

Marex OS II – Open for every challenge. At home in all the seas of the world

The open system for propulsion control



The Ultimate Intelligent Control System For Ship Propulsion: Marex OS II

Marex OS II is the latest advancement of our control components for ship propulsion systems, which have been successfully applied for decades. It offers an innovative solution for a variety of vessels with all professional options.



New technologies and materials, design innovations and the integration of bus-suitable electronics have opened to our products to more and more fields of application. In this way, we have continuously developed from the manufacturer of classic control systems based on pneumatics to a

system supplier of electro-pneumatic and fully electronic engine controls. Nevertheless, traditional pneumatic components still are a major part of our program due to their ruggedness and reliability. For either traditional or electronic systems, Rexroth offers the entire range of products.



Marex OS II – a system suitable for all possibilities.

Marex OS II replaces the elaborate remote controls that are typically custom designed for each specific vessel. In the case of Marex OS II, the control hardware is implemented with a few modular components. Signals and data are transmitted via CAN bus. With the corresponding software and parameter adjustments it can be adapted perfectly to almost every kind of propulsion system. For our customers this means reduced planning and projecting costs. Additionally, the intelligent Marex OS II software facilitates the commissioning and provides new methods of failure diagnosis, for example by remote data transmission. Thanks to this technology, we can offer remote controls that are suitable for every type of ship. For our customers this means free choice of propulsion configuration.

We supply to Original Equipment Manufacturers:

Engines:

B & W, Caterpillar, Cummins, Deutz, MaK, MAN, MTU, Scania, Sulzer, Wärtsilä, Volvo-Penta, ...

Gear drives:

L & S, Reintjes, Twin Disk, ZF, ...

Controllable pitch propellers:

Berg, Hundested, Lips, Piening, ...

Waterjets:

FF-Yet, Hamilton, Lips, ...

Shipyards:

New ships, retrofits, repair of sea and inland vessels, yachts, work boats, fishing boats, ferries and passenger ships, ...

Associations:

Deutsche Gesellschaft zur Rettung Schiffbrüchiger (DGzRS, German Association for the Rescue of Shipwrecked Persons), Lotsenbetriebsverein (German pilot association), ...

Authorities:

Fire Brigade, Fishing Authority, Coast Guard, Police, Wasser-Schiff-fahrtsamt (WSA, German authority for shipping), Wasserstraßen-Maschinenamt (WMA, German authority for waterways and engines), Customs Duty, ...

End users:

Ship and yacht owners, ...

Navy:

Germany, Finland, France, Croatia, Norway, Poland, Sweden, ...



Marex OS II – Where Quality Is Launched



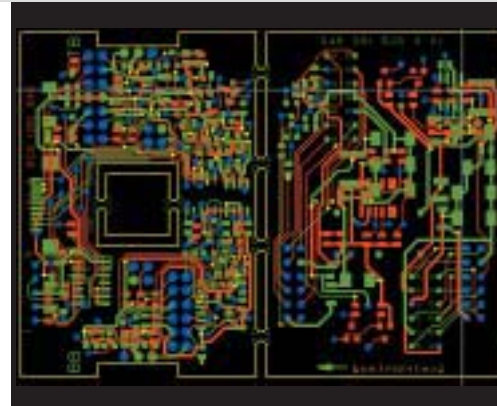
We believe that only if all important manufacturing processes are carried out under one roof, can we guarantee our customers products of first-class quality, ready to meet the high requirements of the ship-building industry. The result of this philosophy are products that are well-known for their reliability and long life.

Certificates of independent classification societies confirm these efforts. In addition, the commitment of our associates assures that our products always meet the highest demands. Especially for innovative products that include complex electronics, like the Marex OS II, this strict quality principle is proving itself.

We layout and equip ...

We perform the layout of the circuits of our electronic components.

We can thus maintain the know-how, control the quality and provide rapid flexibility for further developments.



We program and design ...

We program our software in a structural way by means of the latest case-tools.

Using type-approved software only, we will not leave anything to chance or to others.

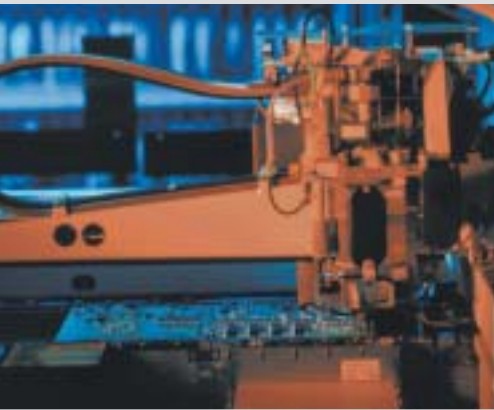


We produce and test ...

For the assembly and adjustment of the Marex OS II control heads, we trust in the skillful hands of our engineers.

And we stand by it. Because even in the age of increasing mobility, particularly in the maritime sector, these high-quality devices are not just „assembly line” products.





Our printed circuits are manufactured by certified and authorized Bosch suppliers only.

This is the best way to produce effectively in accordance with our high quality demands.



We design our devices by using the latest 3D-CAD-systems such as Pro-Engineer.

Even complex geometries can be laid out quickly and easily. Rapid prototyping is easily utilized when needed.



We test our software in our company, but, in addition, independent institutes check it.

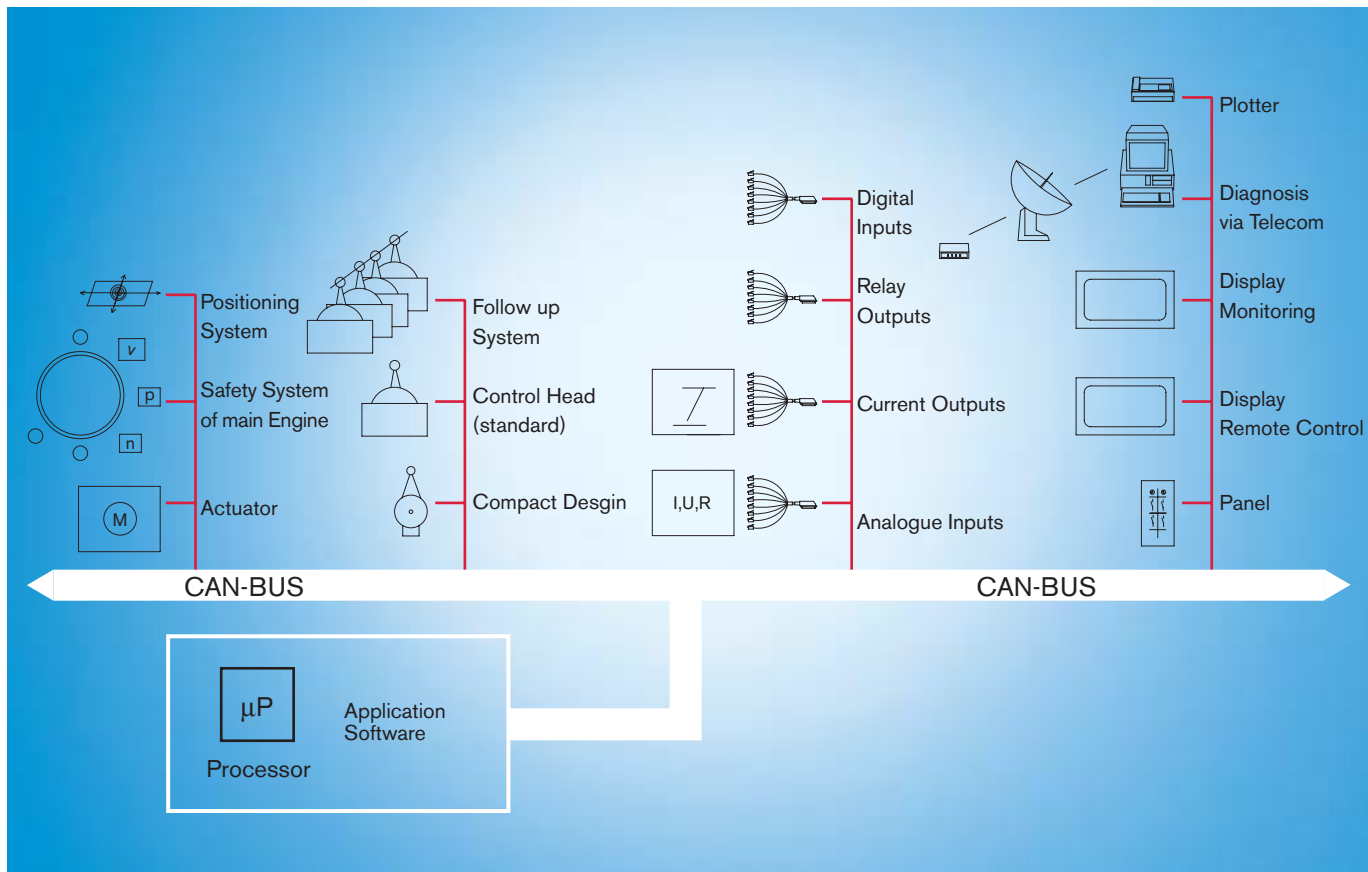
We can thus offer the highest grade of software quality without „operational blindness“.

Our products are developed according to the instructions of following classification societies

Germanischer Lloyd, Rina, Nippon Kaiji Kyokai, ABS, BV, LR, Korean Register, Russian Maritime Register, Polski Register



Marex OS II – The System For The Future



Marex OS II stands for “Open System”.

Thanks to its modular design, the remote control can be adapted individually to the respective propulsion system. At the same time, safety, monitoring and other external systems can be connected easily by means of serial signal and data transmission via the CAN bus and interface modules.

- In the Marex OS II control system, the bus lines connect the modular components with quick-disconnect plugs.
- The basis for the bus layout is the CAN bus protocol.
- The components have a separate power supply including conditioner.
- The complete system is switched on and off from the main control station (stand-by mode).
- All bus “participants” are monitored cyclically by the integrated self-test system.
- The data processing of the system is distributed. This means, data of subsystems such as lever follow-up or monitoring are processed by their own independent CPU.
- The data of all input and output signals to the peripheral equipment is transferred via I/O-modules.

Marex OS II – Tested For Seaworthiness



Endurance test

It is a real marathon of one million actuations the control head must stand during this test. The moving mechanical parts such as lever bearings, gear-wheels, brakes and others are subject to extremely high stresses during this test. Well-chosen materials and first-class quality make sure that the Marex OS II can withstand this constant operation.



High-voltage test

The resistance of the Marex OS II to high voltage is tested by connecting a voltage of 548 V/50 Hz between terminals and ground and between the terminals themselves. Terminals with the same potential are bridged. The safety circuits of the Marex OS II will protect even sensitive parts against overload.



Vibration test

The resistance of the Marex OS II against ship vibrations is examined in this test. The conditions correspond to a high vibrational strain of 2 - 25 Hz at an amplitude of ± 1.6 mm resp. of 25 - 100 Hz with an acceleration of 4.0 g. The test is made in the main planes with functional tests during the test procedure.



Temperature

From - 25 °C to + 70 °C (- 13 °F to + 158 °F) is the range for the temperature tests. Functional tests in cold environment as well as in dry and humid heat confirm the suitability of the Marex OS II for open decks or applications with frequent temperature variations.



Salt mist test

The salt mist test is required for devices that are applied on open decks. The active control is being sprayed with a saline solution for two hours in a temperature of + 25 °C (+ 77 °F). Afterwards, the Marex OS II is being kept at + 40 °C (+ 104 °F) and 93 % relative humidity of air for seven days. Finally, another functional test is carried out.



EMC-test

An antenna radiates vertically and horizontally an electromagnetic field on the device to be tested. The perfect function of the control must be guaranteed. This procedure is especially important because the screening against electromagnetic interference is examined.

Marex OS II – Technical Part

Applications

With slight hardware variations and selection of the corresponding software, the Marex OS II can be used for remote controls and monitoring of propulsion plants with reversing gear, controllable pitch propeller and Voith-Schneider propellers.

For systems with controllable pitch propellers and Voith-Schneider propellers, load control is part of the Marex OS II hard- and software. For reversing gear control systems auxiliary functions such as speed synchronizing in case of multiple-engine systems, trolling resp. modulation (controlled clutch slip) and shaft brake are part of the Marex OS II hard- and software.

For safe command transfer and comfortable maneuvering with multiple control stations, a lever follow-up system is available.

By means of the auxiliary module Marex GS - „GS“ for „global service“ - remote data transmission between the vessel and the service station is realized. Marex GS allows service support at a low cost due to a fast and precise analysis of possible disturbances of the propulsion system and their elimination.



Type 230



Type 240



Type 250



MPC – modular

◆ Control head and operating components

◆ Control head type 230



◆ Control head type 240



◆ Control head type 241



◆ Control head system type 251 – Palm Beach



◆ Operating / indication module type 231



◆ Operating / indication module type 242



◆ Output and control components

◆ Control unit MPC



◆ Power supply unit EPU



◆ Emergency module type 232



◆ Actuator



◆ Electro-pneumatic converter



◆ 3/2-way-solenoid valve



▲ Accessories

▲ Accessories sub-D



▲ Accessories M12



▲ Accessories adapter



▲ Push-pull-cable / mounting kit



Control head - type 230

for reversing gear and controllable pitch propeller systems



◆ Technical data

Design	CAN bus suitable control head
Operating temperature	- 25 °C to + 70 °C
Weight	see table
Operating voltage	24 V DC + 30 % / - 25 %
Operating current	2.5 A max.
Protection (above panel plate)	IP 66 acc. to IEC 60 529 (DIN VDE 0470)
Scale illumination	by LED
Scale colour	see table



→ The control head

is transmitting signals to the MPC for reversing gear or controllable pitch propeller propulsion systems. Depending on the function the control heads are equipped with detents in positions O (neutral), I (ahead) and III (astern).

