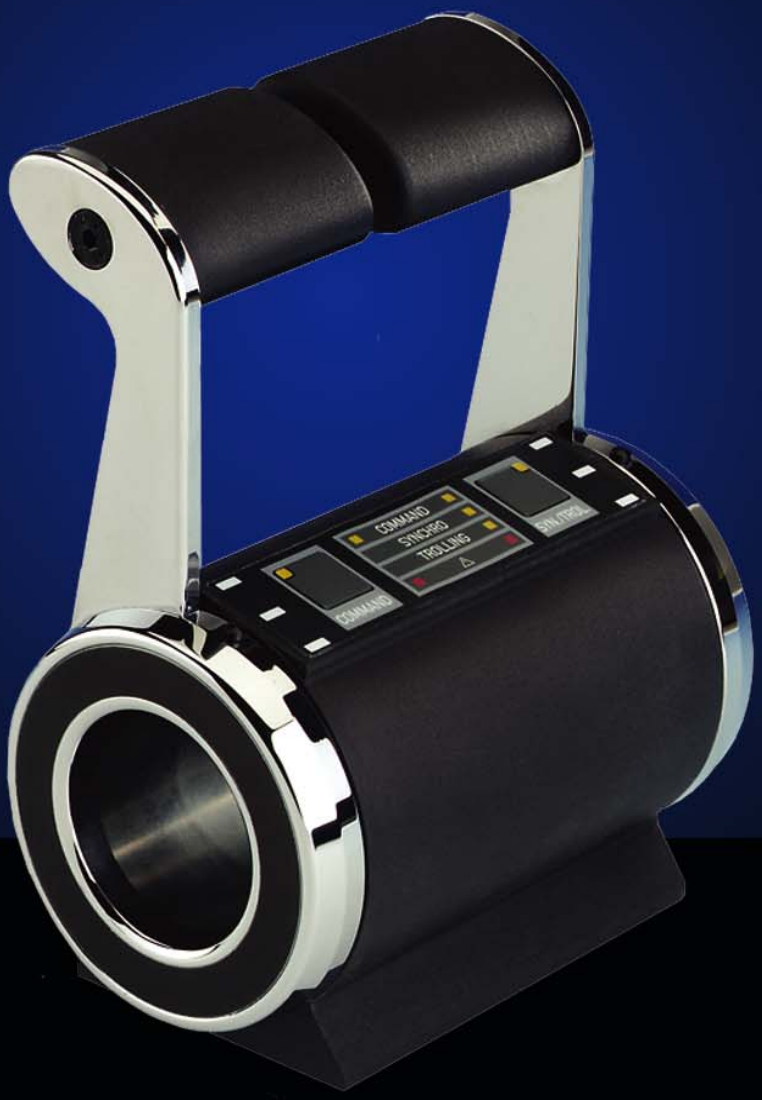
Technical Information

# Throttle lever control Mini-Marex-C

## MAN marine Diesel engines D 28 range and model D 0836 LE 401

*Assembly, function, operation*



# Contents

# User's Manual

## Mini-Marex-C -System

For systems with actuator

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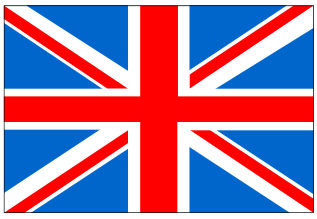

## Imprint



The diagrams and drawings used in this manual are for guidelines only and are not to be used for the actual design.



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## 1.1 Explanation of Symbols and Signs:

Some passages within this user's manual are marked with symbols opposite. To these passages attention has to be paid in particular.

This sign is to be found where there is potential danger to safety, operating, and function of the control system which could affect the safety of the ship and its crew.

This sign is to be found where special advises and tips are given to the system operator.

## 1.2 Safety Advises:

Before starting the installation and tests of the control system, read all the following instructions and act with particular caution in accordance with them.
Non-observance will cause the loss of any warranty claims on Rexroth Mecman GmbH

The control system and its components has to be installed and put into service in accordance with the instructions of this user's manual only.

The system is designed for the control of Diesel engines. If gas engines are applied, the system components must be located away from areas with danger of explosion. The regulations regarding dangerous explosive areas have to be followed.

For operating the remote control a separate 'emergency stop' push button at each station is an absolute requirement.

Cables belonging to the system and in accordance with the instructions of this user's manual may be used only.

The power supply has to be turned OFF before installation work is started. In this case the supply voltage has to be secured against turning ON again.

During operation prevention against reaching inside the actuator and putting in objects has to be provided, there is an injury danger.

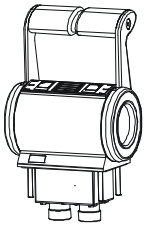
The supply voltage must correspond to the details on the type plates of actuator and supply unit.

The admissible cable length between battery and supply unit must not exceed 10m, if wire size 2,5mm² is used.

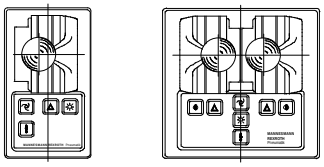
## 1.3 System set-up

The Mini-Marex-*C* control system is designed for the remote control of marine propulsion plants with reversing gears . It is applied mainly on pleasure boats, yachts and small work boats.

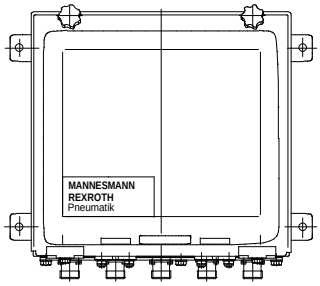
The system consists of the following pre-assembled components:



Elegant control head for twin engine propulsion including all necessary components as indicators and push buttons.

