	150	LC1 D150	GS1 L	DF2 QA1161	DF4 QA1161	0	160
110	158	ATS 48C17Y	ATS 48C21Y	NS250p MA (1)	220	LC1 F165	GS1 N	DF2 HA1201	DF4 HA1201	1	200
132	207	ATS 48C21Y	ATS 48C25Y	NS250p MA (1)	220	LC1 F265	GS1 N	DF2 HA1251	DF4 HA1251	1	250
190	257	ATS 48C25Y	ATS 48C32Y	NS400p MA (1)	320	LC1 F265	GS1 QQ	DF2 JA1311	DF4 JA1311	2	315
220	310	ATS 48C32Y	ATS 48C41Y	NS830p MA (1)	500	LC1 F400	GS1 QQ	DF2 JA1401	DF4 JA1401	2	400
250	380	ATS 48C41Y	ATS 48C48Y	NS830p MA (1)	500	LC1 F400	GS1 S	DF2 KA1501	DF4 KA1501	3	500
315	460	ATS 48C48Y	ATS 48C59Y	NS830p MA (1)	500	LC1 F500	GS1 S	DF2 KA1631	DF4 KA1631	3	630
400	540	ATS 48C59Y	ATS 48C66Y	NS830p (1) Micrologia 5.0	630	LC1 F630	GS1 V	DF2 LA1601	DF4 LA1601	4	600
450	630	ATS 48C66Y	ATS 48C79Y	NS630p (1) Micrologia 5.0	630	LC1 F800	GS1 V	DF2 LA1601	DF4 LA1601	4	600
500	880	ATS 48C79Y	ATS 48M10Y	NS800p MA (1) Micrologia 5.0	800	LC1 BL33	GS1 V	DF2 LA1601	DF4 LA1601	4	800
630	850	ATS 48M10Y	ATS 48M12Y	C1001p (1) STR35 ME	1000	LC1 BL33	GS1 V	DF2 LA1101	DF4 LA1101	4	800
				NS1000p (1) Micrologia 5.0	1000	LC1 BP33	GS1 V	DF2 LA1101	DF4 LA1101	4	1000
800	1100	ATS 48M12Y	-	C1001p (1) STR35 ME	1000	LC1 BP33	GS1 V	DF2 LA1101	DF4 LA1101	4	1000
				NS1250p (1) Micrologia 5.0	1250	LC1 BP33	-	DF2 LA1251	-	4	1250
				C1251p (1) STR35 ME	1250	LC1 BP33	-	DF2 LA1251	-	4	1250

(3) Sostituire p con N, HoL, in funzione del potere d'interruzione, vedere tabella qui di seguito riportata.

Potere d'interruzione degli interruttori automatici in base alle norme IEC 60947-2

900 V	Icu (kA)
GV2 L20, GV2 L22, GV2 L32	10
GK3 EF40	20
GK3 EF65, GK3 EF90	15
NS60	25
900 V	Icu (kA)
	N H L
NS100	18 50 100
NS160, NS250, NS630	30 50 70
NS400	30 50 100
NS800, NS1000	40 50 100
NS1250	40 50 -
C801, C1001	40 50 100
C1251	40 50 -

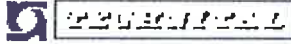
Corrente di cortocircuito massima presunta dell'avviatore in base alle norme IEC 60947-4-2

Avviatore	Iq (kA)
Da ATS 48D17Y a ATS 48C32Y	50
Da ATS 48C41Y a ATS 48M12Y	70

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Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Alimentazione 500 V

Coordinamento tipo 2

Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 50 a 63)
interruttori automatici, contattori, fusibili ultra rapidi, avviatori

Associazione: interruttore automatico, contattore, avvitatore

Motore kW	A	Avvitatore		Tipo di interruttore automatico		Calibro A	Tipo di contattore
		Classe 10 Applicazioni standard	Classe 20 Applicazioni severe	Telemecanique Makin Orion			
M1		A1		Q1			KM1, KQ/2, KMG
7,5	12	-	ATS 48D17Y	NS80H MA NS100p MA (1)		12,5	LC1 D40 LC1 D80
9	14	ATS 48D17Y	ATS 48D22Y	NS80H MA NS100p MA (1)		25	LC1 D40 LC1 D80
11	18,4	ATS 48D22Y	ATS 48D32Y	NS80H MA NS100p MA (1)		25	LC1 D40 LC1 D80
18,5	28,5	ATS 48D32Y	ATS 48D38Y	NS100p MA (1) NS80H MA		50	LC1 D80
22	33	ATS 48D38Y	ATS 48D47Y	NS100p MA (1) NS80H MA		50	LC1 D80
30	45	ATS 48D47Y	ATS 48D62Y	NS100p MA (1) NS80H MA		50	LC1 D80
37	55	ATS 48D62Y	ATS 48D75Y	NS100p MA (1)		100	LC1 D80
45	65	ATS 48D75Y	ATS 48D88Y	NS100p MA (1)		100	LC1 D80
55	80	ATS 48D88Y	ATS 48C11Y	NS100p MA (1)		100	LC1 D115
75	105	ATS 48C11Y	ATS 48C14Y	NS100p MA (1)		150	LC1 D115
90	130	ATS 48C14Y	ATS 48C17Y	NS100p MA (1)		150	LC1 D150
110	156	ATS 48C17Y	ATS 48C21Y	NS250p MA (1)		220	LC1 F185
132	207	ATS 48C21Y	ATS 48C25Y	NS250p MA (1)		220	LC1 F285
160	257	ATS 48C25Y	ATS 48C32Y	NS400p MA (1)		320	LC1 F400
220	310	ATS 48C32Y	ATS 48C41Y	NS400p MA (1)		320	LC1 F400
250	360	ATS 48C41Y	ATS 48C48Y	NS630p MA (1)		500	LC1 F500
315	460	ATS 48C48Y	ATS 48C59Y	NS630p MA (1)		500	LC1 F500
400	540	ATS 48C59Y	ATS 48C68Y	NS630bl. Micrologie 5.0		630	LC1 F630
450	630	ATS 48C68Y	ATS 48C79Y	NS630bl. Micrologie 5.0		630	LC1 F600
500	680	ATS 48C79Y	ATS 48M10Y	NS900L Micrologie 5.0		800	LC1 BL33
630	850	ATS 48M10Y	ATS 48M12Y	NS1000L Micrologie 5.0		1000	LC1 BP33
800	1100	ATS 48M12Y	-	NS1250p (1) Micrologie 5.0 (2)		1250	LC1 BP33

(1) Sostituzione p con M, H o L, in funzione del polare d'interruzione, vedere tabella polare d'interruzione nella pagina precedente.

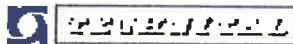
(2) Il coordinamento di tipo 2 è ottenuto solamente se i fusibili ultra rapidi restano nel circuito di alimentazione del motore e non vengono cortocircuitati a fine avviamento.

Associazione fusibili ultra rapidi (obbligatoria in coordinamento tipo 2), avvitatore

Avvitatore Riferimento	Fusibili ultra rapidi Riferimento	Dimens. mm	Calibro A	PI kA ² ·s
A1	Q3			
ATS 48D17Y	DF3 ER90	14 x 51	50	2,3
ATS 48D22Y e ATS 48D32Y	DF3 FR80	22 x 58	60	5,6
ATS 48D38Y e ATS 48D47Y	DF3 FR100	22 x 58	100	12
ATS 48D62Y e ATS 48D75Y	DF4 00125	00	125	45
ATS 48D88Y e ATS 48C11Y	DF4 00180	00	180	82
ATS 48C14Y e ATS 48C17Y	DF4 30400	30	400	120
ATS 48C21Y e ATS 48C32Y	DF4 31700	31	700	490
ATS 48C41Y	DF4 33800	33	800	490
ATS 48C48Y e ATS 48C59Y	DF4 331000	33	1000	900
ATS 48C68Y	DF4 2331400	2 x 33	1400	1200
ATS 48C79Y	DF4 441800	44	1800	1800
ATS 48M10Y e ATS 48M12Y	DF4 442200	44	2200	4100
Corrente di cortocircuito massima presunta da l'avvitatore in base alle norme IEC 60947-4-2				
Avvitatore	Iq (kA)			
ATS 48D17Y	50			
Da ATS 48D22Y e ATS 48D47Y	20			
ATS 48D62Y e ATS 48D75Y	50			
ATS 48D88Y	40			
Da ATS 48C11Y e ATS 48C32Y	50			
ATS 48C41Y	40			
Da ATS 48C48Y e ATS 48C79Y	50			
ATS 48M10Y e ATS 48M12Y	85			

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Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Alimentazione 690 V

Coordinamento tipo 1

Componenti da associare in base alle norme IEC 60947-4-1 a IEC 60947-4-2 (in base agli schizzi pagine da 56 a 63)

Associare o interruttore automatico (colonna azzurro), contattore, avviatore, o sezionatore/fuoribili (colonna blu scuro), contattore, avviatore

Motore KW	Avviatore Classe 10 Applicazioni standard	Classe 20 Applicazioni severe	Tipo di interruttore automatico		Tipo di contattore	Tipo d'interruttore o sezionatore (blocco a giorno)	Fusibili Am Riferimento		Dimensioni	Calibro	
			Telemecanique Merlin Gerin	Calibro			Senza percussore	Con percussore			
MI	A1		O1		KM1, KM2, KM3				A		
11	12,1	-	ATS 48D17Y	NS100p MA (1) NS80H MA	12,5 12,5	LC1 D18	GK1 FK	DP2 FA18	DP3 FA18	22x58	16
15	16,5	ATS 48D17Y	ATS 48D22Y	NS100p MA (1) NS80H MA	25 25	LC1 D25	GK1 FK	DP2 FA25	DP3 FA25	22x58	20
18,5	20,2	ATS 48D22Y	ATS 48D32Y	NS100p MA (1) NS80H MA	50 50	LC1 D32	GK1 FK	DP2 FA25	DP3 FA25	22x58	25
22	24,2	ATS 48D32Y	ATS 48D38Y	NS100p MA (1) NS80H MA	50 50	LC1 D40	GK1 FK	DP2 FA32	DP3 FA32	22x58	32
30	33	ATS 48D38Y	ATS 48D47Y	NS100p MA (1) NS80H MA	50 50	LC1 D40	GK1 FK	DP2 FA40	DP3 FA40	22x58	40
37	40	ATS 48D47Y	ATS 48D62Y	NS100p MA (1) NS80H MA	50 50	LC1 D65	GK1 FK	DP2 FA50	DP3 FA50	22x58	50
45	49	ATS 48D62Y	ATS 48D75Y	NS100p MA (1)	100	LC1 D80	-	-	-	-	-
55	58	ATS 48D75Y	ATS 48D85Y	NS100p MA (1)	100	LC1D-115	-	-	-	-	-
75	75,5	ATS 48D85Y	ATS 48C11Y	NS100p MA (1)	100	LC1D-115	-	-	-	-	-
90	94	ATS 48C11Y	ATS 48C14Y	NS160p MA (1)	150	LC1D-150	-	-	-	-	-
110	113	ATS 48C14Y	ATS 48C17Y	NS160p MA (1)	150	LC1D-150	-	-	-	-	-
180	185	ATS 48C17Y	ATS 48C21Y	NS250p MA (1)	220	LC1F-285	-	-	-	-	-
200	203	ATS 48C21Y	ATS 48C25Y	NS400p MA (1)	320	LC1F-330	-	-	-	-	-
250	253	ATS 48C25Y	ATS 48C32Y	NS400p MA (1)	320	LC1F-400	-	-	-	-	-
315	321	ATS 48C32Y	ATS 48C41Y	NS830p MA (1)	500	LC1F-300	-	-	-	-	-
400	390	ATS 48C41Y	ATS 48C48Y	NS830p MA (1)	500	LC1 F630	-	-	-	-	-
500	490	ATS 48C48Y	ATS 48C59Y	NS830p (1) Micrologie 5.0	630	LC1 BL33	-	-	-	-	-
				C801p (1) STR35 ME	800	LC1 BL33	-	-	-	-	-
550	540	ATS 48C59Y	ATS 48C68Y	NS830p (1) Micrologie 5.0	630	LC1 BL33	-	-	-	-	-
				C801p (1) STR35 ME	800	LC1 BL33	-	-	-	-	-
830	805	ATS 48C68Y	ATS 48C79Y	NS800p (1) Micrologie 5.0	800	LC1 BP33	-	-	-	-	-
				C801p (1) STR35 ME	800	LC1 BP33	-	-	-	-	-
710	694	ATS 48C79Y	ATS 48M10Y	NS800p (1) Micrologie 5.0	800	LC1 BP33	-	-	-	-	-
				C801p (1) STR35 ME	800	LC1 BP33	-	-	-	-	-
900	880	ATS 48M10Y	ATS 48M12Y	NS1000p (1) Micrologie 5.0	1000	LC1 BR33	-	-	-	-	-
				C1001L STR35 ME	1000	LC1 BR33	-	-	-	-	-
950	1000	ATS 48M12Y	-	NS1250p (1) Micrologie 5.0	1250	LC1 BR33	-	-	-	-	-
				C1251p (1) STR35 ME	1250	LC1 BR33	-	-	-	-	-

(1) Sostituirsi p con N, H o L, in funzione del potere d'interruzione, vedere tabella qui di seguito riportata

Corrente di cortocircuito massima presunta dell'avviatore in base alla norma IEC 60947-4-2

Avviatore	I _k (kA)	690 V	I _{cu} (kA)
ATS 48D17Y o ATS 48C32Y	50	GV2 L20, GV2 L22, GV2 L32	4
Da ATS 48C41Y a ATS 48M12Y	70	GK3 EF40, GK3 EF65, GK3 EF80, NS400	6

	I _{cu} (kA)		
	N	H	L
NS100	8	10	75
NS160, NS250	8	10	20
NS400	10	20	75
NS630	10	20	35
NS400, NS1000	30	42	25
NS1250	30	42	-
C801, C1001	25	40	60
C1251	25	40	-

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Associazioni (segue)

Avviatori progressivi

Avviatori-rallentatori progressivi Altistart 48

Alimentazione 690 V

Coordinamento tipo 2

**Componenti da associare in base alle norme IEC 60947-4-1 e IEC 60947-4-2 (in base agli schemi pagine da 58 a 63):
interruttori automatici, contattori, fusibili ultra rapidi, avviatori**

Associazione: Interruttore automatico, contattore, avviatore

Motore kW	A	Avviatore	Classe 20	Tipo di interruttore automatico		Calibro A	Tipo di contattore
		Classe 10 Applicazioni standard	Applicazioni severe	Telemecanique Merlin Gerin			
M1		A1			O1		KM1, KM2, KM3
11	12.1	-	ATS 48D17Y	ATS 48D17Y	NS100p MA (1)	12.5	LC1 D80
15	16.5	ATS 48D22Y	ATS 48D22Y	ATS 48D22Y	NS100p MA (1)	25	LC1 D80
18.5	20.2	ATS 48D32Y	ATS 48D32Y	ATS 48D32Y	NS100p MA (1)	50	LC1 D80
22	24.2	ATS 48D32Y	ATS 48D32Y	ATS 48D32Y	NS100p MA (1)	50	LC1 D80
30	33	ATS 48D39Y	ATS 48D47Y	ATS 48D47Y	NS100p MA (1)	50	LC1 D80
37	40	ATS 48D47Y	ATS 48D62Y	ATS 48D62Y	NS100p MA (1)	50	LC1 D80
45	49	ATS 48D62Y	ATS 48D75Y	ATS 48D75Y	NS100p MA (1)	100	LC1 D115
55	58	ATS 48D75Y	ATS 48D89Y	ATS 48D89Y	NS100p MA (1)	100	LC1 D115
75	75.5	ATS 48D89Y	ATS 48C11Y	ATS 48C11Y	NS100p MA (1)	100	LC1 D115
90	94	ATS 48C11Y	ATS 48C14Y	ATS 48C14Y	NS400p MA (1)	320	LC1 F265
110	113	ATS 48C14Y	ATS 48C17Y	ATS 48C17Y	NS400p MA (1)	320	LC1 F265
160	165	ATS 48C17Y	ATS 48C21Y	ATS 48C21Y	NS 400p MA (1)	320	LC1 F265
200	203	ATS 48C21Y	ATS 48C25Y	ATS 48C25Y	NS400p MA (1)	320	LC1 F400
250	253	ATS 48C25Y	ATS 48C32Y	ATS 48C32Y	NS400p MA (1)	320	LC1 F500
315	321	ATS 48C32Y	ATS 48C41Y	ATS 48C41Y	NS630p MA (1)	500	LC1 F500
400	390	ATS 48C41Y	ATS 48C48Y	ATS 48C48Y	NS630p MA (1)	500	LC1 F630
500	490	ATS 48C48Y	ATS 48C59Y	ATS 48C59Y	NS630BL Micrologia 3.0	630	LC1 BL33
560	549	ATS 48C59Y	ATS 48C66Y	ATS 48C66Y	NS630BL Micrologia 3.0	630	LC1 BL33
630	605	ATS 48C66Y	ATS 48C79Y	ATS 48C79Y	NS800L Micrologia 3.0	800	LC1 BP33
710	694	ATS 48C79Y	ATS 48M10Y	ATS 48M10Y	NS800L Micrologia 3.0	800	LC1 BP33
900	880	ATS 48M10Y	ATS 48M12Y	ATS 48M12Y	NS1000L Micrologia 3.0	1000	LC1 BR33
950	1000	ATS 48M12Y	-	-	NS1250p (1) Micrologia 3.0 (2)	1250	LC1 BR33

(1) Sostituzione p con N, H o L, in funzione del potere d'interruzione, vedere tabella potere d'interruzione nella pagina precedente.


(2) Il coordinamento di tipo 2 è ottenuto solamente se i fusibili ultra rapidi restano nel circuito di alimentazione del motore e non vengono cortocircuitati a fine avviamento.

Associazione fusibili ultra rapidi (obbligatoria in coordinamento tipo 2), avviatore

Avviatore Riferimento	Fusibili ultra rapidi Riferimento	Dimens.	Calibro A	Pi kA _s
A1	O3			
ATS 48D17Y	DF3 ER80	14 x 51	50	2,3
ATS 48D22Y e ATS 48D32Y	DF3 FR80	22 x 58	80	5,6
ATS 48D39Y e ATS 48D47Y	DF3 FR100	22 x 58	100	12
ATS 48D62Y e ATS 48D75Y	DF4 00125	00	125	45
ATS 48D89Y e ATS 48C11Y	DF4 00160	00	160	82
ATS 48C14Y e ATS 48C17Y	DF4 30400	30	400	120
Da ATS 48C21Y a ATS 48C32Y	DF4 31700	31	700	490
ATS 48C41Y	DF4 33800	33	800	490
ATS 48C48Y e ATS 48C59Y	DF4 331000	33	1000	900
ATS 48C66Y	DF4 2331400	2 x 33	1400	1200
ATS 48C79Y	DF4 441800	44	1800	1800
ATS 48M10Y e ATS 48M12Y	DF4 442200	44	2200	4100

Corrente di cortocircuito massima presente da l'avviatore in base alla norma IEC 60947-4-2

Avviatore	I _c (kA)
ATS 48D17Y	50
ATS 48D22Y e ATS 48D32Y	15
ATS 48D39Y e ATS 48D47Y	20
ATS 48D62Y e ATS 48D75Y	50
ATS 48D89Y	20
Da ATS 48C11Y a ATS 48C32Y	50
ATS 48C41Y	25
Da ATS 48C48Y e ATS 48C79Y	50
ATS 48M10Y e ATS 48M12Y	85

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Funzioni

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

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Regolazione delle correnti con PowerSuite su PPC

Preregolazione di base dell'avviatore

L'avviatore è fornito pronto all'impiego per la maggior parte delle applicazioni. Le principali funzioni validate e i valori e regolazioni di default delle stesse sono i seguenti:

- Corrente nominale motore (dipende dal calibro avviatore)
- Corrente di limitazione: 400 %
- Tempo rampa di accelerazione: 15 s
- Coppia iniziale all'avviamento: 20 %
- Scelta del tipo di arresto: arresto ruota libera
- Protezione termica del motore: classe 10
- Tempo prima del riavviamento: 2 s
- Soglia di perdita fase motore: 10 %
- Frequenza rete: automatico
- Ingressi logici RUN e STOP: comando 2 fili o 3 fili mediante cablaggio
- Ingresso logico LI3: forzatura arresto ruota libera
- Ingresso logico LI4: comando in modo locale (collegamento seriale disattivato)
- Uscita logica LO1: allarme termico motore
- Uscita logica LO2: motore alimentato
- Uscita relè R1: relè di difetto
- Uscita relè R3: motore alimentato
- Uscita analogica: corrente motore

Funzioni di regolazione

b Corrente nominale motore (corrente massima permanente)

La corrente nominale dell'avviatore può essere adattata alla corrente nominale motore indicata sulla targa motore.
Campo di regolazione: da 0,4 a 1,3 volte il calibro in corrente nominale dell'avviatore.

b Corrente di limitazione

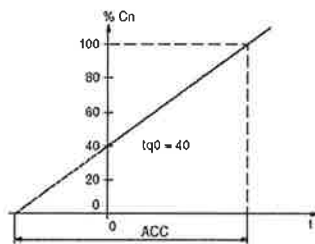
La corrente massima di avviamento è regolabile.
Campo di regolazione: da 150 a 700 % della corrente nominale motore regolata e limitata al 500% della corrente massima permanente definita per il calibro dell'avviatore.

b Tempo della rampa di accelerazione

Durante la fase di avviamento, l'Altistart 48 applica al motore una rampa di coppia. Il tempo (ACC) regolato corrisponde al tempo impiegato dalla rampa per passare da 0 alla coppia nominale. Campo di regolazione: da 1 a 60 s.

b Coppia iniziale all'avviamento

La coppia iniziale $tq0$ applicata al motore permette di vincere istantaneamente la coppia resistente all'avviamento. Campo di regolazione: da 0 a 100 % della coppia nominale del motore.



Rampa di accelerazione per un tempo ACC con coppia iniziale all'avviamento $tq0 = 40\%$ della coppia nominale motore.

b Scelta del tipo di arresto

È possibile scegliere tra tre tipi di arresto:

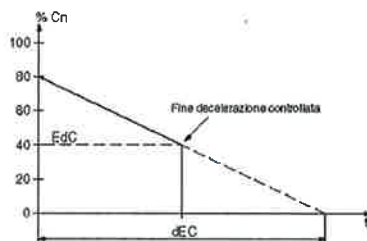
v Arresto del motore a ruota libera

v Arresto del motore in decelerazione mediante controllo della coppia (applicazione pompa)

Questo tipo di arresto consente di decelerare progressivamente su rampa una pompa centrifuga per evitare un suo arresto brusco. Permette di rendere il transitorio idraulico sufficientemente dolce allo scopo di ridurre in modo significativo i colpi di ariete.

Il tempo della rampa di decelerazione (dEC) è regolabile.

Durante la fase di decelerazione la portata della pompa diminuisce fino a diventare irrilevante ad una certa velocità, tanto da rendere inutile il proseguire della decelerazione. È possibile regolare una soglia di coppia (EdC) a partire dalla quale il motore passa a ruota libera, evitando di riscaldare inutilmente il motore e la pompa.

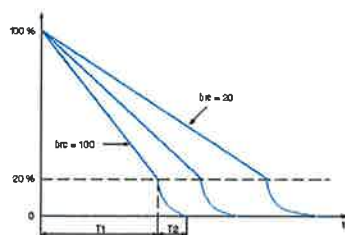


Arresto decelerato con controllo della coppia per un tempo dEC con soglia EdC di passaggio a ruota libera. EdC = 40 % della coppia nominale motore.

v Arresto del motore in frenatura dinamica (applicazione: arresto delle macchine a forte inerzia)

Questo tipo di arresto garantisce il rallentamento del motore in caso d'inerzia importante.

Il livello della coppia di frenatura (brc) è regolabile. Il tempo di frenatura dinamico (T1) corrisponde alla durata del rallentamento per passare dal 100 % al 20 % della velocità nominale motore. Per migliorare la frenatura a fine decelerazione l'avviatore inietta una corrente continua per un periodo di tempo regolabile (T2).