→ Type numbers – standard version (scale and lever grey, handle and ring black)

For application (fig.)	Scale colour ahead / neutral / astern	Detents in position	Number of engines / levers	Lever follow-up	Weight [kg]	Type number
Reversing gear propulsion system fig. 1	green / yellow / red	0, I, III	1	without	3.1	362 230 000 0
				with	3.8	362 230 050 0
			2	without	3.4	362 230 100 0
				with	4.3	362 230 150 0
Controllable pitch propeller system fig. 1	green / yellow / red	0	1	without	3.1	362 230 200 0
				with	3.8	362 230 250 0
			2	without	3.4	362 230 300 0
				with	4.3	362 230 350 0
Only speed setting system fig. 2	- / yellow / red	0, I	1	without	3.1	362 230 400 0
				with	3.8	362 230 450 0
			2	without	3.4	362 230 500 0
				with	4.3	362 230 550 0

→ Type numbers – black version (scale, lever, handle and ring black)

For application (fig.)	Scale colour ahead / neutral / astern	Detents in position	Number of engines / levers	Lever follow-up	Weight [kg]	Type number
Reversing gear propulsion system Fig. 1	green / yellow / red	0, I, III	1	without	3.1	362 230 001 0
				with	3.8	362 230 051 0
			2	without	3.4	362 230 101 0
				with	4.3	362 230 151 0
Controllable pitch propeller system Fig. 1	green / yellow / red	0	1	without	3.1	362 230 201 0 *
				with	3.8	362 230 251 0
			2	without	3.4	362 230 301 0
				with	4.3	362 230 351 0 *
Only speed setting system Fig. 2	- / yellow / red	0, I	1	without	3.1	362 230 401 0 *
				with	3.8	362 230 451 0 *
			2	without	3.4	362 230 501 0 *
				with	4.3	362 230 551 0 *

*on request

→ Type numbers – black / chrome version (scale and handle black, lever and ring chromed)

For application (fig.)	Scale colour ahead / neutral / astern	Detents in position	Number of engines / levers	Lever follow-up	Weight [kg]	Type number
Reversing gear propulsion system Fig. 1	green / yellow / red	0, I, III	1	without	3.1	362 230 002 0
				with	3.8	362 230 052 0 *
			2	without	3.4	362 230 102 0
				with	4.3	362 230 152 0 *
Controllable pitch propeller system Fig. 1	green / yellow / red	0	1	without	3.1	362 230 202 0 *
				with	3.8	362 230 252 0 *
			2	without	3.4	362 230 302 0 *
				with	4.3	362 230 352 0 *
Only speed setting system Fig. 2	- / yellow / red	0, I	1	without	3.1	362 230 402 0 *
				with	3.8	362 230 452 0 *
			2	without	3.4	362 230 502 0 *
				with	4.3	362 230 552 0 *

*on request

Control head - type 230

for reversing gear and controllable pitch propeller systems



→ Pc. Numbers – blue version (scale blue, lever and ring chromed, handle made of wood)

For application (fig.)	Scale colour ahead / neutral / astern	Detents in position	Number of engines / levers	Lever follow-up	Weight [kg]	Type number
Reversing gear propulsion system Fig. 1	green / yellow / red	0, I, III	1	without	3.1	362 230 003 0 *
				with	3.8	362 230 053 0 *
			2	without	3.4	362 230 103 0 *
				with	4.3	362 230 153 0 *
Controllable pitch propeller system Fig. 1	green / yellow / red	0	1	without	3.1	362 230 203 0 *
				with	3.8	362 230 253 0
			2	without	3.4	362 230 303 0 *
				with	4.3	362 230 353 0 *
Only speed setting system Fig. 2	- / yellow / red	0, I	1	without	3.1	362 230 403 0 *
				with	3.8	362 230 453 0 *
			2	without	3.4	362 230 503 0 *
				with	4.3	362 230 553 0 *

*on request

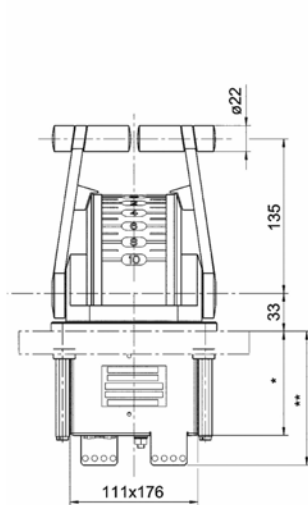
▲ Spare parts

Device	Description	Type number
Main board	electronic board*	on request
Mechanical spare parts	break-unit, lever, handle	on request
Electronic spare parts	potentiometer	on request

* Software version and version of printed circuit board are needed

Technical drawing

fig. 1



top view fig. 1

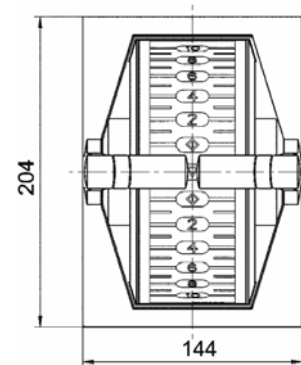
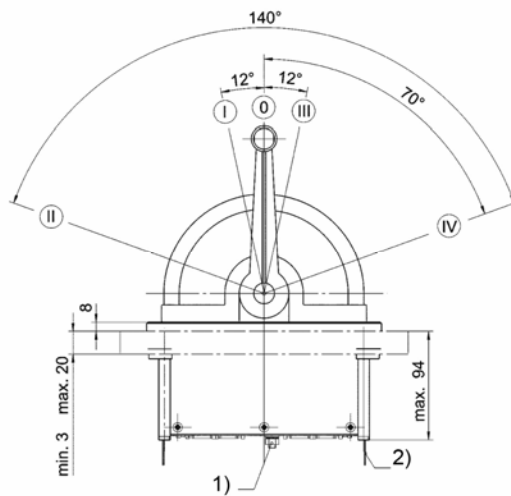
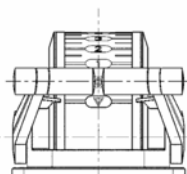
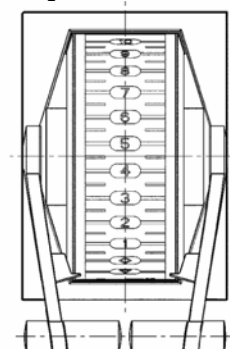
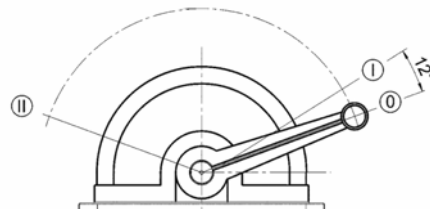


fig. 2



top view fig. 2



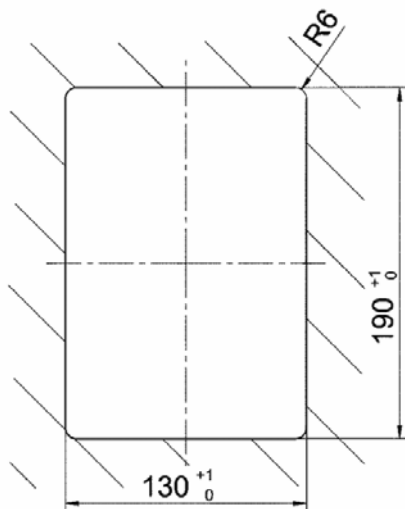
- 1) static bonding connection
- 2) traction relief for cable of supply voltage

- * without lever follow-up 90 mm, with lever follow-up 155 mm
- ** without lever follow-up 116 mm, with lever follow-up 181 mm

Control head - type 230

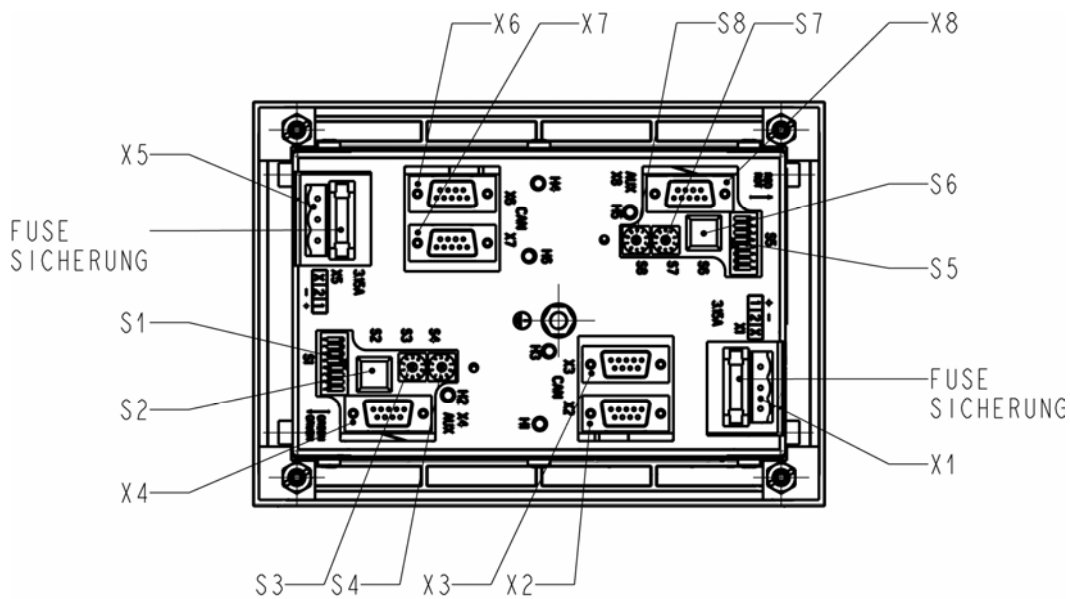
for reversing gear and controllable pitch propeller systems

Panel cutout



Connecting diagram

Bottom view of twin control head



- X1, X5* connector power supply
- X2, X6* connector CAN-bus input
- X3, X7* connector CAN-bus output
- X4, X8* connector operating / indication module
- S1, S2, S5*, S6* special operation
- S3, S4, S7*, S8* CAN-bus address
- *only on control heads with two levers

Control head - type 240

for fixed and controllable pitch propeller systems



◆ Technical data

Design	CAN-bus suitable control head
Operating temperature	- 25 °C to + 70 °C
Weight	see table
Power supply	via CAN-bus cable
Protection	IP 66 acc. to IEC 60 529 (DIN VDE 0470)
Indication	by LED and buzzer



→ The control head

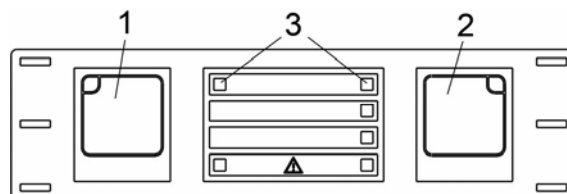
is transmitting signals to the MPC for reversing gear or controllable pitch propeller propulsion system. Depending on the function the control heads are equipped with detents in positions O (neutral), I (ahead) and II (astern). Integrated in the control head is a operating and indication panel.

→ Type numbers

For application	Special	Number of engines / levers	Lever	Weight [kg]	Type number
Reversing gear propulsion system		1	standard	1.4	362 240 160 0
			short	1.4	on request
		2	standard	1.4	362 240 060 0
			short	1.4	on request
	scale points	1	standard	1.4	on request
			short	1.4	on request
		2	standard	1.4	362 240 032 0
			short	1.4	362 240 031 0
Controllable pitch propeller system	combinator	1	standard	1.4	R417 000 368
		2	standard	1.4	R417 000 372
	only rpm (blocked in astern)	1	standard	1.4	R417 000 366
		2	standard	1.4	R417 000 374
	separate rpm / pitch only pitch	1 engine / 2 levers	standard	1.4	R417 000 370
		2	standard	1.4	R417 000 376

→ Functions

Type number	Push button 1 for	Push button 2 for	Indication 3 for	Figure
362 240 160 0 362 240 060 0	station transfer, low/high idle, warming up	synchronization or trolling	command active, synchronization, trolling, alarm	1
362 240 032 0 362 240 031 0	station transfer, low/high idle, warming up	synchronization or trolling	command active, synchronization, trolling, alarm	2
R417 000 368	station transfer, rpm constant	clutch on/off	command active, clutch on, rpm constant, alarm	3
R417 000 372	station transfer	rpm-constant	command active, rpm constant, alarm	4
R417 000 366	station transfer, rpm constant	clutch on/off	command active, clutch on, rpm constant, alarm	5
R417 000 374	station transfer, rpm constant	combinator on/off	command active, combinator on, rpm constant, alarm	6
R417 000 370	station transfer, rpm constant	clutch on/off	command active, clutch on, rpm constant, alarm	7
R417 000 376	clutch 1 on/off	clutch 2 on/off	command active, clutch 1 on, clutch 2 on, alarm	8



▲ Spare parts

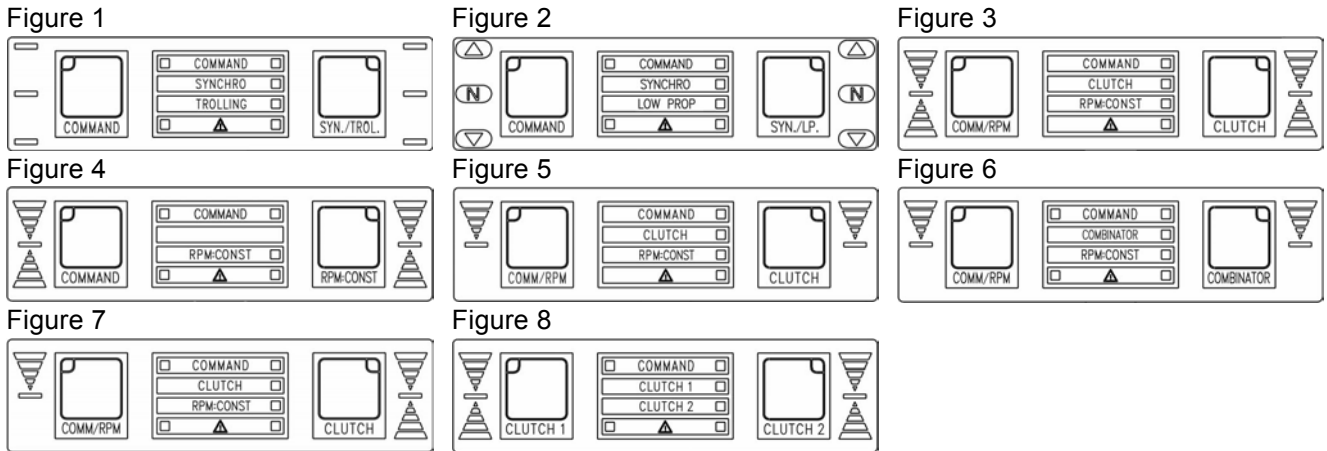
Device	Description	Type number
Spare parts		on request

Control head - type 240

for fixed and controllable pitch propeller systems



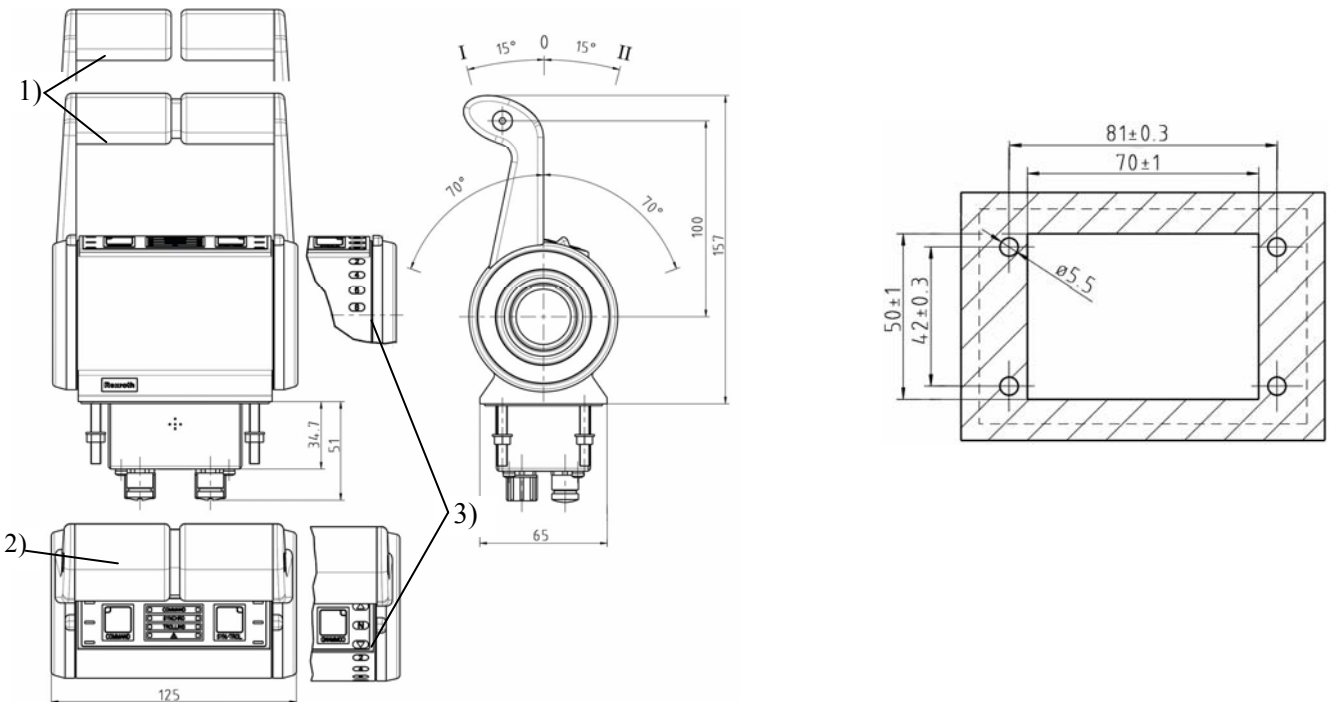
Panel layouts



Technical drawing / panel cut out

Outline drawing

panel cut out

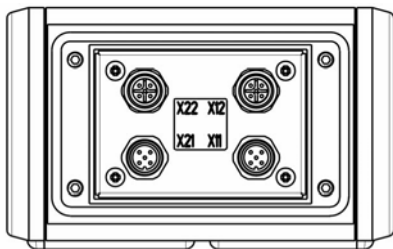


Remark: 1) See table "number of levers"

2) See table "panel layouts"

3) Housing modification for figure 2

Terminal assignment



X11, X21* = CAN input
X12, X22* = CAN output

* only on control head with two levers

Control head - type 241

for fixed and controllable pitch propeller systems

◆ Technical data

Design	CAN-bus suitable control head
Operating temperature	- 25 °C to + 70 °C
Weight	see table
Power supply	via CAN-bus cable
Protection	IP 66 acc. to IEC 60529 (DIN VDE 0470)
Indication	by LED and buzzer



→ The control head

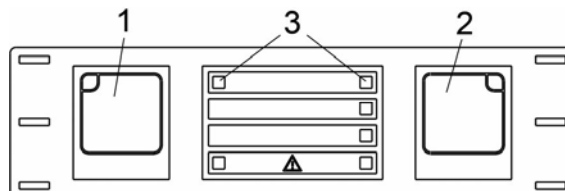
is transmitting signals to the MPC for reversing gear or controllable pitch propeller propulsion system. Depending on the function the control heads are equipped with detents in positions O (neutral), I (ahead) and II (astern). Integrated in the control head is an operating and indication panel.