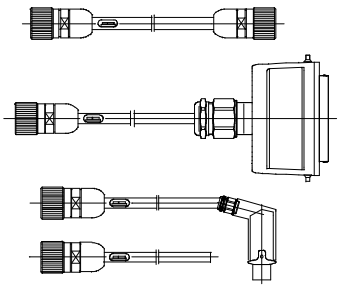


Control panels for single and twin engine propulsion including control heads, indication lamps, push buttons, and dimmer.




Actuators with integrated electronic for engine control and gear shifting. Connection with up to four (4) remote stations is possible.

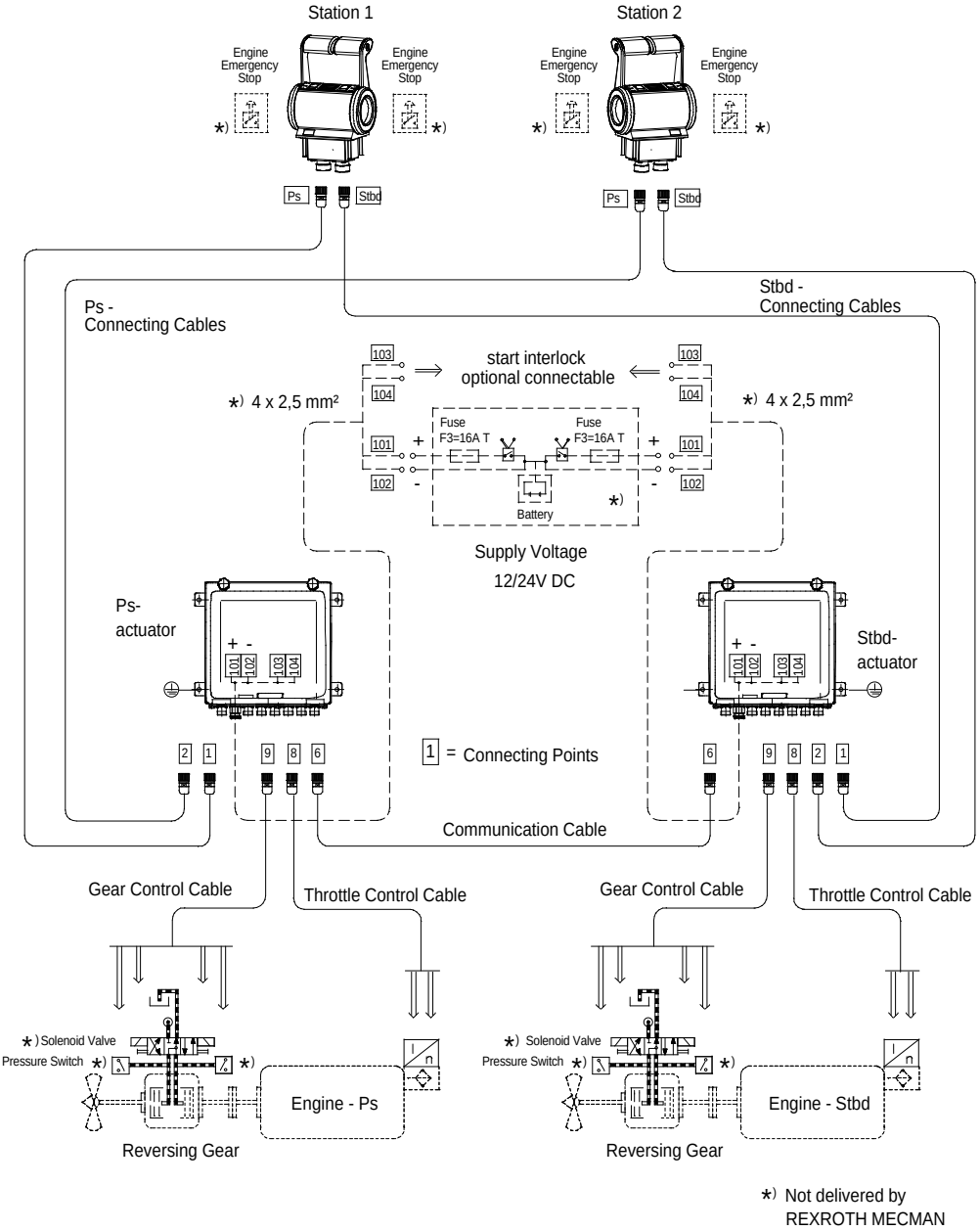
Optional features:
Active speed synchronization for twin engine propulsion plants and / or electrical slip control for trolling gears.



Pre-assembled electric cables with connector plugs in standard or special design for an easy connection of all system components.

For command setting alternatively the above shown control head or one of the control panels may be applied. Because of identical connection and functions a mix is possible.

The block diagram below shows **by way of example** the configuration of a twin engine propulsion system with two (2) control stations. Clearly shown are the individual system components as well as the connections of the electrical cables.
For further block diagrams showing single and twin engine systems see section“ 8. Block Diagrams ”




A separate ‘Engine Emergency Stop’ device for each engine must be located at each control station.

The admissible length of the power supply cable between battery and actuator must not exceed 10m, if wire size 2,5 mm² is used.