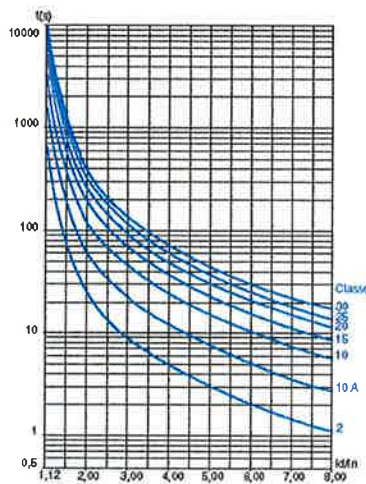


Arresto in frenatura dinamica per diversi livelli della coppia di frenatura brc.

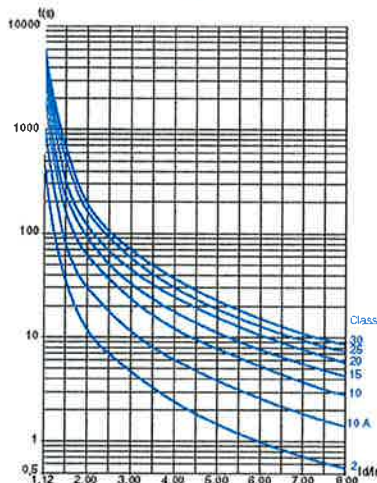


Funzioni (segue)

Avviatori progressivi
Avviatori-rallentatori progressivi Altistart 48



Curve di protezione termica del motore, a freddo.



Curve di protezione termica del motore, a caldo.

Funzioni di protezione

L'Altistart 48 dispone di funzioni che consentono di proteggere il motore e la macchina.

b Protezione termica del motore mediante calcolo

L'avviatore calcola costantemente il riscaldamento del motore a partire dalla corrente nominale regolata e dalla corrente realmente assorbibile. Sono previste diverse classi di protezioni per adattarsi al motore e all'applicazione utilizzati, secondo quanto previsto dalla norma IEC 60947-4-2: classe 30, classe 25, classe 20 (applicazione severa), classe 15, classe 10 (applicazione standard), classe 10 A, sotto classe 2.

Le diverse classi di protezione sono date per differenti capacità di avviamento del motore:
- a freddo senza difetto termico (corrisponde ad uno stato termico motore stabilizzato con motore fuori tensione).
- a caldo senza difetto termico (corrisponde ad uno stato termico motore stabilizzato a potenza nominale).

La funzione protezione termica del motore può essere disattivata.

In seguito ad un arresto del motore o allo scollegamento dell'avviatore, il calcolo dello stato termico prosegue, anche se il controllo non è alimentato. Il controllo termico dell'Altistart impedisce il riavviamento del motore se il suo riscaldamento risulta ancora troppo elevato. In caso d'impiego di motori speciali con protezione termica non garantita dalle curve, si consiglia di prevedere l'installazione di una protezione termica esterna mediante sonda o relè termico.

Di base l'avviatore viene fornito prerogolato con una classe di protezione 10. Le curve di intervento sono stabilite in funzione del rapporto tra la corrente di avviamento Id e la corrente nominale motore In (regolabile).

Tempo d'intervento a freddo

Tempo d'intervento per applicazione standard (Classe 10)			Tempo d'intervento per applicazione severa (Classe 20)		
Id = 3 In	Id = 4 In	Id = 5 In	Id = 3,5 In	Id = 4 In	Id = 5 In
46 s	23 s	15 s	63 s	48 s	29 s

Tempo d'intervento a caldo

Tempo d'intervento per applicazione standard (Classe 10)			Tempo d'intervento per applicazione severa (Classe 20)		
Id = 3 In	Id = 4 In	Id = 5 In	Id = 3,5 In	Id = 4 In	Id = 5 In
23 s	12 s	7,5 s	32 s	25 s	15 s

b Reset dello stato termico motore

L'attivazione di questa funzione azzerava lo stato termico motore calcolato dall'avviatore.

b Protezione termica motore con sonde PTC

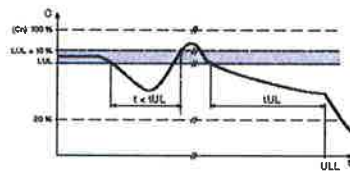
L'avviatore integra la funzione di gestione delle sonde PTC evitando in tal modo l'impiego di un dispositivo esterno. Il difetto o l'allarme "superamento temperatura sonde PTC" possono essere segnalati da un'uscita logica configurabile o visualizzati mediante collegamento seriale. Questa funzione può essere disattivata.

Nota: Le funzioni "protezione con sonde PTC" e "protezione termica del motore mediante calcolo" sono indipendenti e possono essere attive contemporaneamente.

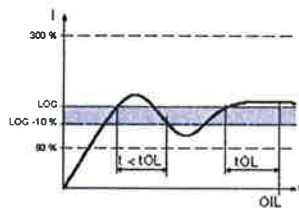
b Ventilazione dell'avviatore: il ventilatore di raffreddamento degli avviatori entra in funzione quando la temperatura del radiatore raggiunge i 50°C e viene invece disattivato quando la temperatura scende nuovamente a 40°C.

b Protezione termica dell'avviatore

L'avviatore è protetto mediante sonda termica analogica contro i sovraccarichi termici.



Rilievamento sottocarico motore (ULL).



Rilievamento sovracorrente motore (OIL).



Configurazione sovracorrente e sottocarico dell'avviatore con PowerSuite su PC.

Funzioni di protezione (segue)

b Protezione sottocarico motore

L'avviatore rileva un sottocarico motore se, per un certo intervallo di tempo regolabile (t_{ULL}), la coppia motore scende al di sotto di una soglia di coppia preregolata (LUL). La soglia sottocarico motore può essere regolata dal 20 al 100 % della coppia nominale motore. La durata massima consentita sotto carico è regolabile da 1 a 60 s. Il rilevamento del sottocarico può attivare un allarme o un difetto. La funzione di rilevamento può essere disattivata. L'allarme "rilevamento sotto carico motore" può essere segnalato da un'uscita logica configurabile e/o visualizzato mediante collegamento seriale nello stato dell'avviatore. Il difetto "rilevamento sotto carico motore" (ULF) blocca l'avviatore e può essere visualizzato mediante collegamento seriale.

b Protezione tempo di accelerazione prolungato

Questa protezione consente di rilevare un avviamento effettuato in condizioni non corrette, come ad esempio un rotore bloccato o un motore la cui velocità di rotazione non arriva a raggiungere il regime nominale. Se la durata dell'avviamento supera il valore impostato (da 10 a 999 s), l'avviatore segnala il difetto. Questa funzione può essere disattivata.

b Protezione sovracorrente corrente

L'avviatore rileva un sovracorrente se per un dato intervallo di tempo regolabile (t_{OIL}) la corrente motore supera la soglia di sovracorrente preregolata (LOC).

La soglia di sovracorrente è regolabile dal 50 al 300 % della corrente nominale motore.

La durata massima consentita del sovracorrente è regolabile da 0,1 a 60 s.

Questa funzione è attiva solamente in fase di regime stabilito.

Il rilevamento della sovracorrente può attivare un allarme o un difetto. La funzione di rilevamento può essere disattivata. L'allarme "rilevamento sovracorrente" può essere segnalato da un'uscita logica configurabile e/o visualizzato mediante collegamento seriale.

Il difetto "rilevamento sovracorrente" (OLC) blocca l'avviatore e può essere visualizzato mediante collegamento seriale nello stato dell'avviatore.

b Protezione contro l'inversione delle fasi della rete

Questa funzione permette di rilevare il senso di rotazione delle fasi del motore; quando è attiva segnala un difetto in caso di inversione del senso di rotazione.

b Tempo prima del riavviamento

Questa funzione permette di evitare più avviamenti successivi che potrebbero provocare:

- un eccessivo riscaldamento termico dell'applicazione, non tollerato,
- un passaggio in difetto termico con conseguente necessità di un intervento di manutenzione,
- sovracorrenti in caso d'inversione del senso di rotazione o di successione sugli ordini marcia/arresto.

In seguito ad un ordine di arresto il motore non può riavviare prima che sia trascorso l'intervallo di tempo impostato.

Il riavviamento viene effettuato al termine della temporizzazione se l'ordine di marcia è presente o se viene dato un nuovo ordine di marcia.

Campo di regolazione: da 0 a 999 s.

b Rilievamento perdita di una fase motore

Questa funzione permette di regolare la sensibilità della protezione per rilevare l'assenza di corrente o un abbassamento di corrente in una delle tre fasi del motore per un tempo di almeno 0,5 s o in tutte e tre le fasi del motore per un tempo di almeno 0,2 s. Il valore minimo del livello di corrente può essere regolato tra il 5 e il 10 % della corrente nominale dell'avviatore.

b Riavviamento automatico

In seguito ad un blocco su guasto questa funzione autorizza fino a sei tentativi di riavviamento successivi a 60 s uno dall'altro se il guasto è stato eliminato e se gli ordini di marcia sono ancora presenti. Dopo il sesto tentativo l'avviatore resta bloccato ed è necessario riarmare il guasto prima di poter riavviare.

Se questa funzione è attiva il relè di sicurezza resta inserito in caso di rilevamento dei difetti perdita fase rete, perdita fase motore e frequenza rete fuori tolleranza. Questa funzione può essere utilizzata solo con il comando 2 fiii.

Funzioni (segue)

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48

Funzioni di regolazione avanzata

b Limitazione di coppia

Destinata principalmente alle applicazioni a forte inerzia e a coppia costante tipo trasportatore, questa funzione limita il riferimento della rampa di coppia al valore regolato.

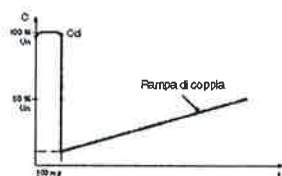
La funzione permette ad esempio di limitare la coppia ad un valore costante per tutta la durata dell'avviamento.

Campo di regolazione: dal 10 al 200 % della coppia nominale dell'avviatore.

b Livello del Boost in tensione

Questa funzione permette di superare un'eventuale coppia "di decollo" (fenomeno di aderenza all'arresto o di duro meccanico). Alla comparsa di un ordine di marcia l'avviatore applica al motore una tensione fissa per un periodo di tempo limitato prima dell'avviamento. Questa funzione può essere disattivata.

Il valore di regolazione della tensione varia dal 50 al 100 % della tensione nominale motore.



Applicazione di un Boost di tensione uguale al 100 % della tensione nominale motore.

b Collegamento dell'avviatore nel triangolo del motore

Gli avviatori ATS48 ***Q associati a motori con collegamento a triangolo possono essere cablati in serie negli avvolgimenti del motore. Con questo tipo di accoppiamento la corrente nell'avviatore è ridotta con rapporto 3, cosa che consente di utilizzare un avviatore di calibro ridotto. Le regolazioni della corrente nominale e della corrente di limitazione, oltre che della corrente visualizzata in fase di funzionamento restano quelli dei valori in linea indicati sulla targa motore.

Per questa applicazione, le funzioni di arresto in frenatura o in decelerazione non sono attive e resta possibile solo l'arresto a ruota libera.

Se la funzione è selezionata il campo di regolazione della corrente nominale motore e della corrente di limitazione sono moltiplicati per 3.

Questa funzione non è compatibile con le seguenti funzioni: rilevamento perdita di una fase motore, preriscaldamento motore, cascata, arresto decelerato e frenatura dinamica.

Per questo tipo di collegamento rispettare lo schema consigliato a pagina 60.

b Prova su motore di potenza ridotta

Questa funzione permette di testare un avviatore su un motore la cui potenza è molto inferiore a quella dell'avviatore. Permette ad esempio di verificare il cablaggio elettrico di un apparecchiatura.

La funzione viene disattivata automaticamente alla messa fuori tensione dell'avviatore.

Alla successiva messa sotto tensione l'avviatore torna alla sua configurazione iniziale.

b Attivazione della funzione cascata

Questa funzione permette, con un solo avviatore, di avviare e decelerare più motori in cascata.

Per poter sfruttare al meglio le prestazioni del comando in coppia, si consiglia di utilizzare motori con potenza compresa tra 0,5 e 1 volta la potenza dell'avviatore. Lo schema di cablaggio della funzione motore in cascata è illustrato a pagina 62.

Questa funzione non è compatibile con le seguenti funzioni: preriscaldamento motore e collegamento nel triangolo del motore.

b Frequenza rete

Questa funzione permette di scegliere tra:

- la frequenza 50 Hz. La tolleranza di controllo del difetto di frequenza è di $\pm 20\%$.
- la frequenza 60 Hz. La tolleranza di controllo del difetto di frequenza è di $\pm 20\%$.

- il riconoscimento automatico della frequenza della rete da parte dell'avviatore. La tolleranza di controllo del difetto di frequenza è del $\pm 6\%$.


v In caso di alimentazione con gruppo elettrogeno si consiglia di scegliere tra 50 o 60 Hz tenuto conto dell'ampia tolleranza.

b Reset del kWh o del tempo di funzionamento

Azzeramento del valore della potenza in kWh e del tempo di funzionamento. In seguito all'ordine di reset il calcolo dei valori viene nuovamente aggiornato.

b Ripristino delle regolazioni di base

Questa funzione permette di riportare ogni regolazione al suo valore iniziale (pre-regolazione di base dell'avviatore, vedere pagina 74).

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Funzioni di regolazione del 2° motore

L'accesso alle funzioni di regolazione del 2° motore richiede l'assegnazione di un ingresso logico alla funzione seconda serie di parametri motore. Le funzioni e i campi di regolazione sono gli stessi per entrambe le serie di parametri motore.

Le regolazioni sono le seguenti (vedere pagina 75):

- Corrente nominale motore,
- Corrente di limitazione,
- Tempo rampa di accelerazione,
- Coppia iniziale all'avviamento,
- Tempo rampa di decelerazione,
- Soglia di passaggio a ruota libera a fine decelerazione,
- Limitazione della coppia massima.

Funzioni di comunicazione

L'Altistart 48 comprende di base un collegamento seriale multipunto RS 485, con protocollo Modbus. Il collegamento seriale si configura dal menu comunicazione con:

- v l'indirizzo dell'avviatore regolabile da 0 a 31,
- v la velocità di comunicazione a scelta fra: 4800, 9600 o 19200 bit/s,
- v il formato dei dati di comunicazione a scelta tra:
 - 8 bit di dati, parità dispari, 1 bit di stop,
 - 8 bit di dati, parità pari, 1 bit di stop,
 - 8 bit di dati, senza parità, 1 bit di stop,
 - 8 bit di dati, senza parità, 2 bit di stop.
- v il time out regolabile da 1 a 60 s.

Soluzioni di dialogo avanzato PowerSuite

Le soluzioni di dialogo avanzato PowerSuite (vedere pagine 52 e 53) presentano i seguenti vantaggi:

- v Connessione all'Altistart 48 e accesso alle funzioni di regolazione, controllo e comando.
- v Visualizzazione dei messaggi in chiaro e in 5 lingue diverse (Francese, Inglese, Tedesco, Spagnolo e Italiano).
- v Preparazione e memorizzazione delle regolazioni su supporto informatico tipo hard disk.
- v Confronto e stampa delle regolazioni con utility.
- v Telecaricamento delle regolazioni dall'avviatore al PC e dal PC all'avviatore.

Funzioni di controllo dall'applicazione

Le funzioni di controllo forniscono le seguenti informazioni:


- b Cos ϕ da 0,00 a 1,00.
- b Stato termico motore: 100 % corrisponde allo stato termico del motore con assorbimento della corrente nominale regolata precedentemente.
- b Corrente motore: visualizzata in Ampere da 0 a 999 A e in kilo-Ampere da 1000 a 9999 A.
- b Durata di funzionamento corrisponde al numero totale di ore di funzionamento dell'avviatore durante le fasi di riscaldamento, accelerazione, regime permanente, decelerazione, frenatura e regime permanente bypassato. Viene visualizzata in ore da 0 a 999 h e in kilo ore da 1000 a 65536 h.
- b Potenza attiva: visualizzata da 0 a 255 %, ove il 100 % corrisponde alla potenza alla corrente nominale regolata e alla piena tensione.
- b Coppia motore visualizzata da 0 a 255 %, ove il 100 % corrisponde alla coppia nominale.
- b Potenza attiva assorbita visualizzata in kV. Il valore della tensione di rete deve essere configurato. La precisione di questa misura dipenda dall'errore tra la tensione configurata e la tensione reale.
- b Potenza in kWh visualizzata con PowerSuite.
- b Visualizzazione dello stato in corso, visualizza i seguenti stati dell'avviatore:
 - v avviatore senza ordine di marcia e potenza non alimentata,
 - v avviatore senza ordine di marcia e potenza alimentata,
 - v accelerazione, decelerazione in corso,
 - v marcia in regime stabilito,
 - v frenatura in corso,
 - v avviatore in limitazione di corrente,
 - v temporizzazione di avviamento non trascorsa.
- b Ultimo difetto. Visualizza l'ultimo difetto rilevato.
- b Senso di rotazione delle fasi. Visualizza il senso di rotazione diretto o indiretto.
- b Codice di blocco del terminale
 - v permette di proteggere l'accesso ai parametri di regolazione e di configurazione dell'avviatore con un codice di accesso. In tal modo risulteranno visibili solo i parametri di controllo.



Visualizzazione dei comandi e regolazioni con PowerSuite su PC

Configurazione		
Stato avv	Marche	
COG	Cos phi	0,90
LOR	Corrente motore	A 51,0
LTR	Coppia motore	% 100
FRIT	Fusi dopo reset	h 100000
TRM	Stato termico mot.	% 30
LAP	Pot. attiva kW	kW 500
LWH	Pot. attiva kWh	kWh 262
LFT	Ultimo difetto	Misura difetto
TRP	Pril. termomotore	Classe 10
PME	Senso rot. fasi	No protezione

Controllo dei parametri con PowerSuite su PC

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Funzioni (segue)

Avviatori progressivi Avviatori-rallentatori progressivi Altistart 48



Configurazione degli ingressi logici con PowerSuite su PPC

Funzioni degli ingressi logici

L'avviatore possiede 4 ingressi logici di cui:

b 2 ingressi logici (RUN e STOP) riservati agli ordini di marcia/arresto

che possono essere dati sotto forma di contatti manlevati o sotto forma di contatti ad impulsi.

v **Comando 2 #** : la marcia e l'arresto sono comandati da un solo ingresso logico. Lo stato 1 dell'ingresso logico comanda la marcia e lo stato 0 l'arresto.

v **Comando 3 #** : la marcia e l'arresto sono comandati da 2 ingressi logici diversi. L'arresto si ottiene all'apertura (stato 0) dell'ingresso STOP.

L'impulso sull'ingresso RUN è memorizzato fino all'apertura dell'ingresso STOP.

b 2 Ingressi logici (L13 e L14) configurabili con le seguenti funzioni :

v **Arresto ruota libera**: associata ad un ordine di comando di arresto frenato o decelerato, l'attivazione dell'ingresso logico provoca l'arresto del motore a ruota libera.

v **Difetto esterno**: permette all'avviatore di prendere in carico un difetto ulente esterno (livello, pressione, ecc...). Quando il contatto è aperto l'avviatore passa in difetto.

v **Preriscaldamento motore**: permette di proteggere il motore contro il gelo o contro sbalzi di temperatura che possono provocare il formarsi di condensa. Quando l'ingresso logico è attivato una corrente regolabile attraverso il motore al termine di una temporizzazione regolabile da 0 a 999 s. Questa corrente riscalda il motore senza provocarne la rotazione. Questa funzione è incompatibile con le funzioni: collegamento nel triangolo del motore e in cascata.

v **Forzatura in modo di comando locale**: in caso di utilizzo del collegamento seriale questa funzione permette di passare dalla modalità linea (comando tramite collegamento seriale) al modo di comando locale (comando tramite morsetteria).

v **Inibizione di tutte le protezioni**: permette una marcia forzata dell'avviatore nei casi di emergenza senza tenere conto dei principali difetti (rimozione del fumo in emergenza ad esempio).

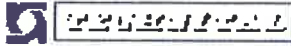
Attenzione: l'impiego di questa funzione implica la perdita della garanzia dell'avviatore.

v **Riarmo difetto termico motore**: permette il riarmo del difetto a distanza.

v **Attivazione della funzione cascata**: in questo caso la protezione termica motore è inibita e il relè R1 è configurato come relè d'isolamento difetto. Permette di avviare e decelerare più motori in successione con un solo avviatore (vedere schema pagine 62 e 63).

v **Riarmo di tutti i difetti**: permette il riarmo dei difetti a distanza.

v **Seconda serie di parametri motore**: permette di selezionare una seconda serie di parametri per avviare e decelerare due motori diversi con un solo avviatore.



Funzioni della uscita logica

L'avviatore possiede 2 uscite logiche (LO1 e LO2) che permettono, in base alla configurazione, di segnalare a distanza i seguenti stati o eventi:

- b Allarme termico motore: informa che lo stato termico del motore ha superato la soglia di allarme e permette di evitare l'avviamento di un motore se la capacità termica è insufficiente.
- b Motore allarmato: informa che nel motore è potenzialmente presente della corrente.
- b Allarme sovracorrente motore: la corrente motore è superiore alla soglia regolata.
- b Allarme sottocorrente motore: la coppia motore è inferiore alla soglia regolata.
- b Allarme sonde termiche PTC motore: informa riguardo al superamento dello stato termico rilevato dalla sonda PTC motore.
- b Seconda serie di parametri motore attivata.

Funzioni dei relè e dell'uscita analogica

L'avviatore possiede 3 relè di cui 2 configurabili.

- b relè di fine avviamento R2 : non configurabile.

Il relè di fine avviamento comanda il contattore di bypass dell'avviatore. È attivato al termine dell'avviamento del motore. Viene disattivato al momento dell'ordine di arresto e in caso di guasto; l'avviatore riprende quindi il comando su richiesta di frenatura o di decelerazione.

- b Funzioni del relè R1

Il relè R1 può essere configurato come:

- v relè di difetto: il relè R1 viene attivato quando l'avviatore è alimentato e non sono presenti guasti. Viene disattivato alla comparsa di un difetto con passaggio del motore a ruota libera.
- v relè d'isolamento: il contatto del relè R1 si chiude con l'ordine di comando Run e si apre con l'ordine di arresto, a fine decelerazione in seguito ad un arresto decelerato o in caso di guasto. Il contattore di linea viene in tal modo disattivato e il motore isolato dalla rete (vedere schéma pagina 59)

- b Funzioni del relè R3

Il relè R3 si configura per segnalare gli stessi stati o eventi delle uscite logiche LO1 o LO2 (vedere sopra).

- b Funzioni dell'uscita analogica in corrente AO

v L'uscita analogica AO dà un'immagine dei seguenti valori:

- corrente motore, coppia motore, stato termico motore, cos ϕ , potenza attiva.

v All'uscita analogica sono associate le regolazioni:

- del tipo di segnale emesso: 0-20 mA o 4-20 mA
- della messa in scala del segnale. Questa funzione associa l'ampiezza massima dell'uscita analogica (20 mA) ad una percentuale del valore nominale del parametro, regolabile tra 50 e 500 %.



Configurazione dell'uscita analogica con PowerSuite su PC

Tabella di compatibilità delle funzioni

Funzioni	Arresto in decelerazione	Arresto in frenatura dinamica	Forzatura arresto ruota libera	Protezione termica	Rilevamento perdita di una fase motore	Collegamento nel triangolo motore	Prova su motore di bassa potenza	Motori in cascata	Preriscaldamento motore
Arresto in decelerazione									
Arresto in frenatura dinamica									
Forzatura arresto ruota libera									
Protezione termica									(2)
Rilevamento perdita di una fase motore						(1)			(1)
Collegamento nel triangolo motore					(1)				
Prova su motore di bassa potenza									
Motori in cascata									
Preriscaldamento motore				(2)	(1)				

 Funzioni compatibili
 Funzioni incompatibili
 Senza oggetto

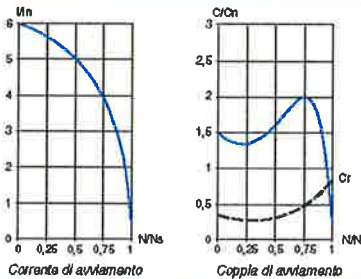
(1) Perdita di una fase motore non rilevata.
 (2) Durante il preriscaldamento motore, la protezione termica non è garantita.