→ Type numbers

For application	Special	Number of engines / levers	Weight [kg]	Type number
Reversing gear propulsion system		1	1.4	R417 000 357
		2	1.4	R417 000 356
Controllable pitch propeller system	combinator	1	1.4	R417 000 369
		2	1.4	R417 000 373
	only rpm (blocked in backward)	1	1.4	R417 000 367
		2	1.4	R417 000 375
	separate rpm / pitch	1 engine / 2 levers	1.4	R417 000 371
	only pitch	2	1.4	R417 000 377

→ Functions

Type number	Push button 1 for	Push button 2 for	Indication 3 for	Figure
R417 000 357	station transfer, low/high idle, warming up	synchronization or trolling	command active, synchronization, trolling, alarm	1
R417 000 356	station transfer, low/high idle, warming up	synchronization or trolling	command active, synchronization, trolling, alarm	1
R417 000 369	station transfer, rpm constant	clutch on/off	command active, clutch on, rpm constant, alarm	2
R417 000 373	station transfer	rpm-constant	command active, rpm constant, alarm	3
R417 000 367	station transfer, rpm constant	clutch on/off	command active, clutch on, rpm constant, alarm	4
R417 000 375	station transfer, rpm constant	combinator on/off	command active, combinator on, rpm constant, alarm	5
R417 000 371	station transfer, rpm constant	clutch on/off	command active, clutch on, rpm constant, alarm	6
R417 000 377	clutch 1 on/off	clutch 2 on/off	command active, clutch 1 on, clutch 2 on, alarm	7



▲ Spare parts

Device	Description	Type number
Spare parts		on request

Control head - type 241

for fixed and controllable pitch propeller systems



Panel layouts

Figure 1

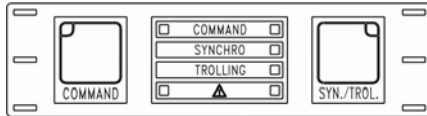


Figure 2

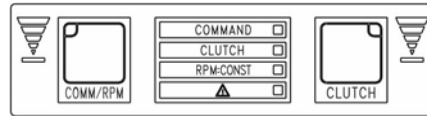


Figure 3

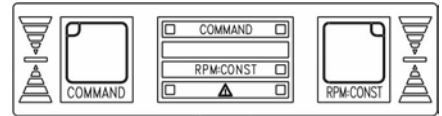


Figure 4

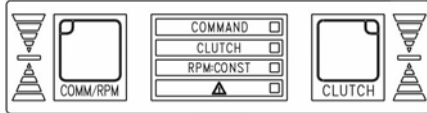


Figure 5

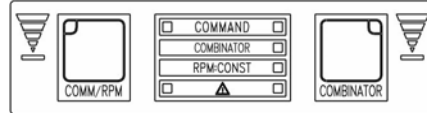


Figure 6

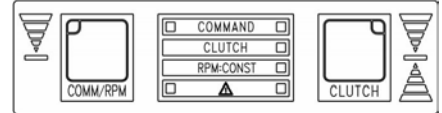
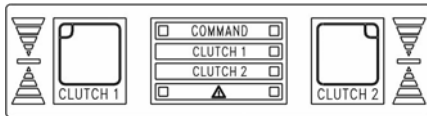
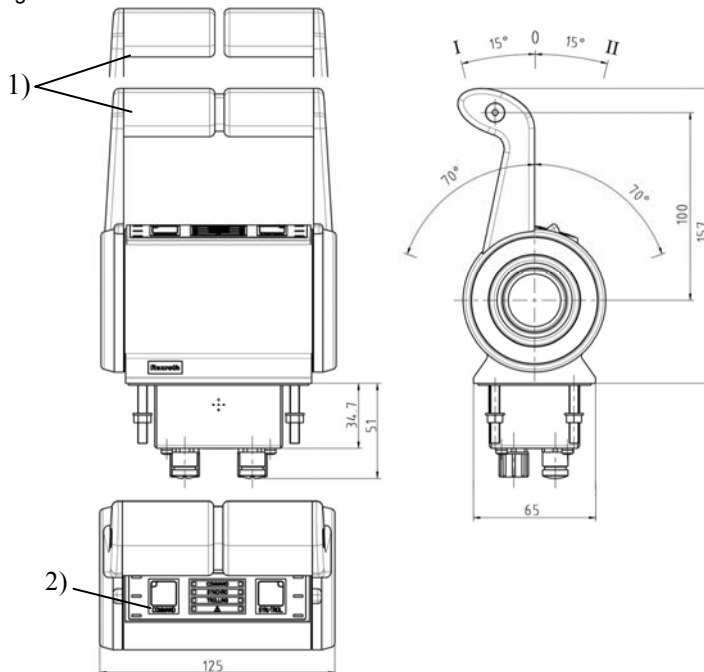


Figure 7



Technical drawing / panel cutout

Outline drawing

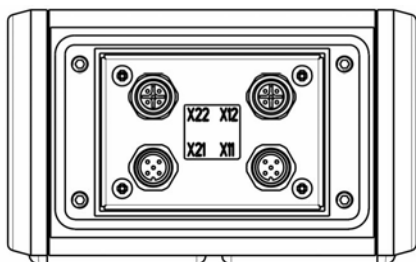


panel cutout

Remarks: 1) See table - number of levers

2) See table "panel layouts"

Terminal assignment



X11, X21* = CAN input
X12, X22* = CAN output

* only on control heads with two levers

Control head system - type 251 - Palm Beach

for fixed propeller systems



◆ Technical data

Design	CAN bus suitable control head system
Operating temperature	- 25 °C to + 70 °C
Weight	see table
Power supply	via CAN-bus cable
Protection	IP 66 acc. to IEC 529 (DIN VDE 0470)

→ The control head is transmitting signals to the MPC for reversing gear propulsion systems with detents in positions O (neutral), I (ahead) and II (astern).



→ Type numbers

Device	Figure	Special	Number of engines / levers	Weight	Type number
Control head system 251*	1	2 x control head type 251 1 x control unit type 251 2 x cable M12, 2m	2 / 2*	5.1 kg	R417 000 327
Control head type 251*	2	-			R417 000 068
Operating and indication module type 251	3	-			R417 000 215

*handle for control head has to be ordered separately

▲ Accessories

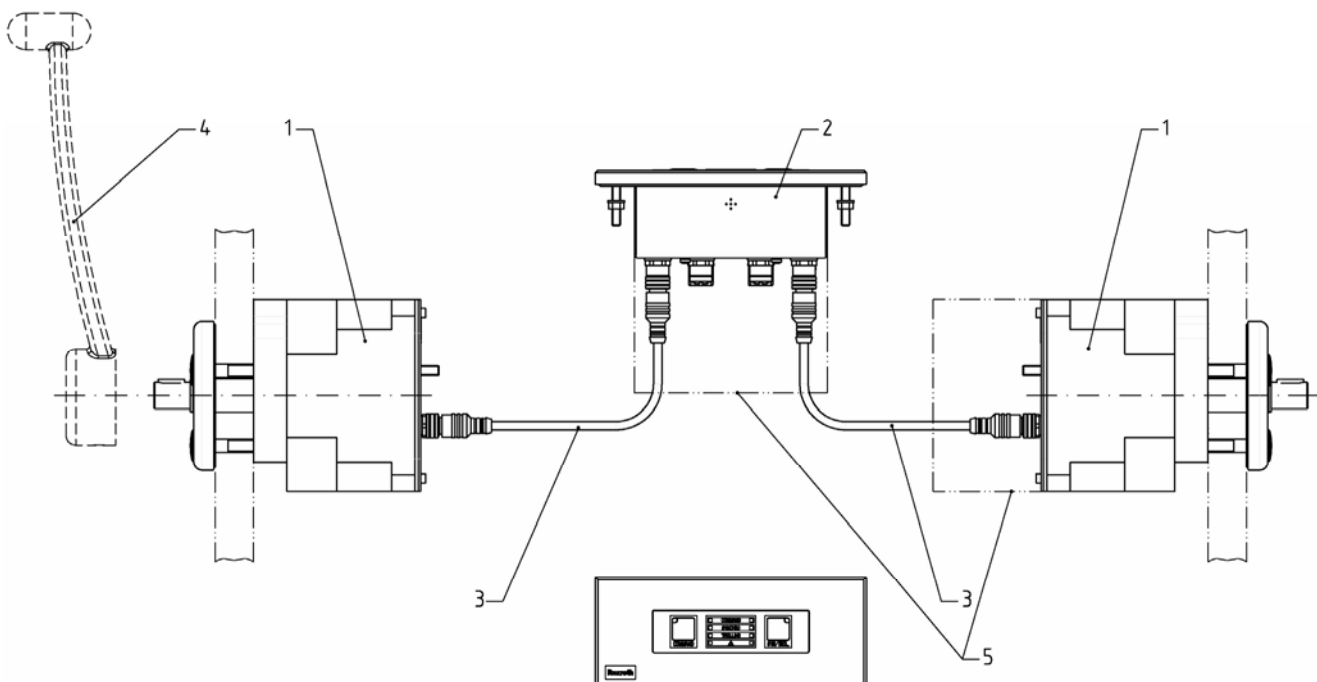
Device	Figure	Description	Type number
handle	4	handle for control head type 251	R417 000 107
cable*	-	cable to connect the control head to the operation module	894 605 480 2

*see also cable M12

▲ Spare parts

Device	Description	Type number
Spare parts	-	on request

Figure 1 - system overview



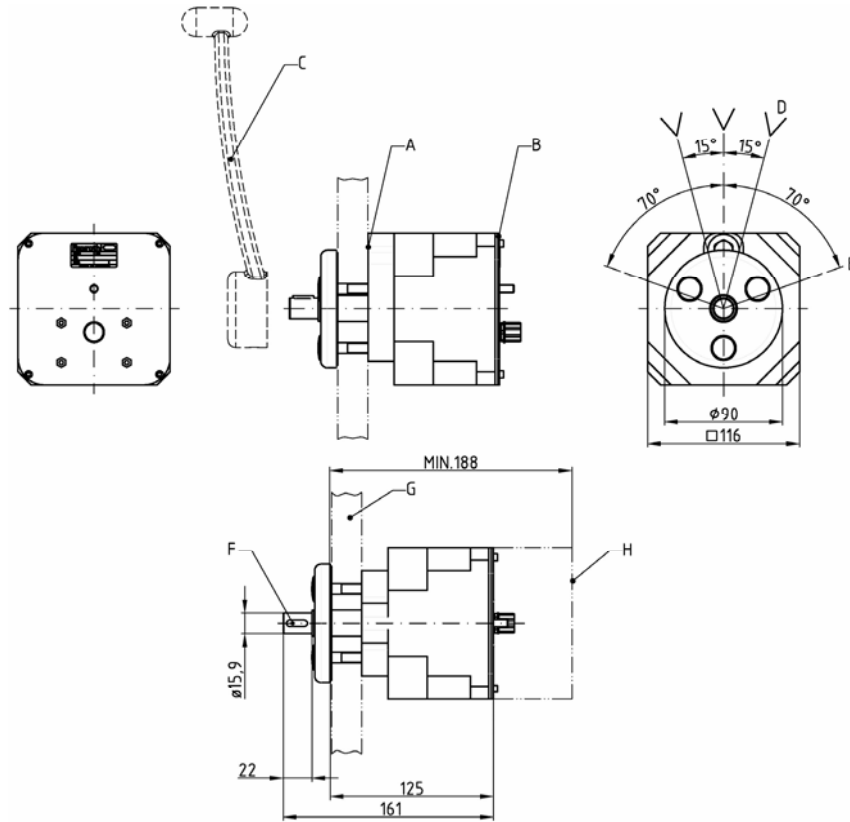
1 control head type 251
2 operating module type 251
3 cable M12

4 handle (has to be ordered separately)
5 installation space for connectors

Control head system - type 251 - Palm Beach

for fixed propeller systems

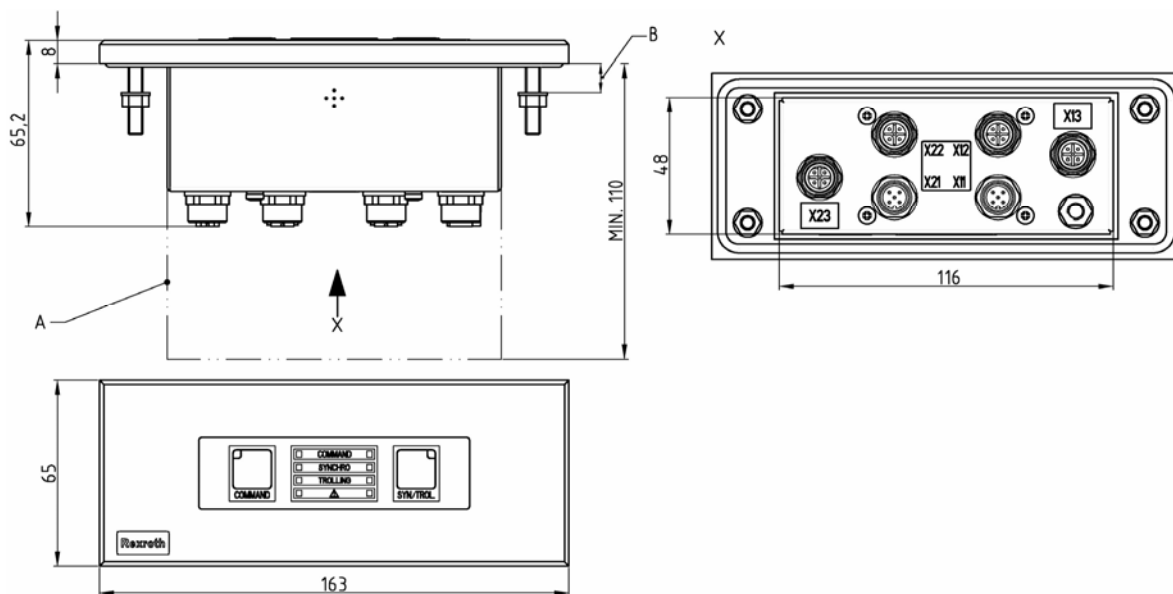
Figure 2 - technical drawing – control head type 251