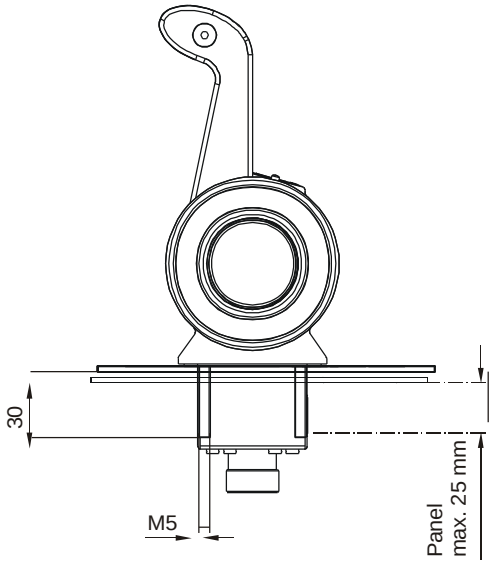
## 2.1 Control head

When mounting the control head, provide enough space below the console to be accessible for plugging the electrical cable connections. After connecting the cables they also need to be secured externally using tie wraps.

The corresponding panel cut-out is shown overleaf.

The control head mounted on the console surface has to be secured with the enclosed hex. nuts M5 and flat washers.

For installation of the control head the mounting surface must not exceed 25 mm thickness.

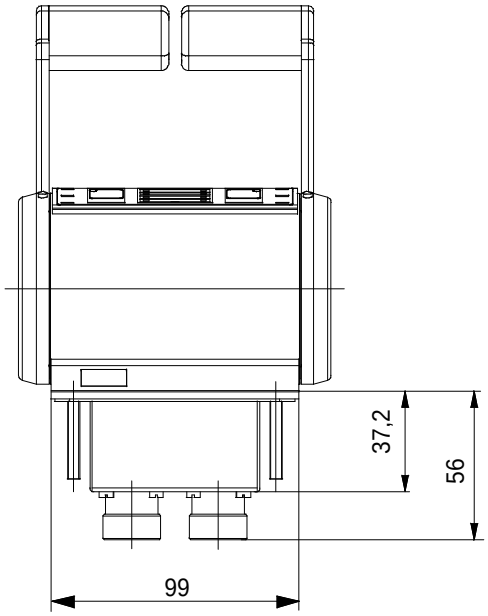


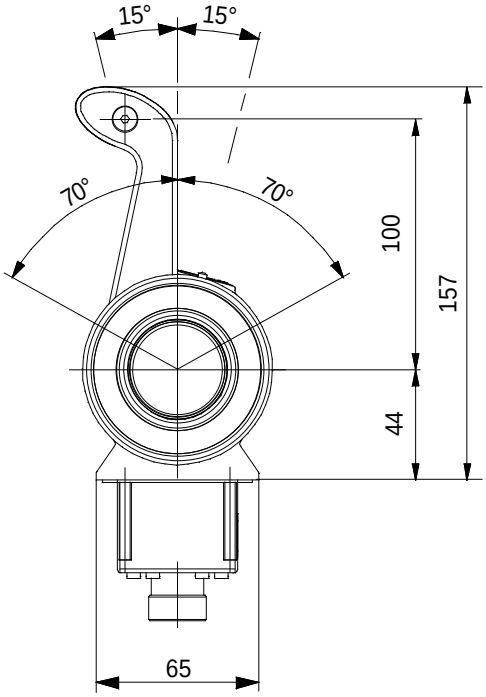

To prevent water penetrating between console surface and control head, a circulating form seal is fixed on the underside of the control panel.

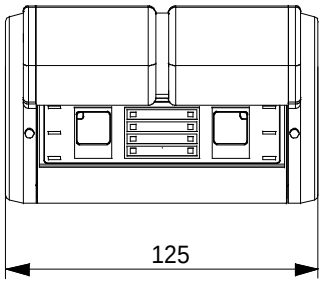
Check the form seal for damages and especially on weather exposed control stations take care for a proper sealing between console surface and control head, especially on exterior control stations.
**Protection IP 66 above and below console panel.**

## 2.1.1 Outline Dimensions

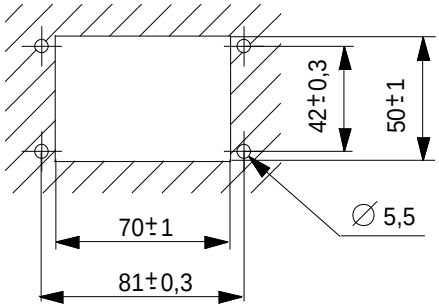
Control head for
Twin Engine Propulsion




Panel Cut-out



## 2.2 Control Panel

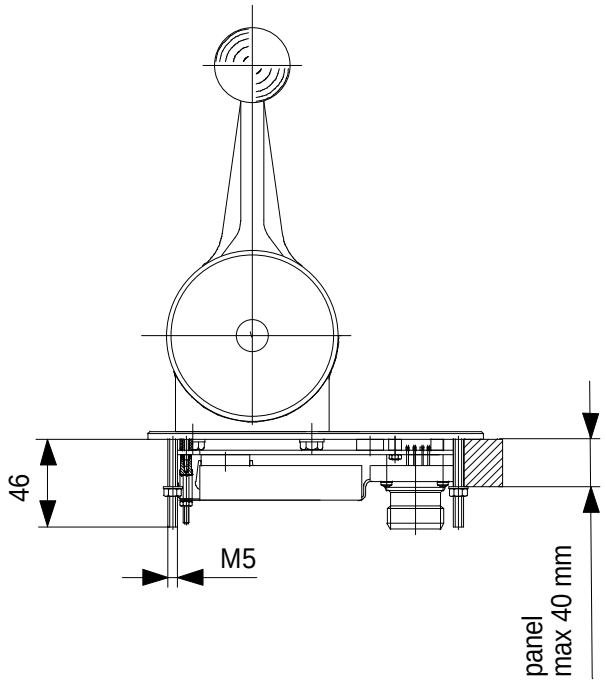
When mounting the control panel, provide enough space below the console to be accessible for plugging the electrical cable connections. After connecting the cables they also need to be secured externally using tie wraps.

