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REVISIONE		DESCRIZIONE	EL.	CON.	APP.

MINISTERO DELLE INFRASTRUTTURE E DEI TRASPORTI
MAGISTRATO ALLE ACQUE

NUOVI INTERVENTI PER LA SALVAGUARDIA DI VENEZIA

LEGGE N.798 DEL 29-11-1984
CONVENZIONE REP. N. 7191 DEL 04-10-1991
ATTO ATTUATIVO REP 8100 del 19-12-2005 (PROGETTAZIONE)
ATTO ATTUATIVO A VALERE SU 6^ ASSEGNAZIONE CIPE PER IL "SISTEMA MOSE" (OPERA)

INTERVENTI ALLE BOCCHE LAGUNARI PER LA REGOLAZIONE DEI FLUSSI DI MAREA

CUP: D51B02000050001

PROGETTO ESECUTIVO

WBS: CO.Q1.68: MEZZI PER LA SOSTITUZIONE DELLE PARATOIE
WBE: CO.Q1.68.PE.01: REALIZZAZIONE DEL 1° MEZZO

Progetto Mose
FORNITURA DI UN MEZZO PER LA SOSTITUZIONE DELLE PARATOIE (JACK-UP) CON CONTESTUALE OPZIONE PER LA FORNITURA DI UN SECONDO MEZZO (JACK-UP) GEMELLO

SPECIFICA TECNICA
PROPULSORI, MOTORI ELETTRICI E CONVERTITORI

ELABORATO COMAR SCARL	CONTROLLATO COMAR SCARL	APPROVATO COMAR SCARL
A. BENVENUTI	G. PINZONI	A. SORGATO
N. ELABORATO	REVISIONE	DATA
OP4921-IM0005-S004	00	01/07/2011

COORDINAMENTO PROGETTAZIONE
S. Pastore M. Brotto

CONSORZIO VENEZIA NUOVA
M. Brotto

PROGETTAZIONE ESECUTIVA
TECHNITAL
IL RESPONSABILE : Ing. A. SCOTTI

COMAR
COstruzioni Mose ARsenale
IL PRESIDENTE : Ing. S. TOMARELLI

OPERA PROTETTA AI SENSI DELLA LEGGE 22 APRILE 1941 N° 633 TUTTI I DIRITTI RISERVATI
QUALSIASI RIPRODUZIONE ED UTILIZZAZIONE NON AUTORIZZATE SARANNO PERSEGUITE A RIGORE DI LEGGE

MINISTERO DELLE INFRASTRUTTURE E DEI TRASPORTI
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It	Codice	Titolo	Pagine
1	INL-050099-01	Four (4) Schottel pumpjets - type SPJ 0320 RD as main propulsion units - Technical Specification	33
2		Schottel pumpjets - type SPJ 0320 RD Datasheet ½ - Thrust deduction 0%	1
3		Schottel pumpjets - type SPJ 0320 RD Datasheet 2/2 - Thrust deduction 9%	1
4	INL0099	Installation Drawing	1
5		Marelli Motori – Datasheet	10
6		ABB drives – Datasheet	6
7	3AUA0000047151	ABB drives – Dimensional drawing	1

FOUR (4) SCHOTTEL PUMPJETS

TYP SPJ 0320 RD

AS MAIN PROPULSION UNITS

Vessel type	: Jack Up
Operation area	: Italy, Coast
class	: RINA
class notation	: C+ SPECIAL SERVICE - ASSISTED PROPULSION - SHELTERED AREA NAVIGATION - DYNAPOS AM/AT
SCHOTTEL Project no.	: INL-050099-01

Rev. No	Issue Date	Issue Description	Originator/Dpt.
0	2010-10-18	Revision due to interface meeting 12.10.2010 in COMAR	Dipl. Ing. A. Witschel

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1. SCOPE OF SUPPLY

1.1 List of components supplied by SCHOTTEL

- 4x SPJ 0320 RD
- Parts per thruster:
- separate lube oil tank
- steering system parts, according to chapter steering system
- Prime mover, Type: Asynchrony frequency controlled electric motor
- Frequency converter(Active front End)for control of electric prime mover
- Shaftline parts, configuration according to chapter power transmission
- 1x Switch cabinet for SCHOTTEL control system
- 1x Switch cabinet for SCHOTTEL power part steering system
- 1x Brake resistor for SCHOTTEL power part steering system
- per ship set:
- 1x Tool set
- 1x Spare Parts
- 1x Maintenance oil pump

1.2 Spare Parts

Spare parts will be supplied according to requirements of classification societies restricted service, basically consisting of:

- one set of sealing
- one set of flexible hoses and fittings for the hydraulic system
- one set of relays and LEDs (depends on construction of electrical system)

1.3 Additional agreements

1.)Thrust values:
Theoretical thrust at bollard pull condition (1 thruster)
without thrust deduction
due to installation respected: 101,7 kN
Theoretical thrust at speed of 5 kn(1 thruster) without thrust deduction due to installation considered: 83,6 kN
Thrust deduction can vary between 15% - 35% depending on thruster installation, thrust direction angle and vessel's speed

2.) Switch cabinet steering control:
The switch cabinet will be equipped with a local control panel. From this panel it will be possible to steer the Pump Jet in time dependent manner and control the motor speed as well in time dependent manner.

Furthermore an emergency stop, lamp test and common alarm light will be provided, which shall connected to central warning unit.
Additionally a thrust direction indicator and impeller speed indicator will be fitted in switch cabinet door.

3.) Normal Operation will be with a maximum nominal power of 1200 kW @ 813 rpm. Only in particular situations more power will be realeased, for example during lowering of Jack Up Legs.

4.) Remarks regarding electric Prime Movers in SCHOTTEL supply:
Motors: Make MARELLI, Jacket fresh water cooled IC77W, Type B5J 560 LA 6, weight: about 10.000 kg
AFE Frequency converters: Make ABB, Air Cooled, Type ACS 800-37-2320-7

Dimensions and weight switch cabinets power part, each: W=4230 mm, H=2314 mm, D=646 mm, weight about: 3800 kg plus additional control cubicle with W=600 mm.

5.) Documentation:
The final documentation will be supplied in 6 fold in Italian and English language. It shall be supplied latest 3 months after delivery date of the thrusters.

6.) Fixation materials:
SCHOTTEL will supply all bolts, washers and nuts necessary for fixation of Pump Jets in outer wells and necessary for fixation of CENTAFLEX shaft.

7.) Product Properties:
Product properties: rated power (=1200kW), Maximum power for 10 hour continuous load (=1650kW), Maximum power for 30 minutes continuous load (=2200kW).
Theoretical Thrust Values considering 0% thrust deduction at 0 kn ship speed per unit:
1200 kW @ 813 rpm: 101,7 kN
1380 kW @ 852 rpm: 111,6 kN
1650 kW @ 904 rpm: 125,7 kN (value can not be reached due to missing power of prime mover!)
2200 kW @ 995 rpm: 152,3 kN (value can not be reached due to missing power of prime mover!)
Thrust deduction can vary depending on installation and steering angle between 8% - 35%.

8.) One day sea trial and one interface meeting with the future shipyard of 1 day is also included in SCHOTTEL scope of supply.

2. TECHNICAL DATA (for each unit)

2.1. THRUSTER

Power applied to input shaft	: 1600 kW
Input speed	: 895 r.p.m ±3%
Gear Reduction Ratio	: 2,944
Gear Service factor	: 0.808
Well diameter	: 3400 mm
Well supply	: not Schottel supply
Minimum immersion	: 1,0 m
Casing material	: STEEL
Loss of displacement	: about 11 m³
Impeller material	: NIRESIST
Installation into vessel	: rigid from below
Weight excl oil & auxiliaries	: 28 t (approximately)

Note: The final weight will be determined in the installation proposal.

Thruster rating

Working hours	: < 3000 -5000 h / per annum
Load	: alternating max. 10 h continuous full load max. 75% full load
Overload	: Prime mover torque can exceed rated torque for max. 10% (standard)
Operation area	: Inland waterways with limited water depth or Restricted coastal service

Steering

Type	: SCHOTTEL Steering-System SST 1002
Rotation Speed	: 15 sec. /180°

Components
2 electric steering motor(s) mounted on SPJ

Input power	:11 kW (each motor)

2.2. PRIME MOVER

A frequency controlled 3 phase AC asynchronous motor with squirrel-cage rotor will be used as prime mover.

Rated power	: 1600 kW
Rated rpm	: 0 - 895 r.p.m.
Rated voltage	: 690 V
Rated frequency	: 0 - 45Hz
Rated duty	: S1
Installation	: IM B3
Frame size	: 560
Type of protection	: IP 55
Insulation class	: F/F
Special enclosures	: 3 x PT100 for windingtemperature, 2 x PTC for bearings, anti condensation heating
Protection against condensation	: internal heating
Classification	: RINA

Fresh water motor cooling water data:
Cooling water entry: 38 °C
Cooling water quantity: 7,2 m^3/h
Max allowed cooling water pressure: 6 bar
Quantity of heat to be removed: 45 kW

The fresh water cooling pump is within yard supply.

An anti-condensation heating prevents the winding from corrosion at stand still condition, rated voltage is 230 V.
Incorporated temperature detectors protect the windings against over temperature.

Control Cabinet for Frequency Control

steel sheet cabinet IP 54, cable entry from below, equipped with:

Frequency converter	**: Active Front End**
Rated power	**: 1600 kW**
Rated voltage	**: 690 V**
Rated frequency	**: 50 Hz**
Output frequency	**: 0 – 45 Hz**

- EMC-Standard: EN 61800-3 (industrial environment)
- Main Contactor
- Main motor protection relays
- Anti condensation heating
- Relays for signalling of operation and failures

The electric motor and the frequency control are de rated following classification rules for marine propulsion systems of classification company RINA.

N.B.:
1) The frequency control is also provided with an additional input speed of –50% to flush the unit in case foreign elements are blocking the suction inlet.

2) Frequency converters cause harmonic distortions on supply networks. Therefore we have already offered AFE Frequency control. A THD calculation has in every case to be effected for the supply network by the shipyard to check that this non linear consumer can be integrated in the network without problems. In extreme cases additional filters or increased generator power can become necessary.

2.3. POWER TRANSMISSION

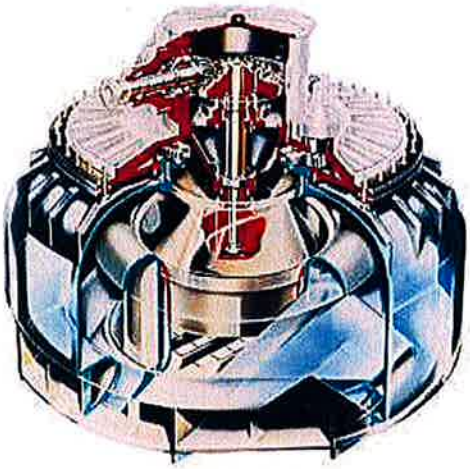
Transmission components (shaft(s), coupling(s))

The **power transmission** consists of the following components:

- 1 (one) CENTAX CENTALINK shaft

3. DESIGN & CONSTRUCTION (for each unit)

3.1 GENERAL DESIGN FEATURES



Picture 1: Symbol picture

Function

The SCHOTTEL Pump-Jet is a water-jet propulsion system similar to a rotary pump and totally integrated into the ship's hull. The water is vertically aspirated by the impeller via the rounded suction inlet from the bottom. The suction inlet is protected by an inlet grid. The impeller, placed near to suction inlet, is driven by a bevel gear box with a suitable gear reduction.

The impeller, equipped with pressure vanes aspirates the water axially and distributes it radially into the casing. The casing-geometry is optimized for maximum pressure increase.

The lower housing with the bottom plate can be rotated 360° continuously clockwise and counter-clockwise around its vertical axis by the steering gear of the Pump Jet. Inside the water flow is accelerated by three times compared to the intake speed.
The bottom plate is centrally equipped with the above described suction inlet and with three symmetrically arranged nozzles, the water leaves the nozzles by an angle of about 14° compared to horizontal.

Power transmission within the SCHOTTEL Pump-Jet is arranged by a horizontal input shaft, a bevel gear and a vertical shaft to the impeller. The spiral bevel gears for the power transmission are made of high quality case-hardened steel. Shafts are made of high grade steel and run in roller bearings. Output shaft is equipped with a triple sealing system, radial shaft seals are special seawater resistant running rings.

Sealings

The sealing system at the vertical shaft contains one sealing package which consists of three radial lip ring sealings with leakage control system. One sealing is placed at the inner side to seal the oil of the SPJ-unit. Two sealings are designed to seal against water. The sealing package is additionally protected against dirt and mud.
The leakage control system is filled with oil and connected through a pipe to a header tank, thus a potential oil or water leakage can be detected.

The steering gearbox is equipped with two sealing packages, each consists of three radial lip ring sealings with support rings between. One sealing of each package is placed at the inner side to seal the oil of the SPJ-unit. Two sealings are designed to seal against water. The sealing packages are additionally protected against dirt and mud.

All radial lip ring sealings on the vertical shaft, as well as on the steering system, running on a high quality stainless steel liner with tungsten carbide coating.

Lubrication

The lubrication is ensured by oil bath lubrication with circulation by centrifugal force. The cooling of the oil is achieved by emission of heat to the water that is flowing around. The separate lub oil header tank with level gauge is equipped with a liquid level switch for the alarm indication 'oil level too low' to be connected to the warning unit.
The lub oil header tank has to be installed at least 1000 mm above loaded waterline.

Installation

The unit is provided with a mounting flange for **rigid mounting from below** into an outer well within the vessel's hull. The well has to be integrated completely into the vessel's structure. The SCHOTTEL PumpJet is bolted directly to the outer well and sealed by an O-ring. The lower edge of the outer well is fitted to the bottom of the vessel. Necessary mounting material is supplied by SCHOTTEL, i.e. bolts and sealing.

3.2 STEERING SYSTEM

SCHOTTEL Steering-System SST 1002

Function
This is a way-dependent full follow up electric steering system with time dependent back-up system.
The SPJ thrust can be directed in every desired steering angle by reading an analogue signal for required steering angle coming from integrated bridge. The electronic control compares the presetting with the actual angle of the SPJ and transmits a signal corresponding to the differential angle to the electric steering motor. If the presetting angle is equal to the angle of the SPJ the control will be aligned.
The proportional steering system works in such a way that with small angle of steering the corresponding steering speed is low and with bigger angle of steering the steering speed is higher. Thus the steering speed is proportionally regulated by the steering angle.
The SCHOTTEL SPJ position is indicated via an electric feed-back system by a thrust direction indicator. The thrust direction is also shown by a mechanical indicator on the SPJ.
In case of failure of the electronic Copilot steering system, the steering is automatically switched over to a time dependent steering system.