Curve

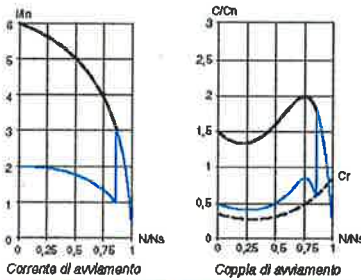
Avviatori progressivi Avviamento convenzionale dei motori asincroni trifase

Avviamento diretto



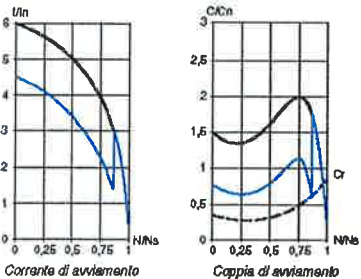
- b Corrente di avviamento: da 4 a 8 volte la corrente nominale.
- b Coppia di avviamento: da 0,5 a 1,5 volte la coppia nominale.
- b Caratteristiche:
 - v motore 3 morsetti, piccola e media potenza,
 - v avviamento a carico,
 - v picchi di corrente e cadute di tensione elevati,
 - v apparecchiatura semplice,
 - v avviamento brusco per la meccanica.
- b Nessuna regolazione dei parametri.

Avviamento "stella-triangolo"



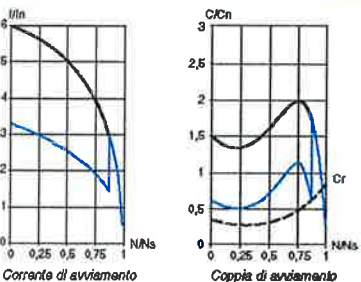
- b Corrente di avviamento: da 1,8 a 2,8 volte la corrente nominale.
- b Coppia di avviamento: 0,5 volte la coppia nominale.
- b Caratteristiche:
 - v motore 6 morsetti,
 - v avviamento a vuoto o con debole coppia resistente,
 - v picchi di corrente e di coppia elevati al passaggio "stella-triangolo",
 - v apparecchiatura che necessita manutenzione,
 - v limiti meccanici all'avviamento.
- b Nessuna regolazione dei parametri.

Avviamento statico a resistenze

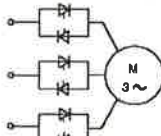


- b Corrente di avviamento: 4,5 volte la corrente nominale.
- b Coppia di avviamento: da 0,5 a 0,75 volte la coppia nominale.
- b Caratteristiche:
 - v motore 3 morsetti, forte potenza,
 - v avviamento a coppia resistente crescente,
 - v picchi di corrente elevati,
 - v apparecchiatura importante e voluminosa che richiede manutenzione,
 - v limiti meccanici all'avviamento.
- b Nessuna regolazione dei parametri.

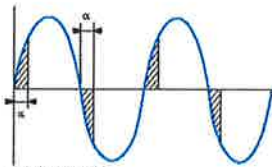
Avviamento mediante autotrasformatore



- b Corrente di avviamento: da 1,7 a 4 volte la corrente nominale.
- b Coppia di avviamento: da 0,4 a 0,85 volte la coppia nominale.
- b Caratteristiche:
 - v motore 3 morsetti, forte potenza,
 - v cadute di tensione e picchi di corrente elevati al momento dell'accoppiamento in piena tensione,
 - v apparecchiatura complessa e voluminosa, che richiede manutenzione,
 - v limiti meccanici all'avviamento.
- b Nessuna regolazione dei parametri.

Avviamento convenzionale elettronico mediante tensione variabile e limitazione di corrente


Schema di principio



Angolo d'innasco

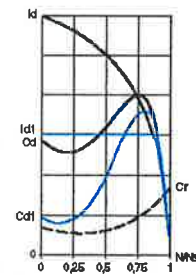


Figura 1

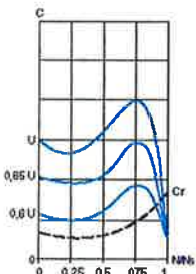


Figura 2

b L'alimentazione del motore asincrono trifase, con aumento progressivo della tensione all'avviamento, si ottiene mediante un gradatore il cui circuito è formato da 6 tiristori, montati in antiparallelo su ogni fase della rete.

v In base all'istante e all'angolo di innasco dei tiristori, viene fornita una tensione che aumenta progressivamente con una frequenza fissa.

v L'aumento progressivo della tensione di uscita può essere controllato dalla rampa di accelerazione, asservito al valore della corrente di limitazione o legato ad entrambi i parametri.

b La figura 1 illustra l'evoluzione della coppia in funzione della corrente di avviamento. La limitazione della corrente di avviamento I_{d1} ad un valore prestabilito I_{d1} , provoca una riduzione della coppia di avviamento C_{d1} praticamente uguale al rapporto del quadrato delle correnti I_{d1} e I_d .

Esempio

Su un motore le cui caratteristiche sono: $C_d = 2 C_n$ per $I_d = 6 I_n$, se limitiamo la corrente a $I_{d1} = 3 I_n$, ovvero $0,5 I_d$, avremo una coppia di avviamento: $C_{d1} = C_d \times (0,5)^2 = 2 C_n \times 0,25 = 0,5 C_n$.

b La figura 2 illustra le caratteristiche coppia/velocità di un motore a gabbia in funzione della tensione di alimentazione. La coppia varia con il quadrato della tensione a frequenza fissa. L'aumento progressivo della tensione elimina il picco di corrente istantaneo alla messa in tensione.

Vantaggi di un avviamento con l'Altistart 48

b Avviamento convenzionale elettronico

Per evitare i problemi legati:

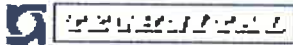
- ai limiti meccanici all'avviamento,
 - ai transistori idraulici all'accelerazione e alla decelerazione nelle applicazioni di pompaggio,
- gli avviamenti convenzionali elettronici utilizzano diverse limitazioni di corrente, o commutazioni di più rampe di tensione.

La regolazione diventa allora complessa e deve essere modificata ad ogni evoluzione del carico.

b Avviamento con l'Altistart 48

Il comando in coppia dell'Altistart 48 permette invece di comandare, con una sola rampa di accelerazione, un avviamento senza limiti meccanici ed un controllo in dolcezza dei transistori idraulici.

Le regolazioni sono semplici ed efficaci qualunque sia il carico.

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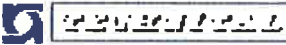
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In ragione dell'evoluzione delle Norme e dei materiali, le caratteristiche riportate nei testi e nelle illustrazioni del presente documento si potranno ritenere impegnative solo dopo conferma da parte di Schneider Electric.

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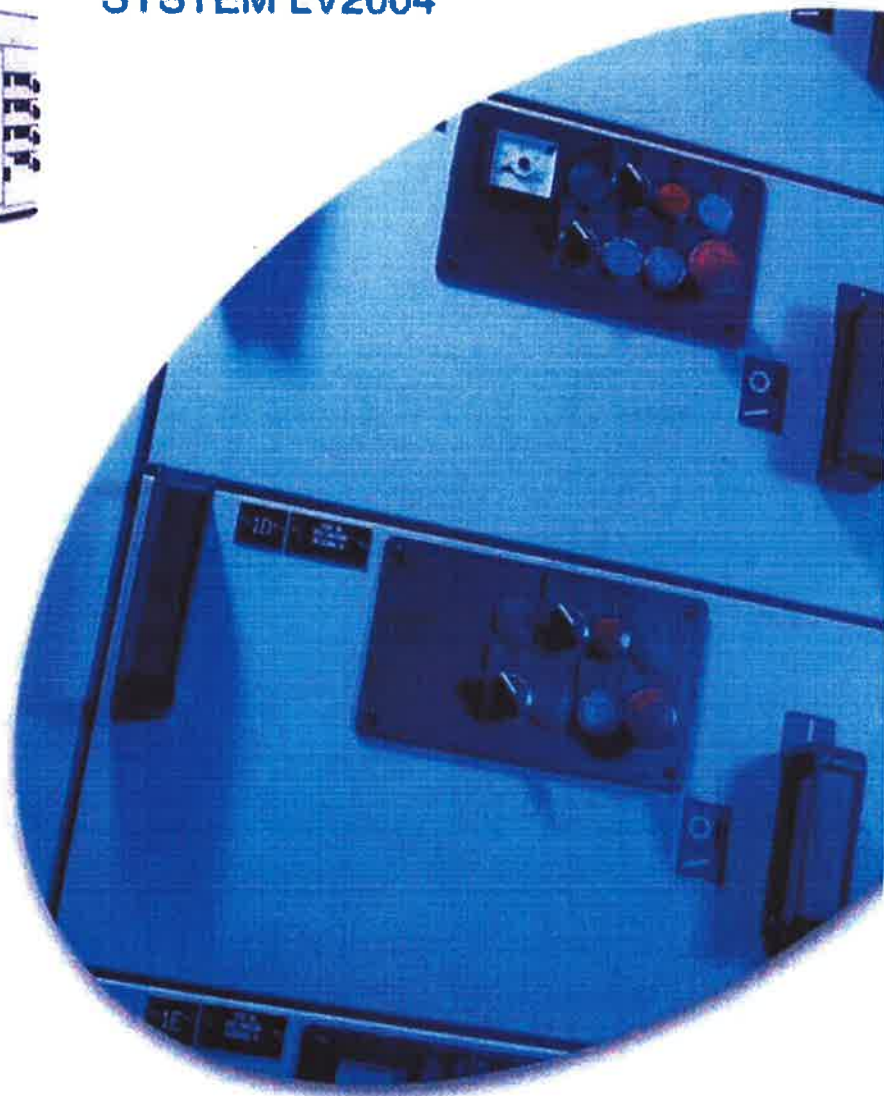
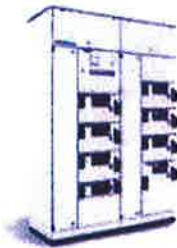
5. MCC




**QUADRI ELETTRICI
E
AUTOMAZIONE**

Catalogo Ediz. Genn. 2003

Motor Control Center SYSTEM LV2004



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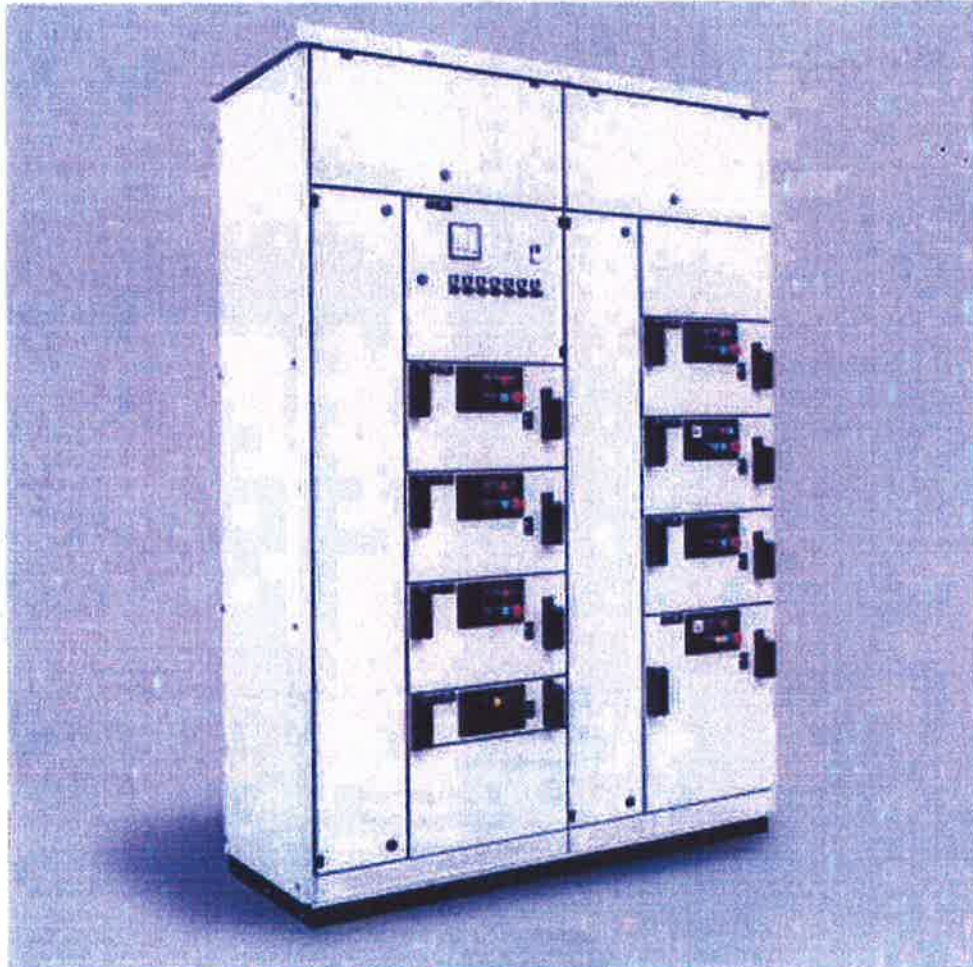
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**SYSTEM LV2004
Motor Control Center**

**Presentazione
Présentation
Presentation**



Presentazioni

I quadri Motor Control Center tipo "SYSTEM" LV 2004 sono un sistema modulare a cassette estraibili destinati al comando, al controllo e alla protezione dei motori in bassa tensione. Grazie alla loro versatilità si adattano facilmente a qualsiasi configurazione di impianto, schema elettrico e luogo d'installazione. La completa accessibilità dal fronte del quadro ne consente l'installazione contro parete o la realizzazione della versione doppio fronte con conseguente ottimizzazione degli spazi. Le operazioni d'inserzione ed estrazione dei cassette estraibili e l'accessibilità al vano cavi in entrata e uscita si possono effettuare dal fronte, senza pericolo di contatto con eventuali parti in tensione.

Présentation

Les tableaux Motor Control Center "SYSTEM" LV 2004 sont un système modulaire à tiroirs débranchables destinés à la commande, au contrôle et à la protection des moteurs en basse tension. Grâce à leur grande souplesse, ils s'adaptent facilement à toutes les configurations d'installation, schéma électrique et lieux d'installation. L'accessibilité complète par l'avant du tableau permet de les installer contre un mur ou de réaliser la version double face, ce qui permet d'optimiser les espaces. Toutes les opérations d'embrochage/débrochage des tiroirs, et l'accessibilité à la zone raccordement câbles en entrée et en sortie peuvent être effectuées par l'avant sans risque de contact avec parties sous tension.

Presentation

SYSTEM MCC type LV 2004 is a modular system of withdrawable units for the supply, control and protection of low voltage motors. Thanks to their versatility they can easily be adapted to suit any plant configuration, electrical diagram, and installation site. The fact that the switchboard is completely accessible from the front means that it can be installed against a wall or back to back with consequent space-saving. All the operations involving insertion and removal of the withdrawable unit as well as those of accessing the supply and outlet cable cupboards can be done from the front without any danger of coming into contact with any live parts.



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Utilizzazione

Grazie alla loro concezione modulare semplice e robusta, trovano impiego in impianti per centrali, impianti industriali, impianti di bordo e ovunque siano richieste:

- sicurezza del personale;
- flessibilità e continuità di servizio;
- affidabilità;
- rapidità nelle operazioni di utilizzo e manutenzione;
- facilità d'installazione e collegamento;
- necessità di ampliamenti e modifiche.

Norme

Il quadro SYSTEM LV2004 è stato progettato e costruito in conformità alle norme nazionali e internazionali;

- CEI EN 60439-1: apparecchiature assemblate di protezione e di manovra per basse tensioni (quadri BT);
- e l'equivalente norma internazionale IEC 60439-1.

Prove

Prove di tipo

I quadri SYSTEM LV2004 sono stati sottoposti alle prove di tipo previste dalle norme.

Su richiesta è disponibile la relativa documentazione, rilasciata da laboratori nazionali e internazionali.

Prove individuali

Tutti i quadri vengono sottoposti alle prove individuali previste dalle norme, quali:

- controllo dell'apparecchiatura, compreso il controllo del cablaggio e, se necessario, una prova di funzionamento elettrico;
- prova dielettrica;
- verifica dei mezzi di protezione e della continuità elettrica del circuito di protezione;
- verifica della resistenza d'isolamento.

Utilisation

Grâce à leur conception modulaire simple et robuste, ils peuvent être employés dans des centrales, des installations industrielles, des installations à bord de bâtiment et partout où il est nécessaire d'avoir :

- sécurité du personnel;
- flexibilité et continuité de service;
- fiabilité;
- rapidité dans les opérations d'utilisation et d'entretien;
- facilité d'installation et de raccordement;
- nécessité d'extension et des modifications.

Normes

Le tableau SYSTEM LV2004 a été conçu et construit conformément aux principales normes nationales et internationales :

- EN 60439-1: ensembles d'appareillage à basse tension;
- et équivalent norme international IEC 60439-1.

Essais

Essais de type

Les tableaux SYSTEM LV2004 ont été soumis aux essais de type prévus par les normes. La documentation de laboratoires, nationaux et internationaux, est disponible sur demande.

Essais individuels

Tous les tableaux sont soumis aux essais individuels prévus par les normes :

- contrôle de l'appareillage, y compris le contrôle du câblage et, si nécessaire, un essai de fonctionnement électrique;
- essais diélectriques;
- vérification des moyens de protection et de la continuité électrique des circuits de protection;
- vérification de la résistance d'isolement.

Use

Thanks to their simple and robust modular structure these switchboards can be used in power production plants, industrial plants, on board installations and anywhere else they are required:

- personnel safety;
- flexibility and continuity of service;
- reliability;
- rapidity of use and maintenance;
- easy installation and connections;
- possibility of extensions and modifications.

Standards

SYSTEM LV2004 switchboard has been designed and built respecting the main international and national standards;

- EN 60439-1: low-voltage switchgear and controlgear assemblies;
- and the equivalent international standard IEC 60439-1.

Tests

Type Tests

SYSTEM LV2004 switchboards are subjected to the type tests foreseen in the standards. On request the documentation from national and international laboratories is available.

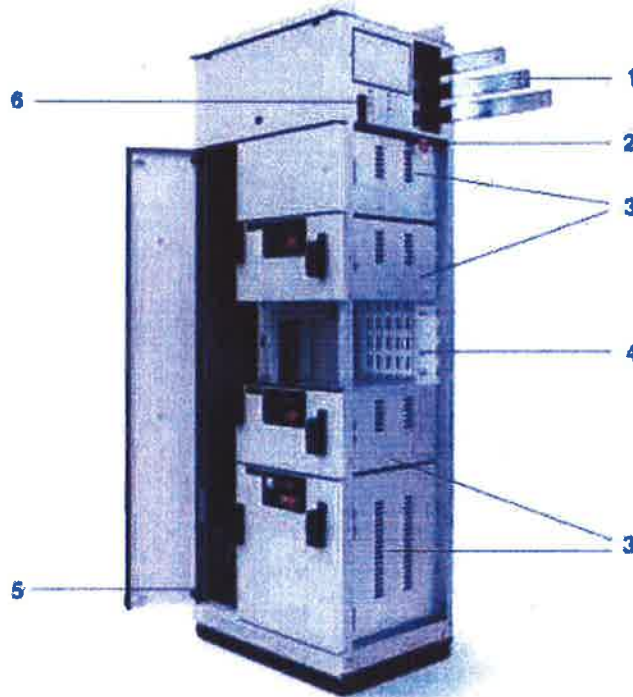
Routine tests

All the switchboard are subjected to the routine tests foreseen in the standard:

- inspection of the assembly, including inspection of wiring and, if necessary, electrical operation test;
- dielectric test;
- checking of protective measures and of the electrical continuity of the protective circuits;
- checking of insulation resistance.

SYSTEM LV2004 Motor Control Center

Composizione di uno scomparto Composition d'une colonne Structure of a section



- 1 Sistema sbarre principali
- 2 Conduttore di protezione
- 3 Cassetti estraibili
- 4 Sistema sbarre ausiliarie
- 5 Cella connessioni cavi di potenza e ausiliari
- 6 Cella collegamenti interpartimenti circuiti ausiliari

- 1 Jeu de barres principal
- 2 Conducteur de protection
- 3 Tirrois débranchables
- 4 Jeu de barres auxiliaires
- 5 Compartiment raccordement câbles de puissance et auxiliaires
- 6 Compartiment raccordement circuit auxiliaires entre colonnes

- 1 Main busbar
- 2 Protective conductor
- 3 Withdrawable units
- 4 Distribution busbar
- 5 Connection space for power and auxiliary cables
- 6 Compartment for connection between sections for auxiliary circuit

Composizione di uno scomparto

Uno scomparto SYSTEM LV2004 è costituito da elementi standardizzati la cui tecnica di assemblaggio consente di effettuare eventuali operazioni di modifica e/o adattamento in completa sicurezza, senza regolazioni e attrezzature particolari. La struttura è caratterizzata da 3 zone funzionali:

- zona sistema sbarre principale e distribuzione;
- zona apparecchiature;
- zona connessioni.

Queste 3 zone sono racchiuse in un involucro metallico che realizza il grado di protezione contro i contatti con parti attive e la penetrazione di corpi estranei liquidi e solidi (CEI EN60529).

La concezione modulare del quadro consente:

- semplicità nella definizione tecnica del quadro;
- standardizzazione elevata dei componenti;
- intercambiabilità immediata dei cassetti estraibili di medesima grandezza;
- modifica della configurazione dei cassetti negli scomparti con semplice spostamento delle parti fisse dei cassetti;
- rapidità e affidabilità nelle operazioni di sostituzione e/o modifica dei componenti

Composition d'une colonne

Une colonne SYSTEM LV2004 est constituée d'éléments standardisés dont la technique d'assemblage permet si nécessaire d'effectuer des modifications et/ou des adaptations en toute sécurité sans réglages ni outils particuliers. Le chassis du tableau est caractérisé par 3 zones fonctionnelles :

- zone jeu de barres principal et distribution;
- zone appareillage;
- zone raccordement.

Ces 3 zones sont contenues dans une enveloppe métallique qui réalise la protection contre les contacts avec des parties actives et la pénétration de corps étrangers liquides et solides (EN 60529).

La conception modulaire du tableau permet :

- simplicité de définition technique du tableau;
- une standardisation élevée des composants;
- l'interchangeabilité immédiate des tiroirs débranchables de même grandeur;
- la modification de la configuration des tiroirs dans les colonnes par simple déplacement des parties fixes des tiroirs;
- rapidité et fiabilité dans les opérations de remplacement et/ou modification des composants.

Structure of a section

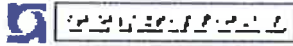
SYSTEM LV2004 section consists of standardised elements whose mode of installation enables operations of modification and/or adaptation to be performed in complete safety, without particular settings or tools. The supporting structure has three functional spaces:

- main busbar and distribution busbar space;
- switchgear space;
- connections space.

These three spaces are enclosed in a metallic casing, whose walls provide protection against contact with live parts and the penetration of liquid and solid foreign bodies (EN 60529).

The modular design of the switchboard guarantees:

- simplicity in the technical definition of the switchboard;
- a high standardisation of basic component;
- the immediate interchangeability of withdrawable units of the same size;
- the modification of the layout of the withdrawable unit in the section simply by moving the fixed parts of the drawers;
- rapidity and reliability when changing or modifying the components.