The corresponding panel cut-out is shown overleaf.

The control head mounted on the console surface has to be secured with the enclosed hex. nuts M5 and flat washers.

The electronic board of the control panel must be protected from contact with other parts below the console. Otherwise **damages** to the circuit board or **malfunctions may cause**.

For installation of the control panel the mounting surface must not exceed 40 mm thickness.
If the mounting surface is less then 12 mm thick, the enclosed intermediate pieces are to be used to prevent damages to the electronic board during installation.



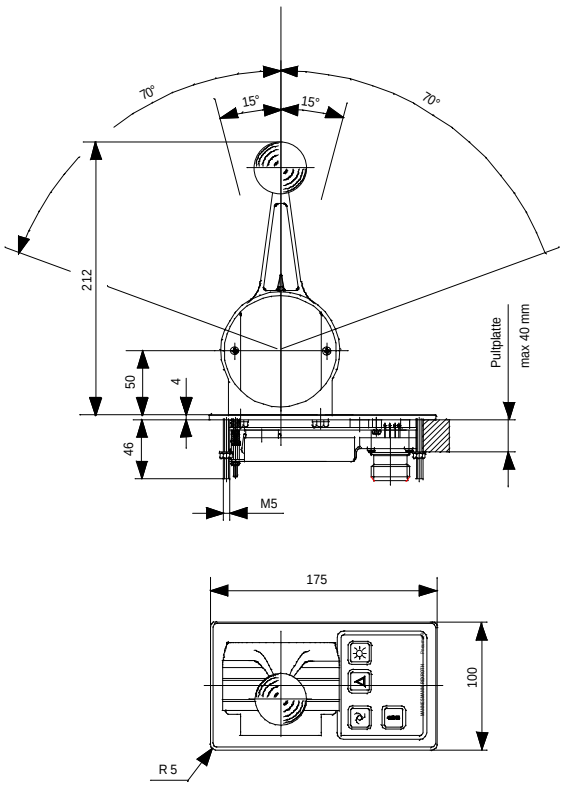

To prevent water getting between console surface and control head, a circulating form seal is fixed on the underside of the control panel.

Check the form seal for damages and especially on weather exposed control stations take care for a proper sealing between console surface and control head, especially on exterior control stations. **Protection IP 66 above console panel.**

Penetration of water may cause **failures** and can **destroy electronic components**.

## 2.2.1 Outline Dimensions

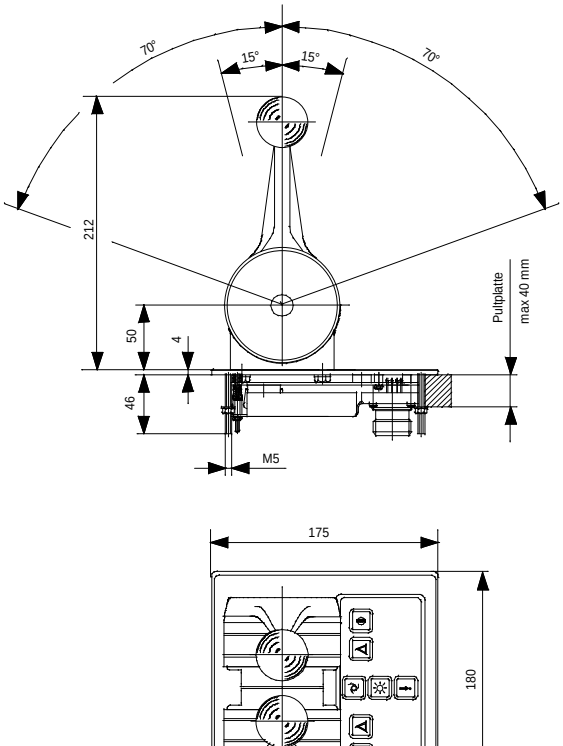
**Control Panel for Single Engine Propulsion:**







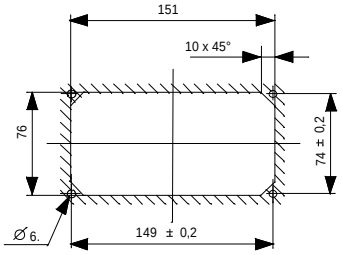
**Control Panel for Twin Engine Propulsion:**