Components
The frequency controlled electric steering motor is mounted on the SCHOTTEL SPJ.
SCHOTTEL will supply loose, for installation by the shipyard:

- 1 switchbox IP54 with digital programmable modules
- steering panel, see electric system

- 1 x 6 pulse frequency converter integrated in switchbox
- SKS Filter to avoid THD integrated in switchbox
- frequency controlled electric steering motor(s) mounted on SPJ

4. AMBIENT CONDITIONS

Maximum environmental temperature during operation: 50°C

Mechanical system:

Ambient air temperature	**: between 5°C and max. 55°C**
Relative humidity of air	**: max. 95% without condensation**
Seawater temperature	**: max. 30°C**

Electric system:

Electric parts switchbox	**: 0°C - 50°C**
Bridge parts (inside)	**: 0°C - 50°C**
Bridge parts (outside)	**: (-)20°C - 50°C**
Relative humidity of air	**: max. 95% without condensation**
Vibration	**: 0,7g**

5. POWER SUPPLIES (For each unit)

Electrical

For safe operation of the propulsion system SCHOTTEL requires the following power supply from the ship's sources:

- 690V/50Hz, 3Ph AC main power supply from the main switch board to the power control system of the electric motor
- 400V/50Hz, 3Ph AC main power supply from the main switch board to the thruster control system.
- 230V/50Hz, 2Ph AC (F 16 A) power supply from the main switch board to the SCHOTTEL switch box in the engine room (e.g. for service plug).
- 24 V DC (+/-) 20% with a max. ripple of 1 V (max. 300 W) for emergency operation of the SCHOTTEL switch box.
- 24 V DC (+/-) 20% with a max. ripple of 1 V (fuse 2 A) from the emergency switch box to the steering desk for emergency power supply of each thrust direction indicator.

6. COATING AND PAINT STRUCTURE (for each unit)

Lower parts

1 x 2K Epoxy-resin-primer	approx.	40 µm
3 x abrasion resistant coating system (2K Epoxy-resin)	3 x approx.	100 µm

Upper gearbox as well as other steel parts inside the ship

sand blasting SA 2 1/2 acc. DIN EN ISO 12944-4: 1998-07

2x 2K Epoxy layer of anticorrosive primer	approx. each	50-60µm
1x 2K P.U. top coat, grey RAL 7000	approx.	50-60µm

Electric switchboxes*

RAL 7035, structure

Panels*

Black anodized

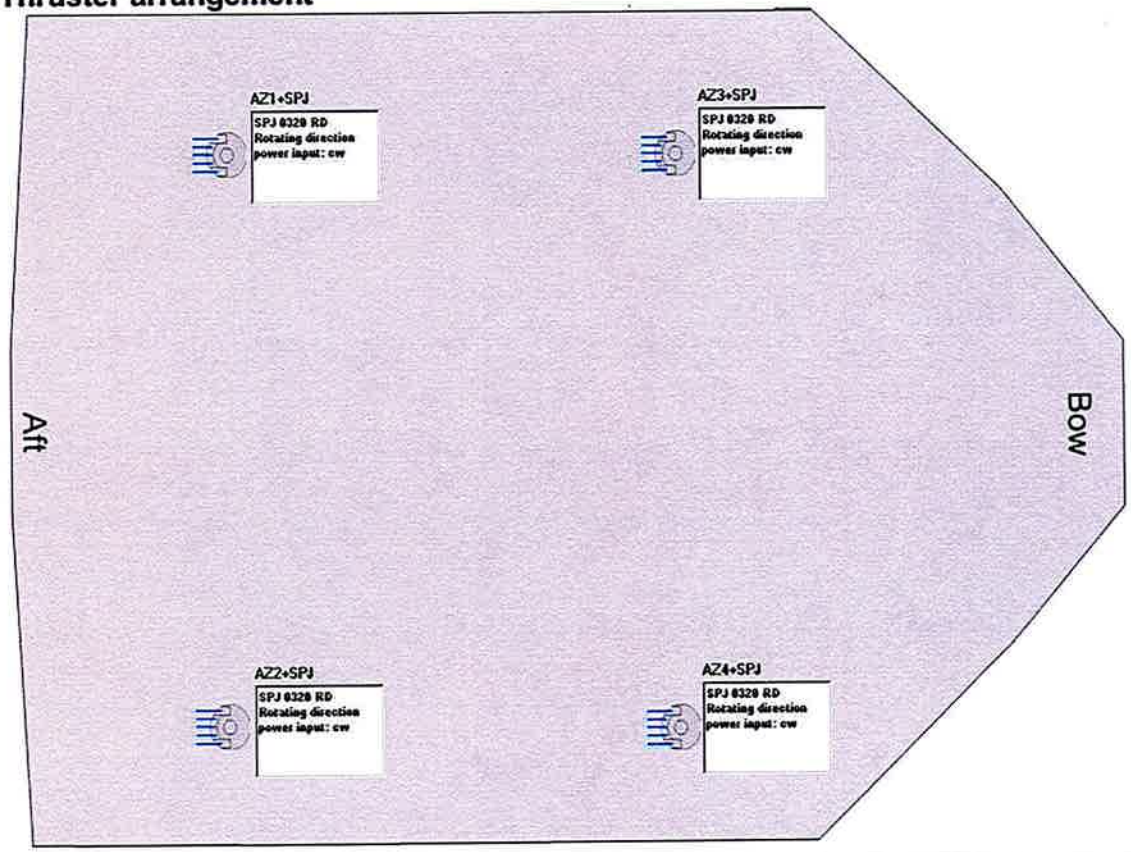
All components will be painted in order to protect the Pump Jet from oxidation and corrosion. All not painted surfaces will be protected with grease during shipment to avoid oxidation.

* If SCHOTTEL scope of supply.

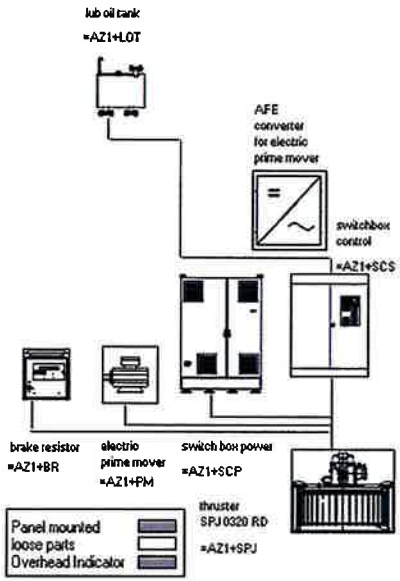
7. ELECTRICAL SYSTEM

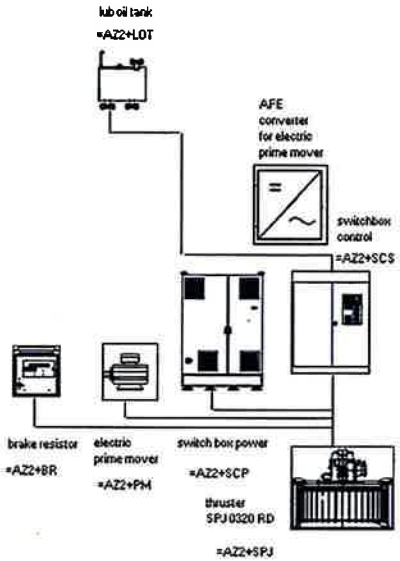
7.1. Unit arrangement

Thruster arrangement

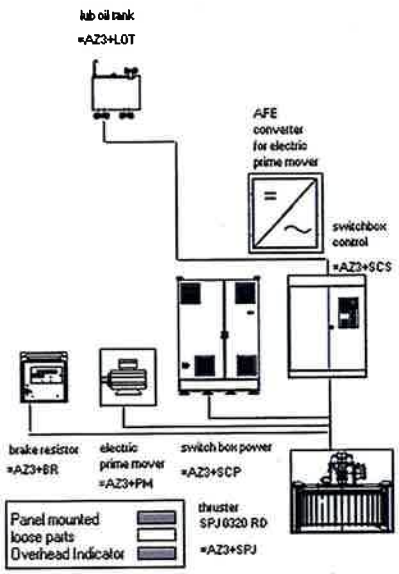


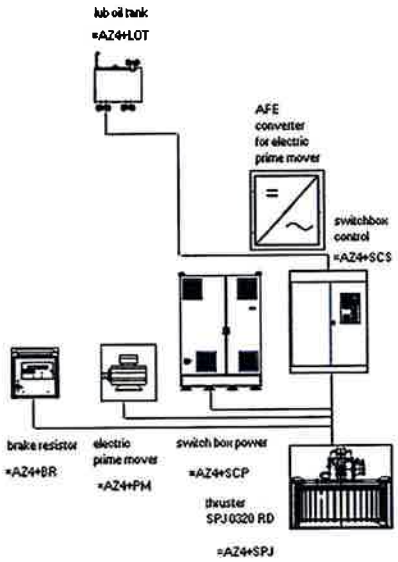
Unit arrangement unit 1-2





Unit arrangement unit 3-4





7.2. Switch cabinet

Switch cabinet control system

The switch cabinet is the central component of the electric system. Incoming AC voltage is converted and stabilized into 24 V DC voltage. Alternatively a 24V DC feed line is also possible. Furthermore all necessary control elements, printed circuit boards, fuses etc. are installed and wired inside. For easy connection of external cabling terminal blocks with corresponding numbering are used.

The switch cabinet will be supplied loose for installation according to local space requirement. Final position of switch cabinet should be selected regarding avoidance of extreme temperatures, humidity and vibration.

Type of protection: IP 23

Local Control Panels

The following components will be mounted into a control panel at the door of each control switch cabinet of the SCHOTTEL control system.

Controls (one for each thruster)

- "EMERGENCY STOP" push button
  - (only with electrical maindrive)
- Push buttons "NON FOLLOW UP STEERING"
- Push buttons "NON FOLLOW UP RPM-CONTROL"

Indicators (one for each thruster)

- Pilot lamps "NON FOLLOW UP STEERING ON"
- Pilot lamps "NON FOLLOW UP RPM-CONTROL ON"
- Thrust direction indicators with build-in illumination
- Shaft speed indicators with build-in illumination

BUS – System

Communication between control panels and switch cabinet control system in engine room is effected via a BUS system. For the transport of data information in BUS system special shielded cables have to be applied, type FMKHC (with twisted pair wires). Data transfer between panels and switch cabinet by shielded BUS cables may not be interrupted by terminals, due to the risk of electromagnetic disturbances. Power cables have to be separated from bus cables in cable channels and a distance of minimum 300 mm to these cables has to be respected.

Switch cabinet power part

Components for the control of the electrical steering motors are installed into separate switch cabinets for each unit. The switch cabinet will be mounted in the engine control room.

Type of protection: IP 23

7.4 Interfaces & alarms

Interface to remote control system

To operate the vessel without SCHOTTEL bridge control elements a remote control interface is included.

Remark:
This interface is used for azimuth set point values from DP/JS–System, too. Switching over between DP/JS-operation and normal-operation is not in SCHOTTEL scope of supply.
For detailed information about the connection see the Appendix "Interface description".

Interface to VDR-System

SCHOTTEL provides following signals to the VDR System **(RS422, NMEA 0183):**

- Actual speed value to engine (set point)
- Nominal value speed setting (feed back)
- Actual value shaft speed
- Nominal value steering setting (set point)
- Actual value steering (feed back)
- Actual activated desk
- Actual activated external system

Alarms

SCHOTTEL supplies potential free contacts to the ship warning unit. The alarm signals are available at the terminals of the switch cabinets and the connection boxes of the components. The signals for alarm suppressing are also connected to these terminals.

For indication of a common alarm on the SCHOTTEL desk control panels (if panels are in SCHOTTEL scope of supply) it is necessary that a potential free signal for

"common alarm" will be delivered from the ship warning unit back to the SCHOTTEL control system.

All alarms that are required according to class requirements for rudder machinery will be indicated as "STATUS-SIGNALS" on the SCHOTTEL bridge panel (if panels are in SCHOTTEL scope of supply).

For detailed information about the alarm transmitter connection, see the attachment "Interface Description".

8. TECHNICAL DOCUMENTATION

- Installation documents by e-mail in advance.
- Operation manuals (6 x paper & 1 x CD, language: italian)

9. COMMISSIONING

One service engineer(s) for in total twenty (20) mandays working days (10 hours/day) for final check and commissioning per ship set. This also includes travel expenses and accommodation for in total two trip(s).

If further days or travels are necessary which were not caused by SCHOTTEL, the following applies:

Rate per day service engineer 750 €. Travelling time and expenses are to be added and will be invoiced based on real expense.

If applicable, participation at sea acceptance tests, harbour acceptance tests, FMEAs, site acceptance tests, bollard pull tests or similar will be charged at real expense as above, as SCHOTTEL has limited influence on duration.

Important remark
Please note that full power must be made available for successful commissioning. The SCHOTTEL Pump Jet must be submerged by given "minimum immersion" value in chapter one. If one of both parameters is not fulfilled, a second journey and a second commissioning will be necessary on customer's expenses.
Our service department will assist you checking if all necessary requirements are fulfilled.

10. TEST & CERTIFICATES

The propulsion system will be supplied with a certificate of: RINA

SCHOTTEL will effect the following tests:

- FAT
- Works certificate

11. EXCLUSIONS

- Outer Wells
- Protection of all moving parts
- Installation of the system
- Electrical and hydraulic connections between SCHOTTEL-components and ship's sources
- Oil filling of all aggregates
- Alarm system (other than mentioned alarm switches)
- All parts not specifically indicated in the above specification as being part of our scope of supply.