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SYSTEM LV2004
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Caratteristiche generali
Caractéristiques générales
Main characteristics

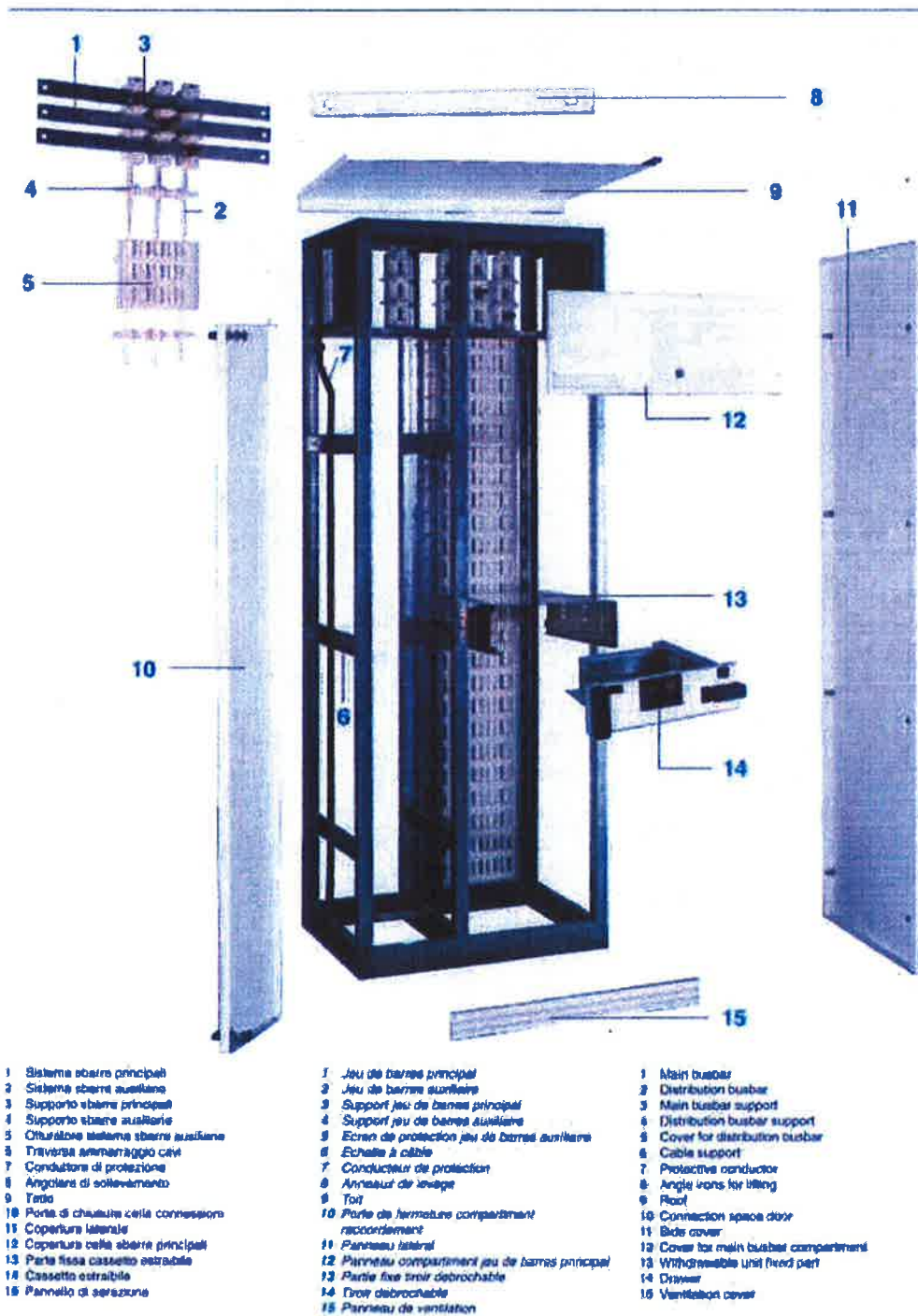
SYSTEM LV2004

Caratteristiche elettriche / Caractéristiques électriques / Electrical characteristics		
Tensione nominale d'isolamento (Ui) Tension assignée d'isolement (Ui) Rated insulation voltage (Ui)		1000 V
Tensione nominale di impiego (Ue) Tension assignée d'emploi (Ue) Rated operational voltage (Ue)		800 V
Frequenza nominale / Fréquence assignée / Rated Frequency		50/60 Hz
Corrente nominale (In) (1) Courant assignée (In) (1) Rated current (In) (1)	sbare principali barres principales main busbars	≤ 2000 A
	sbare distribuzione barres de distribution distribution busbars	630 A
Corrente nominale di breve durata per 1 sec. (Icw) Courant assignée de courte durée pour 1 sec. (Icw) Rated short-time current for 1 sec. (Icw)		50/70 kA
Corrente nominale di picco (Ipk) Courant assignée de crête (Ipk) Rated peak withstand current (Ipk)		105/154 kA
Grado di protezione (secondo EN 60529) Degré de protection (selon EN 60529) Degree of protection (according to EN 60529)	Involucro esterno enveloppe extérieure external enclosure a portella aperta porte ouverte with open door	standard IP31 (su richiesta fino IP54) standard IP31 (sur demande jusqu'à IP54) standard IP31 (on request up to IP54) IP2X
Condizioni normali di servizio Conditions normales d'emploi Normal service conditions	installazione / installation ambienti / environnement / ambient temperatura ambiente température de l'air ambiant ambient air temperature umidità relativa humidité relative relative humidity altitudine altitude altitude grado di inquinamento degré de pollution pollution degree	all'interno / à l'intérieur / indoors normale / normal / normal min -5°C; max 40°C (media 24 ore - 35°C) min -5°C; max 40°C (moyenne 24 heures - 35°C) min -5°C; max 40°C (period of 24 hours - 35°C) max 50% a 40°C ≤ 2000 m ≤ 3
Numero moduli massimo per scomparto Nombre maximum de modules par colonne Maximum number of modules for section		12
Grandezze cassette estraibili Modules tiroirs débranchables Size of withdrawable unit		1/2-1-2-3-4
Corrente nominale pinze cassette Courant assignée pinces tiroirs Rated current clamps on withdrawable unit		≤ 400 A
Corrente nominale connettori contatti ausiliari Courant assignée connecteurs contacts auxiliaires Rated current of auxiliary connector on withdrawable unit		10 A
Colore standard involucro esterno Couleur standard enveloppe extérieure Standard colour of external enclosure		RAL 9002
Accessibilità / accessibilité / Access		dal fronte / par l'avant / from the front
Installazione Installation Installation		contro parete o doppio fronte contre un mur ou dos à dos against a wall or back to back
Entrate e uscite cavi Entrée et sortie des câbles Entry and exit of cables		dall'alto o dal basso par le haut ou par le bas from top or bottom
Dimensioni scomparto	larghezza / largeur / width	800 mm
Dimensioni colonne	altezza / hauteur / height	2385 mm
Dimensioni di una sezione	profondità / profondeur / depth	830 mm
Protezione dalle paratie arco interno (IEC 61641) Protection paratiees arc interne (IEC 61641) Protection paratiees against internal arc (IEC 61641)		su richiesta sur demande on request

(1) Per valori superiori, consultare
(1) Pour des valeurs supérieures, nous consulter
(1) For higher values, contact us

SYSTEM LV2004
Motor Control Center

Caratteristiche costruttive
Caractéristiques constructives
Constructional characteristics



- 1 Sistema sbarre principali
- 2 Sistema sbarre ausiliarie
- 3 Supporto sbarre principali
- 4 Supporto sbarre ausiliarie
- 5 Chiusura sistema sbarre ausiliarie
- 6 Traversa smontaggio cavi
- 7 Conduttori di protezione
- 8 Angolare di sollevamento
- 9 Tetto
- 10 Porta di chiusura della connessione
- 11 Copertura laterale
- 12 Copertura celle sbarre principali
- 13 Parte fissa cassetto estraibile
- 14 Cassetto estraibile
- 15 Pannello di sezionamento

- 1 Jeu de barres principal
- 2 Jeu de barres auxiliaires
- 3 Support jeu de barres principal
- 4 Support jeu de barres auxiliaires
- 5 Ecran de protection jeu de barres auxiliaires
- 6 Echelle à câbles
- 7 Conducteurs de protection
- 8 Anneaux de levage
- 9 Toit
- 10 Porte de fermeture compartiment raccordement
- 11 Panneau latéral
- 12 Panneau compartiment jeu de barres principal
- 13 Partie fixe tiroir débranchable
- 14 Tiroir débranchable
- 15 Panneau de ventilation

- 1 Main busbar
- 2 Distribution busbar
- 3 Main busbar support
- 4 Distribution busbar support
- 5 Cover for distribution busbar
- 6 Cable support
- 7 Protective conductor
- 8 Angle iron for lifting
- 9 Roof
- 10 Connection space door
- 11 Side cover
- 12 Cover for main busbar compartment
- 13 Withdrawable unit fixed part
- 14 Drawer
- 15 Ventilation cover



Caratteristiche costruttive

Il quadro SYSTEM LV2004 è costituito da uno o più scomparti affiancati per montaggio a semplice o a doppio fronte.

Struttura di sostegno

La struttura di sostegno è autoportante, realizzata in lamiera aluzinc di spessore minimo 2 mm, assemblata a mezzo rivetti e bulloni, opportunamente forata con passo modulare. È costituita da una struttura monoblocco suddivisa in 3 zone principali:

- zona sistema sbarre, riservata alle sbarre di distribuzione principale e di derivazione;
- zona apparecchiatura, riservata alle unità funzionali partenze motori o linea, contenute in cassetti estraibili o in celle fisse per unità funzionali di arrivo, misura, servizi ausiliari ecc.;
- zone connessioni, riservata ai cavi di potenza, alle connessioni ausiliarie e relativi accessori.

Involucro

La struttura di sostegno dello scomparto viene completata, per quanto riguarda l'involucro esterno, col montaggio di porte, coperture, piastre ecc., e, all'interno, con eventuali diaframmi o barriere, utilizzando lamiera di spessore 1,5 mm, in particolare:

- sul fronte, tramite porte e/o coperture;
- sulle fiancate laterali, tramite coperture asportabili montate alle estremità del quadro;
- sul retro, tramite coperture fissate a mezzo viti o rivetti;
- sulla parte inferiore e superiore, tramite piastre di chiusura per l'ingresso e l'uscita cavi;
- tra gli scomparti, tramite pannelli divisorii.

Protezione delle superfici

La struttura di sostegno, gli eventuali diaframmi o barriere interne e i cassetti estraibili sono realizzati in lamiera aluzinc, mentre le coperture dell'involucro esterno sono in lamiera verniciata con polvere tipo epossipolistere termoidurente spessore minimo 50 micron, essiccata in forno a 180°C.

Caractéristiques constructives

Le tableau SYSTEM LV2004 est constitué d'une ou de plusieurs colonnes disposées l'une à côté de l'autre pour montage simple ou dos à dos.

Chassis

Le chassis est autoportant, réalisé en tôle aluzinc d'une épaisseur de 2 mm, assemblé au moyen de rivets et de boulons, percé à pas modulaire. Il est constitué d'une structure monobloc, divisée en 3 zones principales :

- zone jeu de barres, réservée à la jeu des barres principale et de distribution;
- zone appareillage, réservée aux unités fonctionnelles départs moteurs ou ligne contenues dans des tiroirs débrochables ou dans des compartiments fixes pour unités fonctionnelles d'arrivée, de mesure, de services auxiliaires etc.;
- zones raccordement, réservée aux câbles de puissance, aux borniers auxiliaires et aux accessoires correspondants.

Enveloppe

En ce qui concerne l'enveloppe extérieure, le chassis de la colonne est complété par des portes, des panneaux, des plaques etc. et à l'intérieur éventuellement par des cloisons ou des barrières en tôle de 1,5 mm d'épaisseur, en particulier :

- à l'avant, par des portes et/ou des panneaux;
- sur les côtés, par des panneaux amovibles montés aux extrémités du tableau;
- à l'arrière, par un panneau fixé au moyen de vis ou de rivets;
- sur la partie inférieure et supérieure, par des plaques de fermeture pour l'entrée et la sortie des câbles;
- entre les colonnes, par des panneaux de division.

Protection des surfaces

Le chassis, les éventuelles cloisons ou barrières et les tiroirs débrochables sont réalisés en tôle aluzinc, alors que les couvertures de l'enveloppe extérieure sont en tôle peinte à la poudre type époxy-polyester d'une épaisseur minimum de 50 microns, séchée au four à 180°C.

Constructional characteristics

SYSTEM LV2004 switchboard consists of several sections placed one next to the other for mounting free-standing or back to back.

Supporting structure

The self-supporting structure made of aluzinc sheet steel with a minimum thickness of 2 mm, is assembled using rivets and bolts for which holes of a standard size have already been drilled. It consists of a mono-block structure divided into three main spaces:

- busbar space, reserved for the main busbar and distribution busbars;
- switchgear space, reserved for functional units for motor or line, contained outlets in withdrawable unit or fixed compartment, for power supply, measuring equipment or auxiliary services etc.;
- connections space reserved for power supply cables, auxiliary connections and corresponding accessories.

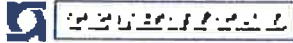
Enclosure

The external surface of supporting structure of the section is supplied with doors, covers and plates etc. and, inside with partitions and barriers where necessary. These are made of sheet steel which is 1.5 mm thick. The main ones are:

- on the front, by doors and/or covers;
- on the sides, by removable cover mounted at the edges of the switchboard;
- at the back, by a cover which is fixed by rivets or screws;
- on the top and bottom, by cover plates which can be opened to permit the entry and exit of cables;
- between the sections, by dividing panels.

Protection of surfaces

The supporting structure and any partitions or barriers as well as the drawers are made of aluzinc steel plate, while all the covers of the external enclosure are made of steel plate coated with epoxypolyester type thermosetting powder with a minimum thickness of 50 microns, dried in an oven at 180°C.



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Zona sistema sbarre Zone jeu de barres Busbar space

Sistema sbarre principale

Il sistema sbarre principale è situato nella parte superiore dello scomparto, disposto orizzontalmente in una cella segregata e ha il compito di distribuire la corrente ai diversi scomparti che compongono il quadro. È accessibile dal fronte tramite portella ed è protetto all'interno contro i contatti accidentali da una barriera in materiale isolante trasparente.

È costituito da una o più sbarre di rame in parallelo, fissate alla struttura di sostegno tramite appositi supporti isolanti, opportunamente dimensionato per sopportare la corrente nominale e le sollecitazioni termiche e dinamiche derivate dalla corrente di corto circuito. Il collegamento del sistema sbarre principale tra scomparti adiacenti è diretto, senza l'ausilio di particolari punti di interconnessione.

Sistema sbarre di distribuzione

Il sistema sbarre di distribuzione è situato nella parte posteriore dello scomparto, disposto verticalmente in una cella segregata, derivato dal sistema sbarre principale e ha il compito di distribuire la corrente alle varie unità funzionali di uscita. È costituito da sbarre in londina di rame (diametro 22 mm), fissate alla struttura di sostegno tramite appositi supporti isolanti, opportunamente dimensionato per sopportare la corrente nominale e le sollecitazioni termiche e dinamiche derivate dalla corrente di corto circuito. Il profilo delle sbarre è appositamente studiato per consentire l'inserimento diretto delle pinze dei cassetti estraibili. Uno schermo di protezione, disposto su tutta l'altezza del sistema sbarre, garantisce un grado di protezione IP20 contro i contatti diretti a cassetto asportato o porta aperta.

Conduttore di protezione

La continuità elettrica delle masse metalliche è realizzata mediante un conduttore di protezione costituito da una sbarra di rame di sezione 250 mm² (500 mm² su richiesta), imbullonata alla struttura di sostegno e comprendente:

- un conduttore orizzontale, situato nella zona superiore dello scomparto, destinato alla interconnessione e messa a terra delle masse metalliche dei diversi scomparti che compongono il quadro;

- un conduttore verticale, situato nella zona connessione, opportunamente forato per consentire il collegamento degli schermi metallici o conduttori di terra dei cavi di potenza.

A questo conduttore sono collegate anche le connessioni di messa a terra delle differenti apparecchiature e degli ausiliari installati nel quadro.

Jeu de barres principal

Le jeu de barres principal est situé dans la partie supérieure de la colonne, disposé horizontalement dans un compartiment isolé. Il sert à distribuer la courant aux différentes colonnes qui constituent le tableau. Il est accessible par l'avant grâce à une porte et à l'intérieur il est protégé par une cloison en matière isolante transparente contre les contacts accidentels.

Il est constitué d'une ou plusieurs barres en parallèle en cuivre fixées à la chassis par des supports isolants, conçus pour supporter la courant assignée et les contraintes thermiques et dynamiques dérivant du courant de court circuit. La liaison du jeu de barres entre les colonnes est direct sans joints d'interconnexion.

Jeu de barres de distribution

Le jeu de barres de distribution est situé dans la partie arrière de la colonne, disposé verticalement dans un compartiment isolé; dérivé du jeu de barres principal, il sert à distribuer la courant aux différentes unités fonctionnelles de départ. Il est constitué de barres rondes en cuivre diamètre 22 mm fixées au chassis par des supports isolants, adaptés, conçus pour supporter la courant assignée et les contraintes thermiques et dynamiques dérivant du courant de court circuit.

Le profil des barres est étudié spécialement pour permettre l'insertion directe des pinces des tiroirs débrochables. Un écran de protection, disposé sur toute la hauteur du jeu de barres, garantit un degré de protection IP20 contre les contacts directs quand le tiroir est enlevé ou quand la porte est ouverte.

Conducteur de protection

La continuité électrique des masses métalliques est réalisée au moyen d'un conducteur de protection constitué d'une barre ayant une section de cuivre de 250 mm² (500 mm² sur demande) boulonnée à la chassis et comprenant:

- un conducteur horizontal, situé dans la partie supérieure de la colonne, destiné à l'interconnexion et mise à la terre des masses métalliques des différentes colonnes qui composent le tableau;

- un conducteur vertical, situé dans la zone raccordement, percé de façon appropriée pour permettre le raccordement des écrans métalliques ou des conducteurs de protection des câbles de puissance.

Les connexions de mise à la terre des différents appareillages et des auxiliaires installés dans le tableau sont également branchés à ce conducteur.

Main busbars

The main busbar is situated in the upper part of the section lying horizontally in an insulated compartment. It has the function of distributing the current to the different sections of the switchboard. It can be accessed from the front through a door cover. Inside, it is protected against accidental contacts by a barrier made of transparent insulation material.

It consists of one or more parallel copper bars attached to the supporting structure by insulated supports and it is suitably designed so as to withstand the rated current and the thermal and dynamic stresses caused by a short circuit current. Busbar connections between adjacent sections are direct and do not require connecting devices.

Distribution busbars

The distribution busbar is situated in the rear part of the section, lying vertically in an insulated compartment; derived from the main busbar this has the task of distributing the current to the various outgoing units. It consists of copper bars with a diameter of 22 mm, fixed to the support structure by insulated supports and suitably designed to withstand the rated current and the thermal and dynamic stresses caused by a short circuit current. The bars have been specially designed to enable the pins of the drawers to be inserted. A protective shield which covers the entire height of the bar system, guarantees a level of protection IP20 against direct contacts when the drawer has been removed or when the door is open.

Protective conductor

Electrical continuity in the metal masses is achieved by means of a protective conductor consisting of a copper bar with a cross-section of 250 mm² (500 mm² on request) bolted to the supporting structure and including:

- a horizontal conductor situated in the upper part of the section, destined for interconnections and earthing of the metal masses of the various sections which make up the switchboard;

- a vertical conductor, situated in the connection space, which has been pierced to allow it to be connected to the metallic shielding or earth conductor of the power cables. The earth connections of the various pieces of equipment and auxiliary devices installed in the switchboard are also connected to this conductor.



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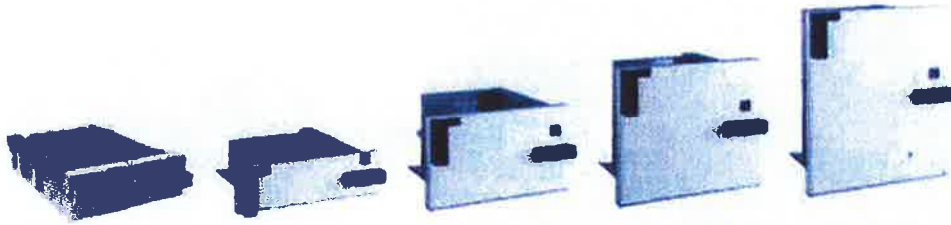
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Zona apparecchiature Zone appareillages Switchgear space



La zona apparecchiature costituisce la parte principale dello scomparto. In essa sono contenute tutte le apparecchiature di potenza, ausiliarie, di misura e protezione del quadro raggruppate opportunamente in unità funzionali estraibili o fisse. L'altezza utile è suddivisa in 12 moduli e ogni unità funzionale può occupare un numero di moduli intero da 1 a 4 per le unità in cassetto estraibile, da 1 a 12 per le unità in cella fissa.

Unità funzionali fisse

Le unità funzionali in cella fissa sono generalmente destinate a contenere:

- l'interruttore o il sezionatore generale del quadro;
- la unità di uscita con corrente nominale maggiore di 400 A;
- eventuali apparecchiature ausiliarie, di misura e protezione;
- apparecchiature elettroniche di regolazione velocità motori.

Unità funzionali estraibili (cassetto estraibile)

I cassettei estraibili sono unità funzionali indipendenti che possono essere facilmente inserite o asportate dagli scomparti. Sono intercambiabili tra loro a parità di grandezza (n° moduli) e configurazione di schema elettrico, disponibili in 5 grandezze (1/2-1-2-3-4 moduli) e utilizzabili per una corrente nominale fino a 400 A.

La zona appareillages constitue la partie principale de la colonne. On y trouve tous les appareillages de puissance, auxiliaires, de mesure et de protection du tableau regroupés de façon appropriée en unités fonctionnelles débrochantes ou fixes. La hauteur utile est divisée en 12 modules et chaque unité fonctionnelle peut occuper un nombre entier de modules de 1 à 4 pour les unités en tiroir débrochant, de 1 à 12 pour les unités en compartiments fixes.

Unités fonctionnelles fixes

Les unités fonctionnelles en compartiments fixes servent généralement à contenir:

- le disjoncteur ou l'interrupteur général du tableau;
- les unités fonctionnelles de sortie avec courant assigné supérieur à 400 A;
- éventuels appareillages auxiliaires de mesure et de protection;
- les appareillages électroniques de réglage de la vitesse des moteurs.

Unités fonctionnelles débrochantes (tiroir débrochant)

Les tiroirs débrochantes sont des unités fonctionnelles indépendantes qui peuvent facilement être raccordées ou retirées de la colonne. Ils sont parfaitement interchangeables entre eux si le nombre des modules et la configuration du schéma électrique sont identiques. Ils sont disponibles en 5 grandeurs (1/2-1-2-3-4 modules) et utilisables pour un courant nominal jusqu'à 400 A.

The switchgear space is the main part of the section. It contains all the power supply, measuring, protection and auxiliary equipment of the switchboard grouped into withdrawable unit or fixed compartment units.

The working height is divided into 12 modules and each functional unit can consist of a number of modules ranging from 1 to 4 for the withdrawable units and 1 to 12 for the fixed compartment units.

Fixed functional units

The functional units in fixed compartments generally contain:

- the general circuit breaker or switch of the switchboard;
- the outgoing units with rated current more than 400 A;
- eventual auxiliary, measure and protection equipment;
- electronic equipment of motor speed regulation.

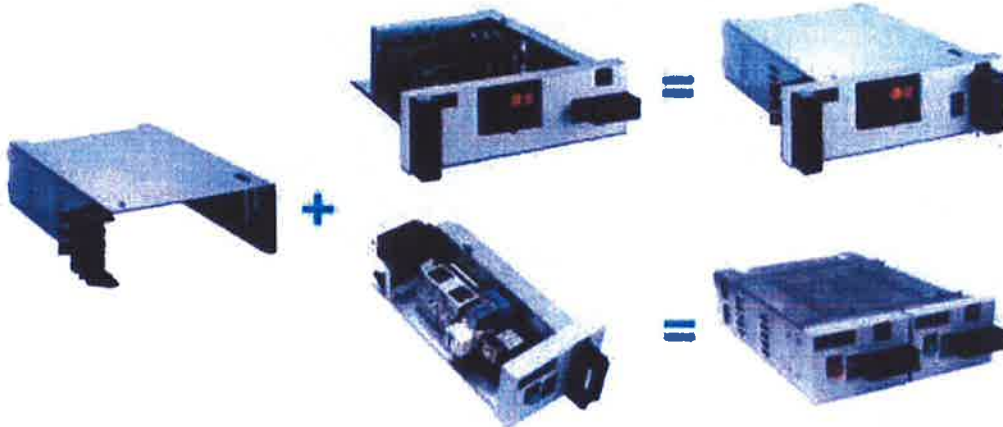
Withdrawable functional units

The withdrawable units are independent functional units which can easily be inserted and removed. They are perfectly interchangeable if they are of the same size (number of modules) and have the same electrical diagram. They are available in five sizes (1/2-1-2-3-4 modules) and can be used for a rated current of up to 400 A.