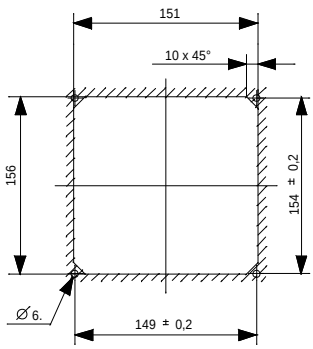




**Panel cut out:**



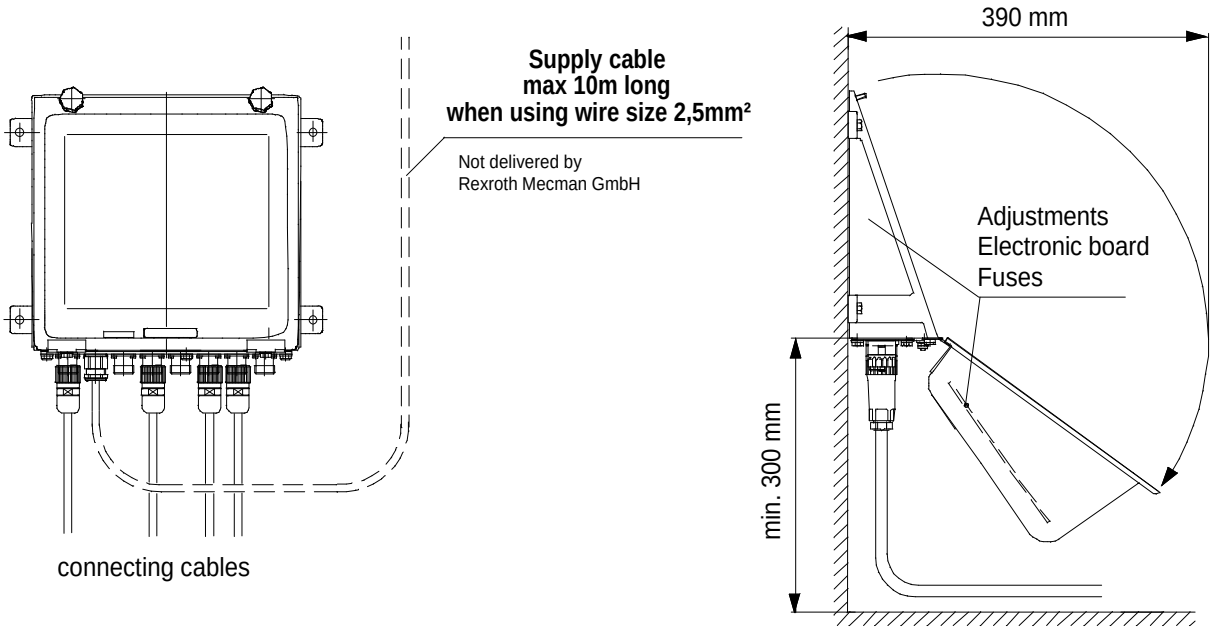

**Panel cut out:**



## 2.3 Actuator

The actuator and supply unit are fastened with 4 mounting screws each. Mounting holes and outline dimensions of the components are shown overleaf. Bulkhead mounting with the cable connections and push-pull cables directed downwards is preferred according to the drawing below.

The devices should be installed in the engine room to a location that will ensure poor vibration. Also they should be located away from direct engine heat ( admissible temperature range 248K...333K / corresponding to -25°C...+60°C ).



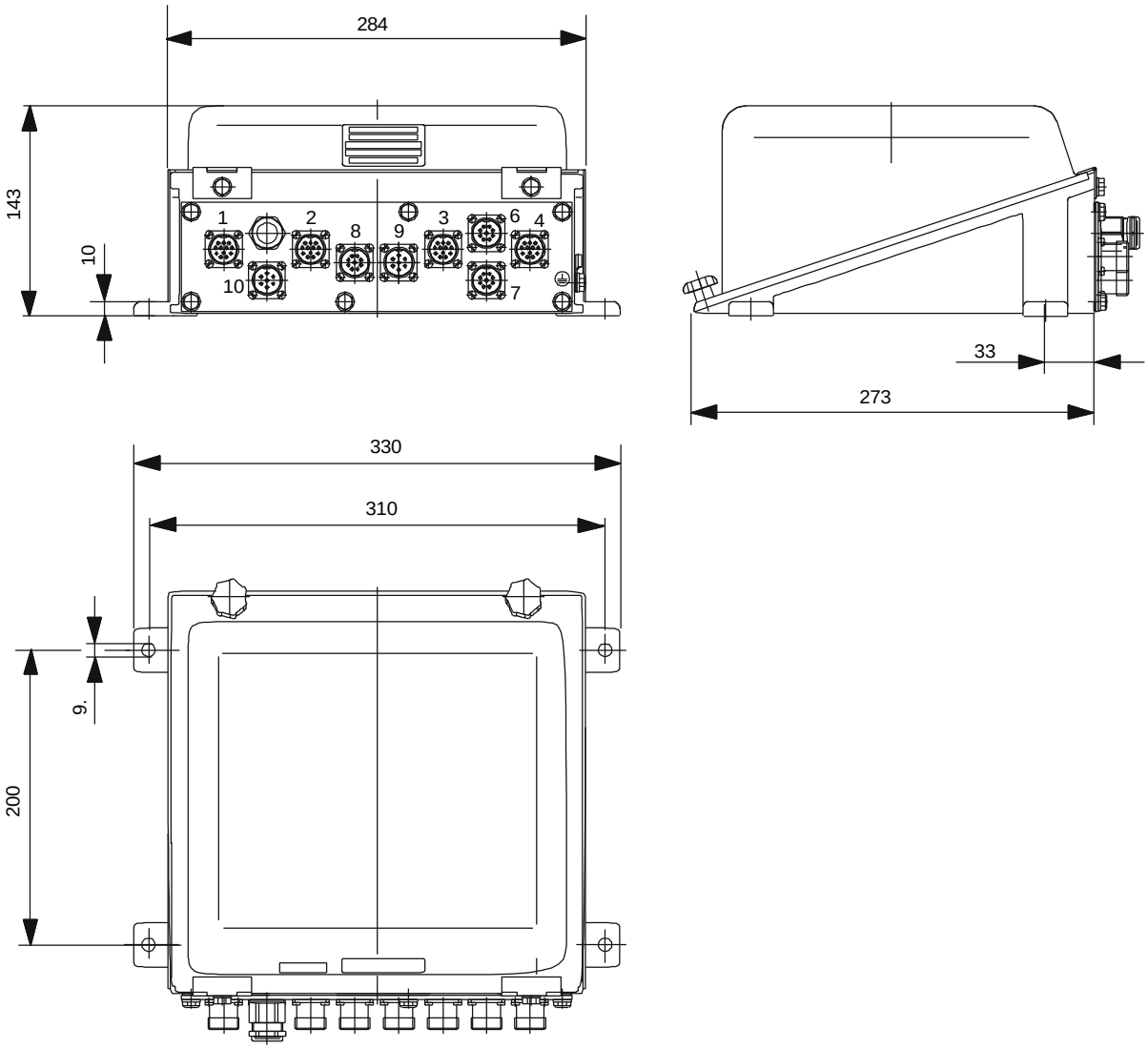

Provide sufficient space to be accessible for the electrical cable installations.
After mounting the actuator, the cover has to open completely. For the control set up or adjustment modifications all devices for adjustments placed on the electronic board have to be accessible without restrictions.