A beak force adjustable after removal of cap
 B detent force adjustable after removal of cover
 C lever (figure 4) has to be ordered separately
 D detent positions
 E lever amplitude

F parallel key form A 3/16" x 3/16" x 5/8" B.S. 46
 G thickness of panel plate 10mm up to 25mm; for panel plates thinner than 20mm, distance plates are enclosed
 H installation space for connectors

Figure 3 - technical drawing – operating module type 251



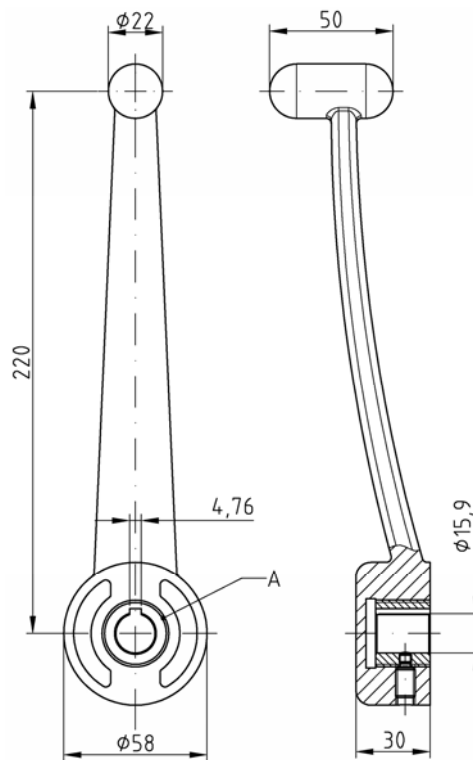
X11, X12, X21, X22 CAN-bus
 X13, X23 control head

A installation space for connectors
 B thickness of panel plate 2mm up to 20mm

Control head system - type 251 - Palm Beach

for fixed propeller systems

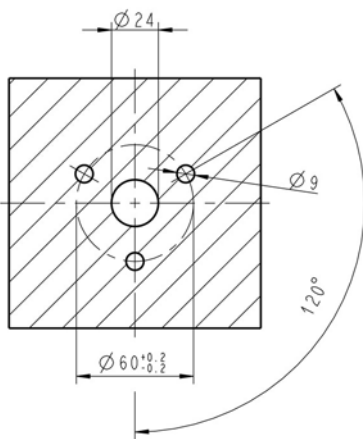
Figure 4 - technical drawing – handle for control head type 251



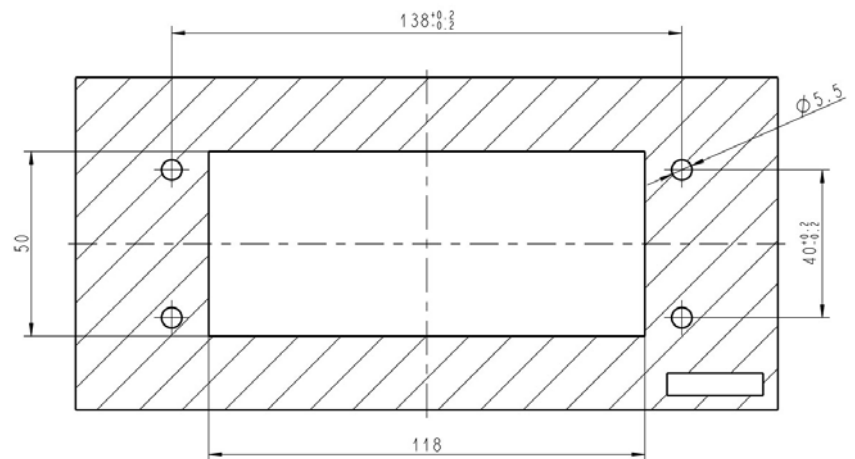
A handle can be adjusted in steps of 10°.

Panel cutout

control head



operation module



Operating / indication module - type 231

for fixed and controllable pitch propeller systems



◆ Technical data

Design	I ² C bus suitable operation / indication module for indication and / or data input
Operating temperature	- 20 °C to + 70 °C
Weight	0.8 kg
Operation current	0.8 A max.
Protection (above panel plate)	IP 66 acc. to IEC 60 529 (DIN VDE 0470)
Illumination	by LED



→ The operating / indication module is connected to the control head type 230.

→ Type numbers – standard version (grey foil)

Operating module							
Fig.	Version	Colour Key* 1 / 2 / 3 / 4	Key 1	Key 2	Key 3	Key 4	Type number
1	standard, horizontal	R / Y / Y / G	alarm / test	take-over	special function	dimmer	362 231 200 0
2	standard, vertical	Y / G / Y / R	take-over	dimmer	special function	alarm / test	362 231 201 0
3	special conf.	Y / Y / G / Y	take-over	ind. Astern	ind. Neutral / dimmer	ind. Ahead	362 231 290 0
4	gear function	Y / Y / Y / Y	ind. warming up	ind. Astern	ind. Neutral	ind. Ahead	362 231 210 0
5	engine free conf.	G / R / Y / Y	free [start]	free [stop]	free	free	362 231 301 0
6	free configuration	Y / Y / Y / Y	free	free	free	free	362 231 300 0

Indication module		
Fig.	Version	Type number
7	speed, 0 – 100 %, vertical	362 231 500 0
8	pitch, ahead / neutral / astern [- 100 / 0 / +100], vertical	362 231 501 0
9	rudder, port / starboard [100 / 0 / 100], horizontal	362 231 502 0

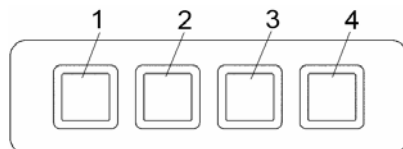
* R = red, G = green, Y = yellow, ind. = indication

→ Type numbers – black version (black foil)

Operating module							
Fig.	Version	Colour Key* 1 / 2 / 3 / 4	Key 1	Key 2	Key 3	Key 4	Type number
1	standard, horizontal	R / Y / Y / G	alarm / test	take-over	special function	dimmer	362 231 202 0
2	standard, vertical	Y / G / Y / R	take-over	dimmer	special function	alarm / test	362 231 203 0
3	special conf.	Y / Y / G / Y	take-over	ind. Astern	ind. Neutral / dimmer	ind. Ahead	362 231 291 0
4	gear function	Y / Y / Y / Y	ind. warming up	ind. Astern	ind. Neutral	ind. Ahead	362 231 211 0
5	engine free conf.	G / R / Y / Y	free [start]	free [stop]	free	free	362 231 303 0
6	free configuration	Y / Y / Y / Y	free	free	free	free	362 231 302 0

Indication module		
Fig.	Version	Type number
7	speed, 0 – 100 %, vertical	362 231 504 0
8	pitch, ahead / neutral / astern [- 100 / 0 / +100], vertical	362 231 505 0
9	rudder, port / starboard [100 / 0 / 100], horizontal	362 231 506 0

* R = red, G = green, Y = yellow, ind. = indication



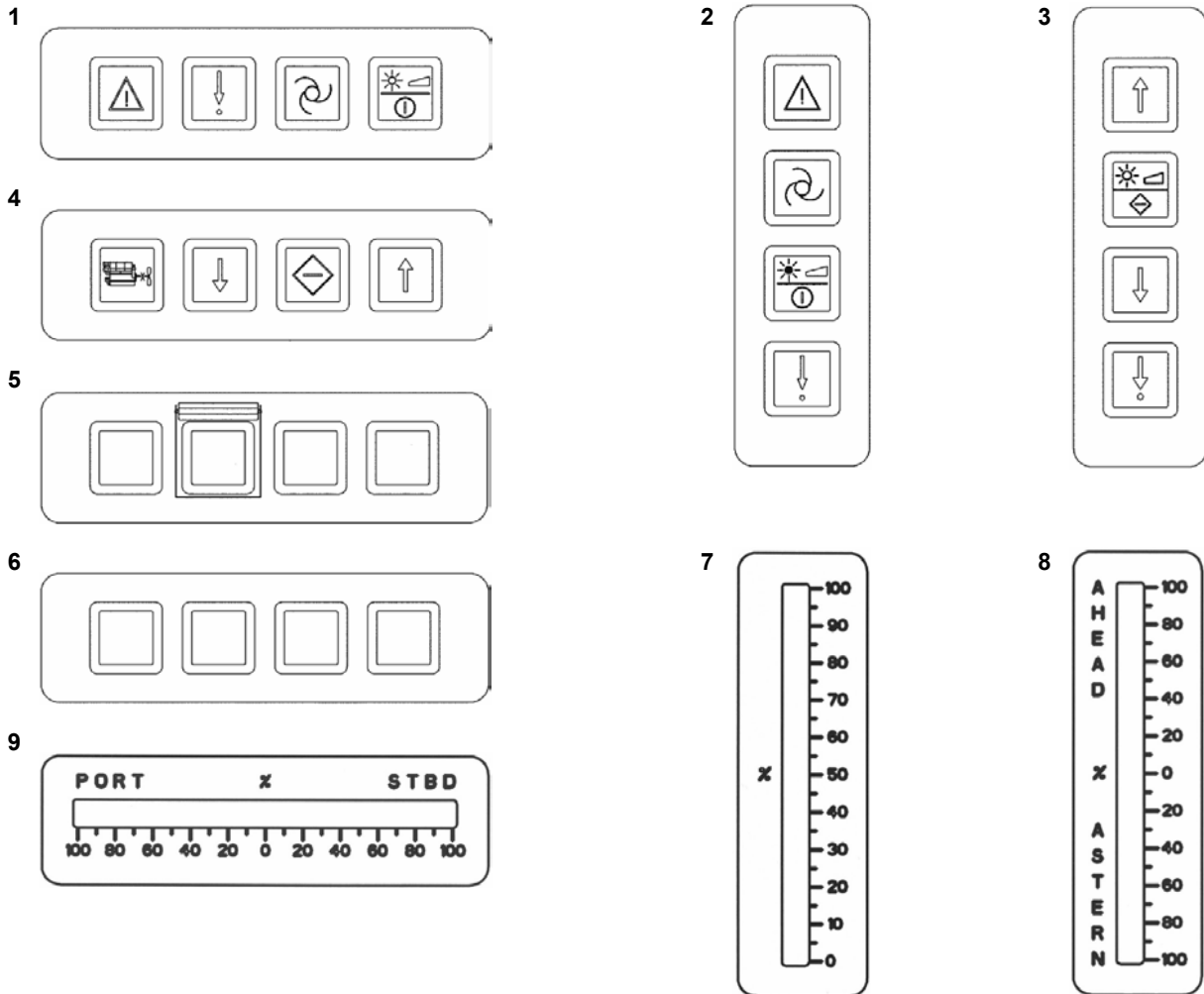
▲ Accessories

Device	Description	Type number
Covering plate for panel cutouts	Plate without foil to cover cutouts	362 231 209 0

Operating / indication module - type 231

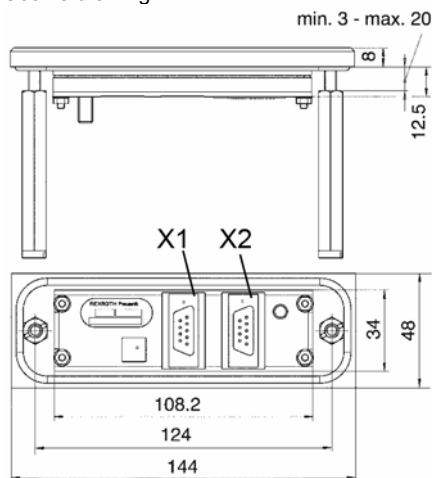
for fixed and controllable pitch propeller systems

Figures of foil

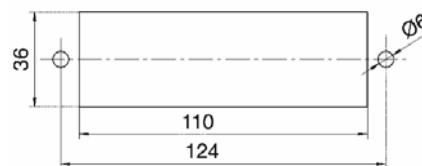


Technical drawing / panel cutout

Outline drawing



panel cutout



X1, X2 plug connection I²C-bus

Operating / indication module - type 242

for fixed and controllable pitch propeller systems



◆ Technical data

Design	CAN bus suitable operation / indication module for indication and / or data input
Operating temperature	- 20 °C to + 70 °C
Weight	0.8 kg
Operation current	0.8 A max.
Protection	IP 66 acc. to IEC 60 529 (DIN VDE 0470)
Illumination	by LED



→ The operating / indication module can be connected to the CAN-Bus of Marex OS II remote control.

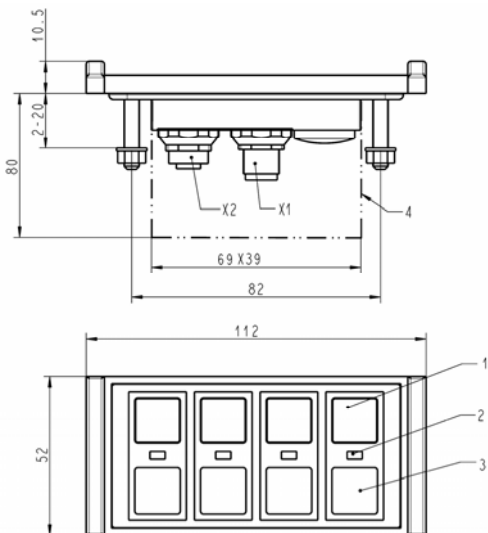
→ Type numbers – standard version (black with chromed side frames)

Operating module							
Fig.	Version	Colour key* 1 / 2 / 3 / 4	Key 1	Key 2	Key 3	Key 4	Type number
1	horizontal	G / R / Y / Y	free [dimmer]	free [alarm/test]	free [take-over]	free [special function]	R417 000 506
2	vertical	G / R / Y / Y	free [dimmer]	free [alarm/test]	free [take-over]	free [special function]	R417 000 507
2	vertical	Y / Y / Y / Y	free	free	free	free	R417 000 304
1	horizontal	Y / Y / Y / Y	free	free	free	free	R417 000 243

* R = red, G = green, Y = yellow, ind. = indication

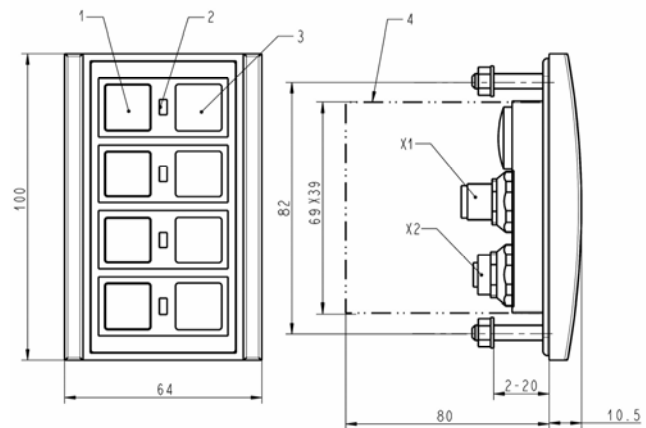
Technical drawing

Figure 1



1 title block (the fields can only be labeled once)
2 LEDs
3 push buttons

Figure 2



4 installation space for connectors
X1 CAN-input
X2 CAN-output

Panel cutout

Figure 1

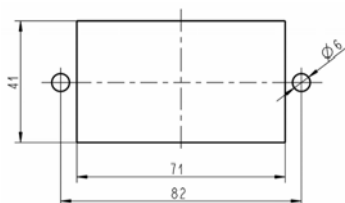
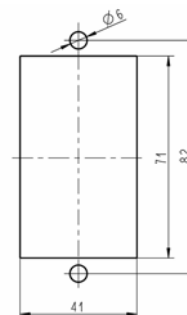


Figure 2



Control unit – MPC

for reversing gear propulsion systems



◆ Technical data

Design	modular	
Operating temperature	- 20 °C to + 70 °C	
Vibration resistance	4g (2...100Hz) – IEC 60068-2-6, test Fc	
Weight	2.4 kg	
Operating voltage	24 V DC – 25 % / + 30 % or 12 V DC – 20 % / + 30 %	
Operating current	24 V DC:	3 A max.
	12 V DC:	6 A max.
Protection	IP 20 acc. to IEC 60529 (DIN VDE 0470)	
Fuse	10 A (T)	



→ The MPC is the central processing unit of the remote control. It is also responsible for data in- and output.