Appendix A: INTERFACE DESCRIPTION

1 Contents

nomination	description
=AZX+SCS	Switch box steering control system
=AZX+SCP	Switch box steering control power
=AZX+SPJ	pump jet
RC	Remote control
MSB	main switch board 400V/50Hz
PM	Propulsion motor
ICS	integrated controlled safety system, warning unit
ESB	Emergency switchboard 24V DC
LOG	Speed Log
VDR	Voyage data Recorder
LOT	Lube oil tank

Example

For azimuth thrusters:

=AZX+SCS, in interface list

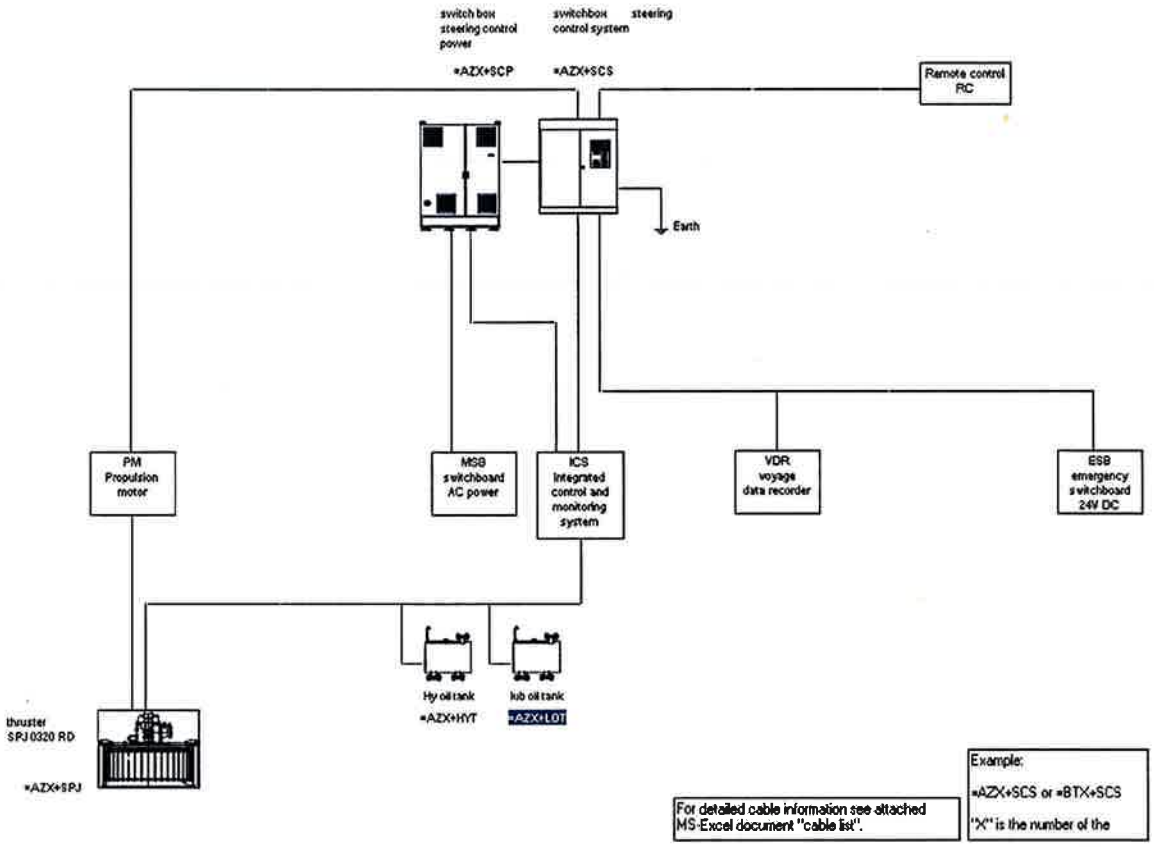
X is the number of thruster
1 = Aft Azimuth thruster, port
2 = Aft Azimuth thruster, starboard

For thrusters:

=PM, in interface list

X is the number of thruster, enumeration of thruster numbers is from stern to bow

2 Overview Interfaces



Interface steering and control system

Power supply

AC power supply control system

=AZX+SCP	signal specification	terminal no.		signal direction	terminal no.		signal specification	MSB
Feed line Control system	L1 L2 L3	-S1	2 4 6	⇦			Fused	400V/50Hz
Earth connection	PE	-X1	4	⇦			Earth connection	
Feed line (e.g. for service plug)	L N	-X1	25 26	⇦			Fuse 16A	230V/50Hz

DC power supply

=AZX+SCS	signal specification	terminal no.		signal direction	terminal no.		signal specification	ESB
Feed line Back up power supply	24V DC (+) 24V DC (-, GND)	-X2	1 2	⇦			Fuse 16A	24V DC
Feed line indicators	24V DC (+) 24V DC (-, GND)	-X2	3 4	⇦			~ 50W Fuse 2A	24V DC

Interface to remote control steering system

Digital outputs

=AZX+SCS	signal specification	terminal no.		signal direction	terminal no.		signal specification	RC
Ready for remote or Local active	11 14 12	-X8	K41	⇨			30V/ DC, max.2A 250V AC max.2,5A	Contact 11/14 closed if azimuth control at bridge
FFU steering system in service	11 14 12	-X8	K42	⇨			30V/ DC, max.2A 250V AC max.2,5A	Contact 11/14 closed if FFU steering is in service
NFU steering system in service	11 14 12	-X8	K43	⇨			30V/ DC, max.2A 250V AC max.2,5A	Contact 11/14 closed if NFU steering is in service

Digital Inputs

=AZX+SCS	signal specification	terminal no.		signal direction	terminal no.		signal specification	RC
NFU steering in service	24V DC, max. 0,5A	-X8	41	⇦				NFU steering in service **(Pulse 1s)**
NFU turning thruster clockwise	24V DC, max. 0,5A	-X8	42	⇦				NFU turning thruster clockwise
NFU turning thruster counter clockwise	24V DC, max. 0,5A	-X8	43	⇦				NFU turning thruster counter clockwise
Feed line for signals terminals 1 – 3		-X8	44	⇨			Feed line	

Analogue signals

=AZX+SCS	signal specification	terminal no.		signal direction	terminal no.		signal specification	RC
Nominal value FFU steering ± 180°	steering setting signal (isolated input)	-X8 -X8	45 46	⇦			4-20mA(+) 4-20mA(-) Max load 500 Ohm	Steering angle value 4mA -180°Ps 12mA ahead 20mA +180°Stb
Actual value thrust direction ± 180°	steering feedback signal (isolated output)	-X8 -X8	47 48	⇨			4-20mA(+) 4-20mA(-) Max load 500 Ohm	Steering angle value 4mA -180°Ps 12mA ahead 20mA +180°Stb
Actual value thrust direction ± 180°	steering feedback signal for Indicators (isolated output)	-X8 -X8	49 50	⇨			4-20mA(+) 4-20mA(-) Max load 500 Ohm	Steering angle value 4mA -180°Ps 12mA ahead 20mA +180°Stb
Max load 500 Ohm (galvanic isolated output)	4-20mA(+) 4-20mA(-)	-X8 -X8	51 52	⇨			4mA = 0rpm 20mA = 100%	Feedback value shaft speed 0-100%

Connection to the VDR

=AZX+SCS	signal specification	terminal no.	signal direction	terminal no.	signal specification	VDR
Status signals	Converter RS 232 to RS 422	A102 TA TB	⇨		Proprietary sentence RS 422 Bandrate: 4,8kbit/s or 9,6kbit/s Data bits:8 Stop bits:1 Parity: None	

Following Information will be provided (according to NMEA 0183, VTG)

- Currently selected speed of engine/drive motor (speed set point)
- Actual speed of engine/drive motor (speed feedback value)
- Actual propeller speed (propeller speed feedback value)
- Currently selected steering angle (azimuth set point)
- Actual steering angle (azimuth feedback value)
- Currently activated control desk
- Currently activated external system

Interface to Ship alarm system

Switch box steering control system

=AZX+SCS	signal specification	terminal no.	signal direction	terminal no.	signal specification	ICS
indication	24V DC, max. 0,5A	-X4 1 -X4 2	⇦			Collective alarm of the unit
Failure AC/DC Converter	11 14 12	-X4 K1	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure feed line 24V DC	11 14 12	-X4 K2	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure control system	11 14 12	-X4 K3	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure NFU system	11 14 12	-X4 K4	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure FFU steering control	11 14 12	-X4 K6	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
FFU steering locked	11 14 12	-X4 K7	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/12 is normal closed Delay time 0s
Failure values external system	11 14 12	-X4 K8	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Lube oil level min (SPJ only)	11 14 12	-X4 K13	⇨		30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s

Switch box steering control power part

=AZX+SCP	signal specification	terminal no.	signal direction	terminal no.	signal specification	ICS
Main switch switched Off Contact N.C.		-X4 1 -X4 2			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Phase failure feed line Contact N.C.		-X4 3 -X4 4			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Failure steering motors Contact N.C.		-X4 5 -X4 6			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Overload steering motors Contact N.C.		-X4 7 -X4 8			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Failure frequency converter steering Contact N.C.		-X4 9 -X4 10			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Over temperature frequency converter steering Contact N.C.		-X4 11 -X4 12			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Fault braking System Frequency converter Contact N.C.		-X4 17 -X4 18			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Fault clima control switch box Contact N.C.		-X4 19 -X4 20			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Failure anti condensation heater steering motors		-X4 23 -X4 24			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Fault fans Steering motors Contact N.C		-X4 25 -X4 26			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s
Fault brake control Steering motors Contact N.C		-X4 27 -X4 28			30V DC, max. 2A 250V AC, max. ,5A	Delay time 0s

Interface prime mover power part

Power supply
AC power supply for electric prime mover

=PM	signal specification	terminal no.		signal direction	terminal no.		signal specification	MSB
Feed line Prime mover	L1 L2 L3	-X0	L1 L2 L3	⇦			Fused	690V/50Hz
Earth connection	PE	PE		⇦			Earth connection	

AC power supply - Heating

VSD	signal specification	terminal no.		signal direction	terminal no.		signal specification	Heating Distribution
Feed line (for motor and switchbox heating)	L N	-X30	1 2	⇦			Fuse 16 A	230VAC

DC power supply

VSD	signal specification	terminal no.		signal direction	terminal no.		signal specification	Battery System
Feed line Back up power supply	24V DC (+) 24V DC (-, GND)	-X4	L+ L-	⇦				24V DC

Interface converter prime mover

Digital inputs

=VSD	signal specification	terminal no.		signal direction	terminal no.		signal specification	Kongsberg
Feed line for signals terminals 1 – 3				⇨			Feed line	
	24V DC, max. 0,5A			⇦				DP in Service
	24V DC, max. 0,5A			⇦				Joystick in Service
	24V DC, max. 0,5A			⇦				RPM NFU ON/OFF
	24V DC, max. 0,5A			⇦				Manual in Service
	24V DC, max. 0,5A			⇦				Start flushing
	24V DC, max. 0,5A			⇦				Stop flushing
	24V DC, max. 0,5A			⇦				k-thrust zero position
	24V DC, max. 0,5A			⇦				NFU speed setting Increase speed
	24V DC, max. 0,5A			⇦				NFU speed setting Decrease speed
	24V DC, max. 0,5A			⇦				Converter ON
	24V DC, max. 0,5A			⇦				Converter OFF

Digital outputs

=VSD	signal specification	terminal no.	signal direction	terminal no.	signal specification	Kongsberg
Converter in local Control	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Converter in NFU control	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Over-Temperature FC	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Over-Temperature Drive	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Power limited	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Overload Warning alarm	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Control fault	11 14 12				30V DC, max: 2A 250V AC, max.2,5A	
Ready to start	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
converter switched ON contact closed if converter is ON	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
converter switched OFF contact closed if converter is switched OFF	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
Flushing run	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	
RPM Setvalue Failure (loss signal)	11 14 12				30V DC, max. 2A 250V AC, max.2,5A	

Analogue signals

=VSD	signal specification	terminal no.		signal direction	terminal no.		signal specification	Kongsberg
Max load 500 Ohm (galvanic isolated input, loop monitoring by thruster supplier)	4mA = 0% load 20mA = 100%			⇦			4-20mA(+) 4-20mA(-)	Pumpjet RPM Setpoint value 0-100%
Max load 500 Ohm (galvanic isolated output)	4-20mA(+) 4-20mA(-)			⇨			4 mA = 0% 20mA = 100%	Motor Current 0-100% (Loop monitoring by Kongsberg)
Max load 500 Ohm (galvanic isolated output)	4-20mA(+) 4-20mA(-)			⇨			4 mA = 0% 20mA = 100%	RPM motor pump jet from FC (Loop monitoring by Kongsberg)

Interface to Ship alarm system
Switch box converter prime mover

VSD	signal specification	terminal no.	signal direction	terminal no.	signal specification	ICS
Failure AC Control Voltage	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure AC/DC converter	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure DC/DC converter	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Motor Over-Temperature warning	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Motor Over-Temperature failure	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
High Bearing Temperature Warning	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure Drive Water Cooling	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Temperature Switch Cabinet 55°C	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure Frequency Converter	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Ready for Operation	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Room FAN running	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s
Failure RPM Control	11 14 12	-X7			30V DC, max. 2A 250V AC, max. ,5A	Contact 11/14 is normal closed Delay time 0s

Room FAN Switchbox

VSD	signal specification	terminal no.		signal direction	terminal no.		signal specification	Room FAN Distribution
Fan Request		-X4					30V DC, max. 2A 250V AC, max.2,5A	Fan Request
Room Fan Running	24V DC, max. 1W	-X4						Room Fan Running

Power Management

VSD	signal specification	terminal no.		signal direction	terminal no.		signal specification	Power Management
Power Request		-X4					30V DC, max. 2A 250V AC, max.2,5A	Power Request
Power Release	24V DC, max. 1W	-X4						Power Available
Thruster Running	11 14 12	-X4					30V DC, max. 2A 250V AC, max.2,5A	Thruster Running

Main-Switchboard – Emergency Stop System

VSD	signal specification	terminal no.	signal direction	terminal no.	signal specification	Emergency Stop - MSB
Emergency Stop Channel1 (Steering Control System)		-X5			24V DC, max. 1A	
Emergency Stop Channel5 (LOCAL VSD)		-X5			24V DC, max. 1A	
Emergency Stop Active	24V DC, max. 1W	-X5				Emergency Stop Active

SCHOTTEL Pump Jet SPJ

Project : INL-050099-01
User : Dipl. Ing. A. Witschel
Date : 27.08.10

Type	max. Power [kW]	Type :
SPJ 15 RD	75,00	
SPJ 57 RD	257,00	
SPJ 82 RD	419,40	
SPJ 320 RD	**2200,00**	
SPJ 520 RD	3500,00	
SPJ 20 II	110,00	
SPJ 22	110,00	
SPJ 57 T	250,00	
SPJ 82 T	400,00	
SPJ 132 T	581,00	
SPJ 220 T	1000,00	

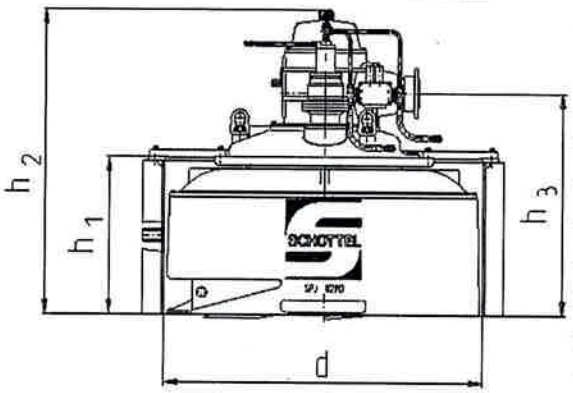
Your choice:

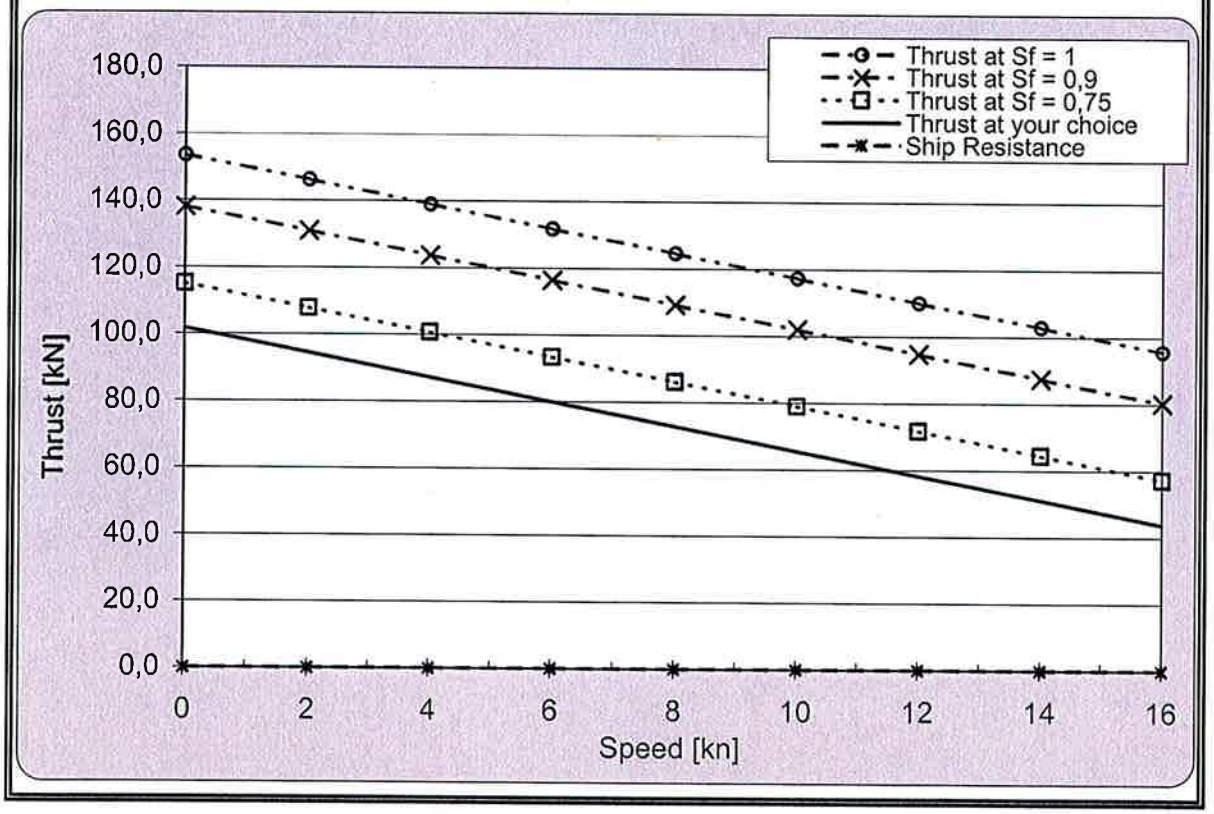
Input per unit :	1200	kW
Number of units :	1	
Thrust deduction :	0,00000001	%

The thrust deduction depends on the installation !

Your results :

SPJ-Type :	SPJ 320 RD
Number of units :	1
Input power per unit :	1200 kW
	1632 hp
Input speed :	813 rpm
Input torque :	14.096 Nm
Service factor :	0,66
Total Bollard Pull :	101,7 kN
	10,36 T
Dimensions per SPJ unit :	
Diameter of well, d :	3.400 mm
Height of well, h_1 :	1.632 mm
Height of SPJ, h_2 :	2.671 mm
Height of flange, h_3 :	2.261 mm
Weight of SPJ :	26.000 kg
Loss of buoyancy :	11 m^3
Gear reduction :	2,944





SCHOTTEL Pump Jet SPJ

Project : INL-050099-01
User : Dipl. Ing. A. Witschel
Date : 27.08.10

Type	max. Power [kW]	Type :
SPJ 15 RD	75,00	☐
SPJ 57 RD	257,00	☐
SPJ 82 RD	419,40	☐
SPJ 320 RD	**2200,00**	☒
SPJ 520 RD	3500,00	☐
SPJ 20 II	110,00	☐
SPJ 22	110,00	☐
SPJ 57 T	250,00	☐
SPJ 82 T	400,00	☐
SPJ 132 T	581,00	☐
SPJ 220 T	1000,00	☐

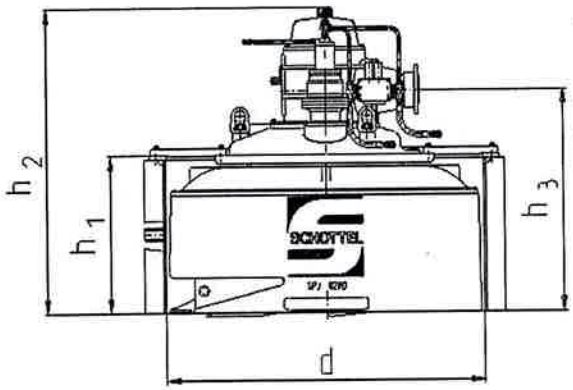
Your choice:

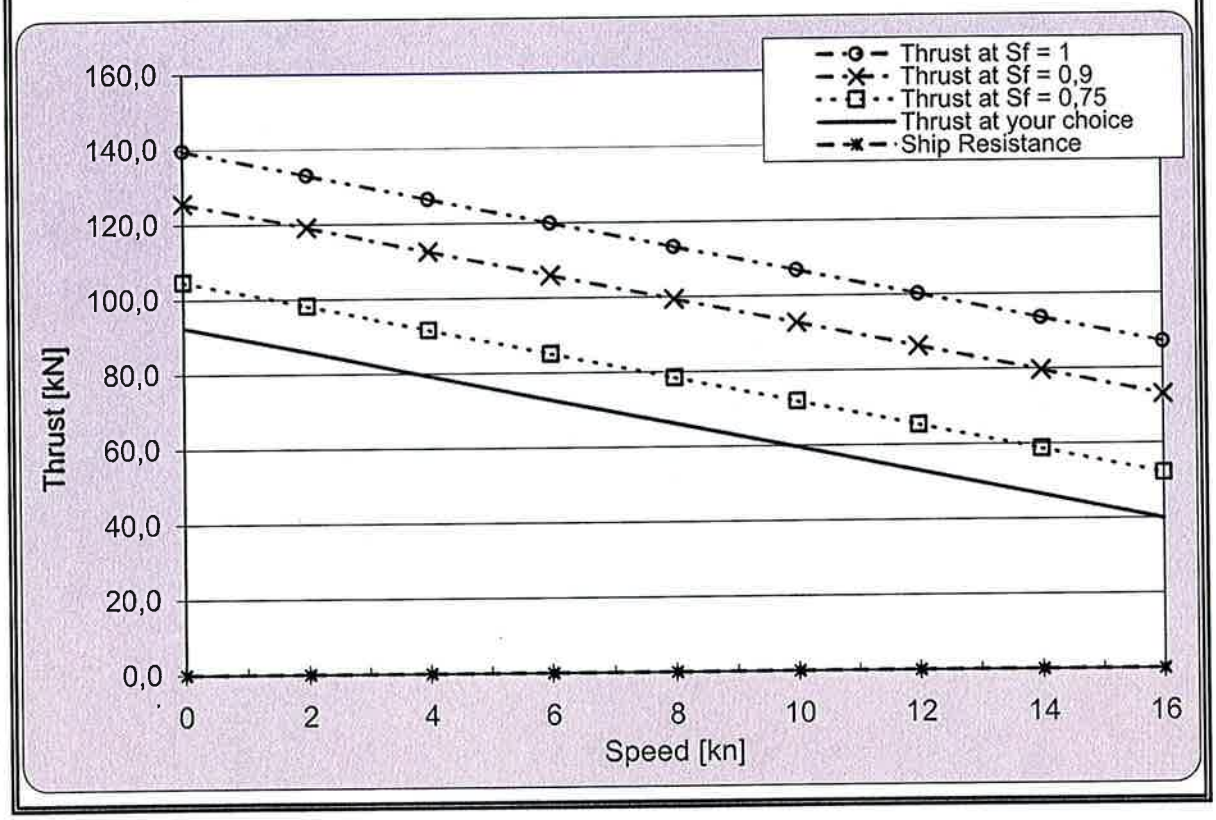
Input per unit :	1200	kW
Number of units :	1	
Thrust deduction :	9	%

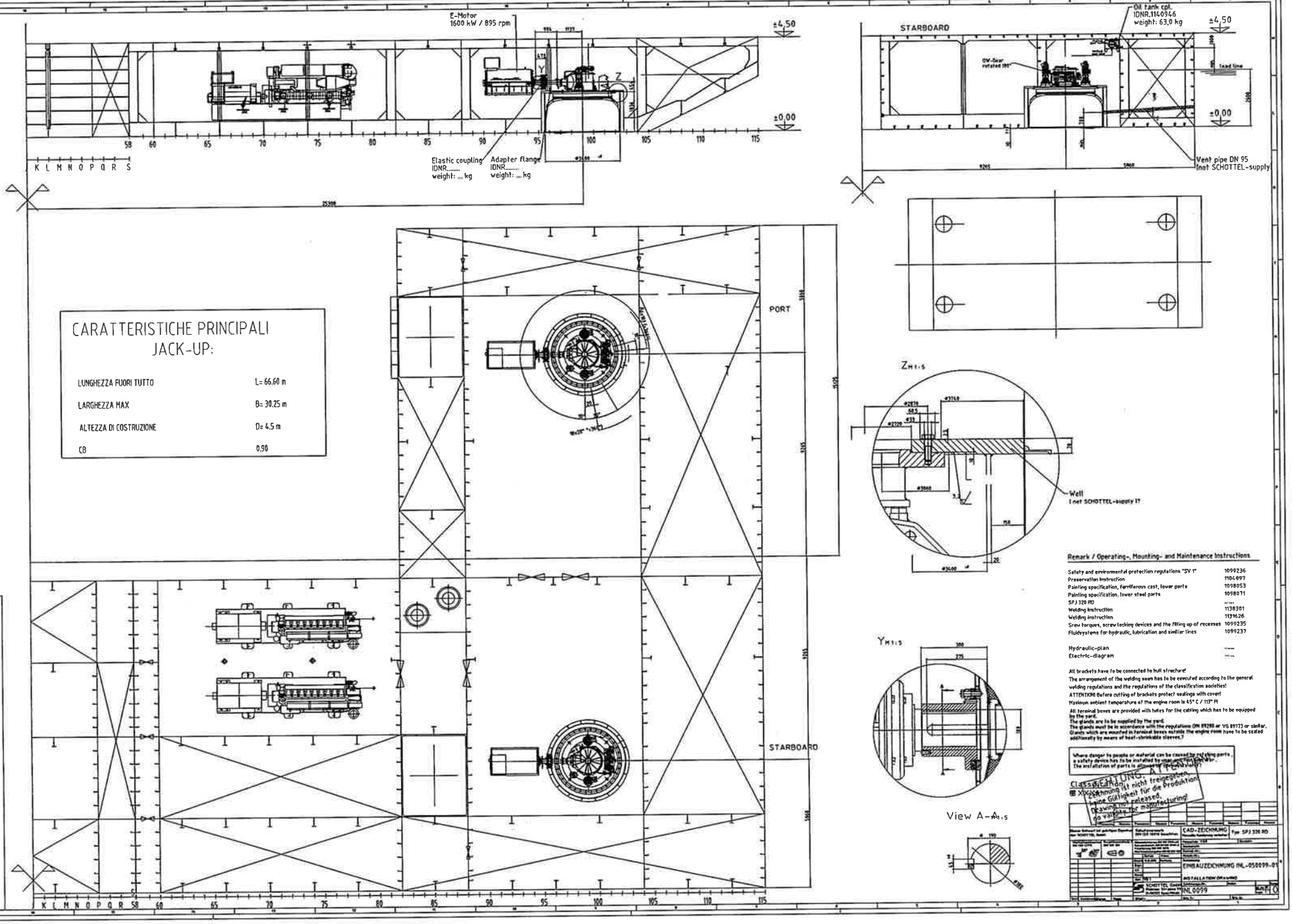
The thrust deduction depends on the installation !