Fuses placed on filter board and interface board inside the actuator have to be accessible as well.

The actuator unit is designed for the control of Diesel engines. If gas engine propulsion systems are used, locate the components outside the explosive area. The regulations regarding explosive areas have to be followed.

## 2.3.1 Outline Dimensions

The actuator has to be fastened by means of four (4) mounting screws M8.



## 3.1 Grounding

The actuator has to be grounded according to the actualities on-the-spot.

The actuator has to be grounded directly to one of the four mounting screws of each device. If a direct grounding (connection to ship's mass) is not possible, the grounding has to be carried out by means of flexible earth leads or earth strips ( see tables below ).

Dimensioning of flexible earth leads

| **length up to** | **size** |
|---|---|
| 50 mm | 6 mm² |
| 100 mm | 10 mm² |
| 150 mm | 25 mm² |
| 200 mm | 70 mm² |

Dimensioning of earth strips ( 0,2 mm or thicker )

| **length up to** | width |
|---|---|
| 100 mm | 20 mm |
| 200 mm | 50 mm |
| 300 mm | 75 mm |
| 500 mm | 125 mm |

The above said goes also for data cables especially marked in the operating manual and diagrams.

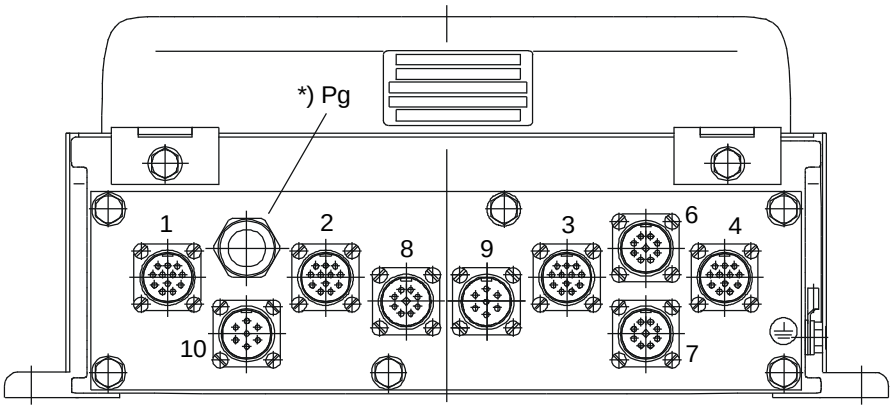
A long-lasting good grounding contact has to be ensured.

For twin engine systems a sufficient potential equalisation between both propulsions plants has to be provided.

## 3.2 Arrangement of Actuator Sockets

The following figure shows the socket arrangement of the actuator and their assignment.

**Not used sockets must be sealed by means of the included protective plugs. Otherwise the actuators´s protection will be dimished.**




| **Socket No.** | **Connection to...** |
|---|---|
| **1** | Control panel – station 1 |
| **2** | Control panel – station 2 |
| **3** | Control panel – station 3 |
| **4** | Control panel – station 4 |
| ***) Pg** | Supply voltage and start interlock |
| **6** | Communication cable between actuators for twin engine propulsion |
| **7** | Trolling control cable |
| **8** | Throttle control cable and RPM feed back signal |
| **9** | Gear control cable and clutch feed back signal |
| **10** | Actuator for mech. gear shifting |

## 3.3 Power Supply

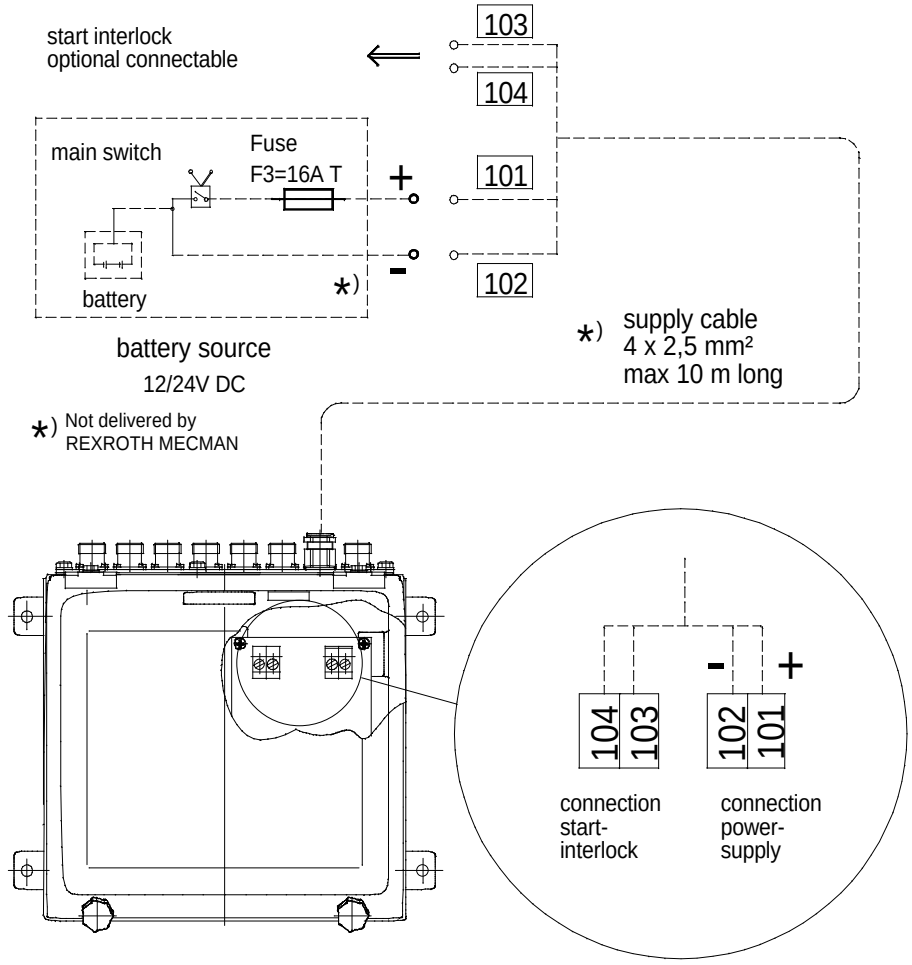
The control system operates from 10V up to 32Volt, DC and draws 30A (shortly), 10A (continuously).