→ Type numbers

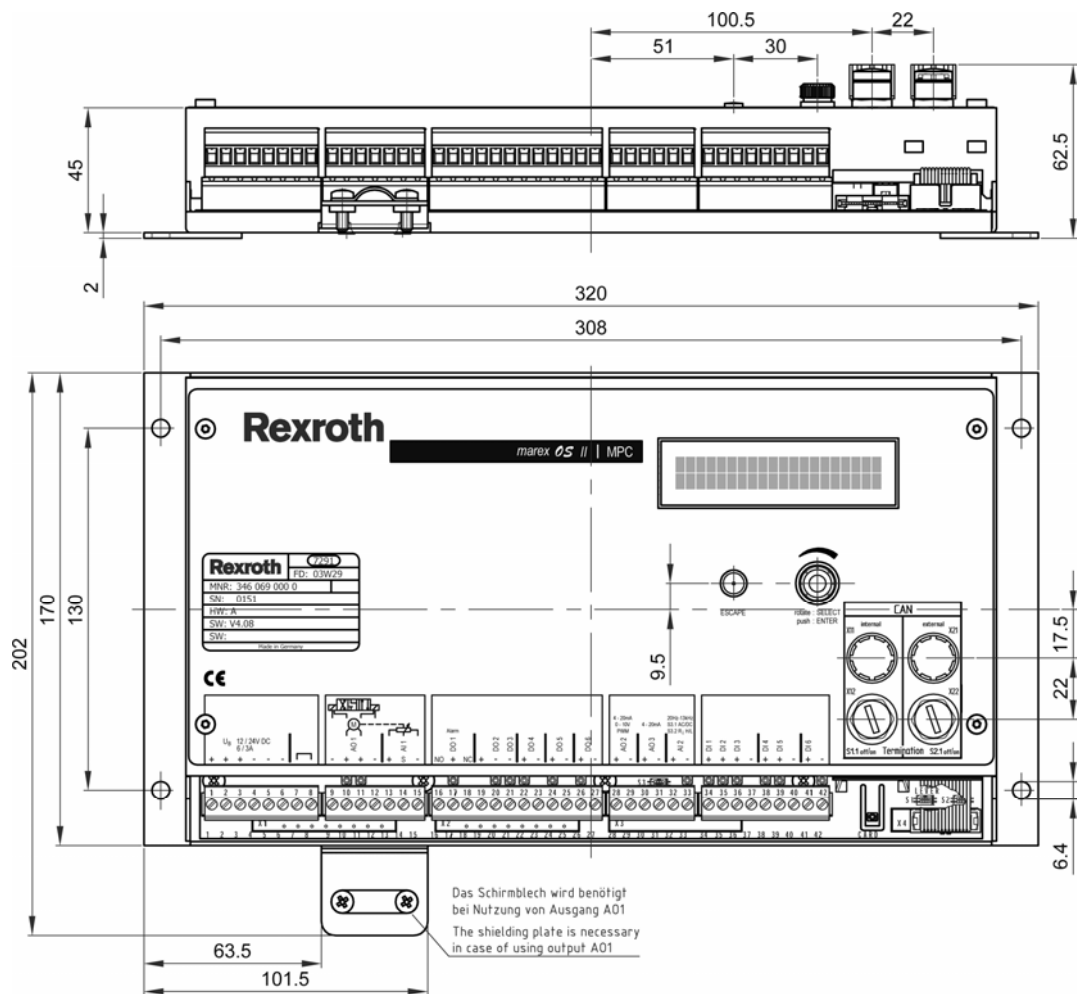
For application	Type number
Reversing gear propulsion system	346 069 000 0

▲ Spare parts

Device	Description	Type number
Fuse	fuse 10 A (T)	894 245 201 4

For repair and / or replacement the software version and adjusted parameters (parameter list) are needed.

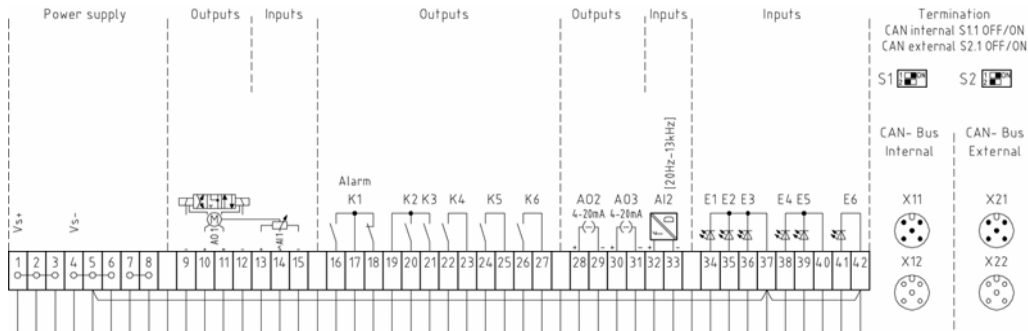
Technical drawing



Control unit – MPC

for reversing gear propulsion systems

Terminal assignment



Connection	Function	Description
1, 2, 3	Vs+ +	power supply
4, 5, 6	Vs- -	power supply of MPC
7, 8		support clamp for free use
9	AO1 -	proportional valve A
10	+	actuator
11	+	
12	-	proportional valve B
13	AI1 +	potentiometer
14	collector	
15	-	
16	K1 NO	alarm
17	+	
18	NC	
19	+	reversing gear
20	K2 NO	
21	K3 NO	ahead astern
22	K4 +	trolling on/off
23	NO	
24	K5 +	engine start release (closed if gear setting neutral)
25	NO	
26	K6 +	speed synchronization on/off
27	NO	
28	AO2 +	electronic speed setting
29	-	
30	AO3 +	electronic trolling
31	-	
32	AI2 +	rpm feedback
33	-	
34	E1 +	digital feedback signal of gear box 6-32V DC
35	E2 +	
36	E3 +	
37	-	
38	E4 +	digital input for special function 6-32V DC
39	E5 +	
40	-	
41	E6 +	digital input for special function 6-32V DC
42	-	
X11, X12		internal CAN bus
X21, X22		external CAN bus
S1		terminating resistor
S2		terminating resistor

Control unit – MPC

for reversing gear propulsion systems



◆ Technical data

Design	cabinet	
Operating temperature	- 20 °C to + 70 °C	
Vibration resistance	4g (2...100Hz) – IEC 60068-2-6, test Fc	
Weight	2.4 kg	
Operating voltage	24 V DC – 25 % / + 30 % or 12 V DC – 20 % / + 30 %	
Operating current	24 V DC:	3 A max.
	12 V DC:	6 A max.
Protection	with screw cable gland	IP 54 acc. to IEC 60529 (DIN VDE 0470)
Fuse		10 A (T)



→ The MPC is the central processing unit of the remote control. It is also responsible for data in- and output.

→ Type numbers

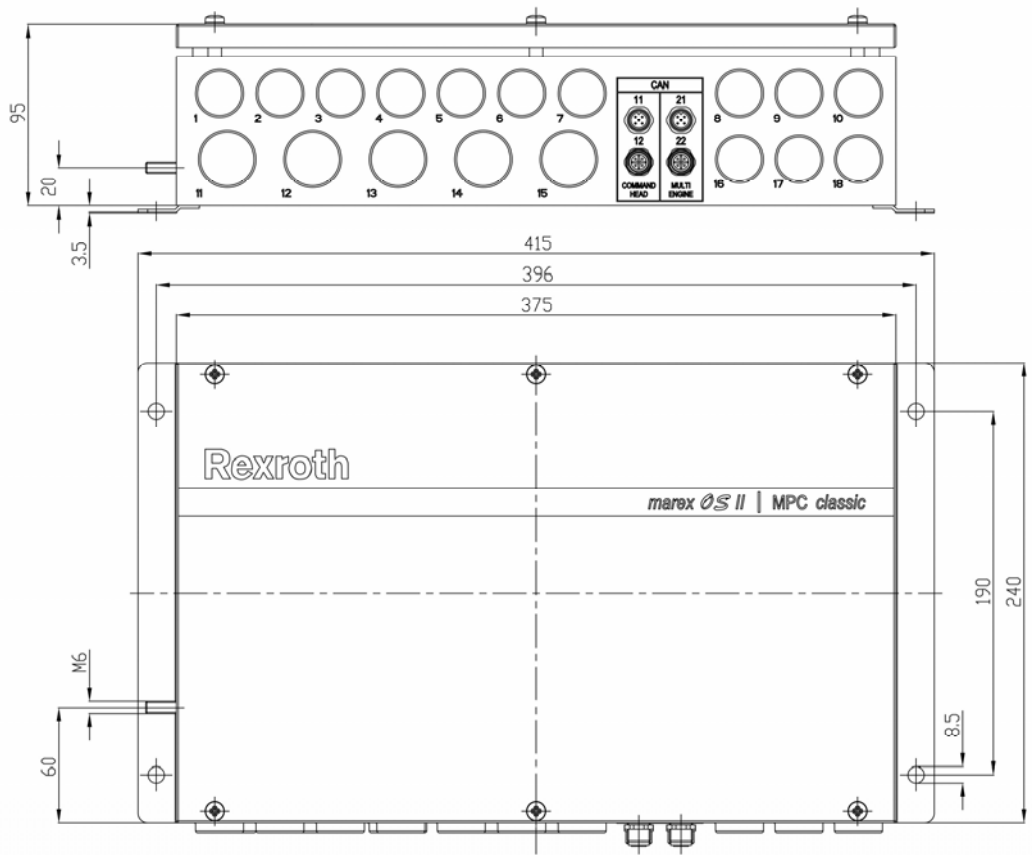
For application	Type number
Reversing gear propulsion system	346 069 002 0

▲ Accessories / spare parts

Device	Description	Type number
Fuse	fuse 10 A (T)	894 245 201 4

For repair and / or replacement the software version and adjusted parameters (parameter list) are needed.

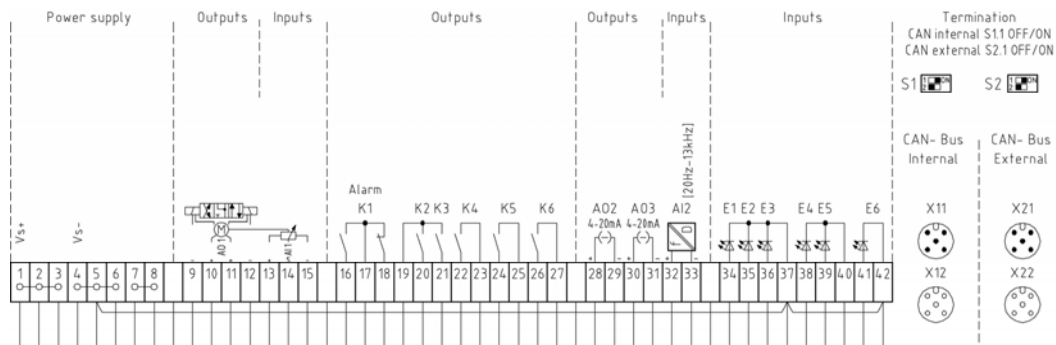
Technical drawing



Control unit – MPC

for reversing gear propulsion systems

Terminal assignment



Connection	Function	Description
1, 2, 3	Vs+ +	power supply
4, 5, 6	Vs- -	power supply of MPC
7, 8		support clamp for free use
9	AO1 -	proportional valve A
10	+	actuator
11	+	
12	-	proportional valve B
13	AI1 +	potentiometer
14	collector	potentiometer
15	-	
16	K1 NO	alarm
17	+	reversing gear
18	NC	
19	+	ahead astern
20	K2 NO	
21	K3 NO	trolling on/off
22	K4 +	
23	NO	trolling
24	K5 +	
25	NO	engine start release (closed if gear setting neutral)
26	K6 +	start release
27	NO	speed synchronization on/off
28	AO2 +	synchronization
29	-	electronic speed setting
30	AO3 +	4-20mA / 0-10V / PWM
31	-	common AO2
32	AI2 +	electronic trolling
33	-	4-20mA
34	E1 +	common AO3
35	E2 +	rpm feedback
36	E3 +	20-13000Hz
37	-	common AI2
38	E4 +	ahead
39	E5 +	digital feedback signal of gear box 6-32V DC
40	-	astern
41	E6 +	neutral
42	-	common E1-E3
X11, X12		emergency stop
X21, X22		digital input for special function 6-32V DC
S1		special function
S2		common E4, E5
		digital input for special function 6-32V DC
		common E6
		internal CAN bus
		CAN bus (control head, supplementary modules)
		external CAN bus
		CAN bus (communication between MPCs)
		terminator resistor
		terminating resistor for CAN bus X1 on/off
		terminator resistor
		terminating resistor for CAN bus X2 on/off

Control unit – MPC

for reversing gear propulsion systems



◆ Technical Data

Design	plus	
Operating temperature	- 20 °C to + 70 °C	
Vibration resistance	4g (2...100Hz) – IEC 60068-2-6, test Fc	
Weight	2.4 kg	
Operating voltage	24 V DC – 25 % / + 30 % or 12 V DC – 20 % / + 30 %	
Operation current	24 V DC:	3 A max.
	12 V DC:	6 A max.
Protection	with screw cable gland	IP 54 acc. to IEC 60529 (DIN VDE 0470)
Fuse		10 A (T)



→ The MPC

is the central processing unit of the remote control. They is also responsible for data in- and output.