Your results :

SPJ-Type :	SPJ 320 RD
Number of units :	1
Input power per unit :	1200 kW
	1632 hp
Input speed :	813 rpm
Input torque :	14.096 Nm
Service factor :	0,66
Total Bollard Pull :	92,5 kN
	9,43 T
Dimensions per SPJ unit :	
Diameter of well, d :	3.400 mm
Height of well, h_1 :	1.632 mm
Height of SPJ, h_2 :	2.671 mm
Height of flange, h_3 :	2.261 mm
Weight of SPJ :	26.000 kg
Loss of buoyancy :	11 m^3
Gear reduction :	2,944





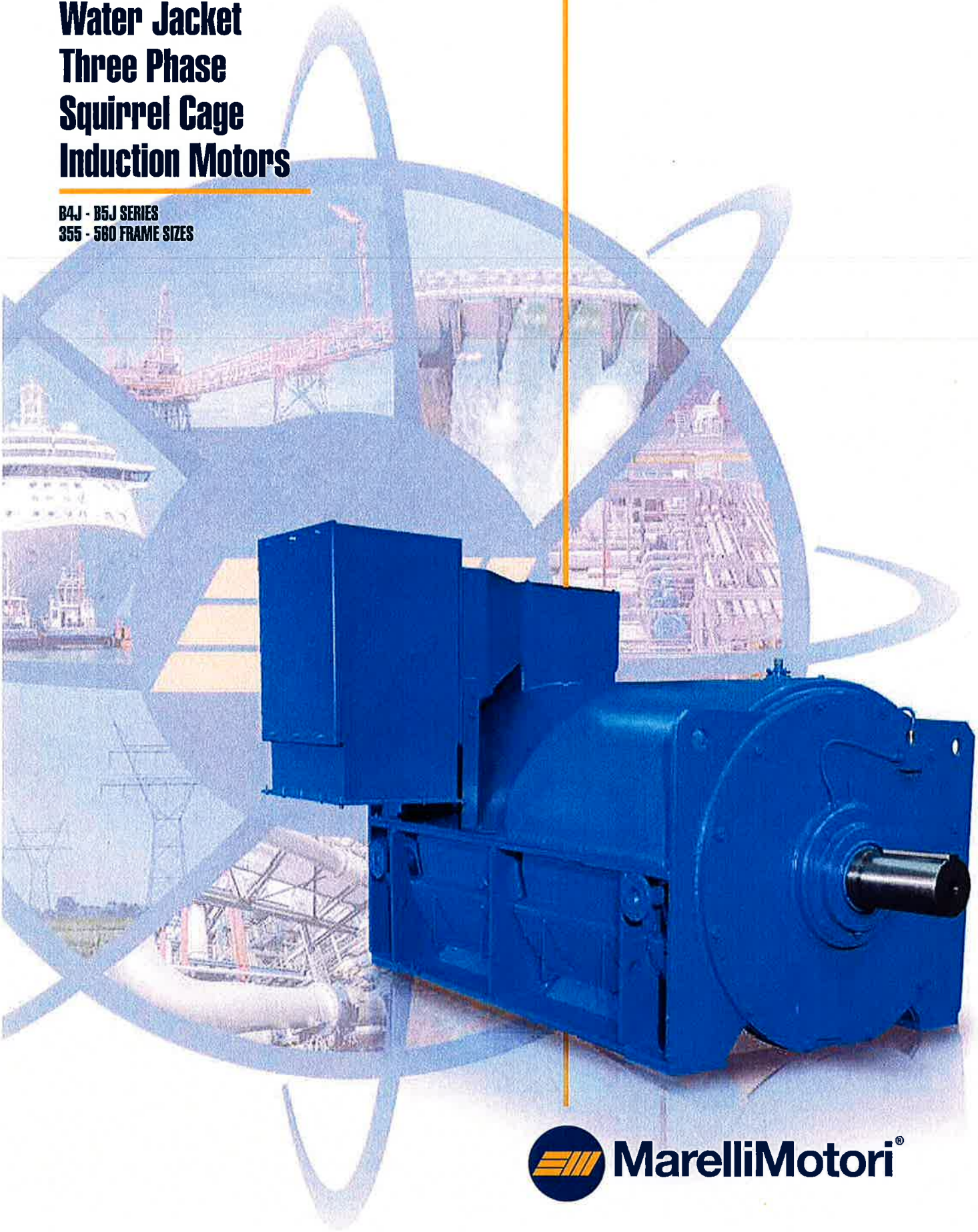


CARATTERISTICHE PRINCIPALI JACK-UP:

LUNGHEZZA FUORI TUTTO	L= 66.60 m
LARGHEZZA MAX	B= 30.25 m
ALTEZZA DI COSTRUZIONE	D= 4.5 m
CB	0.90

Water Jacket Three Phase Squirrel Cage Induction Motors

B4J - B5J SERIES
355 - 560 FRAME SIZES



MarelliMotori®

ASI.CT.036.1 GB

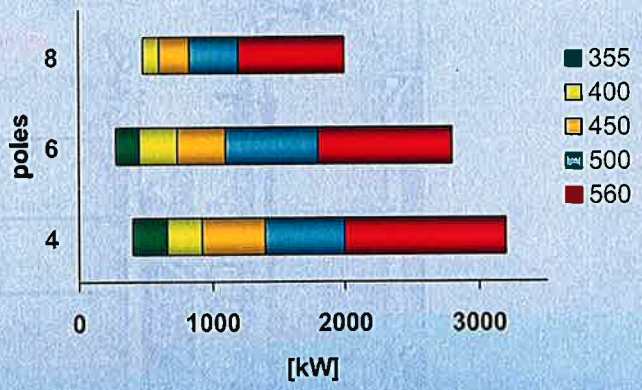
WATER COOLED ASYNCHRONOUS MOTORS 355, 400, 450, 500 AND 560 FRAME SIZES

This series of water cooled motors was designed by **MarelliMotori** for heavy duty applications where space and natural ventilation is limited.

The integral water jacket coolers provide an excellent power output for the compact motor size as compared to traditional heat exchanger designs. These motors, originally designed for tight shipboard applications as main propulsion drives and auxiliary bow thrusters, now find themselves in heavy industry for compressors, pumps, rollers and other rotating equipment.

MarelliMotori has a tradition dating back to 1891 when Ercole Marelli founded the company. With over 100 years of manufacturing excellence and experience, MarelliMotori is recognised as a leading supplier to Industrial, Petrochemical and Marine Industries offering a complete range of **Low**, **Medium** and **High** Voltage Motors and Generators. These quality products are backed up by an organisation of skilled people providing sales, service and technical support to the high standards demanded by customers.

AVAILABLE OUTPUTS - Duty S1 - 50Hz



APPLICATIONS

Marine: main propulsion and thrusters, pumps, etc.

Cement: vibrating equipment, kilns, mills, conveyor belts, fans, etc.

Mining: mills, conveyor belts, compressors, fans, pumps, crushers, etc.

Paper industry: chippers, mixers, debarkers, refineries, etc.

Petrochemical: pumps, compressors

Water: pumps

Process industry: cranes, fans, exhausters, laminators, pumps, etc.

Sugar and alcohol industry: chippers, debarkers, mills, etc.

Hydropower application

MarelliMotori®

Member of CISQ Federation RINA ISO 9001:2008 Certified Quality System

Member of CISQ Federation RINA ISO 14001:2004 Certified Environmental System

RINA BS OHSAS 18001:2007 Certified Health & Safety System

GENERAL FEATURES

Robust construction designed for heavy, arduous and continuous duty in confined spaces.

Standards

IEC 60034, IEC 60072

Approvals

The motors are designed and built in accordance with marine regester rules specifications and comply with: ABS, BV, CCS, DNV, GL, KR, LR, NK, RINA, RS.

Mountings

Vertical or horizontal
Feet and/or flange mountings

Construction

Steel frame
Cast iron or steel terminal boxes and shields
Protection degree IP55
Windings impregnated with VPI system (Vacuum Pressure Impregnation)
Insulation class F
Anti-corrosion and rust frame treatment
Stainless steel nameplate
Simple earthing
Drainage hole
PTCs in windings with terminals in auxiliary terminal box

Supply

Low or Medium Voltage
(for marine application only low voltage allowed)
Inverter

Cooling

Fresh water

Sound Pressure

Low noise level

Bearings

Rolling bearings
Regreasing system
Arrangement for SPM sensor

Safety

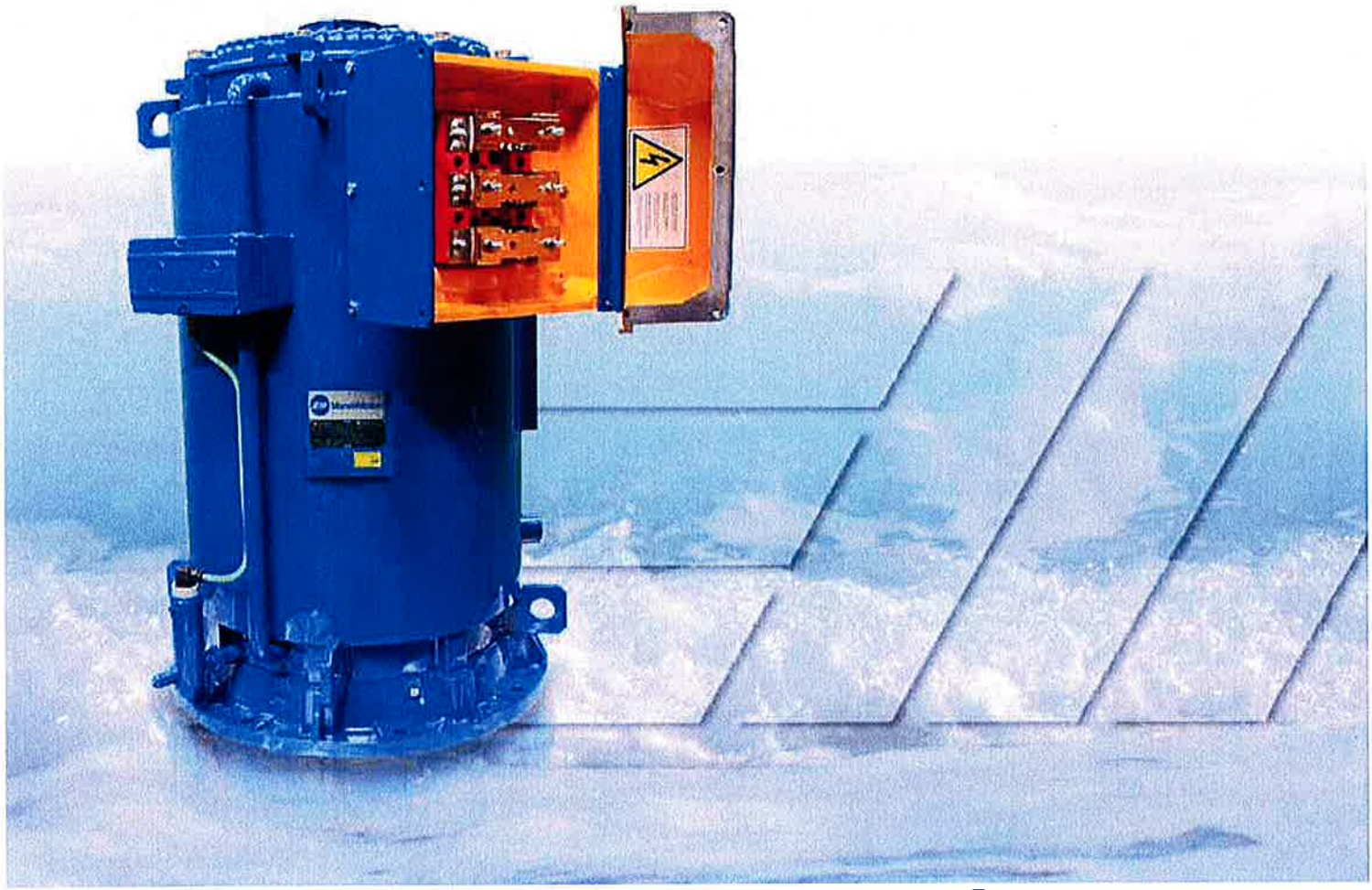
Water leakage sensor

Advantages of Water Jacket Design

No heating dissipation in the installed area
Compact dimensions
No dust circulation

Recommended Uses

When limited space is required
When driven machine is already water cooled
When low noise is required
When switchboard is already water cooled



MarelliMotori®

TECHNICAL FEATURES

DUTY TYPE

The power outputs given in this catalogue refer to S1 duty type. The table below shows the correction factors to calculate the outputs for S2 duty.

S2 – 30'			S2 – 60'	
4 poles	6-8 poles	Frame size	4 poles	6-8 poles
1,30	1,30	355	1,10	1,10
1,30	1,25	400	1,10	1,05
1,25	1,20	450	1,05	1,05
1,15	1,15	500	1,05	1,05
1,15	1,15	560	1,05	1,05

DEGREE OF PROTECTION

Motors are normally provided with IP55 enclosure. A higher degree of protection is available on request.

ENVIROMENTAL CONDITIONS

Electrical tables refer to a cooling water of +38°C.

Please contact MarelliMotori for different environmental conditions and where cooling water temperature is less than 10°C.

INSULATION

All motors have class F insulation which allows a maximum winding temperature rise of 100°C with cooling fluid temperature of 38°C.
On request class H insulation is also available.

TEMPERATURE RISE

The outputs shown in this catalogue refer to temperature rise Class F.

PROTECTIVE TREATMENTS

External Surfaces

Standard finish is a heavy duty epoxy-vinyl paint. Colour is RAL5010.

Special paint finishes can be provided to protect against: acids, alkalis, salt air, anhydrous gases and sea water.

Internal Surfaces

Special tropicalised treatment of internal surfaces and electrical windings and inner cooling channels are coated with rust protector.

MATERIALS

Durability and reliability determine the choice of materials. Fabricated steel frames and cast iron shields are designed for reduced weight.

Terminal boxes for frame sizes up to 400LB are in cast iron and from 400LC to 560 frame size in fabricated steel.

Please contact MarelliMotori for different materials.

Special steel shafts are available for high load applications.

BALANCING AND VIBRATION GRADE

The motors are dynamically balanced with a half key applied to the shaft extension in accordance with standard IEC 60034-14 to vibration grade reduced (A). On request vibration grade special (B) is also available.

COOLING SYSTEM

IC 7 A1 W7 (Self-circulating primary coolant with integral heat exchanger using remote fresh water). Reduces the noise level and it is ideal for constant torque, low speed, inverter applications.

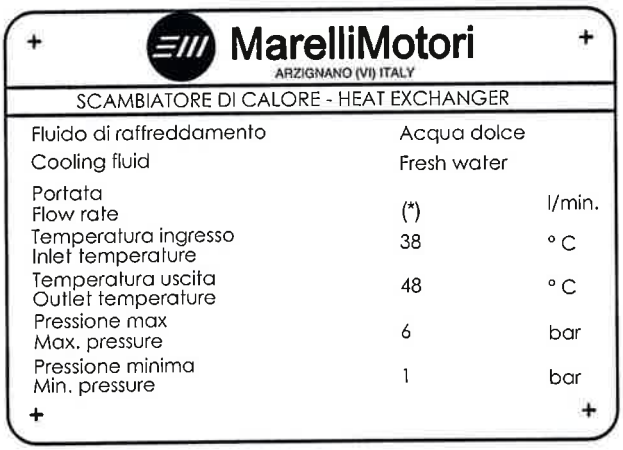
The cooling fluid must be clean water.

Do not use:

- sea water,
- water with more than 120 mg/l of chloride.
- water with solid content over 10 mg/l.

Two flanged connections are provided for inlet and outlet of cooling water.

On the appropriate name plate heat exchanger characteristics are indicated: flow rate, inlet/outlet temperature, min/max pressure.



Frame size mm	Flow rate l/min (*)	Inlet Temp. °C	Outlet Temp. °C	Max Pressure bar	Min Pressure bar
355	50	38	45	6	1
400	65	38	45	6	1
450	70	38	48	6	1
500	75	38	48	6	1
560	120	38	48	6	1

MarelliMotori®

SOUND LEVELS

The electric tables show the sound pressure levels (Lp(A)) measured at no load conditions at one metre distance from the machine according to standard ISO R 1680 with tolerances of 3dB(A). The values do not depend on the supply frequency.