## 3.4 Power supply cable and engine start interlock

For the connection of the supply voltage and engine start interlock a cable gripper at the actuator is provided. It is located above socket No. 10 and is suitable for cable diameter of 8-12 mm .
Depending on the use of engine start interlock cables with 4 or 2 wires with 2,5 $mm^2$ wire size may be applied.
This cable must not be shielded, but if wanted can be connected to the included cable gripper.
The wires are to be connected to the terminal blocks 101/102 for power supply and 103/104 for engine start interlock (see drawing below ).

| Terminal | Connection to ... |
|---|---|
| 101 | ( + ) Supply voltage |
| 102 | ( – ) Supply voltage |
| 103 | Engine start interlock |
| 104 | engine start interlock |

### 3.4.1 Connection to power supply



The supply voltage must correspondent to the details on the actuator's type plate. A false supply voltage may cause **damages** to the circuit board or **function failures**.

The admissible cable length must not exceed 10m, if wire size 2,5 mm² is used. **Function failure**

To protect the actuator electronic, it is recommended to install an **external fuse F3=16A T** .

## 3.4.2 Connection Engine Start Interlock

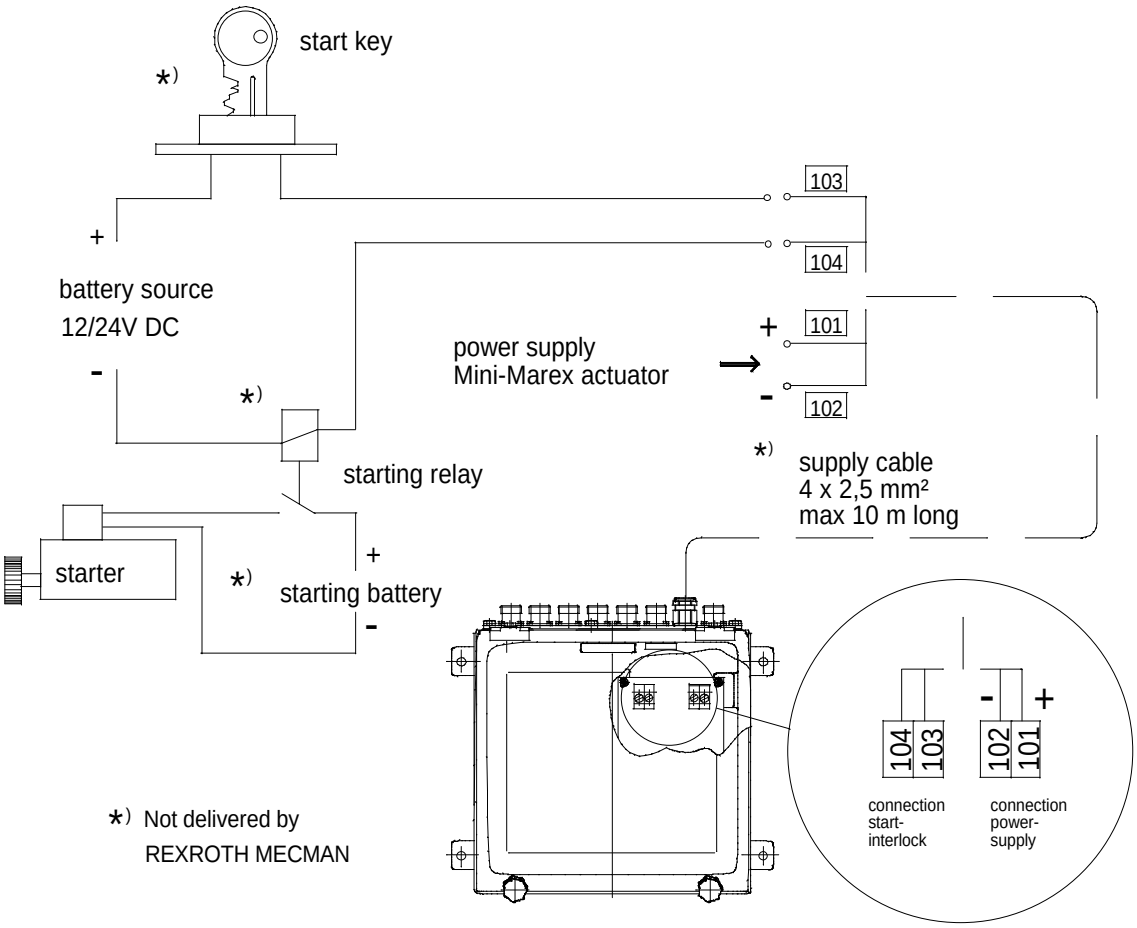
The actuator provides a potential-free relay contact (terminals 103 and 104) to be used for a start interlock that requires the control system to be in definite conditions. The engine can be started under the following conditions only:

- **The remote control must be ON.**
- **One control station must have taken command.**
- **The transmitter in command must be in Neutral or Warming-up position.**

If the starting requirements are not fulfilled, the relay contact interrupts the connection between key start ( key switch, start push button, or others ) and start solenoid relay.