→ Type numbers

For application	Type number
Reversing gear propulsion system	346 069 003 0

▲ Accessories

Device	MPC – plug no.	Length	Type number
Cable for prop-vale and gear setting / feed back signal	4, 5	2 m	894 620 279 2
		5 m	894 620 271 2
		10 m	894 620 270 2
		15 m	894 620 272 2
Cable for rpm setting / feed back signal and trolling setting	6, 7	2 m	892 620 229 2
		5 m	892 620 221 2
		10 m	892 620 220 2
		15 m	892 620 222 2
Actuator for mechanical trolling	3		323 698 000 0
Actuator for mechanical speed or gear setting*	7		323 698 100 0

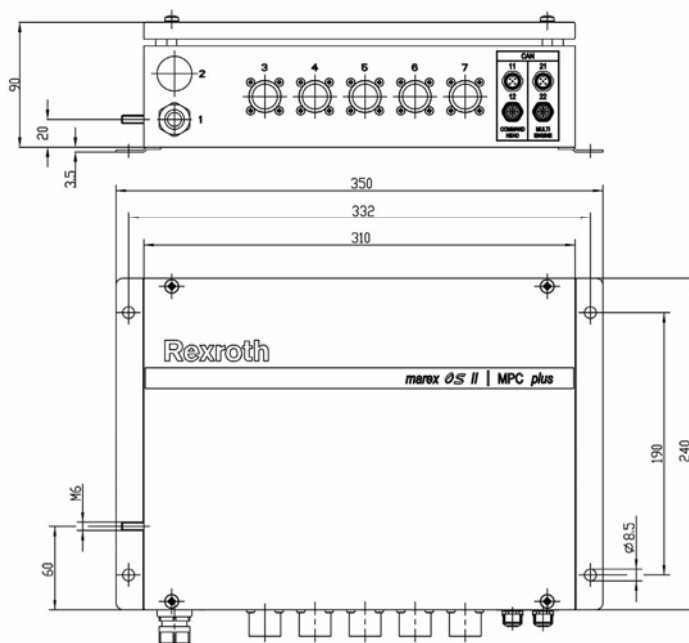
* see page of actuator 323 698 100 0 for power supply and signal cable of actuator

▲ Spare parts

Device	Description	Type number
Fuse	Fuse 10 A	894 245 201 4
Repair / replace	Only repair or complete changing of device possible*	-

* Software version and adjusted parameters (parameter list) are needed to repair or replace the MPC

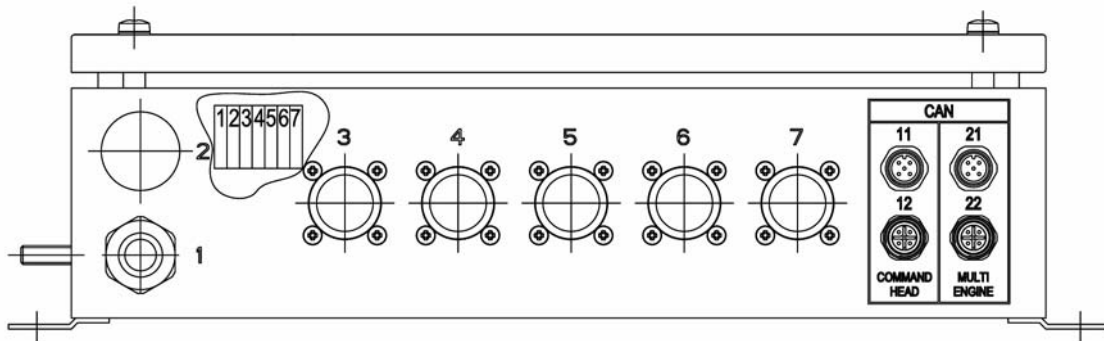
Technical drawing



Control unit – MPC

for reversing gear propulsion systems

Terminal assignment



Connection	pin	Function	Description		
via cable screw 1 or connection 2	1*	+	power supply	12V DC –20% 24V DC +30%	
	2*	-			
	3*	NC	alarm		
	4*	com			
	5*	NO			
	Plug 4	6*	NO	start release	engine start release (closed if gear setting neutral)
		7*	com		
Plug 3	1	+	trolling valve	PWM, direct control of proportional valve for trolling	
	2	-			
	3	+	trolling on	trolling on	
	5	-			
Plug 5	1	+	actuator	for actuator 323 698 000 0 to set mechanical gear or mechanical speed	
	2	-			
	3	ref. 5V DC+	feedback signal		
	4	signal			
	5	com			
Plug 6	1	+	ahead	reversing gear	
	2	+	astern		
	3	-			
	Plug 7	4	+	speed setting	4-20mA / PWM
		5	-		
		6	+	rpm feedback	20-13000Hz
		7	-		
Plug 7	1	+	trolling on	trolling on	
	2	-			
	5	signal		alarm feed back off actuator	
	6	+			
	7	-	trolling signal	4-20mA	
	8	+			
	X11, X12		internal CAN bus	CAN bus (control head, supplementary modules)	
	X21, X22		external CAN bus	CAN bus (communication between MPCs)	

* internal terminal connection

EPU

If the power supply of MPC is not sufficient

◆ Technical data

Operating temperature	- 20 °C to + 70 °C
Weight	1.2 kg
Operating voltage	24 V DC + 30 % / - 25 %
Operation current	2.5 A max.
Protection	IP 20 acc. to IEC 60 529 (DIN VDE 0470)

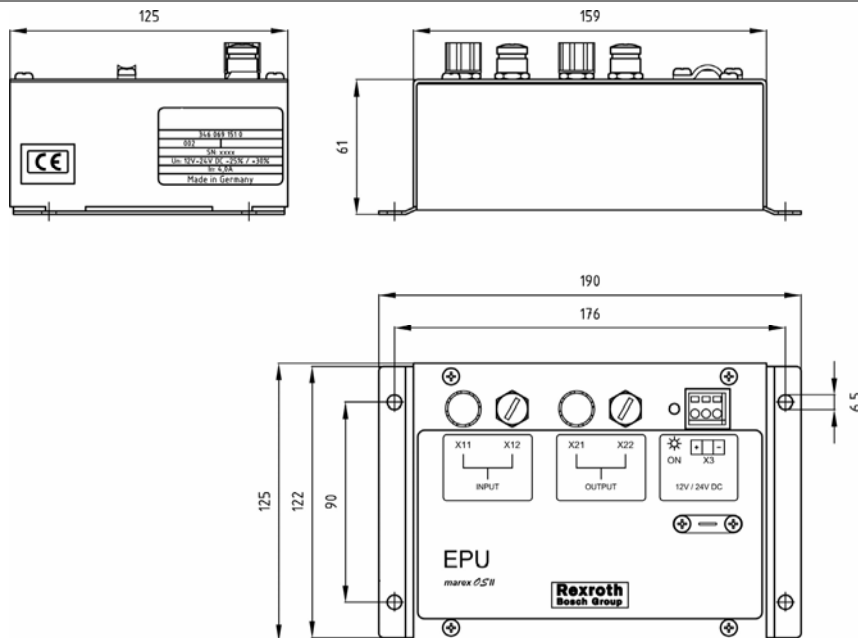


→ The EPU will be needed if the internal power supply via MPC is not sufficient.

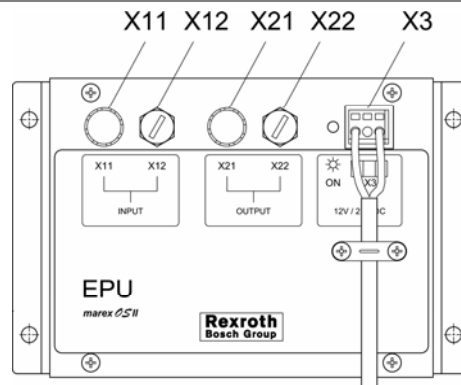
→ Type numbers

Device	Type number
EPU	346 069 151 0

Technical drawing



Terminal assignment



- X11, X12 plug connection CAN bus input
- X21, X22 plug connection CAN bus + power supply output
- X3 plug connection power supply

Emergency module type 232

for fixed propeller systems

Rexroth
Bosch Group

◆ Technical data

Design	CAN bus suitable control head
Operating temperature	- 20 °C to + 70 °C
Weight	see table
Power supply	24 V DC + 30 % / - 25 %
Protection (above panel plate)	IP 66 acc. to IEC 60 529 (DIN VDE 0470)



→ The emergency module

is made for emergency control of reversing gear propeller systems. By pressing the button for station transfer the command can be switched smoothless from main to emergency remote control. Only a relay unit (see accessories) is needed. The command can be taken over on each station. Also an automatic transfer in case of a failure in the main control is possible.

→ Type numbers

For application	Special	Number of engines	Weight [kg]	Type number
Reversing gear propulsion system	Master	1	0.5	362 232 000 0
	Slave	1	0.4	362 232 010 0

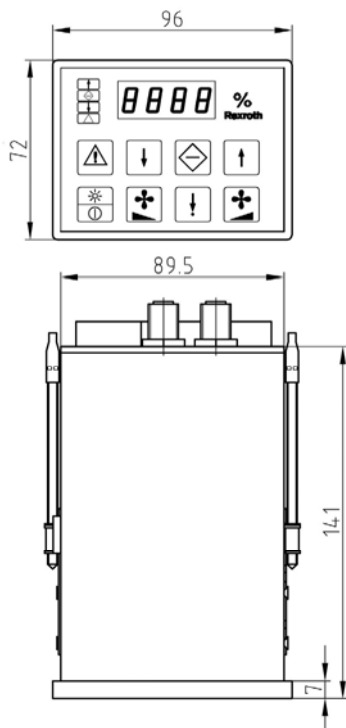
▲ Accessories / spare parts

Device	Description	Type number
CAN bus cable	see CAN bus cable M12	-
Relay unit reversing gear (RG) - modular	Relays unit to switch the out-/ingoo signals from main (mpc-modular) to emergency remote control	R417 000 511
Adapter	to connect a second (third) slave module to the emergency system	R419 800 162

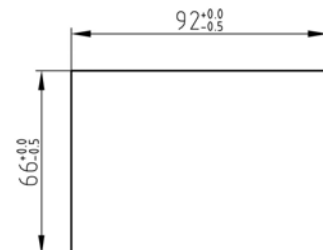
Software version and adjusted parameters (parameter list) are needed to repair or replace the module

Technical drawing / panel cutout

Outline drawing



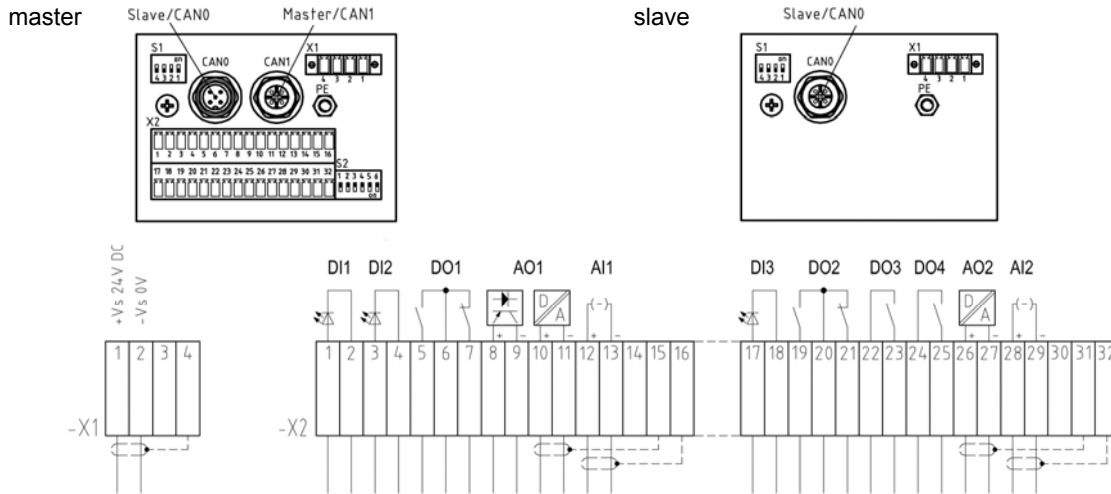
panel cutout



Emergency module type 232

for fixed propeller systems

Terminal assignment



Connection	Function	Description		
X1	1 Vs	power supply		
	2	-		
	3	n.c.		
	4	PE	shield clamp	
X2	1 DI1	ahead	digital feedback signal of gear box 6-32V DC	
	2	-		
	3 DI2	astern		
	4	-		
	5 DO1	NO	alarm	
	6	GND		
	7	NC		
	8 AO1	PWM	rpm by PWM	rpm setting 0-20mA / 4-20mA / 0-10V / 7.5 – 92.5 % te
	9	-		
	10	+	rpm by 4-20mA	
	11	-		
	12 AI1	+	feedback rpm	rpm feedback 0-20mA / 4-20mA
	13	-		
	14	n.c.		
15	PE	shield clamp		
16				
17 DI3	+	feedback command active	for transfer of command between remote control and emergency control	
18	-			
19 DO2	NO	command active		
20	+			
21	NC			
22 DO3	+	ahead	reversing gear	
23	NO			
24 DO4	+	astern		
25	NO			
26 AO2	+	feedback shaft speed	feedback signal of shaft speed 0-10V / 0-20mA	
27	-			
28 AI2	+	free	0-20mA / 4-20mA	
29	-			
30	n.c.			
31	PE	shield clamp		
32				
CAN0	internal CAN bus to connect a slave module			
CAN1	external CAN bus of master module to connect the master to the remote control			
S1				
S2	parameter setting of analog signal range			

Actuator

for mechanical gear shifting, setting of engine speed or pitch adjustment of the propeller



◆ Technical data

Design	actuator with internal electronic board
Operating mode	S5 – 40 % DIN EN 60034-1 (VDE 0530)
Operating temperature	- 25 °C to + 60 °C
Protection	IP 54 acc. to IEC 60 529 (DIN VDE 0470)
Weight	see table
Supply voltage	24 V DC - 25 % / + 30 %
Operating current	4 A max.
Nominal stroke	see table
Nominal lifting force	100 N
Nominal lifting speed	70 mm / s



→ The actuator

will be needed if gear shifting, speed or pitch setting is realized by mechanical levers.

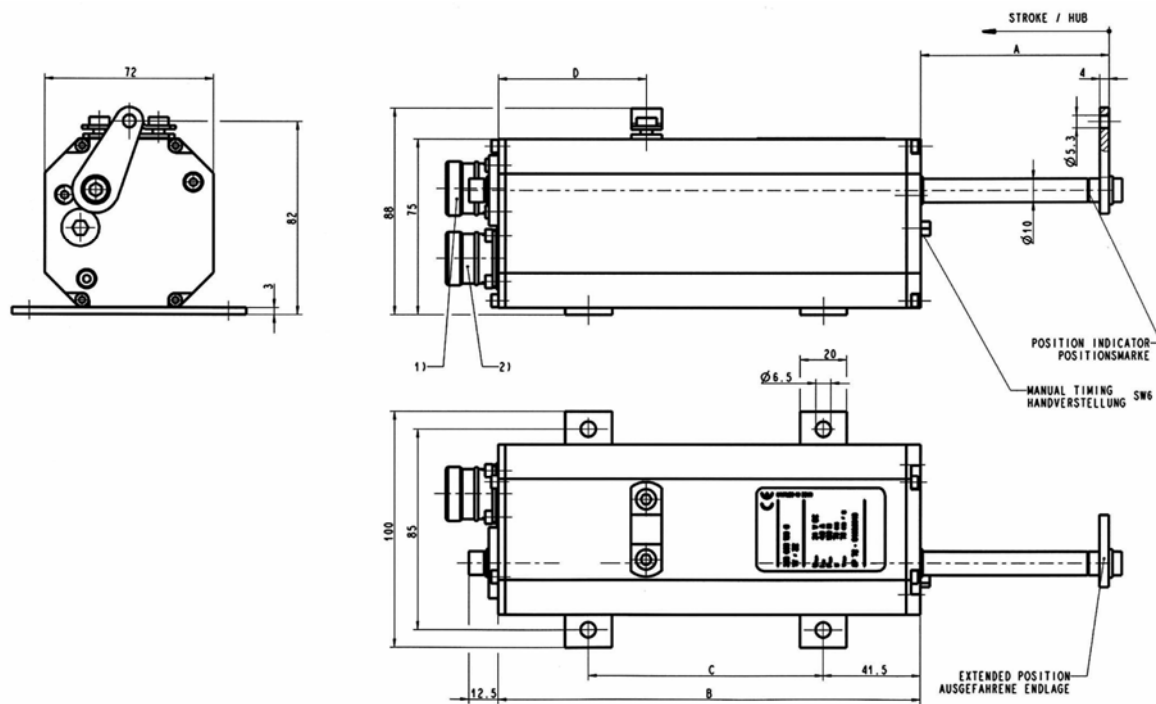
→ Type numbers

Stroke [mm]	Weight [kg]	Type number
70 *	1.8	323 698 100 0
120 **	2.0	323 698 110 0

* standard for mechanical gear or speed setting

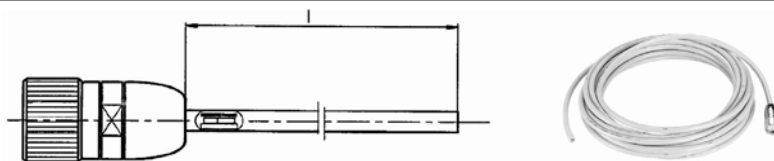
** for mechanical pitch setting where the propeller can be shifted to sailing position

Technical drawing



Stroke [mm]	A [mm]	B [mm]	C [mm]	D [mm]
70	80	180	100	63
120	130	230	150	60

▲ Accessories



Device	Length [m]	Type number
Cable for signal (with two plugs to connect actuator to MPC-plus)	10	R417 000 523
Cable for signal (to connect actuator to MPC-modular and MPC-cabinet)	10	894 620 203 2
Cable for power supply	10	894 620 250 2

Actuator

for mechanical gear shifting, setting of engine speed or pitch adjustment of the propeller



◆ Technical data

Design	actuator, directly controlled by MPC or control unit
Operating mode	S5 – 40 % DIN EN 60034-1 (VDE 0530)
Operating temperature	- 25 °C to + 60 °C
Protection	IP 54 acc. to IEC 529 (DIN VDE 0470)
Weight	see table
Supply voltage	12 V DC over MPC or control unit
Operating current	4 A max.
Nominal stroke	see table
Nominal lifting force	100 N
Nominal lifting speed	70 mm / s



→ The actuator

will be needed if gear shifting, speed or pitch setting is realized by mechanical levers.