SYSTEM LV2004 Motor Control Center

Cassetti estraibili Tiroirs débrochables Withdrawable units



Composizione cassetto estraibile

Ogni cassetto estraibile è costituito da:

- una parte fissa, fissata tramite bulloni alla struttura di sostegno, facilmente asportabile e posizionabile in qualsiasi punto della zona apparecchiatura, atta a contenere:
 - ↳ la parte mobile del cassetto estraibile,
 - ↳ la parte fissa del blocco morsetti in uscita dei circuiti di potenza e ausiliari,
- una parte mobile, atta a contenere:
 - ↳ il blocco pinces di alimentazione,
 - ↳ la parte mobile del blocco morsetti in uscita dei circuiti di potenza e ausiliari,
 - ↳ la apparecchiatura di comando, controllo, protezione e misura,
 - ↳ i meccanismi di manovra,
 - ↳ i dispositivi di blocco.

Dispositivi di blocco e sicurezza

Il cassetto estraibile è corredato dei seguenti dispositivi:

- blocco di sicurezza che impedisce l'estrazione e l'inserimento del cassetto con l'interruttore o il sezionatore in posizione di chiuso (maniglia di manovra in posizione "1");
- blocco a lucchetti (max 3) della maniglia di manovra,
- blocco di posizione "sezionato", che impedisce l'asportazione del cassetto dallo scomparto;
- eventuali finecorsa con funzione di prearresto, inserimento circuiti ausiliari, segnalazione cassetto inserito o sezionato/asportato.

Composition du tiroir débrochable

Chaque tiroir débrochable est constitué:

- d'une partie fixe, fixée au moyen de boulons à la chassis, facilement démontable et pouvant être placée n'importe où dans la zone appareillages, contenant:
 - ↳ la partie mobile du tiroir débrochable,
 - ↳ la partie fixe du bloc des circuits de puissance et auxiliaires,
- d'une partie mobile, contenant:
 - ↳ le bloc pinces d'alimentation,
 - ↳ la partie mobile du bloc de sortie des circuits de puissance et auxiliaires,
 - ↳ les appareillages de commande, contrôle, protection et mesure,
 - ↳ les mécanismes de manœuvre,
 - ↳ les dispositifs de verrouillage.

Dispositifs de verrouillage et de sécurité

Le tiroir débrochable est équipé des dispositifs suivants:

- verrouillage de sécurité qui empêche l'extraction et l'insertion du tiroir sous tension avec le disjoncteur ou l'interrupteur en position fermée (poignée de manœuvre en position "1");
- verrouillage par cadenas (3 max) de la poignée de manœuvre;
- verrouillage position "sezionnée" qui empêche de retirer le tiroir de la colonne;
- butées de fin de course éventuelles avec fonction de pré-déclenchement, insertion circuits auxiliaires, signalisation tiroir raccordé ou sectionné/raté.

Composition withdrawable unit

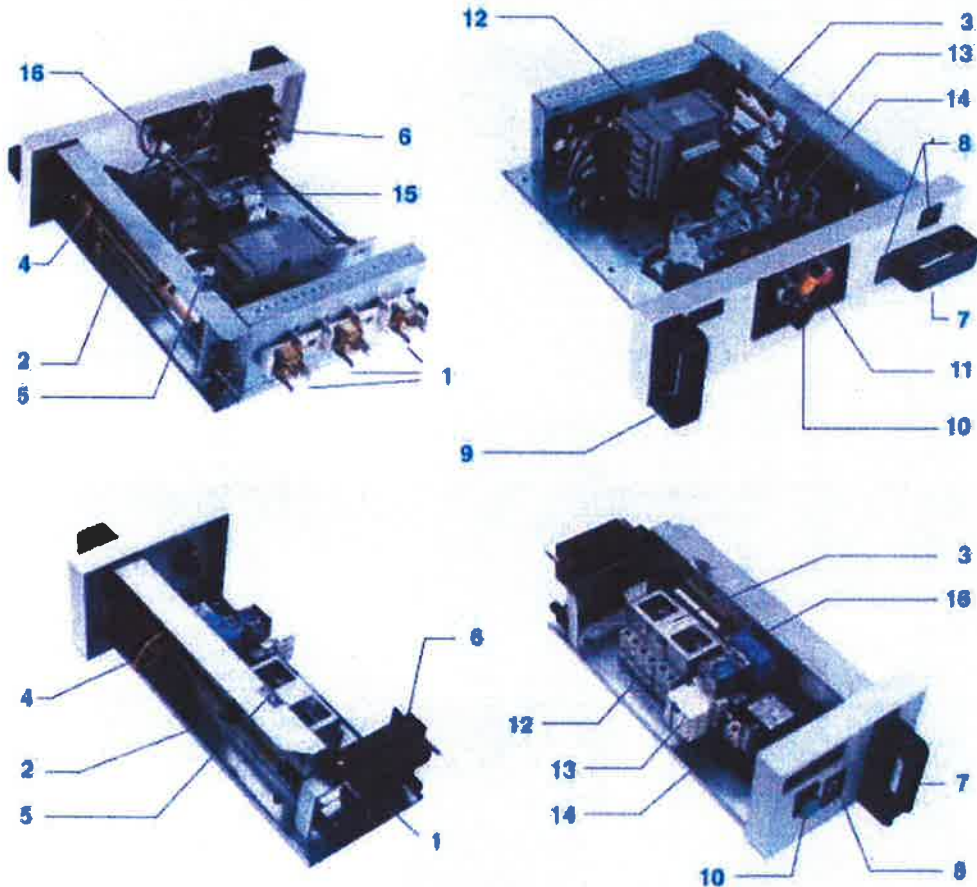
Each withdrawable unit consists of:

- a fixed part, bolted to the supporting structure, which is easy to transport and can be placed in any part of the switchgear zone. This is designed to contain;
 - ↳ the mobile part of the drawer,
 - ↳ the fixed part of the outlet pier block of the power and auxiliary circuits,
- a moving part containing:
 - ↳ the power supply pier block,
 - ↳ the mobile part of the outlet pier block of the power and auxiliary circuits,
 - ↳ the command, control, protection and measurement equipment,
 - ↳ locking devices.

Safety and locking devices

The drawer is equipped with the following devices:

- a safety locking device which prevents the insertion or removal of the drawer when the circuit breaker or isolating switch is closed (manoeuvre handle in position 1);
- padlock blockage (max. 3) of the manoeuvre handle;
- a locking device "disconnected position" which prevents the drawer being removed from the section;
- limit switches can also be provided with the functions of pre-release, insertion of auxiliary circuits, or to signal if the drawer is inserted, or disconnected/removed.



Legenda

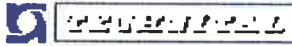
- 1 pinze alimentazione
- 2 albero di comando interruttore/sezionatore
- 3 meccanismo di comando apparecchio di sezionamento
- 4 canna di blocco posizione cassetto
- 5 dispositivo di blocco sportazione cassetto
- 6 parte mobile blocco morsetti in uscita dei circuiti di potenza e/o ausiliari
- 7 maniglia di comando
- 8 etichette di posizione maniglia di comando
- 9 maniglia di estrazione cassetto
- 10 apparecchi ausiliari di comando e segnalazione
- 11 dispositivo rarmo rete termico
- 12 interruttore automatico
- 13 contattore
- 14 relè termico
- 15 interruttori protezione circuiti ausiliari
- 16 relè ausiliario

Legendes

- 1 pinze alimentation
- 2 axe de commande disjoncteur/interrupteur
- 3 mécanisme de commande Appareil de sectionnement
- 4 canne de blocage position tiroir
- 5 dispositif de blocage extraction tiroir
- 6 partie mobile bloc de sortie circuits de puissance et/ou auxiliaires
- 7 poignée de commande
- 8 étiquettes de position poignée de commande
- 9 poignée d'extraction tiroir
- 10 appareils auxiliaires de commande et de signalisation
- 11 dispositif réarmement relais thermique
- 12 disjoncteurs
- 13 contacteur
- 14 relais thermique
- 15 disjoncteurs protection circuits auxiliaires
- 16 relais auxiliaire

Key

- 1 power supply pliers
- 2 shaft for command circuit breaker/sectioning switch
- 3 command mechanism for isolated equipment
- 4 cam for locking drawer position
- 5 device for locking drawer extraction
- 6 mobile part of the output pliers block of the power and/or auxiliary circuits
- 7 control handle
- 8 label position of command handle
- 9 drawer extraction handle
- 10 auxiliary command and signalling equipment
- 11 thermal relay resetting device
- 12 circuit breaker
- 13 contactor
- 14 thermal relay
- 15 circuit breaker protection for auxiliary circuits
- 16 Auxiliary relay



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Dimensione dei cassetti
Dimensions tiroirs débrochables
Dimensions of withdrawable units

Tabella indicativa per la determinazione della grandezza dei cassetti

La tabella riporta la grandezza indicativa in moduli dei cassetti estraibili in funzione delle caratteristiche principali della partenza motore (potenza in kW, tipo di avviamento...) o partenza linea (corrente nominale, con interruttore o fusibile...). Le dimensioni sono state calcolate considerando l'impiego di interruttori o sezionatori Merlin Gerin e avviatori Telemecanique.

Per le partenze motore, oltre alle apparecchiature di potenza (interruttore, contattore, relé termico), sono state previste anche le apparecchiature ausiliarie normalmente utilizzate: due pulsanti, tre segnalatori luminosi, un interruttore di protezione circuiti ausiliari, un relé ausiliario.

In caso di apparecchiature aggiuntive la grandezza indicata devono essere confermate dal nostro ufficio tecnico o è necessario considerare grandezza di cassetto superiore.

Tableau indicatif pour déterminer le nombre des modules des tiroirs

Le tableau indique le nombre des modules des tiroirs débrochables en fonction des caractéristiques de la départ moteur (puissance en kW, type de démarrage...) ou départ ligne (courant assigné, avec disjoncteurs ou fusibles...). Les dimensions ont été calculées en employant des disjoncteurs ou interrupteurs Merlin Gerin et des démarreurs Telemecanique.

Pour les départs moteur en plus de l'appareillage de puissance (disjoncteurs, contacteur, relais thermique) on a prévu des appareillages auxiliaires utilisés normalement: deux boutons, trois voyants, un disjoncteur de protection circuits auxiliaires, un relés auxiliaire.

En cas d'appareillages supplémentaires le nombre des modules indiqués doivent être confirmés par notre service technique ou il faut envisager des tiroirs avec un nombre des modules supérieures.

Indicative table for calculating the size of drawer required

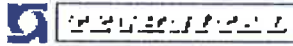
The table gives the indicative size expressed in modules of withdrawable units according to the main characteristics of the motor feeder (power in kW, type of starter...) or the outgoing line (rated current, with circuit breaker or fuses...).

The sizes have been calculated using Merlin Gerin circuit breakers or insulating switches and Telemecanique starters.

For motor feeder as well as power equipment (circuit breaker, contactor, thermal relay) auxiliary equipment normally used has also been foreseen such as: two push-buttons, three lamps, one auxiliary circuit protection circuit breaker, one auxiliary relay.

If supplementary equipment is used the sizes should be confirmed by our technical office or else one should opt for bigger size.

Dimensione cassetto / Dimensions tiroir débrochable / Dimensions of withdrawable units						
Partenza motore / départ moteur / motor outgoing line			Partenza linea / départ ligne / outgoing line			
potenza (kW) 380/400 V 50/60 Hz	avviamento diretto	avviamento diretto reversibile	avviamento stella-triangolo	corrente nominale (A)	partenza linea con interruttore	partenza linea con fusibili e sezionatori
puissance (kW) 200/400 V 50/60 Hz	démarrage direct	démarrage direct à 2 sens de marche	démarrage étoile-triangle	courant assignée (A)	départ ligne avec disjoncteur	départ ligne avec interrupteurs et fusibles
power (kW) 380/400 V 50/60 Hz	direct starting	reversing starting	star-delta starting	rated current (A)	outgoing line with circuit breaker	outgoing line with fuses and load break switch
≤ 3	1/2					
≤ 30	1	1		≤ 50	1/2	1/2
≤ 37	1	2		≤ 125	1	1
≤ 55	2	3	2	≤ 250	2	2
≤ 75	2	4	3	≤ 400	2	3
≤ 110	3					
≤ 160	3					
≤ 250	4					



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Inserzione/estrazione dei cassetti Insertion/extraction des tiroirs Introduction/extraction of the drawers

Cassetto in posizione di "servizio"

Inserimento del cassetto:

- appoggiare il cassetto sulle guide della parte fissa;
- ruotare la manovra di comando in senso antiorario fino alla tacca di estrazione (1);
- spingere a fondo il cassetto (2);
- rilasciare la manovra e l'unità in senso orario fino a raggiungere la posizione "T" (3).

Tiroir en position "servicio"

Insertion du tiroir:

- appuyer le tiroir sur les guides de la partie fixe;
- tourner la poignée de commande en sens inverse de celui des aiguilles d'une montre jusqu'à la butée (1);
- pousser à fond le tiroir (2);
- relâcher la poignée de commande et la tourner en sens horaire jusqu'à la position "T" (3).

Drawer in "connected" position

Introduction of the drawer:

- put the drawer on the guides of the fixed part;
- turn the handle in the counterclockwise direction of rotation up to the limit stop (1);
- push completely the drawer (2);
- release the handle and turn it in the clockwise direction up to the "T" position (3).



Cassetto in posizione di "sezionamento"

Partendo dalla posizione di "servizio":

- ruotare la manovra di comando in senso orario fino alla tacca di estrazione (1);
- tirare il cassetto di circa 40 mm fino a quando si sentirà una scatta di posizione raggiunta (2);
- rilasciare la manovra (3).

Tiroir en position de "sectionnement"

En partant de la position raccordable:

- tourner la poignée de commande en sens inverse de celui des aiguilles d'une montre jusqu'à la butée (1);
- tirer le tiroir sur environ 40 mm jusqu'à ce que l'on entende le clic indiquant que la position est atteinte (2);
- relâcher la poignée de commande (3).

Drawer in "disconnected" position

Starting from the connected position:

- turn the handle in the counterclockwise direction of rotation up to the limit stop (1);
- pull the drawer about 40 mm till you hear a release of reached position (2);
- release the handle (3).



Cassetto in posizione di "estrazione"

Partendo dalla posizione di sezionamento:

- ruotare la manovra di comando in senso orario fino alla tacca di estrazione (1);
- tirare il cassetto fino a raggiungere il blocco di sicurezza di estrazione (che impedisce la prosecuzione della corsa del cassetto) (2);
- rilasciare la manovra (3).

Tiroir en position "débouchée"

En partant de la position sectionnement:

- tourner la poignée de commande en sens inverse de celui des aiguilles d'une montre jusqu'à la butée (1);
- tirer le tiroir jusqu'au verrouillage d'extraction (qui empêche de retirer le tiroir de la section) (2);
- relâcher la poignée de commande (3).

Drawer in "withdraw" position

Starting from the disconnected position:

- turn the handle in the counterclockwise direction of rotation up to the limit stop (1);
- pull the drawer up to the extraction locking device (present to remove the drawer from the section) (2);
- release the handle (3).



Cassetto in posizione di "asportazione"

Rimozione del cassetto:

- sollevare la leva che costituisce il blocco di sicurezza di estrazione (1);
- tirare il cassetto, che non avendo più vincoli potrà essere rimosso dallo scomparto (2).

Tiroir en position "retire"

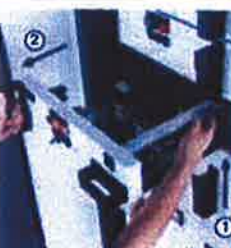
Enleverment du tiroir:

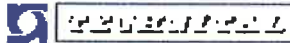
- soulever le verrouillage d'extraction (1);
- tirer le tiroir et l'enlever de la cellule (2).

Drawer in "removed" position

Removal of the drawer:

- lift the extraction locking device (1);
- pull the drawer and remove it from the section (2).





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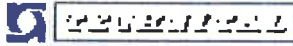
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**Condizioni meccaniche ed elettriche
delle posizioni dei cassetti**
**Conditions mécaniques et électriques
des positions des tiroirs**
**Mechanical and electrical conditions
in different drawer states**

Condizione del cassetto <i>Condition du tiroir</i> State of the drawer	Servizio <i>Raccorde</i> Connected	Prova <i>Essai</i> Test	Sezionato <i>Sectionné</i> Disconnected	Estratto <i>Débranché</i> Withdrawn
Condizioni meccaniche / conditions mécaniques / mechanical conditions				
posizione cassetto <i>position de tiroir</i> drawer position	inserito <i>raccordé</i> connected	inserito <i>raccordé</i> connected	sezionato <i>sectionné</i> disconnected	estratto <i>débranché</i> withdrawn
posizione manovra di comando <i>position de la poignée de commande</i> control handle position	"I"	"O"	"O"	-
blocco estrazione cassetto <i>verrouillage d'extraction tiroir</i> extraction locking device	attivo <i>activé</i> activated	attivo <i>activé</i> activated	attivo <i>activé</i> activated	disattivo <i>déactivé</i> deactivated
possibilità di lucchettaggio della manovra di comando <i>possibilité de verrouiller par cadenas la poignée de commande</i> possibility of padlocking control handle	no	sì (max 3)	sì (max 3)	-
	non	oui (max 3)	oui (max 3)	-
	no	yes (max 3)	yes (max 3)	-
Condizioni elettriche / conditions électriques / electrical conditions				
interruttore/sezionatore generale <i>disjoncteur/interrupteur général</i> main circuit breaker/switch	chiuso <i>fermé</i> closed	aperto <i>ouvert</i> open	aperto <i>ouvert</i> open	-
pinze di potenza lato ingresso <i>pinces d'alimentation</i> incoming power supply pliers	inserite <i>raccordées</i> connected	inserite <i>raccordées</i> connected	sezionate <i>sectionnées</i> disconnected	sezionate <i>sectionnées</i> disconnected
pinze di potenza lato uscita <i>pinces de sortie</i> outlet power supply pliers	inserite <i>raccordées</i> connected	inserite <i>raccordées</i> connected	sezionate <i>sectionnées</i> disconnected	sezionate <i>sectionnées</i> disconnected
circuito principale di potenza all'interno del cassetto <i>circuit principal de puissance à l'intérieur du tiroir</i> main power circuit within drawer	in tensione <i>sous tension</i> live	fuori tensione a valle dell'interruttore/sezionatore <i>hors tension en aval du disjoncteur/interrupteur</i> dead downstream of circuit breaker/switch	fuori tensione <i>hors tension</i> dead	fuori tensione <i>hors tension</i> dead
pinze circuiti ausiliari <i>pinces circuits auxiliaires</i> auxiliary circuit pliers	inserite <i>raccordées</i> connected	inserite <i>raccordées</i> connected	sezionate <i>sectionnées</i> disconnected	sezionate (1) <i>sectionnées (1)</i> disconnected (1)
circuito ausiliario interno al cassetto <i>circuit auxiliaire à l'intérieur du tiroir</i> auxiliary circuit within drawer	in tensione <i>sous tension</i> live	in tensione (predisposto alla prova) <i>sous tension (prêt pour des essais)</i> live (ready for testing)	non in tensione <i>hors tension</i> dead	non in tensione <i>hors tension</i> dead
continuità del circuito di protezione <i>continuité circuit de protection</i> continuity of protective circuit	assicurata <i>assurée</i> assured	assicurata <i>assurée</i> assured	assicurata <i>assurée</i> assured	-
possibilità di accesso all'interno del cassetto <i>possibilité d'accès à l'intérieur du tiroir</i> possibility of accessing within of drawer	no <i>non</i> no	no <i>non</i> no	no <i>non</i> no	sì <i>oui</i> yes

(1) È possibile effettuare la prova dei circuiti ausiliari anche in questa posizione tramite un conduttore preassemblato fornito su richiesta.
(1) On peut aussi essayer les circuits auxiliaires en cette position avec un conducteur pré-assemblé fourni sur demande.
(1) It is also possible to test the auxiliary circuits in this position using a cable with socket and plug that is available on request.



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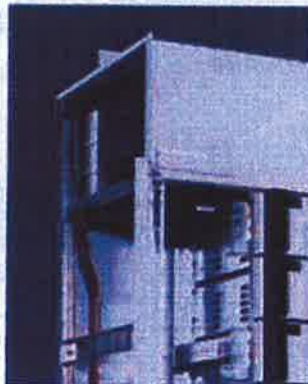
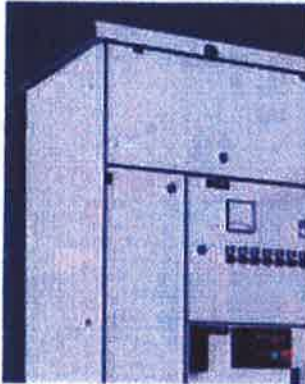
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Zona connessioni Zone raccordement Connections space



La zona connessioni è una cella posizionata sul lato sinistro dello scomparto che si sviluppa per tutta l'altezza dello stesso. È accessibile dal fronte tramite porta incernierata, di dimensioni tali da consentire un comodo allacciamento dei cavi relativi ai circuiti di potenza e ausiliari.

All'interno della cella connessioni sono collocati:

- tutti i morsetti e/o attacchi necessari per il collegamento dei cavi di potenza in entrata e uscita opportunamente protetti da schermi per consentire l'allacciamento alle singole utenze con quelle adiacenti in tensione;
- la morsettiera relativa ai circuiti ausiliari;
- la traversa per l'ammarraggio dei cavi;
- il conduttore di protezione per il collegamento degli schermi metallici o conduttori di terra dei cavi di potenza;
- una piastra di chiusura in alluminio asportabile (posizionabile sul fondo o sul tetto dello scomparto), utilizzata per il montaggio di eventuali passacavi;
- eventuali trasformatori di corrente.

La zone raccordement est un compartiment placé sur le côté gauche de la colonne qui se développe sur toute la hauteur de celui-ci. Elle est accessible par l'avant grâce à une porte montée sur charnières et ses dimensions permettent un raccordement facile des câbles des circuits de puissance et auxiliaires.

A l'intérieur du compartiment on trouve:

- toutes les bornes et/ou les plages pour le raccordement des câbles de puissance en entrée et en sortie, protégés par des écrans pour permettre le branchement de chaque départ avec les autres sous tension;
- le bornier relatif aux circuits auxiliaires;
- les échelles à câble pour la fixation des câbles;
- le conducteur de protection pour le raccordement des écrans métalliques ou les conducteurs de protection des câbles;
- une plaque de fermeture en aluminium amovible (pouvant être placée sur le fond ou sur le toit du compartiment) utilisée pour le montage des presse-étoupes éventuels;
- transformateurs de courant éventuels.

The connections space is a compartment situated on the left-hand side of the section and which is the same height as the section. It can be accessed from the front through a door mounted on hinges and the zone is big enough to comfortably allow for the connection of cables to the power and auxiliary circuits.

Inside the connections space are:

- the terminal power necessary for the connection of the incoming and outgoing power cables, suitably shielded so as to permit the connection of a single unit when the adjacent ones are live;
- auxiliary circuit terminal block;
- cable-support for fixing cables;
- the protection conductor for the connection of the metal shields or earth conductor of the power cables;
- a removable aluminium cover plate (which can be positioned on the top or bottom of the compartment) and is used for the passage of cable glands where required;
- current transformer if required.