BEARINGS

Frame size	D-end		N-end	
	B3	V1	B3	V1
355	6322-C3	6322-C3	6322-C3	6322-C3
400	6322-C3	6322-C3	6322-C3	6322-C3
	6322-C3	6322-C3	6322-C3	7322
450	6326-C3	6326-C3	6326-C3	6326 7326
500	6328-C3	6328-C3	6328-C3	6328 7328
560	NU328-EC-C3 6328M-C3	6238M-C3	NU234-EC-C3	6234 2 x 7328

On request high load configurations are also available: roller or sleeve bearings.

DERATING FOR INVERTER SUPPLY

The B4J and B5J series have been designed to satisfy the requirements of speed control by frequency converter supply. MarelliMotori therefore provides various solutions to obtain the best performances.

To select the best solution please contact MarelliMotori supplying the following information:

1. Load characteristics (quadratic torque, constant torque or torque curve for all other cases) of the driven equipment;
2. Electric supply and speed range;
3. Converter supply characteristics (peak voltage values at the motor terminals, rise time, etc.);
4. Maximum inverter overload (time and current value).

Inverter fed motors will be supplied with enhanced winding insulation and N-end insulated bearing.

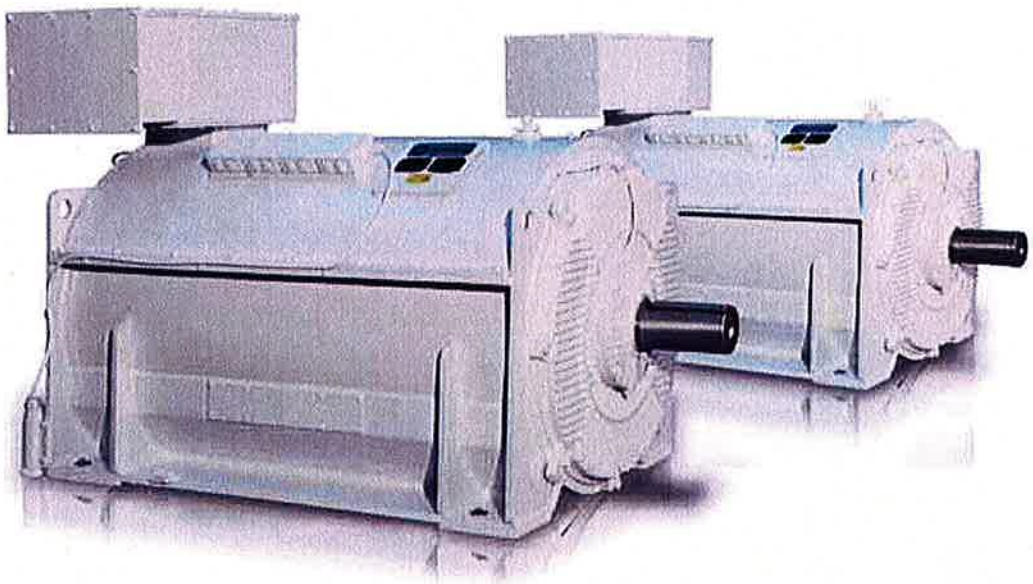
SAFETY

The whole series is supplied with PT100 in windings and internal water leakage sensor as standard.

APPROVALS

In addition to meeting the electrical motor specifications, the B4J and B5J series also match the requirements of marine register rules for pressure vessels.

In particular our motors comply with: ABS, BV, CCS, DNV, GL, KR, LR, NK, RINA, RS.



KR KOREAN REGISTER

Lloyd's Register

ClassNK

RINA 1861

MarelliMotori®

TECHNICAL DATA / LOW VOLTAGE 690V

Rated output 50 Hz kW	Rated output 60 Hz kW	Motor type	Rated speed 50 Hz rpm	Rated speed 60 Hz rpm	Performances at rated outputs 50 Hz Torque Tn N m	Performances at rated outputs 50 Hz Current In A	Performances at rated outputs 50 Hz Efficiency h %	Performances at rated outputs 50 Hz Power factor cos -	DOL starting Current Is/In p.u.	DOL starting Torque Ts/Tn p.u.	Breakdown torque Tmax/Tn p.u.	Sound pressure level Lpa dB(A)	Moment of inertia J kg m²	Approx. Weight kg
4 poles														
330	400	B4J 355 LA4	1484	1784	2121	327	96,0	0,88	5,6	2,1	2,5	69	6,2	1600
400	480	B4J 355 LB4	1486	1786	2568	395	96,3	0,88	5,6	2,1	2,5	69	7,4	1770
450	540	B4J 355 LC4	1486	1786	2889	444	96,4	0,88	5,6	2,0	2,4	69	8,4	1950
500	600	B4J 355 LD4	1486	1786	3210	487	96,6	0,89	5,6	2,0	2,5	69	9,5	2100
550	660	B4J 355 LF4	1487	1787	3529	535	96,7	0,89	5,6	2,0	2,4	69	10,6	2200
600	720	B4J 400 LA4	1486	1786	3852	604	96,7	0,86	5,3	0,8	2,1	71	14	2700
700	830	B4J 400 LB4	1486	1786	4494	696	96,8	0,87	5,4	0,9	2,2	71	17	2950
770	920	B4J 400 LC4	1486	1786	4943	774	96,9	0,86	5,5	0,9	2,1	71	19	3150
980	1150	B5J 450 LA4	1491	1791	6270	958	97,4	0,88	5,7	0,7	2,4	72	30	4040
1050	1250	B5J 450 LB4	1492	1792	6714	1015	97,4	0,89	6,0	0,8	2,5	72	33	4325
1180	1400	B5J 450 LC4	1492	1792	7545	1138	97,6	0,89	6,1	0,8	2,5	72	37	4680
1400	1600	B5J 500 LA4	1493	1793	8946	1364	97,7	0,88	5,3	0,6	2,1	78	49	5730
1560	1800	B5J 500 LB4	1493	1793	9968	1518	97,8	0,88	5,3	0,6	2,1	78	55	6180
1750	2000	B5J 500 LC4	1494	1794	11175	1683	97,9	0,89	5,8	0,6	2,3	78	62	6700
2000	2300	B5J 560 LA4	1494	1794	12771	1996	97,6	0,86	5,2	0,5	2,0	80	111	8220
2400	2800	B5J 560 LB4	1495	1795	15315	2365	97,7	0,87	5,8	0,6	2,1	80	139	9297
2700	3200	B5J 560 LC4	1496	1796	17218	2724	97,7	0,85	7,2	0,8	2,5	80	162	10355
6 poles														
230	280	B4J 355 LA6	990	1190	2216	243	95,4	0,83	5,4	2,2	2,2	66	11	1600
300	350	B4J 355 LB6	991	1191	2888	316	95,7	0,83	5,4	2,2	2,2	66	14	1820
380	450	B4J 355 LC6	992	1192	3654	394	96,1	0,84	5,7	2,5	2,4	66	18	2150
450	530	B4J 400 LA6	994	1194	4319	477	96,3	0,82	5,8	0,9	2,4	68	21	2670
530	630	B4J 400 LB6	994	1194	5087	547	96,7	0,84	5,8	0,9	2,4	68	27	3150
610	735	B4J 400 LC6	994	1194	5855	628	96,8	0,84	5,6	0,8	2,2	68	29	3250
760	900	B5J 450 LA6	994	1194	7294	772	97,0	0,85	5,5	0,8	2,3	70	41	4000
850	1000	B5J 450 LB6	994	1194	8158	863	97,1	0,85	5,3	0,8	2,2	70	46	4300
930	1100	B5J 450 LC6	994	1194	8926	943	97,2	0,85	5,2	0,8	2,2	70	52	4650
1130	1300	B5J 500 LA6	995	1195	10834	1145	97,3	0,85	5,7	0,7	2,3	73	71	5620
1300	1500	B5J 500 LB6	995	1195	12464	1299	97,5	0,86	5,3	0,7	2,1	73	82	6230
1570	1800	B5J 500 LC6	995	1195	15053	1569	97,5	0,86	5,6	0,7	2,2	73	97	6850
1800	2100	B5J 560 LA6	995	1195	17258	1780	97,4	0,87	5,3	0,6	2,3	75	206	8600
2100	2400	B5J 560 LB6	995	1195	20135	2074	97,5	0,87	5,4	0,6	2,3	75	237	9350
2400	2800	B5J 560 LC6	996	1196	22988	2370	97,5	0,87	5,8	0,6	2,5	75	268	10000
8 poles														
400	480	B4J 400 LA8	743	893	5136	430	95,0	0,82	5,5	1,2	2,1	68	26	2670
440	530	B4J 400 LB8	743	893	5650	470	95,7	0,82	5,6	1,2	2,1	68	30	3150
500	600	B4J 400 LC8	743	893	6420	533	95,8	0,82	5,4	1,2	2,1	68	33	3250
550	650	B5J 450 LA8	745	895	7043	568	96,5	0,84	4,8	1,0	2,1	69	55	4000
610	740	B5J 450 LB8	745	895	7811	622	96,6	0,85	4,7	1,0	2,1	69	61	4300
700	830	B5J 450 LC8	745	895	8964	713	96,7	0,85	4,7	1,0	2,1	69	69	4650
780	930	B5J 500 LA8	745	895	9988	794	96,8	0,85	4,7	0,7	2,3	71	95	5620
880	1050	B5J 500 LB8	745	895	11269	885	96,9	0,86	4,7	0,7	2,3	71	110	6230
1000	1200	B5J 500 LC8	746	896	12788	1004	97,0	0,86	5,0	0,9	2,3	71	122	6850
1250	1450	B5J 560 LA8	746	896	15985	1315	97,1	0,82	5,6	0,7	2,4	74	219	8450
1450	1650	B5J 560 LB8	746	896	18543	1526	97,1	0,82	5,6	0,7	2,4	74	252	9320
1700	2000	B5J 560 LC8	746	896	21740	1787	97,2	0,82	5,2	0,7	2,3	74	285	10100

MarelliMotori®

STANDARD CONFIGURATION AND OPTIONS

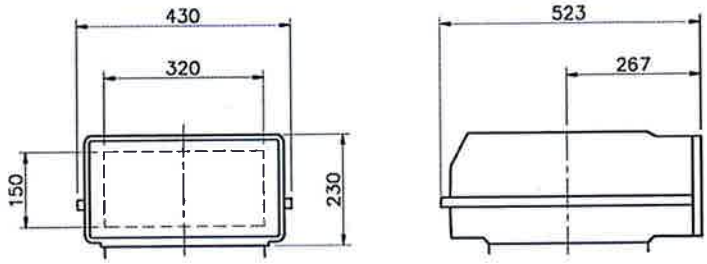
	Description	Frame Size				
		355	400	450	500	560
Degree of Protection						
-	IP 55	S	S	S	S	S
125	IP 56	O	O	O	O	NA
Insulation						
100	Class H	O	O	O	O	O
Painting						
919	Non standard RAL colour	O	O	O	O	O
930	Epoxy-vinyl + polyacrylic	O	O	O	O	O
-	Tropicalisation	S	S	S	S	S
Vibration Grade						
-	Grade A	S	S	S	S	S
133	Grade B	O	O	O	O	O
Bearings						
128	D-end roller bearing	O	O	O	O	O
-*	Sleeve bearings	O	O	O	O	O
-	Regreasing device	S	S	S	S	S
-	Arrangement for SPM	S	S	S	S	S
122	PT100 in bearings	O	O	O	O	O
Drain Holes						
-	Drain holes	S	S	S	S	S
Shaft						
127	Second shaft extension	O	O	O	O	O
Heating elements						
109	Space heaters with terminals placed in auxiliary box	O	O	O	O	O
Windings Protections						
-	PTC (one series of 3 PTC in windings)	S	S	S	S	S
114	PTC (two series of 3 PTC in windings)	O	O	O	O	O
115	PT100 (one series of 3 PT100 in windings)	O	O	O	O	O
115	PT100 (two series of 3 PT100 in windings)	O	O	O	O	O
Inverter Supply						
175	Insulated bearing	O	O	O	O	O
178	Enhanced insulation for use with filter	O	O	O	O	O
178	Enhanced insulation for use without filter	O	O	O	O	O
161	Encoder	O	O	O	O	O