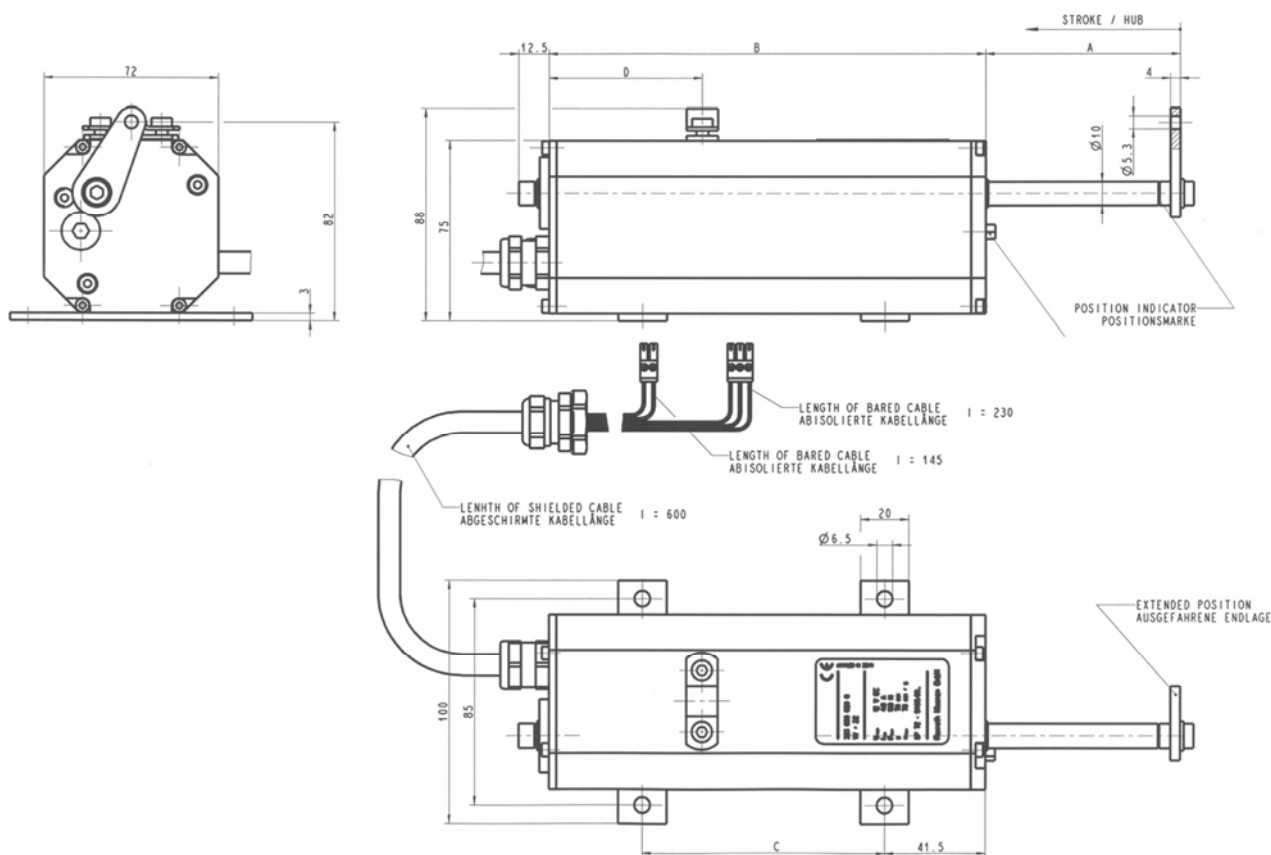
→ Type numbers

Stroke [mm]	Weight [kg]	Type number
70 *	1.8	323 698 020 0
120 **	2.0	323 698 010 0

* standard for mechanical gear or speed setting

** for mechanical pitch setting where the propeller can be shifted to sailing position

Technical drawing



Stroke [mm]	A [mm]	B [mm]	C [mm]	D [mm]
70	80	180	100	63
120	130	230	150	60

▲ Accessories

Device	Length [m]	Type number
Control unit*	see separate page	346 068 000 0

* can control two actuators of these type via CAN bus. E.g. distance between actuator and MPC is > 600 mm

Electro-pneumatic regulating valve

pressure control valve ND 3, M14 x 1.5, analogue action

◆ Technical data

Design		poppet valve
Supply pressure		max. 8 bar*
Output pressure		0 ... 6 bar
Hysteresis		0.02 bar
Nominal flow with supply pressure of 7 bar output pressure 6 bar and Δp 0.2 bar	Qn	300 l/min.
Ambient temperature range		- 20 °C to + 60 °C
Admissible medium		condensate-free and non-lubricated compressed air, filtered 50 μ m
Weight		3.0 kg
Material	housing seals	Al-diecasting NBR
Supply voltage		24 V DC \pm 20%
Admissible ripple		5 %
Current consumption		0.3 A max.
Protected with plug		IP 65 to IEC 60 529 (DIN VDE 0470)
Assembly position		vertical
Vibration resistance		4 g / 2 ... 100 Hz



→ Application area

Electro-pneumatic pressure control valves convert an electrical signal (current, voltage, resistance) proportionally into pneumatic pressure. They are used where electrical control is required to act directly on a change of pressure or force.

→ Type numbers

	Nominal input value**	Nominal input value** alternative	Type numbers
	4 – 20 mA 0 – 10 V DC 2 – 10 kOhm	0 – 20 mA 2 – 10 V DC	346 056 550 0

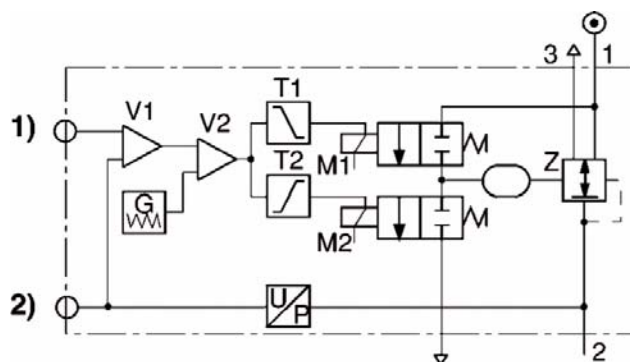
* min. supply pressure: 0.5 bar + max. required output pressure

** adjustment of characteristic line by means of switch "S" on the electronic card 4 – 20 mA characteristic line adjusted ex works.

▲ Accessories (to be ordered separately)

	Spare part	Type number
	electronic card	546 007 681 2
	pressure converter	894 045 012 2
	repair kit (pneumatic part)	346 056 001 2

Functional diagram

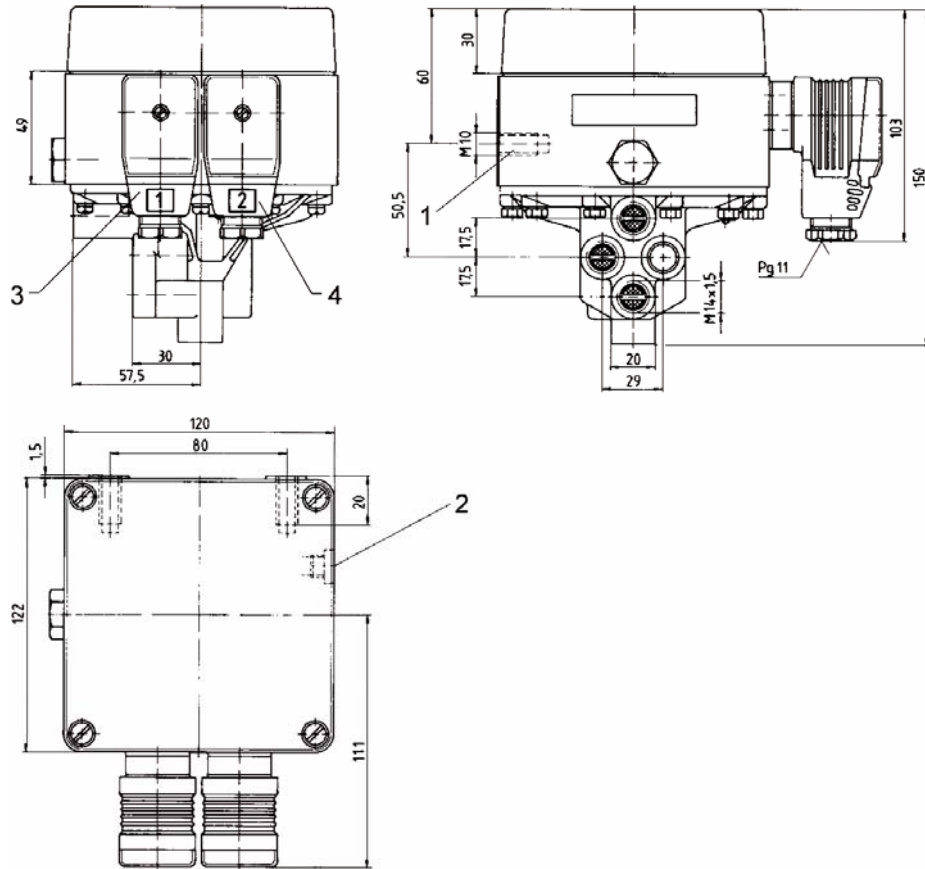


- 1) nominal input value
2) actual output value

The E/P pressure control valve modulates pressure corresponding to an analogue electrical nominal value. The integrated electronics make a comparison between the nominal value and the pressure in the working line (actual value), which is measured by a piezo-resistive pressure sensor. The controller generates electrical positioning signals, which either charge or vent control area Z of the relay valve by means of two pilot valves (M1, M2) in order to obtain the required pressure in the working line.

Electro-pneumatic regulating valve
 pressure control valve ND 3, M14 x 1.5, analogue action

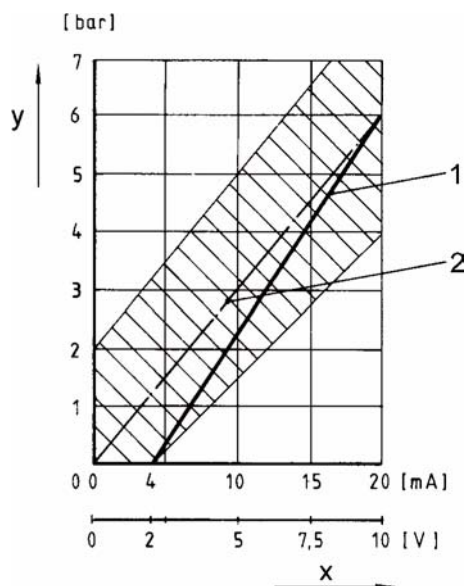
Technical drawing



- 1) Mounting thread
- 2) Loosen plug screw to clean filter

- 3) Plug 1
- 4) Plug 2

Characteristic line



- x) Input current or input voltage, y) Energized pressure
- 1) Characteristic line 1, 2) Characteristic line 2

Electro-pneumatic regulating valve

pressure control valve ND 3, M14 x 1.5, analogue action

Switch position and pin assignment for current activation

Abb. 1/Fig. 1

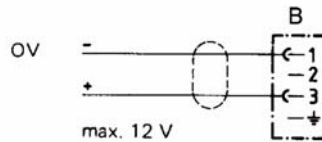
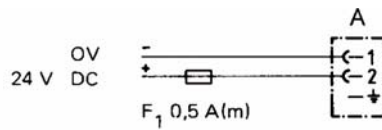
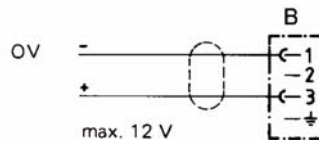


Abb. 2/Fig. 2



- 1) Supply voltage
 - 2) Nominal input current (Ohmic load 100 Ohm; max. 50 mA; max. 12 V DC; to plug 1; pin 1)
 - 3) actual output value (max. total resistance of downstream device 300 Ohm. The actual value is measured between plug 2, pin 3 and plug 1, pin 1. The actual value is short-circuit-resistant for a limited time.)
 - 4) The supply voltage must be protected by an external M 0.5 fuse.
 - 5) Shielding must comply with local limiting conditions. In extreme cases the power supply must also be shielded.
- A) Plug 1 B) Plug 2
Fig. 1: Delivery status 4 - 20 mA Fig. 2: Alternative 0 - 20 mA

Switch position and pin assignment for voltage activation

Abb. 1/Fig. 1

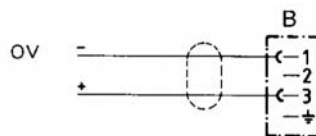
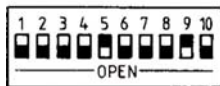
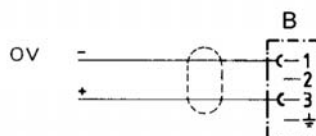
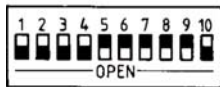


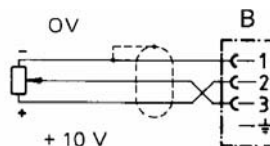
Abb. 2/Fig. 2



To ensure the EMV, plug 2 (B) has to be connected through a shielded cable.
Fig. 1: Voltage control 0 - 10 V DC Fig. 2: Voltage control 2 - 10 V DC

Switch position and pin assignment for potentiometer activation

Abb. 1/Fig. 1



To ensure the EMV, plug 2 (B) has to be connected through a shielded cable.
Fig. 1: Potentiometer activation 2 - 10 kOhm

3/2-way-solenoid valve

electromagnetically operated, monostable, ND7



◆ Technical data

Type		slide valve
Operating pressure range		see table
Nominal flow with supply pressure of 7 bar output pressure 6 bar and Δp 0.2 bar	Qn	1100 NI/min.
Ambient temperature range		- 20 °C to + 70 °C
Admissible medium		compressed air, lubricated or non-lubricated
Weight		0.85 kg
Material	housing	Zn-diecasting
	seals	BUNA-N
Supply voltage		24 V DC \pm 20%
Current consumption		190 mA
Protected with plug		IP 65 to IEC 60 529 (DIN VDE 0470)*
Duty cycle	ED	100%



→ Application area

Suitable for pneumatic components which have to be controlled by electrical signals. Eg. gear box, shaft brake, start and stop of the engine. Valve is non-overlapping.