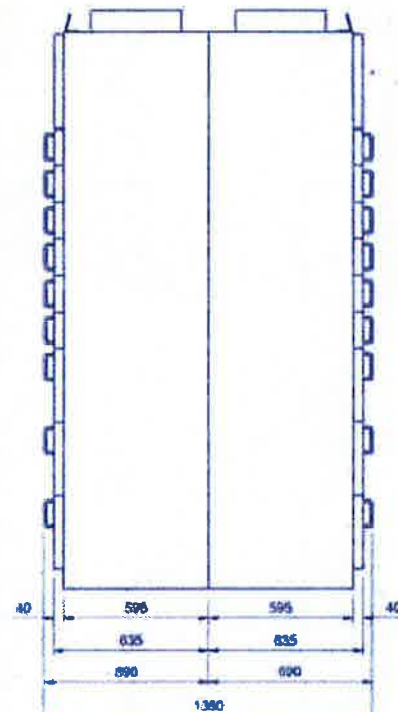
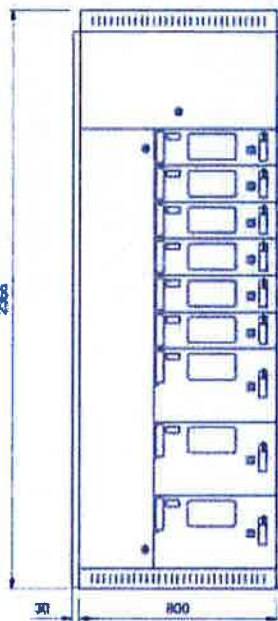
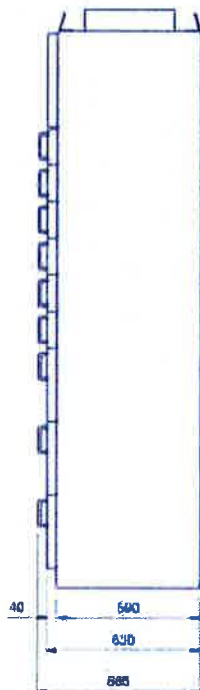
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Installazione Installation Installation

Flanco / Côte / Side
Semplice fronte / Simple front /
Single front

Fronte / Face avant / Front

Flanco / Côte / Side
Doppio fronte / Dos à dos / Back to back



L'installazione del quadro SYSTEM LV2004 si effettua posizionando su un piano d'appoggio, opportunamente predisposto, i singoli scomparti o più scomparti che costituiscono la unità trasportabili che lo compongono. Prima dell'installazione È sempre opportuno verificare:

- che il quadro non abbia subito danni durante il trasporto;
- che sia in posizione verticale;
- la posizione degli appositi angolari per il sollevamento e la movimentazione;
- il rispetto delle distanze di sicurezza dalle pareti;
- la corretta preparazione del piano di appoggio;
- la disposizione degli scomparti.

Fissaggio a pavimento

Il fissaggio a pavimento deve essere effettuato su un piano perfettamente orizzontale utilizzando tasselli ad espansione M12 in corrispondenza dei loro appostamenti previsti. Nel caso di pavimenti non livellati, su richiesta, sono fornibili ferri di base in profilato da annegare a pavimento sporgenti dal piano di appoggio di 1 o 2 mm.

L'installazione du tableau SYSTEM LV 2004 s'effectue en positionnant une ou plusieurs colonnes qui constituent les unités transportables qui le composent sur un plan d'appui prévu à cet effet.

Avant l'installation il faut vérifier :

- que le tableau n'ait pas subi de dommages pendant le transport;
- qu'il soit en position verticale;
- la position des anneaux pour le levage et la manutention;
- la distance de sécurité des murs;
- que le sol soit bien préparé;
- la disposition des colonnes.

Fixation au sol

La fixation au sol doit être effectuée sur un plan parfaitement horizontal en utilisant des chevilles à expansion M12 en correspondance des trous prévus à cet effet.

En cas de sol non nivelé, on peut fournir sur demande, des fers profilés à enterrer dans le sol et dépassant du plan d'appui de 1 ou 2 mm.

A SYSTEM LV2004 switchboard is installed by positioning the single section or several sections which form the transport units of which it consists on a suitably prepared base. Before installing it is always better to check:

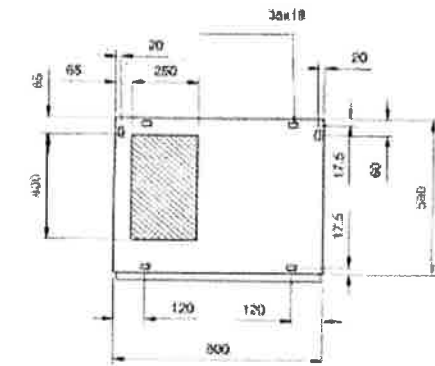
- that no damage was caused to the switchboard during transport;
- that it is in a vertical position;
- the position of the special angle irons for lifting and handling;
- the safety distance from the walls;
- that the support base has been well prepared;
- the layout of the sections.

Fixing the switchboard to the floor

The switchboard must be fixed to a perfectly horizontal surface using the M12 expansion bolts and inserting them in the corresponding anchoring holes.

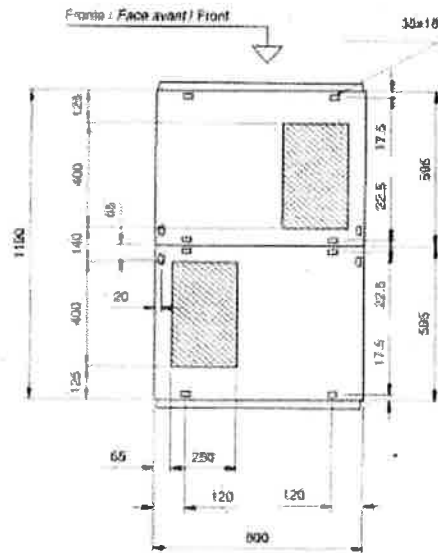
If the floor is not level, on request, it is possible to supply base irons which are embedded in the floor in such a way that they protrude from the support plane by 1 or 2 mm.

Semplice fronte / Simple front / Simple front



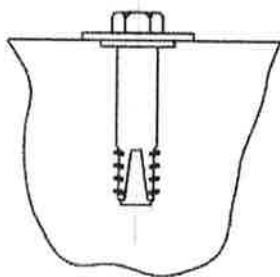
Fronte / Face avant / Front

Doppio fronte / Double front / Back to back



Fronte / Face avant / Front

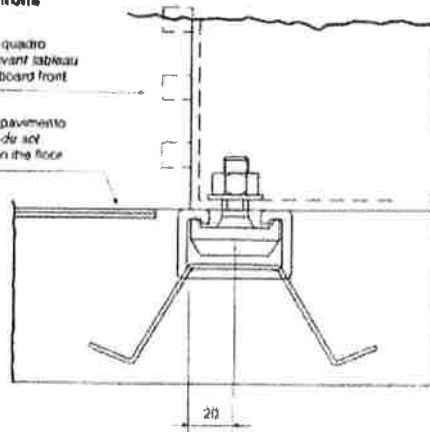
Fissaggio tasselli
Fixation chevilles
Fixing bolts



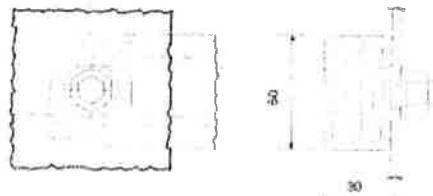
Ferri di base
Fers profiles
Base irons

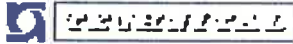
Fronte quadro
Face avant tableau
Switchboard front

Limite pavimento
Limite de sol
Limit on the floor



Colata cemento
Coulée de ciment
Cement ceiling





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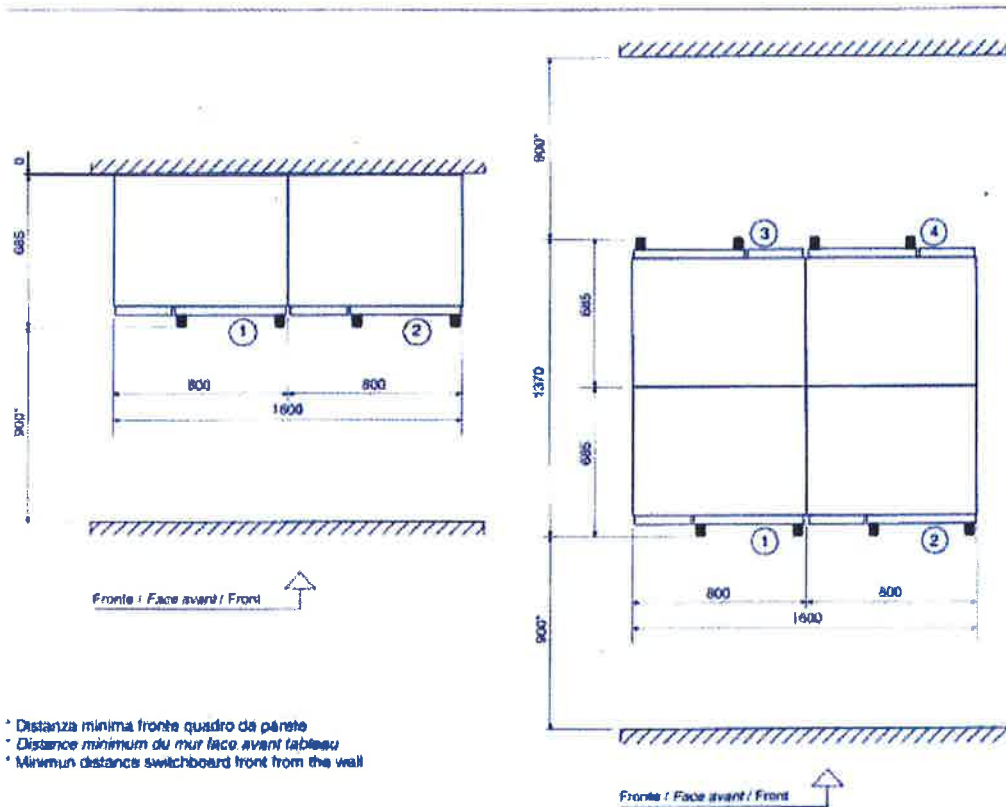
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Pag. n. 301

SYSTEM LV 2004 Motor Control Center

Installazione Installation Installation



- * Distanza minima fronte quadro da parete
- * Distance minimum du mur face avant tableau
- * Minimum distance switchboard front from the wall

Distanze dalle pareti

Prima di preparare il piano di appoggio È necessario verificare che esistano le distanze di sicurezza verso le pareti e considerare i seguenti fattori:

- ingombro dei mezzi a disposizione per il sollevamento, la movimentazione e la manutenzione;
- evitare di addossare i fianchi del quadro a parete nel caso in cui con questa soluzione vengano precluse le vie di fuga

Collegamenti elettrici

A quadro posizionato bisogna provvedere a realizzare le interconnessioni tra gli scomparti necessarie alla continuità elettrica del quadro relativamente:

- al sistema sbarre principale;
 - ai circuiti ausiliari;
 - al conduttore di protezione.
- Successivamente si procederà all'ammarraggio e al collegamento dei cavi di potenza (alimentazione e utenze) e dei cavi dei circuiti ausiliari nell'apposita cella connessioni dello scomparto

Distance des murs

Avant de préparer le sol il faut vérifier que les distances de sécurité des murs soient respectées et considérer les facteurs suivants :

- encombrement des moyens dont on dispose pour le soulèvement, la manutention et l'entretien;
- éviter d'adosser les côtés du tableau au mur si cette solution peut entraver la fuite en cas de danger

Raccordements électriques

Après avoir positionné le tableau faut brancher les colonnes entre elles pour assurer la continuité électrique du tableau relativement :

- au jeu de barres principal;
 - aux circuits auxiliaires;
 - au conducteur de protection.
- Ensuite on procédera à la fixation et au raccordement des câbles de puissance (alimentation et départ) et des câbles des circuits auxiliaires dans le compartiment des raccordements de la colonne

Distance from the walls

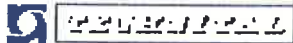
Before preparing the support base it is necessary to check that there is sufficient safety distance from the walls and to consider the following factors:

- the space required for the available lifting handling and maintenance machinery
- avoid placing the sides of the panel against a wall if with this solution possible escape routes are blocked

Electrical Connections

When the switchboard is in position it is necessary to make the connections between one section and the other to ensure continuity of power supply to:

- the main bus-bar;
 - the auxiliary circuits;
 - the protective conductor.
- Later, the power cables (for supply and applications) as well as the auxiliary circuit cables in the special connections compartment of the section will be connected and fixed in position.



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SYSTEM LV 2004 Motor Control Center

Accessori e ricambi Accessoires et pièces de rechanges Accessories and spare parts

Accessori

I quadri SYSTEM LV 2004 sono corredati di:

- traverse per il sollevamento e la movimentazione del quadro;
- targhette indicatrici;
- pannelli di chiusura per celle vuote;
- serie di chiavi per apertura porte;
- pannelli laterali per la copertura delle estremità;
- traverse per l'ammoraggio dei cavi all'interno del quadro;
- viteria per accoppiamento scomparti;
- documentazione tecnica di commessa standard:
 - ↳ disegni fronte quadro e foratura soletta,
 - ↳ schemi unifilari,
 - ↳ schemi funzionali (n° 1 per ogni unità funzionale tipica),
 - ↳ elenco apparecchiature,
 - ↳ verbali di collaudo prove individuali;
- libretto d'istruzioni per l'installazione, esercizio e manutenzione.

Oltre agli accessori di normale fornitura su richiesta il quadro può essere corredato di:

- resistenza anticondensa;
- termostato;
- umidostato;
- illuminazione interna (celle connessioni);
- presa di corrente 15 A;
- schema sinottico;
- ferri di base;
- lamiera di fondo;
- piastre di chiusura per passaggio cavi;
- serratura a chiave sulle porte;
- cordone presa/spina per prova circuiti ausiliari a cassetto sezionato o asportato.

Ricambi

Su richiesta sono fornibili i seguenti pezzi di ricambio:

- blocco pinze alimentazione;
- blocco pinze di uscita;
- maniglia di comando con targhetta O-I;
- maniglia di estrazione;
- cassetto non attrezzato;
- pannelli di chiusura celle vuote.

Accessoires

Les tableaux SYSTEM LV 2004 sont équipés de :

- traverses pour le levage et la manutention du tableau;
- plaques d'identification;
- panneaux de fermeture pour compartiments vides;
- série de clés pour ouverture portes;
- panneaux latéraux pour la couverture des extrémités;
- échelles à câbles pour la fixation des câbles à l'intérieur du tableau;
- visserie pour accouplement colonnes;
- documentation technique standard :
 - ↳ plans face avant tableau et perçage du sol,
 - ↳ schémas unifilaires,
 - ↳ schémas fonctionnels (1 pour chaque unité fonctionnelle typique),
 - ↳ liste appareillages,
 - ↳ compte-rendus des essais individuels;
- notice d'instructions pour l'installation, le fonctionnement et l'entretien.

Mis à part les accessoires normalement fournis, le tableau peut être équipé sur demande de :

- résistance anti-condensation;
- thermostat;
- humidistat;
- éclairage interne (compartiment raccordement);
- prise de courant 15 A;
- schéma synoptique;
- lers profilés pour fixation au sol;
- tôle de fond;
- plaques de fermeture pour presse-étoupe;
- serrures avec clé sur les portes;
- cordon prise/spine pour essai circuits auxiliaires trois sectionnés ou retiré.

Pièces de rechanges

Les pièces suivantes peuvent être fournies sur demande :

- bloc pinces alimentation;
- bloc pinces de sortie;
- poignée de commande avec étiquette de position O-I;
- poignée d'extraction;
- tiroir non équipé;
- panneaux de fermeture compartiments vides.

Accessories

SYSTEM LV 2004 panels are equipped with:

- iron crossbars for lifting and handling the switchboard;
- labels;
- covers for closing empty compartment;
- a series of keys for opening doors;
- side covers for covering edges;
- cable-supports for fixing cables into position;
- bolts for compartments connections;
- standard technical documentation:
 - ↳ single line diagram,
 - ↳ schematic diagram (1 for each typical functional unit),
 - ↳ equipment list,
 - ↳ test report for individual tests,
 - ↳ instruction manual for installation, operation and maintenance.
- instruction manual for installation, operation and maintenance.

Over and above the standard accessories supplied, on request the switchboard can be equipped with:

- heating resistor
- thermostat;
- hydrostat;
- internal lighting (connection compartment);
- current socket 15 A;
- synoptic diagram;
- base frame;
- cover plates;
- cover plates for closing cable glands;
- locks with keys for the doors;
- plug-in connector for testing auxiliary circuits of drawer in disconnected-removed position.

Spare parts


The following pieces can be supplied on request:

- power supply piners block;
- power outlet piners block;
- control handle with labels O-I;
- drawer extraction handle;
- unequipped drawer;
- cover for closing off empty compartments.

SYSTEM LV 2004
Motor Control Center

**Valori indicativi di corrente nominale
 per motori asincroni a gabbia**
**Valeurs indicatives du courant assignée
 pour des moteurs asynchrones à cage**
**Indicatives values of rated current
 for asynchronous cage motors**

Motore monofase/ moteur monophasé Single-phase motor			Motore trifase 4 poli 50/60 Hz / moteur triphasé 4 pôles 50/60 Hz 4 poles, three-phase motors 50/60 Hz							
kW	CV/NIP	230 V [In]	240 V [In]	220/240 V [In]	330 V [In]	415 V [In]	440 V [In]	500 V [In]	690 V [In]	1000 V [In]
0.37	0.5	3.9	3.6	1.8	1.03		0.99	1	0.8	0.4
0.55	0.75	5.2	4.8	2.75	1.6		1.36	1.21	0.9	0.6
0.75	1	6.6	6.1	3.5	2	2	1.68	1.5	1.1	0.75
1.1	1.5	9.0	8.8	4.4	2.6	2.5	2.37	2	1.5	1
1.5	2	12.7	11.7	6.1	3.5	3.5	3.06	2.6	2	1.3
1.8	2.5	15.7	14.4							
2.2	3	18.6	17.1	8.7	5	5	4.42	3.8	2.8	1.9
3	4	24.3	22.2	11.5	6.6	6.5	5.77	5	3.6	2.5
3.7	5			13.5	7.7	7.5	7.1	5.9	4.4	3
4	5.5	29.8	27.1	14.5	8.5	8.4	7.9	6.5	4.9	3.3
4.4	6	34.7	31.8							
5.2	7	39.8	36.5							
5.5	7.5	42.2	39.7	20	11.5	11	10.4	9	6.6	4.5
6	8	44.5	40.8							
7	9	49.5	45.4							
7.5	10	54.4	50	27	15.5	14	13.7	12	8.9	6
9	12		3	2	18.5	17	16.9	13.9	10.6	7
10	13.5			35	20			15	11.5	7.5
11	15			39	22	21	20.1	18.4	14	9
15	20			52	30	28	26.5	23	17.3	12
18.5	25			64	37	35	32.6	28.5	21.3	14.5
22	30			75	44	40	39	33	25.4	17
25	35			85	52	47	45.3	39.4	30.3	20
30	40			100	60	55	51.5	45	34.6	23
33	45			113	68	60	58	50	39	25
37	50			126	72	66	64	55	42	28
40	54			134	79	71	67	60	44	30
45	60			150	85	80	76	65	49	33
51	70			170	98	90	83	75	57	38
55	75			182	105	100	90	80	61	40
59	80			195	112	105	97	85	66	43
63	85			203	117	115	109	89	69	45
75	100			240	138	135	125	105	82	53
80	110			260	147	138	131	112	86	57
90	125			295	170	165	146	129	98	65
100	136			325	188	182	162	143	107	71
110	150			356	205	200	179	156	118	78
129	175			420	242	230	209	184	135	85
132	180			425	245	240	215	187	140	90
140	190			450	260	250	227	200	145	95
147	200			472	273	260	236	207	152	100
150	205			483	280	270	246	210	159	102
160	220			520	300	280	256	220	170	115
180	245			578	333	320	289	254	190	135
185	250			595	342	325	295	263	200	138
200	270			620	370	340	321	281	215	150
220	300			700	408	385	353	310	235	160
250	340			800	460	425	401	360	274	200
257	350			826	475	450	412	365	280	203
280	380			900	510	475	450	400	305	220
295	400			948	546	500	473	416	320	227
300	410			960	565	510	481	420	325	230
315	430			990	584	535	505	445	337	239
335	450			1100	620	550	518	472	355	250
355	480			1150	636	580	549	500	370	262
375	500			1180	670	610	575	527	395	273
400	545			1250	710	650	611	540	410	288
425	580				760	690	650	574	445	302
445	600				790	730	680	595	455	317
450	610				800	740	690	608	460	320
475	645				850	780	730	645	485	335
500	680				900	820	780	680	515	350

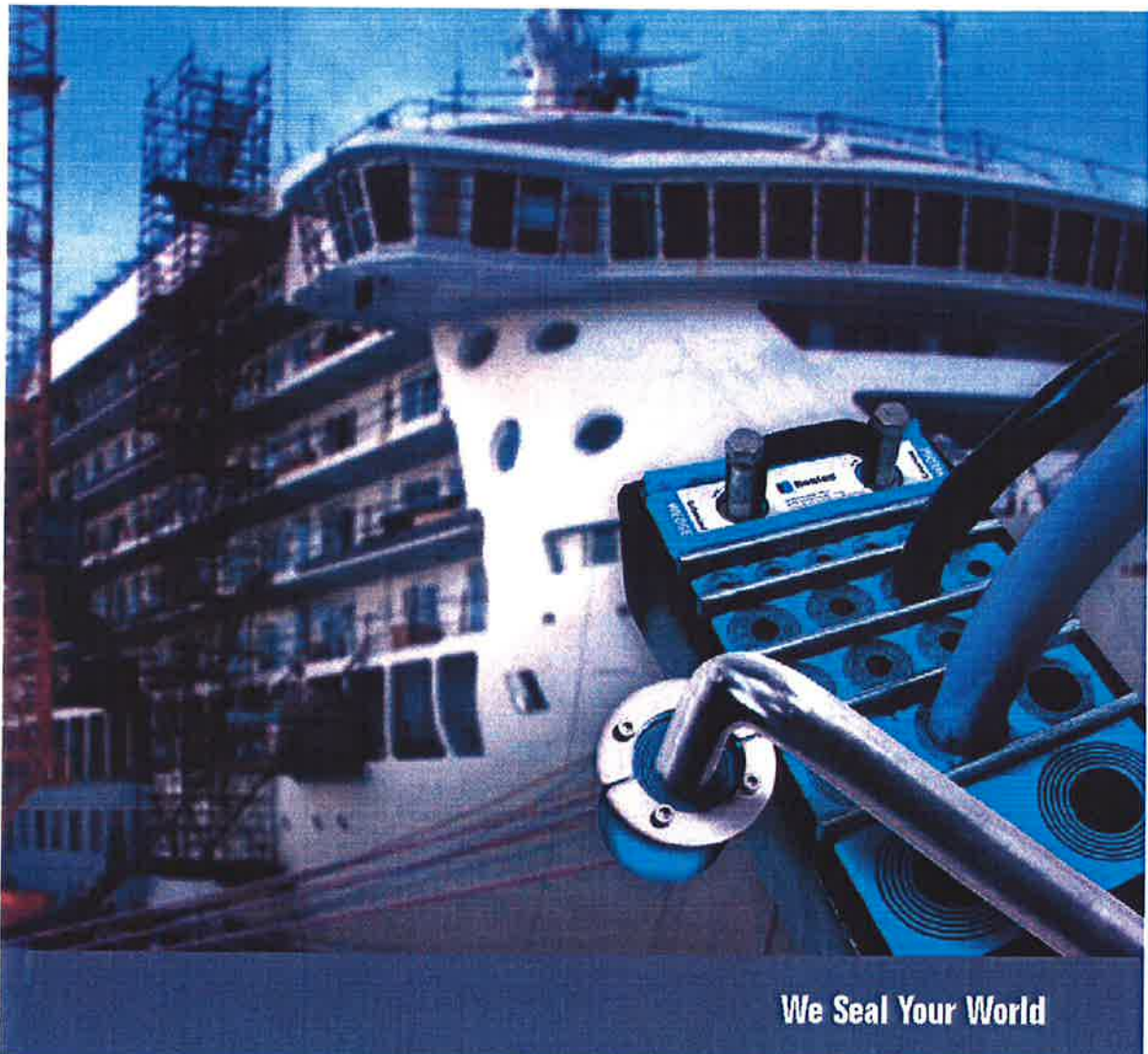
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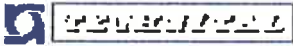


Marine

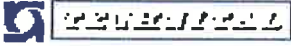
Cable and Pipe Transits



We Seal Your World

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Peace of mind

With Roxtec's cable and pipe transits on board your ships there is simply one less thing to worry about. Safety and reliability are now taken care of and you can turn your focus to other important issues.

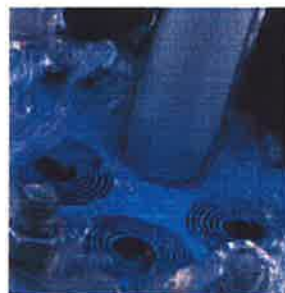
Reliable safety

The benefit of Roxtec is two-fold. First of all, installing and using the sealing system is simple. This results in fewer errors. Secondly, the built-in safety of the system guarantees protection in full accordance with official regulations in combination with market leading technical capabilities and benefits.