S: Standard configuration
O: Option
NA: Not Applicable
*: Contact MarelliMotori

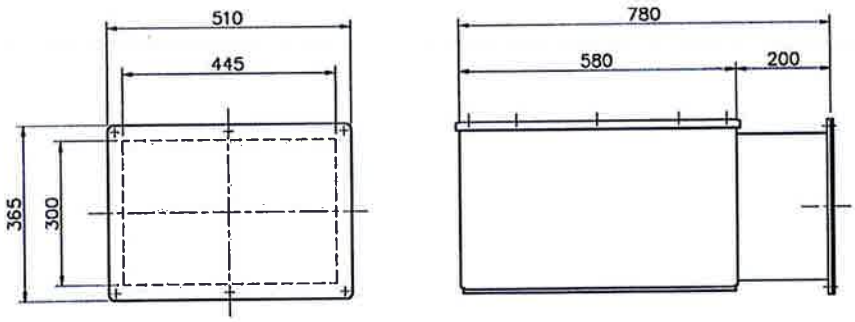
MarelliMotori®

TERMINAL BOX DIMENSIONS

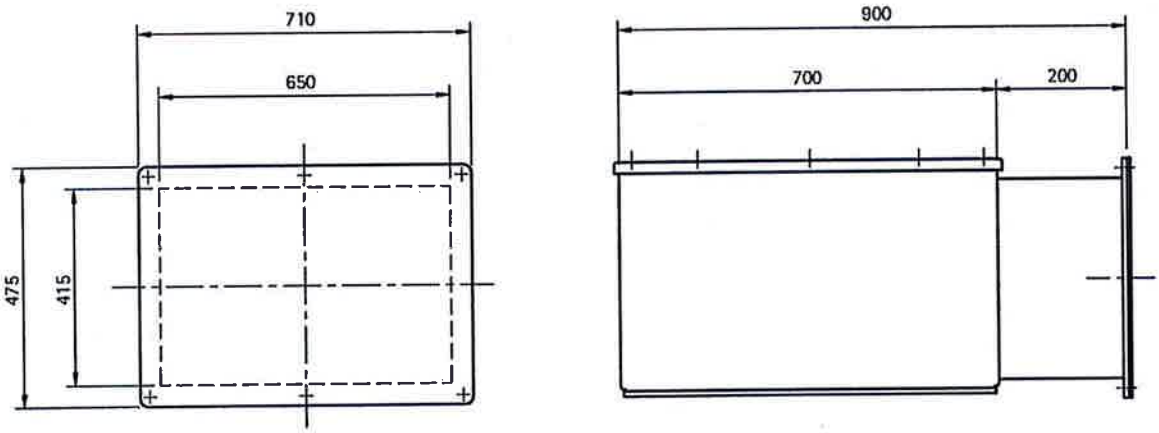
355-400LB



400LC-500



560



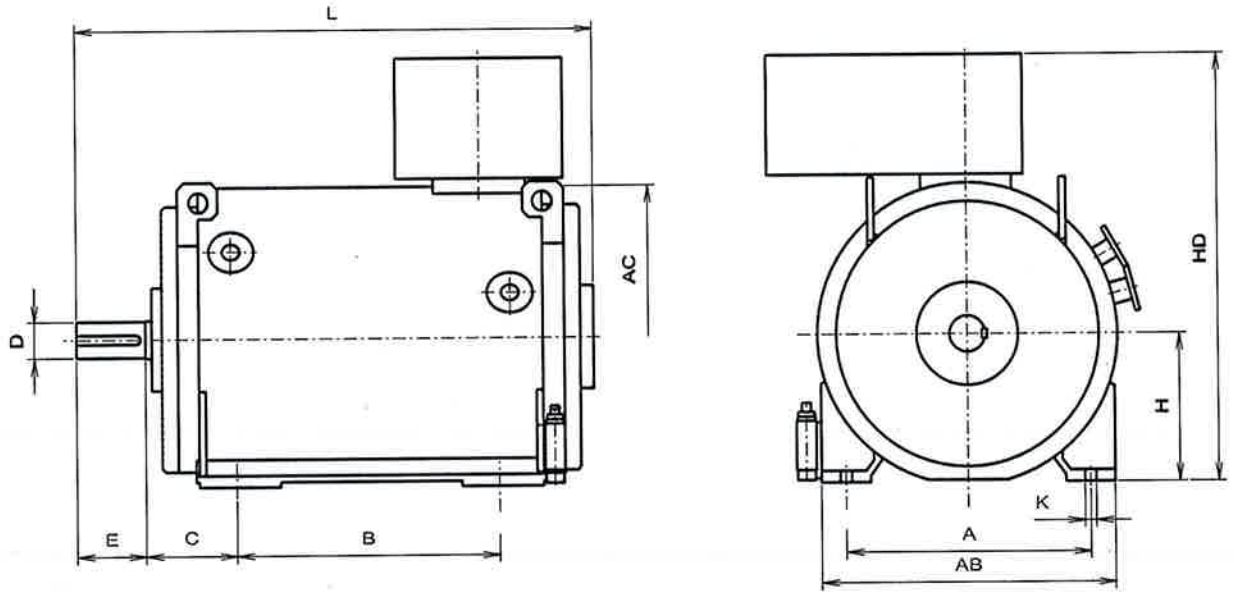
Dimensions in mm

Frame size	Terminal Block	Terminals	Maximum conductor cross section	Cable entrance
355 ÷ 400 LB	Flat coppers bars	Hole for M12 bolt	2 x 300 mm²	Undrilled gland plate
400 LC ÷ 500	Flat coppers bars	Hole for M12 bolt	4 x 300 mm²	Undrilled gland plate
560	Flat coppers bars	Hole for M16 bolt	8 x 300 mm²	Undrilled gland plate

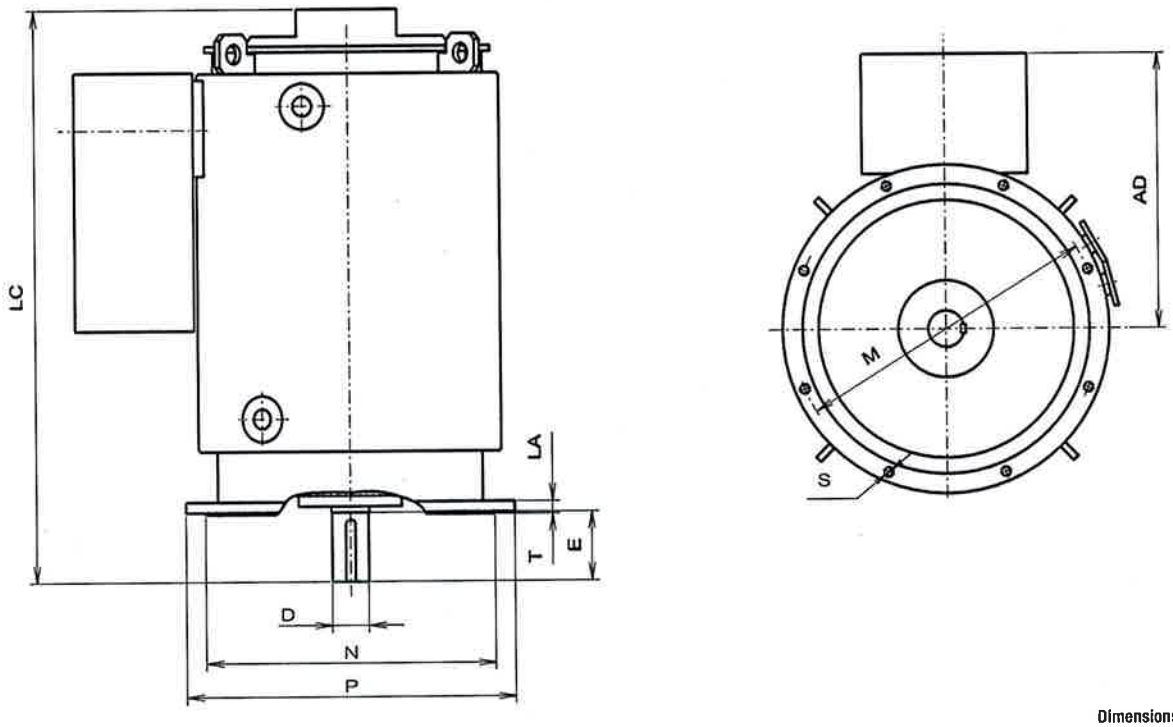
MarelliMotori®

DIMENSIONS

B3



V1



Dimensions in mm

Frame Size	Frame Length	Poles	A	AD	B	C	H	AD	HD	K	L	LC	D	E	LA	M	N	P	S	T
B4J 355	LA - LB	4-8	610	267	630	254	355	610	965	28	1405	1405	100	210	25	740	680	800	24	6
	LC - LF	4-8	610	267	630	254	355	610	965	28	1585	1585	100	210	25	740	680	800	24	6
B4J 400	LA - LB	4-8	686	267	710	280	400	657	1057	35	1785	1785	100	210	28	940	880	1000	28	6
	LC - LD	4-8	686	610	710	280	400	800	1200	35	1785	1785	100	210	28	940	880	1000	28	6
B5J 450	LA - LC	4-8	750	610	1120	280	450	865	1315	35	2000	2000	120	210	30	1080	1000	1150	28	6
B5J 500	LA - LC	4-8	900	610	1250	280	500	950	1450	42	2305	2380	130	250	30	1080	1000	1150	28	6
B5J 560	LA - LC	4-8	1120	610	1800	315	560	1160	1720	42	2690	3000	180	300	30	1320	1250	1400	28	8

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HEADQUARTERS

Marelli Motori S.p.A.
Via Sabbionara, 1
36071 Arzignano (VI) - Italy
(T) +39 0444 479.711
(F) +39 0444 479.888
www.marellimotori.com
sales@marellimotori.com

ITALIAN BRANCHES

Milan

Via Cesare Cantù, 29
20092 Cinisello Balsamo (MI) - Italy
(T) +39 02 660.131.66
(F) +39 02 660.134.83
milan@marellimotori.com

Florence

Via Panciatichi, 37/2
50127 Firenze - Italy
(T) +39 055 431.838
(F) +39 055 433.351
florence@marellimotori.com

MARELLI MOTORI OVERSEAS COMPANIES

GREAT BRITAIN

Marelli UK, Ltd
Meadow Lane - Loughborough
Leicester LE111NB
UK

(T) +44 1509.615518
(F) +44 1509.615514
uk@marellimotori.com

GERMANY

Marelli Central Europe Gmbh
Heilswannenweg 50
31008 Elze
Germany

(T) +49 5068.462-400
(F) +49 5068.462-409
germany@marellimotori.com

USA

Marelli USA, Inc
1620 Danville Road
PO Box 410
Harrodsburg, KY 40330
USA

(T) +1 (859) 734-2588
(F) +1 (859) 734-0629
usa@marellimotori.com

MALAYSIA

Marelli Asia Pacific Sdn Bhd
Lot 7, Jalan Majistret U1/26
Hicom - Glenmarie Industrial Park
40150 Shah Alam Selangor D.E.
Malaysia

(T) +60 3.7805.3736
(F) +60 3.7803.9625
asiapacific@marellimotori.com

SOUTH AFRICA

Marelli Electrical Machines South Africa (Pty) Ltd
Unit 4, 55 Activia Rd - Activia Park
Elandsfontein, 1406 - Gauteng
Republic of South Africa

(T) +27 11.822.5566
(F) +27 11.828.8089
southafrica@marellimotori.com

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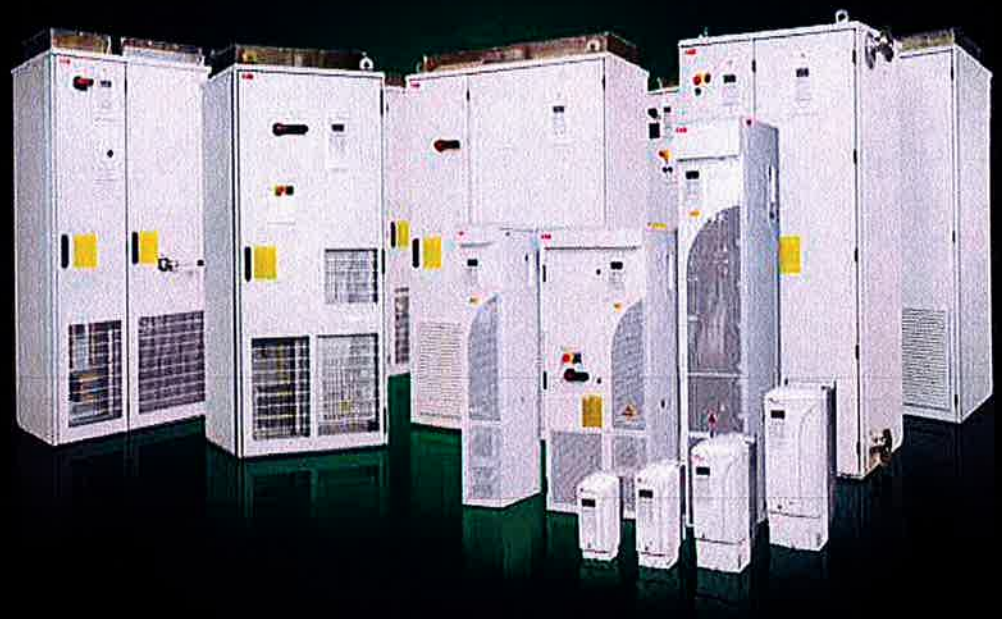


Low voltage AC drives

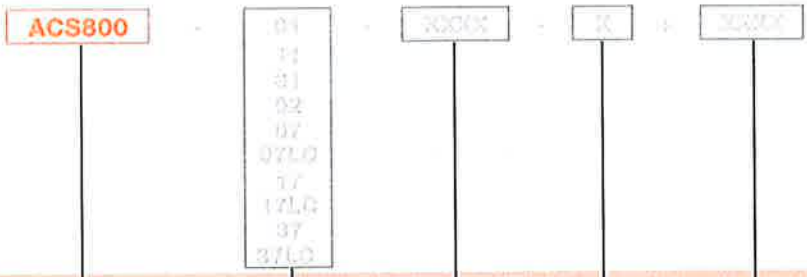
ABB industrial drives

ACS800, single drives 0.55 to 5600 kW Catalog

Power and productivity
for a better world™

Contents

Type code



1 Product series

2 Single drives
Types and constructions
Ratings
Voltages
Dimensions

3 Hardware options

4 Control connections and communications

5 Application software and programming

6 PC tools

7 Summary of features and options

8 Services

9 Contact and web information

Cabinet-built low harmonic drives

ACS800-37, up to 2700 kW

Easy low harmonic solution

ABB's low harmonic drives offer an easy low harmonic solution incorporated in the drive. The solution to overcome harmonic issues simply comes with the drive without the need for additional filtering equipment or complicated multi-pulse transformer arrangements.

Meets the strictest standards

The ACS800-37 is a low harmonic drive in the cabinet-built power range. It is equipped with an built-in active supply unit and low harmonic line filter. The result is exceptionally low harmonic content in the network, with a total current distortion of less than 5.0%. That exceeds, for example, the requirements set by standard IEEE519 even in the weakest network. The ACS800-37 provides you with a simple, compact solution to meet stringent power quality standards.

Beats external solutions

When compared to multi-pulse transformer solutions, the ACS800-37 does not require a dedicated transformer and thus is simpler in terms of cabling arrangements and requires less floor space. Harmonic performance is better than with 12- and 18-pulse solutions, handling online imbalance or other shortcomings in the supply network. Passive or active external filtering devices are avoided with the ACS800-37, making the solution compact and simple. Another advantage of the ACS800-37 is that it always operates with power factor 1.

Extensive range of features

In line with other ACS800 cabinet-built drives, the ACS800-37 offers a wide variety of standardized configurations to adapt to different application requirements. It has an extensive range of built-in features and accessories. The smart module concept enables easy maintenance and redundancy in the high power range.

Main standard features

- Compact design
- IP21 protection degree
- Active supply unit
- Built-in low harmonic filter
- EMC filter for 2nd environment, unrestricted distribution according to EN 61800-3 (option in frame size R6) (category C3)
- Main switch with aR fuses (in frame sizes R6-R8i)
- Line contactor (in frame sizes R7i-R8i, option in frame size R6)
- Removable air circuit breaker (in frame sizes nxR8i)
- du/dt filters (standard in frame sizes nxR8i)
- Common mode filters for motor protection (in frame sizes R7i-nxR8i)
- Coated boards
- Extensive, programmable I/O
- Long lifetime cooling fan and capacitors
- Inputs galvanically isolated
- I/O and fieldbus extension slots inside
- Alphanumeric multilingual control panel with a start-up assistant feature

Accessories for ACS800-37

- Analogue and digital I/O extension modules
- ATEX approved motor protection
- Braking chopper and resistor
- Cabinet heater
- Customer terminal block
- du/dt filters (in frame sizes R6-R8i)
- Earth fault monitoring for unearthed network
- EMC filter for 1st environment, restricted distribution according to EN 61800-3 (category C2)
- Fieldbus modules
- IP22, IP42, IP54 or IP54R protection degrees
- Marine construction
- Output for motor fan
- Pulse encoder interface module
- Safe torque-off
- Top entry and exit of cables
- 1 or 2 thermistor relays
- 3.5 or 8 Pt100 relays

Plus tailor made accessories through ABB's application engineering.