* Plugs to be ordered separately

→ Type numbers

Symbol	Function	Pilot control	Operating pressure range	Connection thread	Type number
	NC	internal	3 to 10 bar	M 14 x 1.5	372 352 222 0
	NO				372 354 222 0
	NC/NO	separate	-0.95 to 10 bar pilot pressure \geq 3 bar		372 353 222 0

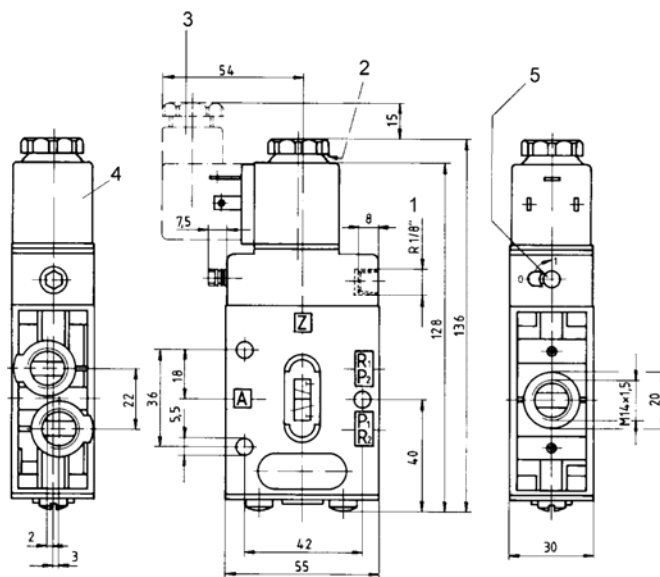
▲ Accessories (to be ordered separately)

Accessorie	Description	Type number
Plug connector	plug connector with LED and protection diode against induced electromotive force	894 101 610 2

▲ Spare parts

Spare part	Description	Type number
Spare part kit	sealings and anker system of valve	372 352 000 2
Coil	coil for 24 V DC \pm 20 %	542 070 702 2

Technical drawing



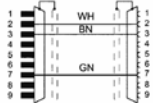
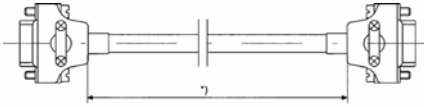
- 1) Only with separate pilot control G 1/8
- 2) After removal of cap - M5 internal thread
- 3) Plug can be fixed at 180° intervals
- 4) Coil can be fixed at 45° intervals
- 5) Manual override

Accessories sub-D

Cable equipped with sub-D plugs

Rexroth
Bosch Group

▲ CAN bus cable with sub-D plug**

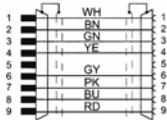
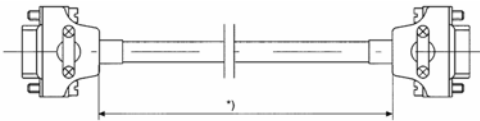


* Cable length see table below

** Connection between CAN bus devices equipped with sub-D plugs

Device	Length [m]	Type number
Shielded cable for CAN bus for devices with sub-D plugs	0.5	894 605 389 2
	2	894 605 446 2
	5	894 605 390 2
	10	894 605 391 2
	15	894 605 392 2
	20	894 605 393 2
	30	894 605 394 2
	40	894 605 395 2
	50	894 605 396 2
	60	894 605 445 2

▲ I²C bus cable with sub-D plug**

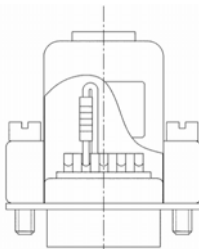


* Cable length see table below

** Connection between control heads type 230 and operating / indication module type 231 or between operating / indication modules

Device	Length [m]	Type number
Shielded cable for I ² C bus for operating / indication module type 231	0.3	894 605 388 2
	0.9	894 605 419 2

▲ Sub-D plug with terminating resistor*



* To close the CAN bus line

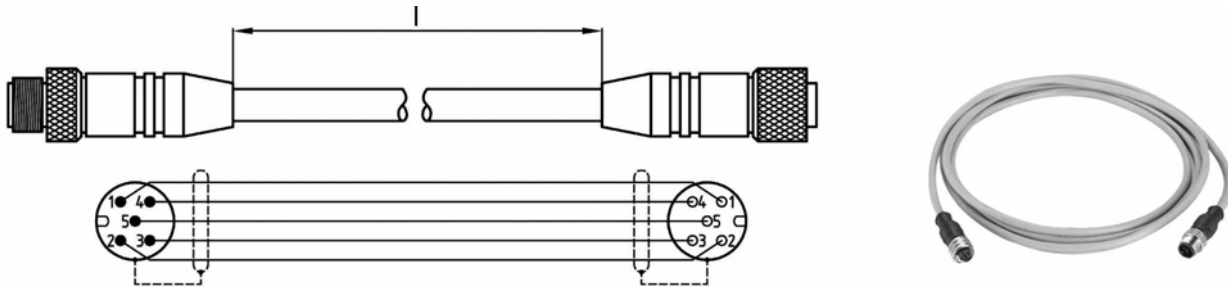
Device	Description	Type number
Plug with terminating resistor	male (with pins)	346 067 361 2
	female (with socket)	346 067 362 2

Accessories – M12

Cable equipped with M12 plugs

Rexroth
Bosch Group

▲ CAN bus cable with M12 plug*

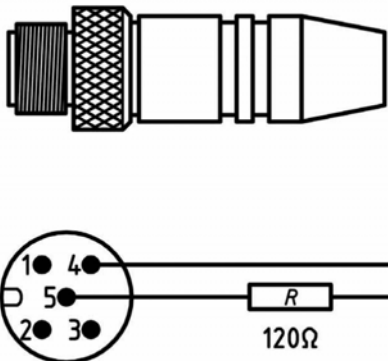


l Cable length see table below

* Connection between CAN bus devices equipped with M12 plugs

Device	Length [m]	Type number
Shielded cable for CAN bus for devices with M12 plugs	0.5	894 605 479 2
	2	894 605 480 2
	5	894 605 481 2
	10	894 605 482 2
	15	894 605 483 2
	20	894 605 484 2
	30	894 605 485 2
	50	894 605 486 2
	80	894 605 487 2
	100	894 605 488 2

▲ M12 plug with terminating resistor*



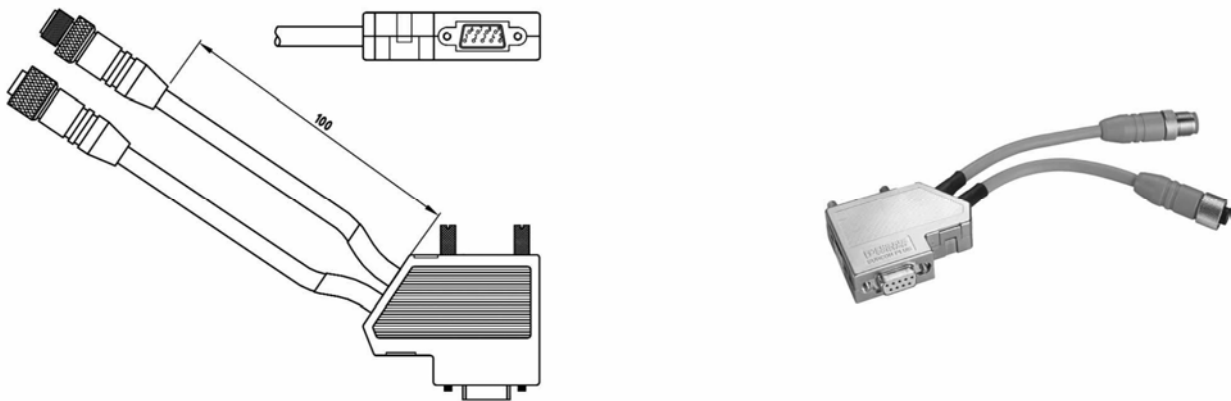
* To close the CAN bus cable

Device	Description	Type number
Plug with terminating resistor	male (with pins)	894 105 426 4
	female (with socket)	894 105 427 4

Adapter

To combine devices with sub-D and M12 plugs

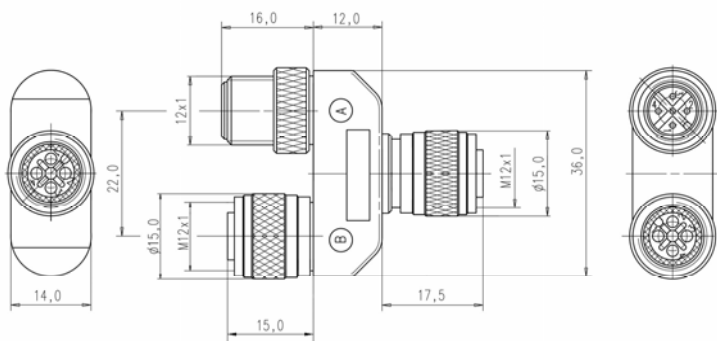
▲ Adapter cable*



* Connection between CAN bus devices equipped with sub-D or M12 plugs

Device	Type number
Adapter	894 605 489 2

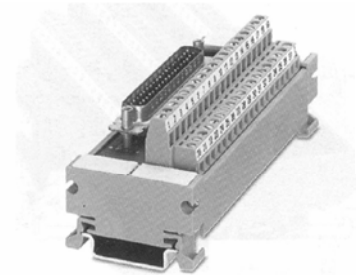
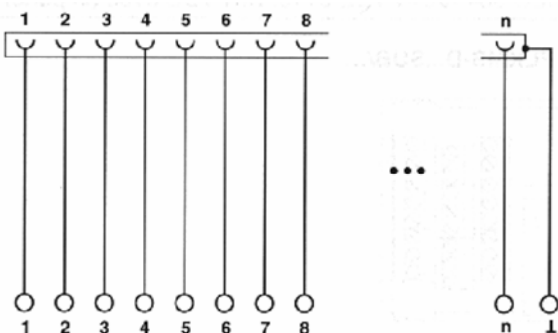
▲ Bus distributor - M12*



* Shielded distributor for e.g. emergency module with sub-D or M12 plugs

Device	Type number
Bus distributor for can bus	R419 800 162

▲ Terminal block – sub-D*



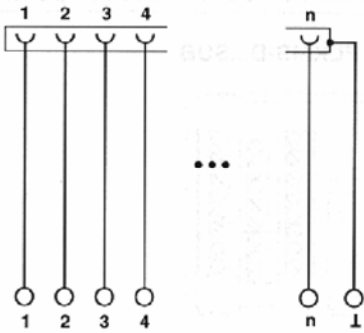
* Terminal block for connection of shielded data cable to prefabricated cables of Marex OS II

Device	Description	Type number
Adapter from 9-pin sub-D to terminal block	male (with pins)	894 305 894 2
	female (with socket)	894 305 895 2

Adapter

To combine devices with sub-D and M12 plugs

▲ Terminal block – M12*



* Terminal block for connection of shielded data cable to prefabricated cables of Marex OS II

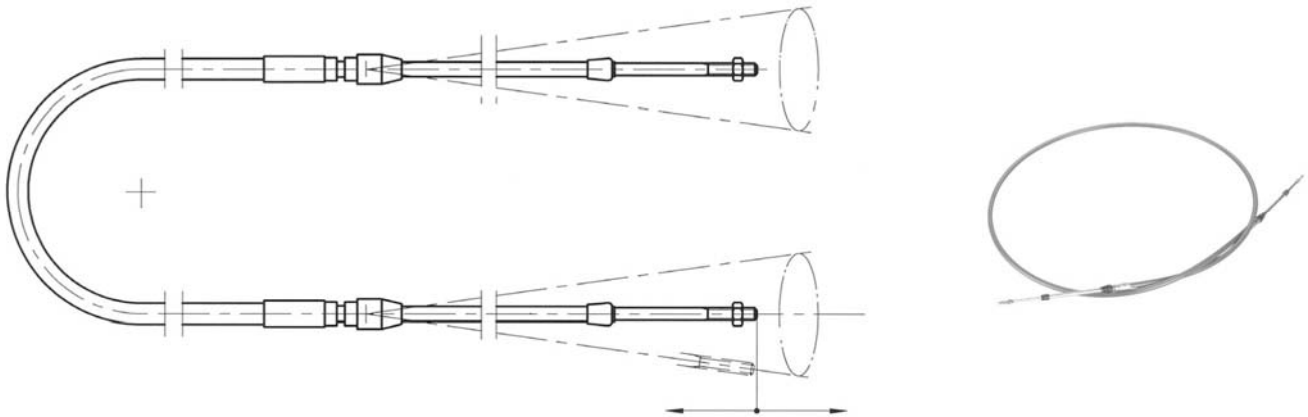
Device	Description	Type number
Adapter from M12 plug to terminal block	male (with pins)	R419 800 072
	female (with socket)	R419 800 073

Accessories – push-pull-cable

For mechanical gear shifting, engine speed setting or pitch adjustment of the propeller



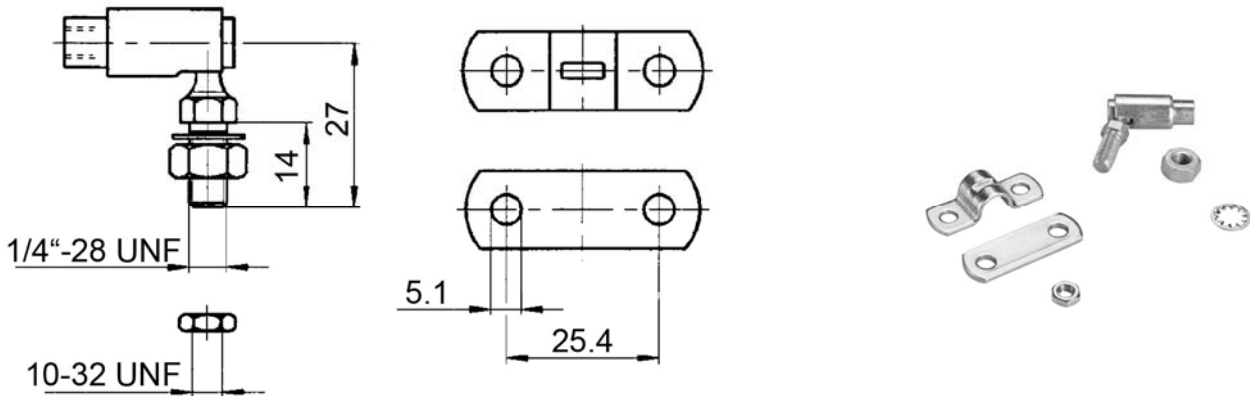
▲ Push-pull-cable



Device	Stroke* [mm]	Length [m]	Type number
Push-pull-cable	70	2	323 699 415 2
		3	323 699 416 2
	120	2	895 420 012 2
		3	895 420 013 2

* 70 mm is normal for mechanical gear or speed setting

▲ Mounting set for push-pull-cable



Device	Type number
Mounting kit	323 699 006 2

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