Our cable and pipe transits help to ensure operational reliability and

integrity, and minimize the influence from hazards induced by water pressure, fire, smoke and gas. The Roxtec sealing system is approved for use in A class rated sections, following tests according to IMO 754(18).

With both safety and operational reliability in world class, thousands of Roxtec customers around the world now consider cable and pipe sealing one less concern.



- Well known and established solution
- Largest number of tests and certificates in the industry
- Certified solutions also for plastic pipes
- Possibility to test installations on site for tightness
- Simple to install for fewer human errors

Ships are always modified

Simple to inspect and modify

Cables and pipes frequently get changed, added or removed on ships. The Roxtec sealing system allows immediate access to make all the necessary changes. Thanks to the modular design of a Roxtec transit it is very easy to inspect and identify problems. The seals can be re-opened and closed repeatedly without compromising the safety.


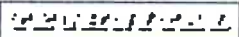
Few disturbances to passengers

The Roxtec sealing system is future-proof. Changes to cables or pipes are usually made by re-using already installed Roxtec transits and components. This reduces the need for structural interventions for new openings. As a result, the disturbance from maintenance on the surrounding environment is



minimized and both passengers and the superintendent are happy.

Roxtec is well-known technology familiar to a wide range of staff and technicians on board ships. This means that the competence to perform maintenance on the cable and pipe transits is wide-spread. Upgrades and installations, such as adding pipes for sprinkler systems, can be performed under local supervision to reduce downtime.

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More than a seal



Reducing thermal bridges

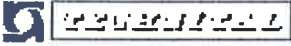
The rubber material in a Roxtec transit helps to insulate HVAC pipes from bulkheads and decks. The reduction of thermal transfer between the cooling or heating pipes and the surrounding environment, saves energy and money. Fewer thermal bridges also reduce service costs due to less water condensation and damage to the insulation.

Less vibration, less material fatigue

The material properties of Roxtec rubber include the ability to withstand vibrations. The result is that a Roxtec transit performs well as a sound and vibration damper, preventing noise, fatigue and structural failure.

Saving time and money

Roxtec and Multidiameter™, our technology based on sealing modules with removable layers, enable customers to save time and money. Costs stay within budgets and time schedules are kept. Typical benefits are lower labour cost, less time needed for installation and replacement, less storage cost for additional inventory, and reduced administrative costs when re-ordering.

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Roxtec keeps your ship safe

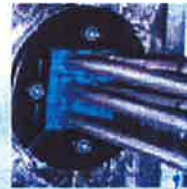
Roxtec's penetration seals help owners and operators of ships, such as cruise liners, LNG carriers, military ships and yachts to achieve certified safety with cost-efficiency.

Shown here are examples of applications and benefits possible with Roxtec.

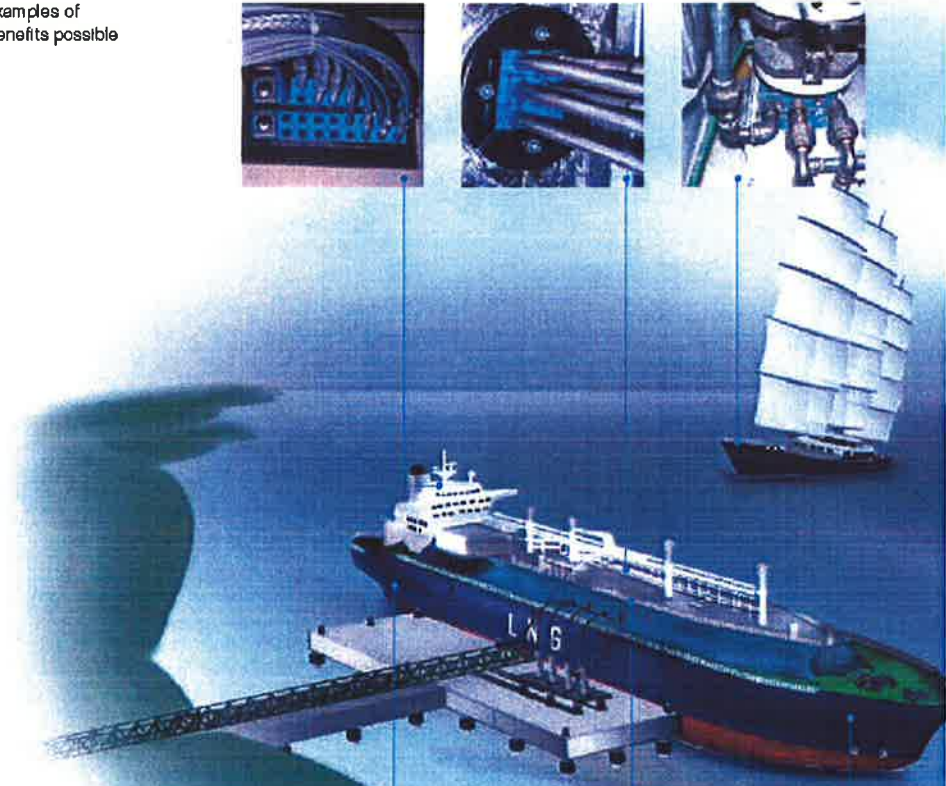
Captain's bridge: Compact seals to IP protect electrical wires to and from enclosures.



Engine room: Roxtec round seal for hydraulic and pneumatic pipes in machine room.



Fire protection system: Pipes sealed with Roxtec when passing through the super structure.



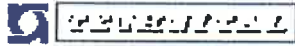
Gastight bulkhead: Back-to-back seal (open view), which allows pressure test on board LNG carrier.



Stress exposed bulkhead: Frame solution with rounded corners to avoid cracks in bulkheads around cable or pipe inlets.



Non-weld zones: Roxtec non-weld solutions protect bulkheads and decks in areas where welding is not desired.



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ELETTRICO

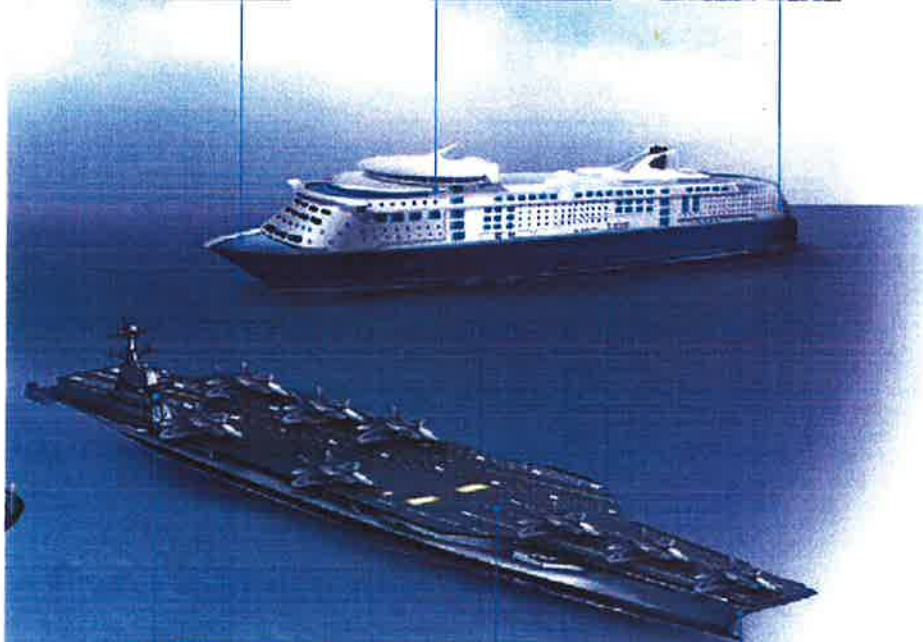
Bulkheads and decks:
Pipe seals for fire protection
of openings with a
variety of plastic pipes.



Lighting: Round seals for
single wires to external
lighting fittings.



Deck of engine room:
Transit welded at an angle
in the deck to handle
large cables with low
bending radius.



Radio room: RFI-shielded
EMC and firestop
solutions for radar and
navigation equipment in
bulkheads.



Cabins and kitchen:
Round seals in bulkheads
and decks for single pipes
of fog system.



Decks and bulkheads:
Combination frames for
fireproof, watertight bulk-
heads and decks with
power and signal cables.

We Seal Your World

A quality system



Multidiameter™

The smart adaptability of the Roxtec technology makes installation of cables and pipes easy and safe. Each Roxtec seal has removable layers that enable a perfect fit to different sizes of cable or pipe. Just peel off a few layers and the seal fits the desired size of a cable or pipe.



Efficient and organized

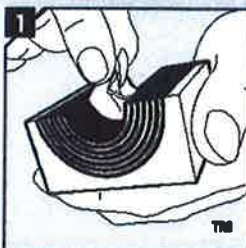
Thanks to the design and the modular build of a Roxtec transit, cables and pipes become neatly organized as they pass through the frame. A small but proper distance between each cable or pipe creates high area efficiency. It also allows for a good overview and easy maintenance.



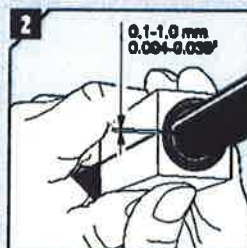
EMC sealing solutions

Roxtec's EMC transits are available for protection against EMI/RFI and for potential equalisation. Our EMC products have been verified in attenuation tests according to EN 50 147-1:1996 and in transfer impedance tests according to standard VG95.

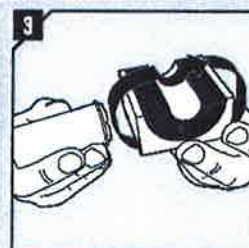
How it works



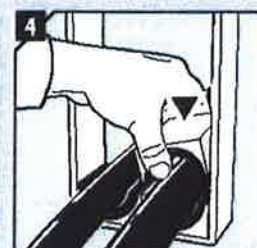
Adapt the modules to fit cables or pipes by peeling layers until you reach the gap seen in pic. 2.



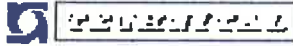
Achieve a 0.1-1.0 mm gap between the two halves when held against the cable/pipe.



Lubricate all modules for the frame thoroughly, both the inside and the outside surfaces.



Insert the modules according to your installation plan (transit plan). Usually start with the largest modules.



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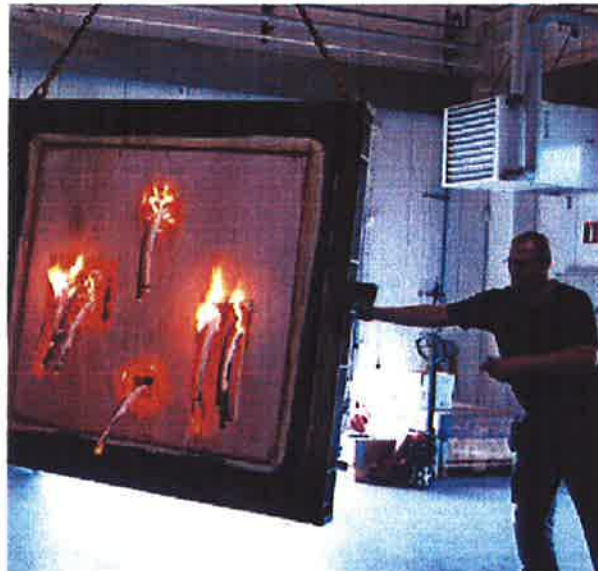
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Ready for plastic pipes

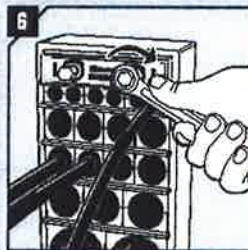
The use of plastic pipes is increasing in shipbuilding. The advantages are obvious when compared to metal pipes, with better resistance against corrosion and less weight. By using Roxtec's penetration seals you get certified fire protection in combination with sound dampening.

Advanced resources including fire lab

Fire tests and pressure tests are performed both in-house and externally. Our own resources with an advanced fire lab enable us to perform preliminary studies as well as individual tests in connection with customer projects whenever desired.



5
Insert a stayplate on top of every finished row of modules.

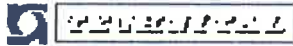


6
Insert the Wedge and tighten the screws until full stop, approx 20 Nm (15 ft.lb.).



7
Attach the Wedge Clip to the wedge bolts to check that the wedge has been properly tightened.

Basic steps in the assembly of a modular-based Roxtec sealing solution.



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We are there for you



Local support for your site team

Roxtec is much more than a supplier. Our sales and support staff around the world play an active role in helping customers find their optimum solution.

Our knowledge, acquired through many years of work in the field, means we can guide you to solutions that suit your needs and applications.

Less design time through RTM and Roxtec

You can save valuable time by using the Roxtec Transit Manager (RTM). The design-aid software automatically generates layouts of packing plans, bill of materials and drawings.

Product installation training


Whenever desired we also provide product installation training through



our sales staff and technicians. We are there to support and train you on site. Call us for more information.

Website for installers

In the Installer's Section of our global website we have collected useful information aimed at staff involved in assembly and installation of the Roxtec sealing system. Instructions and videos can be viewed online or downloaded for free.

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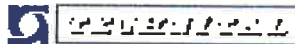
Easy to find our product worldwide

Roxtec solutions are available worldwide through our network of local suppliers. This means fast deliveries from local stocks in more than 70 markets. It also means direct support from local staff on site.



Among our customers are:

Aker Yards, A.P Møller Mærsk, Carnival Corporation, Chantiers de l'Atlantique, China Shipping Company, Color Line, Daewoo, Dalian Shipyard, Danish Navy, DFDS, Disney Cruise Lines, Fincantieri, Finnish Navy, Holland America Line, Italian Navy, Jiangnan Shipyard, Kvaerner Fjellstrand, Mitsubishi Heavy Industries, Northrop Grumman, Perini Navy, P&O European Ferries, Princess Cruises, Royal Caribbean Cruise Line, Spanish Navy, US Navy.



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AUTOMAZIONE E POSIZIONAMENTO DINAMICO -
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ELETTRICO

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Let us be your supplier



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Belgium, Roxtec b.v.b.a/s.p.r.l
Phone +32 9281 1233

Brazil, Roxtec Latin-America Ltda
Phone +55 11 3032 3198

Chile, FACOR Ltda
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(Shanghai) Co. Ltd**
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Denmark, Roxtec ApS
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Finland, Roxtec Finland Oy
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**Hungary, Glob-Prot Trade and
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USA, Canada, Roxtec Inc
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For markets in Algeria, Croatia, Egypt, Greece, Iran, Israel, Kazakhstan,
Oman, Pakistan, Qatar, Republic of Ireland, Saudi Arabia, Taiwan and Turkey,
please find contact information at www.roxtec.com



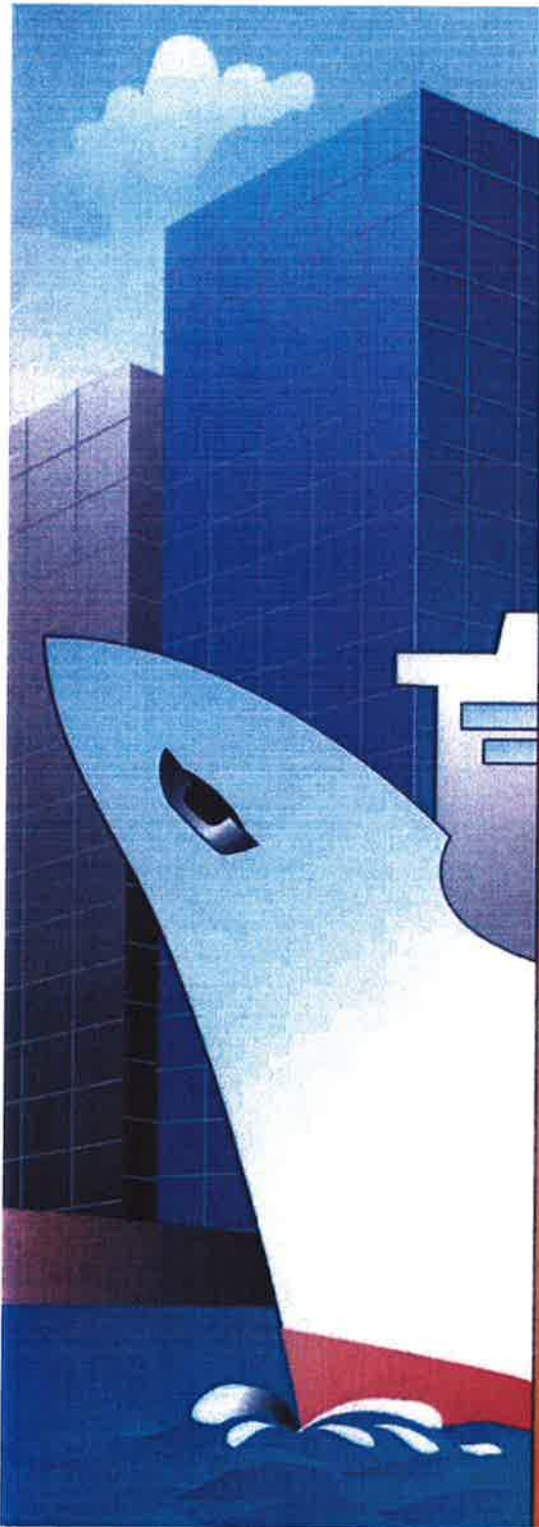
Roxtec International AB
Box 540, 371 23 Karlskrona, SWEDEN
PHONE +46 455 36 67 00, FAX +46 455 820 12
EMAIL info@roxtec.com, www.roxtec.com

RFX0207000101 ver_1.2/08/08/08/27/mrb

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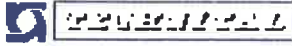
7. STRADE CAVI



L.M.T.

**PERCORSI
FASCI CAVI
E ACCESSORI
ELETTRICI
PER NAVI
ED EDILIZIA**





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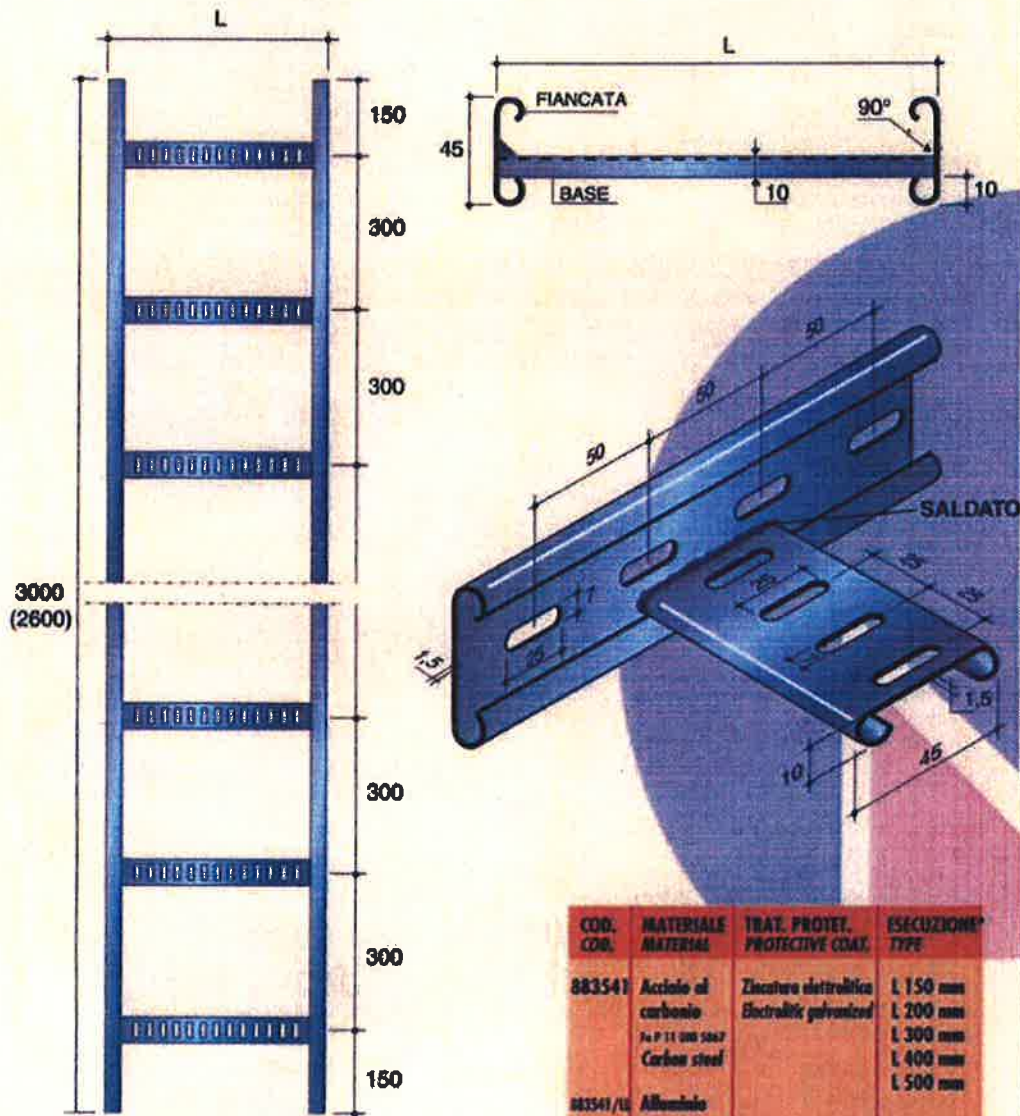
Rev.