Ratings and dimensions

ACS800-37

ACS800 - 37 - 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
$I_{cont.max}$ A	I_{max} A	$P_{cont.max}$ kW	I_N A	P_N kW	I_{hd} A	P_{hd} kW	dBA	kW	m³/h		
U_N = 400 V (Range 380 to 415 V). The power ratings are valid at nominal voltage 400 V.											
120	168	55	114	55	88	45	73	1.8	500	ACS800-37-0060-3	R6
150	234	75	142	75	117	55	73	2.4	500	ACS800-37-0070-3	R6
165	264	90	157	75	132	75	73	2.8	500	ACS800-37-0100-3	R6
202	293	110	194	90	151	75	74	6	1300	ACS800-37-0140-3	R7i
250	363	132	240	132	187	90	74	7	1300	ACS800-37-0170-3	R7i
292	400	160	280	160	218	110	75	7	3160	ACS800-37-0210-3	R8i
370	506	200	355	200	277	132	75	9	3160	ACS800-37-0260-3	R8i
469	642	250	450	250	351	200	75	11	3160	ACS800-37-0320-3	R8i
565	773	315	542	315	423	250	75	14	3160	ACS800-37-0390-3	R8i
730	1000	400	701	355	546	250	75	20	3160	ACS800-37-0510-3	R8i
919	1258	500	882	500	688	355	77	22	6400	ACS800-37-0640-3	2xR8i
1111	1521	630	1067	630	831	450	77	28	6400	ACS800-37-0770-3	2xR8i
1379	1888	800	1324	710	1031	560	77	36	6400	ACS800-37-0960-3	2xR8i
1535	2102	900	1474	800	1149	630	78	39	10240	ACS800-37-1070-3	3xR8i
2056	2814	1200	1973	1100	1538	800	78	54	10240	ACS800-37-1430-3	3xR8i
2610	3573	1600	2506	1400	1953	1100	79	67	12800	ACS800-37-1810-3	4xR8i
U_N = 500 V (Range 380 to 500 V). The power ratings are valid at nominal voltage 500 V.											
120	168	75	114	75	88	55	73	2.4	500	ACS800-37-0070-5	R6
139	234	90	132	90	114	75	73	2.8	500	ACS800-37-0100-5	R6
156	264	110	148 [1]	90	125	75	73	3.4	500	ACS800-37-0120-5	R6
200	291	132	192	132	150	90	74	6	1300	ACS800-37-0170-5	R7i
245	355	160	235 [2]	160	183	110	74	8	1300	ACS800-37-0210-5	R7i
302	438	200	289 [3]	200	226	132	75	8	3160	ACS800-37-0260-5	R8i
365	530	250	350 [4]	250	273	160	75	10	3160	ACS800-37-0320-5	R8i
455	660	315	437	315	340	200	75	12	3160	ACS800-37-0400-5	R8i
525	762	355	504	355	393	250	75	14	3160	ACS800-37-0460-5	R8i
595	863	400	571	400	445	315	75	16	3160	ACS800-37-0510-5	R8i
700	1016	500	672	450	524	315	75	20	3160	ACS800-37-0610-5	R8i
892	1294	630	856	630	667	450	77	24	6400	ACS800-37-0780-5	2xR8i
1005	1458	710	965	630	752	500	77	28	6400	ACS800-37-0870-5	2xR8i
1338	1941	900	1284	900	1001	710	77	38	6400	ACS800-37-1160-5	2xR8i
1528	2217	1120	1467	1120	1143	800	78	41	10240	ACS800-37-1330-5	3xR8i
2037	2956	1400	1956	1300	1524	1000	78	58	10240	ACS800-37-1820-5	3xR8i
2529	3670	1800	2428	1700	1892	1300	79	70	12800	ACS800-37-2200-5	4xR8i

[1] 156 A is allowed at 460 V.
[2] 240 A is allowed at 460 V.
[3] 302 A is allowed at 460 V.
[4] 361 A is allowed at 460 V.

Ratings and dimensions

ACS800-37

ACS800 - 37 - XXXX - 7 - XXXX

Nominal ratings		No-overload use	Light-overload use		Heavy-duty use		Noise level	Heat dissipation	Air flow	Type code	Frame size
$I_{cont.max}$ A	I_{max} A	$P_{cont.max}$ kW	I_N A	P_N kW	I_{hd} A	P_{hd} kW	dBA	kW	m³/h		
U_N = 690 V (Range 525 to 690 V). The power ratings are valid at nominal voltage 690 V.											
57[1]	86	55	54	45	43	37	73	1.8	500	ACS800-37-0060-7	R6
79	120	75	75	55	60	55	73	2.4	500	ACS800-37-0070-7	R6
93[2]	142	90	88	75	71	55	73	2.8	500	ACS800-37-0100-7	R6
139	202	132	133	110	104	90	74	7	1300	ACS800-37-0170-7	R7i
162	235	160	156	132	121	110	74	8	1300	ACS800-37-0210-7	R7i
201	301	200	193	160	150	132	75	11	3160	ACS800-37-0260-7	R8i
279	417	250	268	250	209	200	75	12	3160	ACS800-37-0320-7	R8i
335	502	315	322	250	251	200	75	16	3160	ACS800-37-0400-7	R8i
382	571	355	367	355	286	270	75	17	3160	ACS800-37-0440-7	R8i
447	668	450	429	400	334	315	75	18	3160	ACS800-37-0540-7	R8i
659	985	630	632	630	493	450	77	33	6400	ACS800-37-0790-7	2xR8i
729	1091	710	700	710	545	500	77	32	6400	ACS800-37-0870-7	2xR8i
953	1425	900	914	900	713	710	77	39	6400	ACS800-37-1160-7	2xR8i
1112	1663	1120	1067	1120	831	800	78	48	10240	ACS800-37-1330-7	3xR8i
1256	1879	1250	1206	1200	940	900	78	51	10240	ACS800-37-1510-7	3xR8i
1856	2791	1800	1791	1750	1396	1400	79	77	12800	ACS800-37-2320-7	4xR8i
2321	3472	2300	2228	2300	1736	1600	79	94	17920	ACS800-37-2780-7	5xR8i
2665	3987	2700	2559	2600	1999	2000	79	114	19200	ACS800-37-3310-7	6xR8i

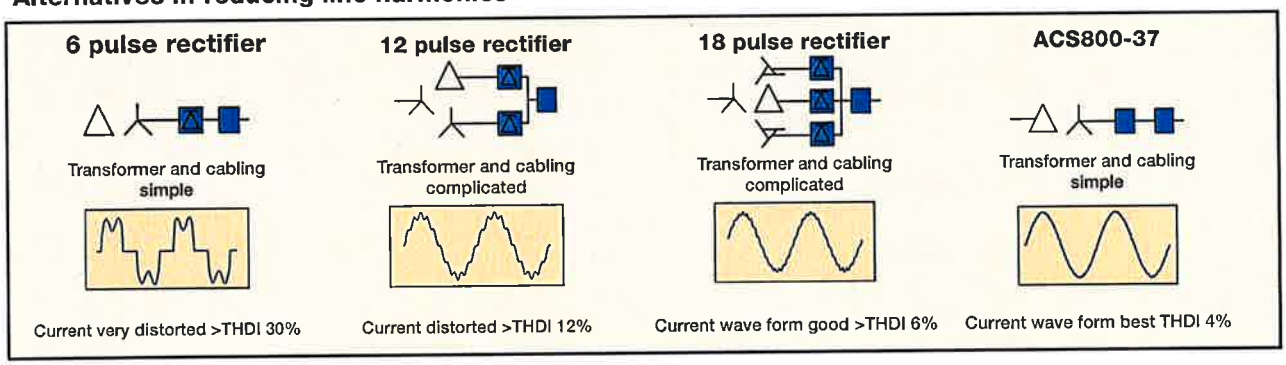
Enclosure

Degree of protection:
IP21 (Standard)
IP22, IP42, IP54, IP54R (Optional)
Paint color:
Light beige RAL 7035 semi-gloss

Frame size	Height IP21/22/42 mm	Height IP54 mm	Width mm	Depth [E] mm	Depth top exit [E] mm	Weight kg
R6	2130	2315	430	646	646	250
R7i	2130	2315	630 [A]	646	646	400
R8i	2130	2315	1230 [B]	646	646	950
2xR8i	2130	2315	2430 [C]	646	776 [F]	2000
3xR8i	2130	2315	3230	646	776 [F]	3060
4xR8i	2130	2315	3830 [D]	646	776 [F]	3600
5xR8i	2130	2315	5130 [D]	646	776 [F]	4780
6xR8i	2130	2315	5330 [D]	646	776 [F]	4930

Note:
[1] 62 A is allowed at 575 V.
[2] 99 A is allowed at 575 V.

Alternatives in reducing line harmonics



[A] 930 mm if equipped with 1st environment (C2) or with du/dt filter in marine version.
[B] 1530 mm if equipped with 1st environment filter and common motor terminal.
[C] 2730 mm if equipped with 1st environment filter (only types 0640-3/0770-3/0780-5/0870-5).
[D] Add 300 mm if top entry.
[E] The depth without the handle.
[F] The depth is 646 mm if common motor terminal is used.

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_{hd}.

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.

For sine filter selections and ratings, contact ABB.

Contact us

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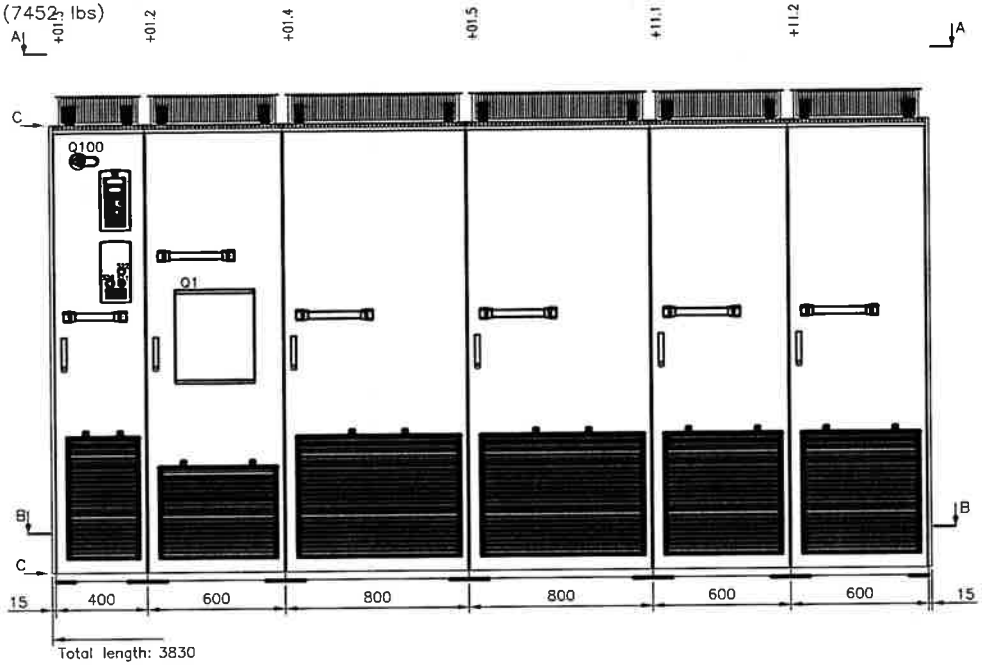
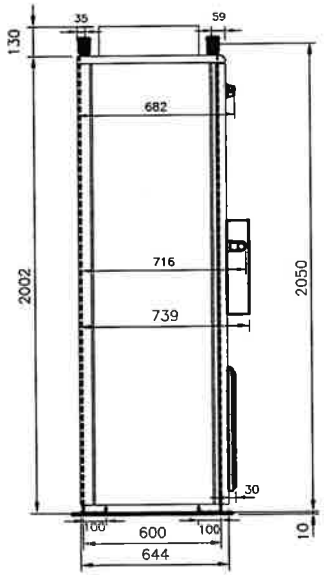
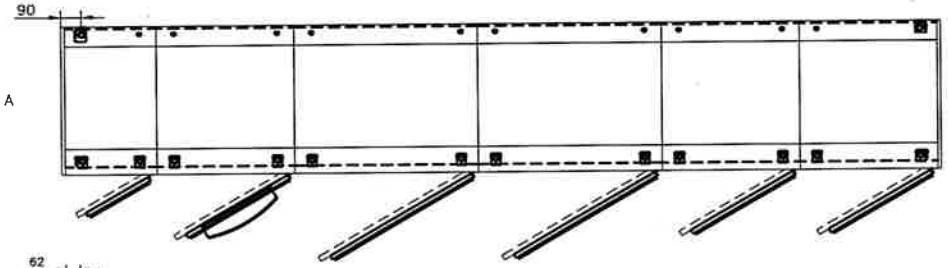
Power and productivity
for a better world™

Type code: ACS800-37-2320-7+B053+C121+G300+G338+P904+Q951
Colour: RAL7035
Dimensions: millimeters (100mm=3.937")
Weight: approx. 3380 kg (7452 lbs)



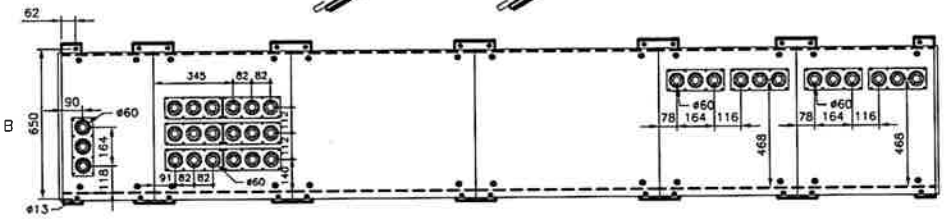


C–C



A – A

A – A
TOP VIEW



B – B

B – B
BOTTOM VIEW

Cust. Doc. No.	Prepared 16.6.2010	DD Configurator	Title DIMENSION DRAWING ACS800-37-2320-7	EDA1	Item des.
Customer	Approved			Scale (A4) 1:30	Rev.ind. A
	Project		ABB ABB Drives	Doc. No. 3AUA0000047151	Lang.
ABB Ref. No.	Cust Ref. No.				Sheet 311
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