Data:

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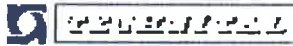
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883541 - PERCORSI FASCI CAVI ELETTRICI - ELECTRIC WIRE - WAYS



COD. COD.	MATERIALE MATERIAL	TRAT. PROTET. PROTECTIVE COAT.	ESECUZIONE* TYPE
883541	Acciaio al carbonio	Zincatura elettrolitica	L 150 mm
		Electrolitic galvanized	L 200 mm
	St P 11 000 5067		L 300 mm
	Carbon steel		L 400 mm
			L 500 mm
883541/U	Alluminio		
883541/X	Acciaio inox		
	AISI 316		
	Steel		

* A richiesta, per quantitativi, altre lunghezze
If required other dimensions



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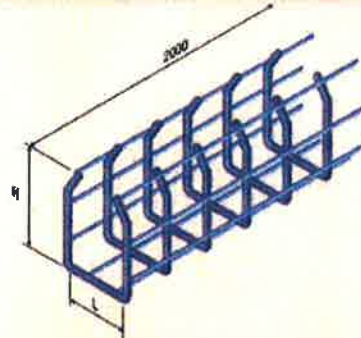
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SPECIFICA TECNICA - IMPIANTO DI GENERAZIONE, DISTRIBUZIONE E UTILIZZO ENERGIA ELETTRICA, AUTOMAZIONE E POSIZIONAMENTO DINAMICO - APPENDICE C - COMPONENTI PRINCIPALI IMPIANTO ELETTRICO

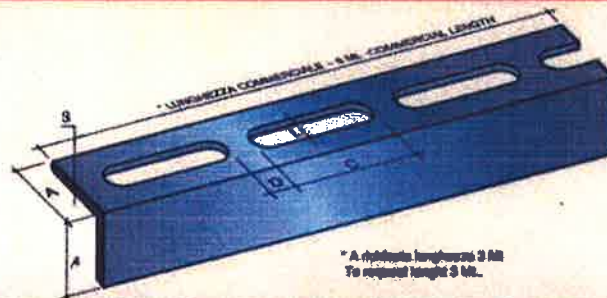
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88100RS - CESTELLI A RETE - GRATING BASKET**MATERIALE:**
RETE (GRATING) Ø 5

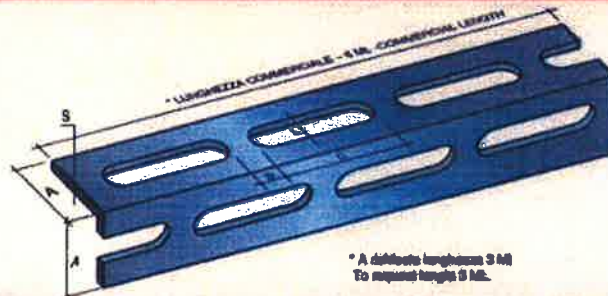
H	L
60	90
100	90
100	120

TRATTAMENTO PROTETTIVO:
ZINCATURA ELETTROLITICA
ELECTROLYTIC ZINC PLATING**111100 - ANGOLARE CON ASOLE SU UN LATO - ANGLE BARS WITH EQUAL FLANGES AND HOLES ON ONE SIDE**

A x S	C	D	L
30x3	50	10	7
30x3	45	10	11
40x5	45	10	11

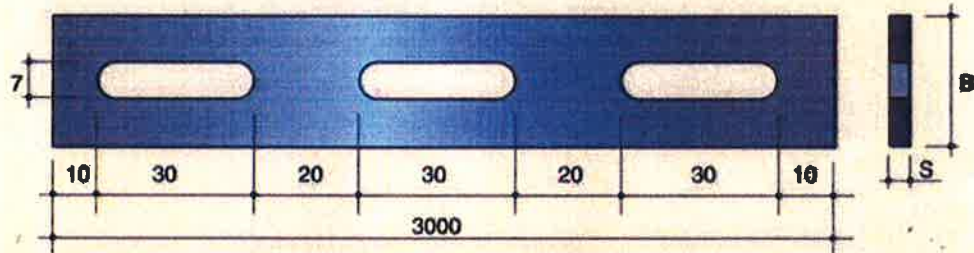
MATERIALE: Fe 360 UNI 7070 (Steel)
TRATTAMENTO PROTETTIVO:
Sabbatura SA 2 1/2
Una mano di antiruggine epossidica allo zinco
Sandblasting SA 2 1/2
One coat of epoxy zinc primer**111200 - ANGOLARE CON ASOLE SUI LATI - ANGLE BARS WITH EQUAL FLANGES AND HOLES ON SIDES**

A x S	C	D	L
30x3	50	10	7
30x3	45	10	11
40x5	45	10	11

MATERIALE: Fe 360 UNI 7070 (Steel)
TRATTAMENTO PROTETTIVO:
Sabbatura SA 2 1/2
Una mano di antiruggine epossidica allo zinco
Sandblasting SA 2 1/2
One coat of epoxy zinc primer**116100 - PROFILATO A "U" CON ASOLE - "U" PROFILES WITH HOLES**

A x B	S	C	D	L
60x20	5	50	10	11
60x30	6	70	14	14
80x45	6	90	18	18
120x55	7	100	20	24

MATERIALE: Fe 360 UNI 7070 (Steel)**TRATTAMENTO PROTETTIVO dopo foratura:**
Sabbatura SA 2 1/2
Una mano di antiruggine epossidica allo zinco
Sandblasting SA 2 1/2
One coat of epoxy zinc primer

883511 - PIATTO ASOLATO CON FORI ELITRICI - PLATE BARS WITH HOLES


MATERIALE: Fe 370
STEEL
LAMIERA (Plate) UNI 7070

TRATTAMENTO PROTETTIVO:
ZINCATURA ELETTROLITICA
ELECTROLYTIC ZINC PLATING

H	S
25	7,5
17	4

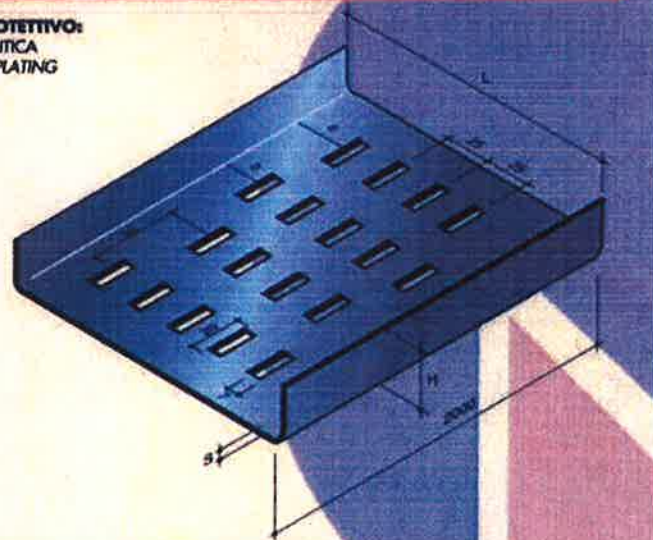
883134 - SOSTEGNI BORDATI DI LAMIERINO CON FORI RETTANGOLARI - BORDERED SUPPORTS

MATERIALE:
Cod. 883134
ACCIAIO AL CARBONIO
Fe 360 (CARBON STEEL)
H= 1,5mm / S= 1,5mm

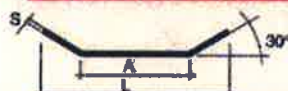
TRATTAMENTO PROTETTIVO:
ZINCATURA ELETTROLITICA
ELECTROLYTIC ZINC PLATING

Cod. 883136
LEGA LEGGERA DI ALLUMINIO (ALUMINIUM)
H= 18mm / S= 2mm

Cod. 883134/X
ACCIAIO INOX AISI 304 (STEEL)
H= 1,5mm / S= 1,5mm

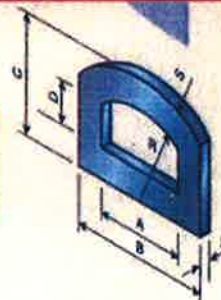


L	a	b
25	7,5	17,5
100	20	10
125	12,5	22,5
150	25	15
200	10	20

**NASTRI ACCIAIO ZINCATO (FE KPGZ 275 UNI 5753) ED ACCIAIO INOX (AISI 304) CON RELATIVE FIBBIE PER ANCORAGGIO CAVI ELETTRICI
GALVANIZED BARRORS IN CARBON STEEL AND IN INOX AISI 304 WITH CONCERNING CLASPS**


L	A	S	peso (weight) kg/m
16	13	0,4	0,050
19	15	0,5	0,075

A	B	C	D	R	S
17	27	20	7	15	5
20	30	20	7	17	5



ROTTOLI DA 100 M.
100 M. ROLLS



XXXXXXXXXXXXXXXXXXXX

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Rev.

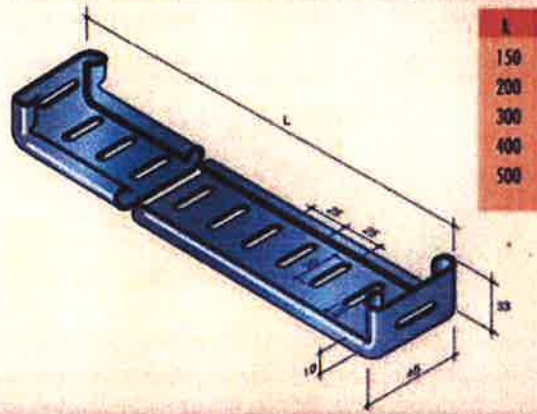
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883522 - TRAVERSE PER PERCORSI CAVI ELETTRICI - CROSS PIECES FOR ELECTRIC WIREWAYS

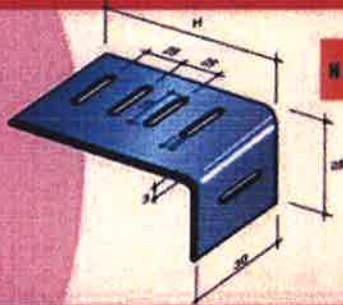
MATERIALE:
Cod. 883522
ACCIAIO AL CARBONIO
Fe P11 UNI 5867
CARBON STEEL
Cod. 883522/LL
ALLUMINIO
Cod. 883522/X
ACCIAIO INOX AISI 304



TRATTAMENTO PROTETTIVO:
ZINCATURA ELETTROLITICA
ELECTROLYTIC ZINC PLATING

883742 - SUPPORTI DI PIATTO FORATI - SUPPORTS OF FLAT-BAR WITH HOLES

MATERIALE: Fe 370
STEEL
LAMIERA (Piatto) UNI 7070



N 50 75 100 125 150 175 200 225 250

TRATTAMENTO PROTETTIVO:
ZINCATURA ELETTROLITICA
ELECTROLYTIC ZINC PLATING

883800 - TONDINI SOSTEGNO CAVI - SINGLE SUPPORTS



883531 B - GIUNZIONE A SNODO - HINGED COUPLINGS FOR ELECTRIC WIRING SUPPORTS

MATERIALE:
Lamiera Fe 360 B
STEEL

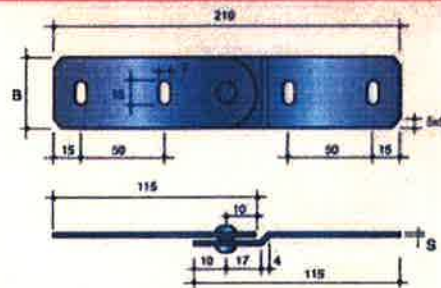
B	S
40	1,5

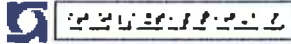
Alluminio
ALUMINIUM

B	S
40	2

Perno Fe 360 B
ROUND BAR Fe 360 B

TRATTAMENTO PROTETTIVO:
ZINCATURA ELETTROLITICA 17µ
ELECTROLYTIC ZINC PLATING 17µ





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CAPICORDA DI POTENZA IN RAME STAGNATO Elettroliticamente - CLIPPER 2005 ELECTROLYTICALLY TIN PLATED



Sez. Conduttore mm ² / Area	Ø Vite mm	Tipo	Dimensioni mm						Sez. Conduttore mm ² / Area	Ø Vite mm	Tipo	Dimensioni mm						
			Ø	B	M	N	L	D				Ø	B	M	N	L	D	
825 + 1,5	3	-	1,8	6,0	4,5	3,5	16,0	3,2	25	4	-	7,0	14,0	5,0	4,0	28,0	4,3	
	3,5	-	1,8	6,5	4,5	3,5	16,0	3,7		5	-	7,0	14,0	4,5	4,0	31,5	5,0	
	4	-	1,8	6,5	5,0	4,0	17,0	4,3		6	07.0085	7,0	14,0	7,0	9,0	32,0	6,4	
	5	-	1,8	7,5	5,5	4,5	18,0	5,3		8	07.0204	7,0	15,0	9,0	9,0	26,0	8,4	
	6	-	1,8	9,0	6,0	5,0	19,0	6,4		10	07.0207	7,0	18,0	11,0	10,0	40,0	10,5	
1,5 + 2,5	3	-	2,4	6,0	4,5	3,5	17,0	3,2	35	25	5	07.0209/2	8,9	17,0	6,5	6,0	34,0	5,3
	3,5	-	2,4	6,5	4,5	3,5	17,0	3,7		4	07.0209	8,9	17,0	7,0	6,0	34,5	6,4	
	4	-	2,4	7,5	5,0	4,0	18,0	4,3		8	07.0210	8,9	17,0	9,0	9,0	38,5	8,4	
	5	-	2,4	8,5	5,5	4,5	19,0	5,3		10	07.0211	8,9	19,0	11,0	10,0	42,5	10,5	
	6	-	2,4	9,0	6,0	5,0	20,0	6,4		12	07.0211/M	8,9	21,0	14,0	12,0	47,5	13,2	
4 + 6	3	-	3,6	7,5	4,5	3,5	20,5	3,7	50	25	6	07.0212	10,0	19,0	8,0	7,0	40,5	6,4
	3,5	-	3,6	7,5	4,5	3,5	20,5	3,7		8	07.0213	10,0	19,0	9,0	8,0	42,5	8,4	
	4	07.0193	3,6	8,0	5,0	4,0	21,5	4,3		10	07.0214	10,0	20,0	11,0	10,0	46,5	10,5	
	5	07.0194	3,6	9,0	6,5	4,0	25,0	5,3		12	07.0214/M	10,0	23,0	14,0	12,0	51,5	13,2	
	6	07.0195	3,6	11,0	7,0	6,0	25,5	6,4		14	-	10,0	25,0	16,0	14,0	55,5	15,0	
10	4	-	4,8	10,0	5,0	4,0	22,5	4,3	70	25	6	07.0215/2	11,3	21,0	8,0	7,0	44,0	6,4
	5	07.0197	4,8	10,0	6,5	4,0	26,0	5,3		8	07.0215	11,3	21,0	9,0	8,0	46,0	8,4	
	6	07.0198	4,8	11,0	7,0	6,0	26,5	6,4		10	07.0216	11,3	21,0	11,0	10,0	50,0	10,5	
	8	07.0199	4,8	15,0	9,0	8,0	30,5	8,4		12	07.0217	11,3	22,0	14,0	12,0	55,0	13,2	
	10	07.0200	4,8	18,0	11,0	10,0	34,5	10,5		14	07.0217/2	11,3	25,0	16,0	14,0	59,0	15,0	
16	4	-	4,8	19,0	14,0	12,0	29,5	13,2	95	25	6	-	11,3	26,0	18,0	16,0	63,0	17,0
	5	-	5,0	11,5	5,0	4,0	25,5	4,3		8	07.0218/2	13,5	25,0	9,0	8,0	52,5	8,4	
	6	07.0201/2	5,0	11,5	6,5	4,0	29,0	5,3		10	07.0218	13,5	25,0	11,0	10,0	56,5	10,5	
	8	07.0201	5,0	11,5	7,0	6,0	29,5	6,4		12	07.0219	13,5	25,0	14,0	12,0	61,5	13,2	
	10	07.0202	5,0	13,0	8,0	8,0	33,5	8,4		14	07.0220	13,5	25,0	16,0	14,0	65,5	15,0	
12	-	5,0	18,0	11,0	10,0	37,5	10,5	16	-	13,5	27,0	18,0	16,0	69,5	17,0			
14	-	5,0	20,0	14,0	12,0	42,5	13,2	20	-	13,5	29,5	22,0	20,0	77,5	21,0			

I capicorda sono ordinati nelle quantità da definire per singolo ordine.

NASTRO ISOLANTE AUTODESTINGUENTE CO. 15/15



07.0405	Nero - Black	15 x 0,13	25 mt.
07.0406	Nero - Black	15 x 0,13	10 mt.
07.0407	Nero - Black	19 x 0,13	25 mt.
07.0407 W	Bianco - White	19 x 0,13	25 mt.
07.0407 B	Blu - Blue	19 x 0,13	25 mt.
07.0407 G	Giallo - Yellow	19 x 0,13	25 mt.
07.0407 GR	Grigio - Gray	19 x 0,13	25 mt.
07.0407 R	Rosso - Red	19 x 0,13	25 mt.
07.0407 V	Verde - Green	19 x 0,13	25 mt.
07.0407 M	Giallo/verde - Yellow/green	19 x 0,13	25 mt.
07.0407 N	Marrone - Brown	19 x 0,13	25 mt.
07.0408	Nero - Black	19 x 0,13	10 mt.
07.0409	Nero - Black	25 x 0,13	25 mt.
07.0411	Nero - Black	50 x 0,13	25 mt.
07.0412	Nero - Black	100 x 0,13	20 mt.
* N 314	Nero - Black	19 x 0,15	25 mt.
* N 132R	Nero - Black	50 x 0,20	20 mt.
* N 132R	Rosso - Red	50 x 0,20	20 mt.
* N 142R	Nero - Black	100 x 0,20	20 mt.
* N 142R	Rosso - Red	100 x 0,20	20 mt.

* Versione resistente alle basse temperature (-10° C)

GUAINA TERMORESTINGENTE IN POLIURETANO AUTODESTINGUENTE ASTM D 374

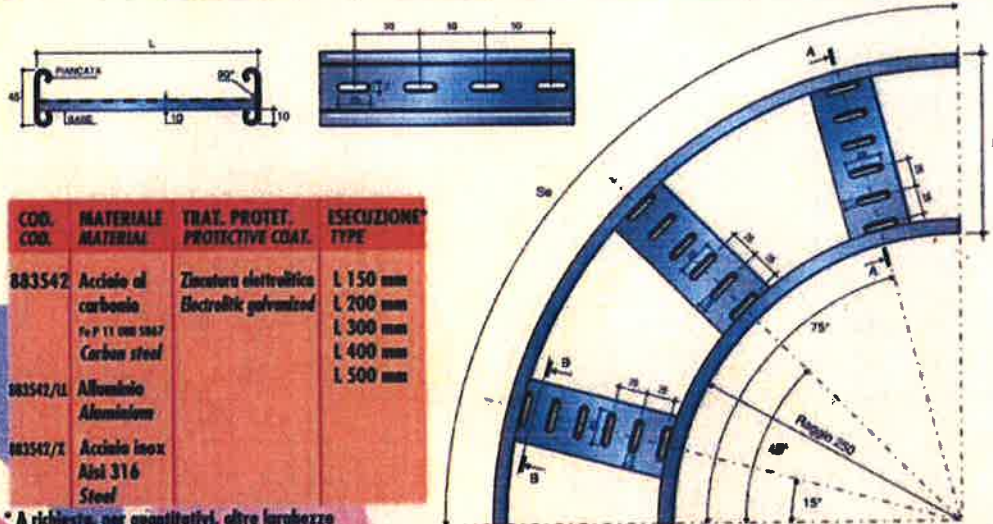


A PIU' SOTILE	Ø Int. Esp. mm	Ø Int. Shk. mm	Spessore mm
07.0450	3,2	1,6	0,43
07.0451	4,0	2,4	0,43
07.0452	4,4	3,2	0,56
07.0453	9,5	4,7	0,56
07.0454	12,7	6,4	0,56
07.0455	19,1	9,5	0,70
07.0456	25,4	12,7	0,70
07.0458	38,1	19,0	0,86

A PIU' GROSSA	Ø Int. Esp. mm	Ø Int. Shk. mm	Spessore mm
12247012	12	4	2,0
12247019	19	6	2,2
12247030	30	8	2,3
12247040	40	12	2,4
12247050	50	16	2,4
12247063	63	19	2,4
12247075	75	22	2,4
12247095	95	30	2,6
122470115	115	36	2,5
122470140	140	42	2,5

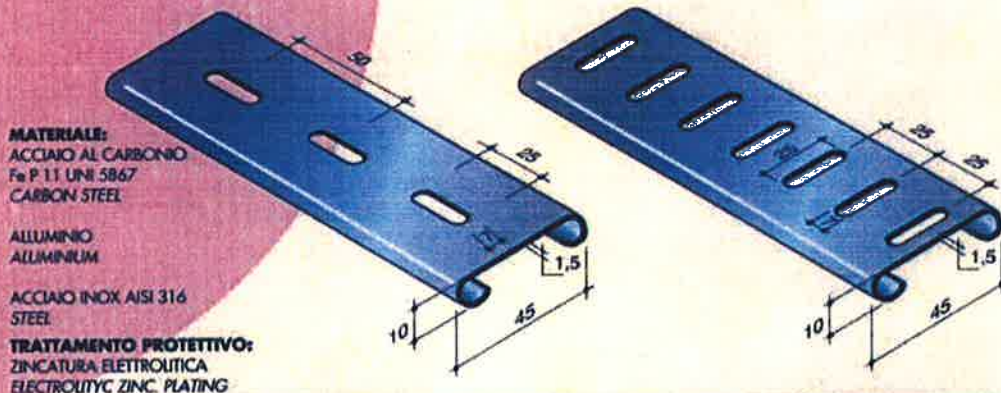
NASTRO AUTOMAGGIORERANTE AUTODESTINGUENTE

N 484	19 x 0,75	10 mt.
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883542 - CURVA A 90° CON TRE SOSTEGNI DI BASE - 90° DEGREE ELBOWS WITH THREE BASE SUPPORTS


COD. COD.	MATERIALE MATERIAL	TRAT. PROTET. PROTECTIVE COAT.	ESECUZIONE TYPE
883542	Acciaio al carbonio Fe P 11 UNI 5867 Carbon steel	Zincatura elettrolitica Electrolytic galvanized	L 150 mm L 200 mm L 300 mm L 400 mm L 500 mm
883542/L	Alluminio Aluminium		
883542/X	Acciaio inox AISI 316 Steel		

* A richiesta, per quantitativi, altre larghezze
 If required other dimensions

883135L - PROFILATO IN LAMIERA FLANGIATA CON FORI LONGITUDINALI - FLANGED PLATE PROFILE WITH LONGITUDINAL HOLES
883135T - CON FORI TRASVERSALI - WITH TRANSVERSAL HOLES


MATERIALE:
 ACCIAIO AL CARBONIO
 Fe P 11 UNI 5867
 CARBON STEEL

ALLUMINIO
 ALUMINIUM

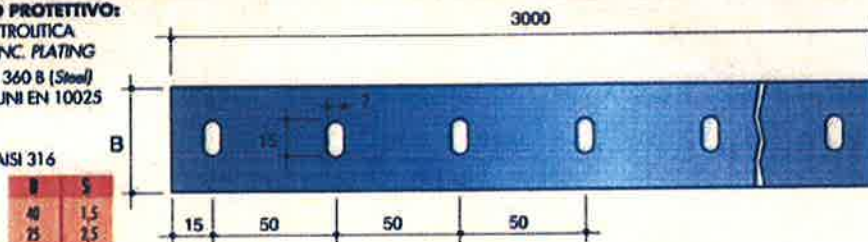
ACCIAIO INOX AISI 316
 STEEL

TRATTAMENTO PROTETTIVO:
 ZINCATURA ELETTROLITICA
 ELECTROLYTIC ZINC PLATING

883511 - PIATTO ASOLATO CON FORI TRASVERSALI - PLATE SHAPE WITH ELLIPTICAL HOLES

TRATTAMENTO PROTETTIVO:
 ZINCATURA ELETTROLITICA
 ELECTROLYTIC ZINC PLATING

MATERIALE: Fe 360 B (Steel)
 LAMIERA (Plate) UNI EN 10025
 ALLUMINIO
 ALUMINIUM
 ACCIAIO INOX AISI 316
 STEEL



FASCETTE DI CABLAGGIO MULTI-LOCKIT IN ACCIAIO A ISI 316 - RIVESTIMENTO IN COPOLIMERO MACRAPOL NERO - OMOLOGATE BSG 4121 - ... PER INFORMAZIONI SULLE CARATTERISTICHE DEI PRODOTTI...




Codice Code	Dimensioni (mm) Dimensions (mm)	Codice Code	Dimensioni (mm) Dimensions (mm)
AE 611	150 x 7	AE 711	150 x 12
AE 612	225 x 7	AE 712	225 x 12
AE 613	300 x 7	AE 713	300 x 12
AE 614	450 x 7	AE 714	450 x 12
AE 615	610 x 7	AE 715	610 x 12


FASCETTE DI CABLAGGIO IN NYLON 6.6 - NATURALE E NERO - AUTOESTINGUENTI ULL 94 - OMOLOGATE R.I.N. - ... PER INFORMAZIONI SULLE CARATTERISTICHE DEI PRODOTTI...



NATURALI				NERE			
Codice	Dimensioni (mm)	Codice	Dimensioni (mm)	Codice	Dimensioni (mm)	Codice	Dimensioni (mm)
S201	75x2,2	S223	180x7,5	S301	75x2,2	S323	180x7,5
S203	98x2,5	S226	300x7,5	S303	98x2,5	S326	300x7,5
S206	140x2,5	S227	360x7,5	S306	140x2,5	S327	360x7,5
S209	140x3,5	S231	540x7,5	S309	140x3,5	S331	540x7,5
S214	200x3,5	S233	750x7,5	S314	200x3,5	S333	750x7,5
S215	200x4,5	S234	780x9	S315	200x4,5	S334	780x9
S216	250x4,5	S237	500x12,5	S316	250x4,5	S337	500x12,5
S217	290x4,5	S241	850x12,5	S317	290x4,5	S341	850x12,5
S219	360x4,5	S243	1000x12,5	S319	360x4,5	S343	1000x12,5

TAGLIACINI A CROCIETTO CABLE CUTTER WITH JACK 	FORBICI PER FASCETTE TONGUE FOR CABLES 	FORBICE PER ELETTRICISTI ELECTRICIAN SCISSORS 
FORBICE PER CAPICORDA TONGUE FOR STRIPPER HEADS 	UTENSILE BAND-IT TONGUE FOR BAND-IT TOOL 	TROVACABLI CABLE-CUTTER 

TRECCE E CAVI PER CONNESSIONI MASSA CON TERMINALI TUBOLARI STAGNATI
... PER INFORMAZIONI SULLE CARATTERISTICHE DEI PRODOTTI...



Sezioni da 2,5 mmq a 150 mmq
 Pesi da 4 mm a 16 mm
 Section from 2,5 mmq to 150 mmq
 Holes from 4 mm to 16 mm


L.M.T. s.n.c.
 Via Maucci, 3 - 35030 RUBANO (PD)
 Tel. (049) 630279-632075 - Fax (049) 632211

**COSTRUZIONI Elettromeccaniche
 STAMPAGGIO GOMMA E TERMOPRESENTI**