The maximum load given to the relay contacts inside the actuator amounts **32V DC / 2A.**
Higher loads may **destroy the relay**.
For higher loads provide an external relay.

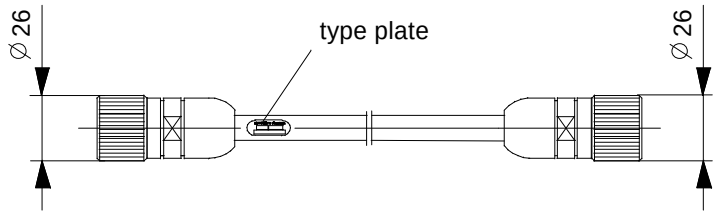
**Connecting diagram for engine start interlock:**




## 3.5 Control Panel Cable

These connecting cables are used between the various control panels and the actuator.

On the cable's type plate a 10-figure Pc. No. - 894 620 24✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.




**Single engine propulsion:**

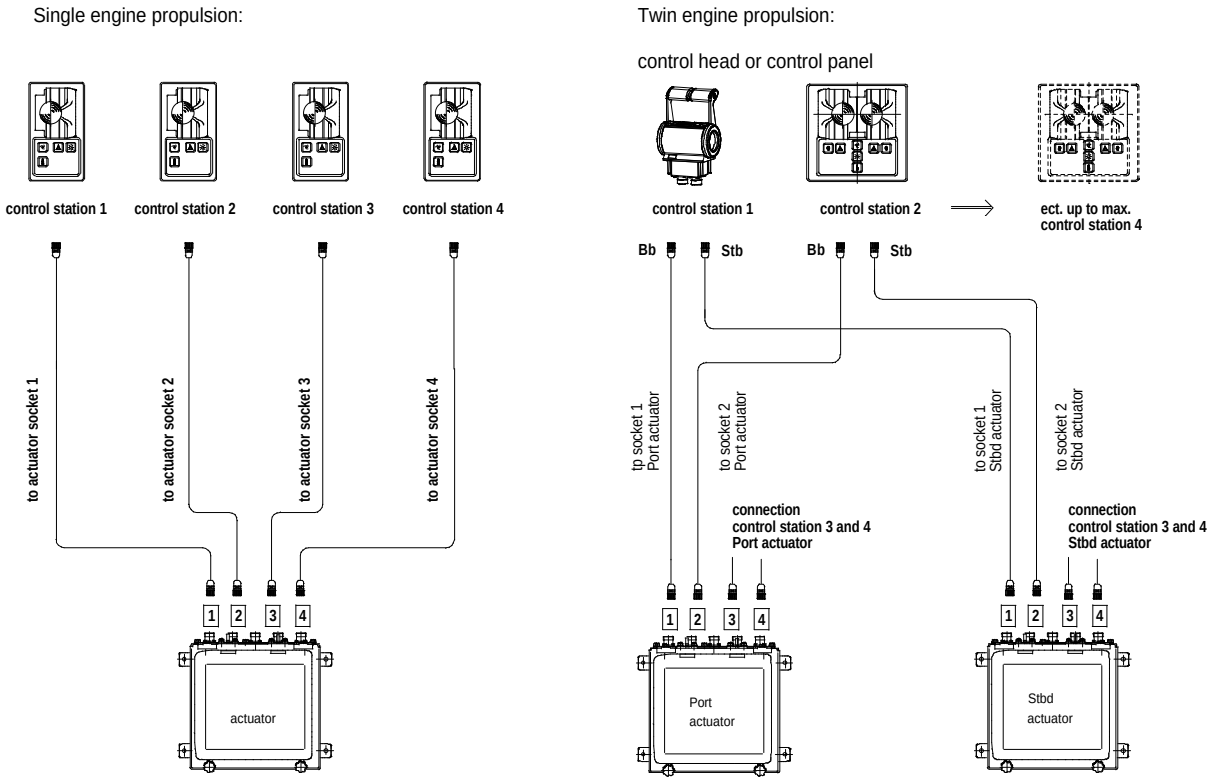
For **single engine propulsion** systems one (1) female connector plug at the underside of the control panel is provided for connecting the cable to the control panel.

Connection: Control panel 1 to be connected to socket 1
Control panel 2 to be connected to socket 2
Control panel 3 to be connected to socket 3
Control panel 4 to be connected to socket 4

**Twin engine propulsion:**

For twin engine propulsion systems two (2) female connector plugs at the underside of the control panel are provided for connecting the cables to the control panels; one each for Port and Stbd.

The connection is done in the same way as for single engine systems, but separated for Port and Stbd.



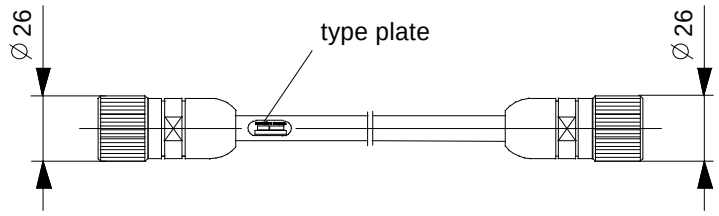

Lock connector plugs after plugging in. A loose connection may cause a **control failure.**

## 3.6 Intercommunication Cable

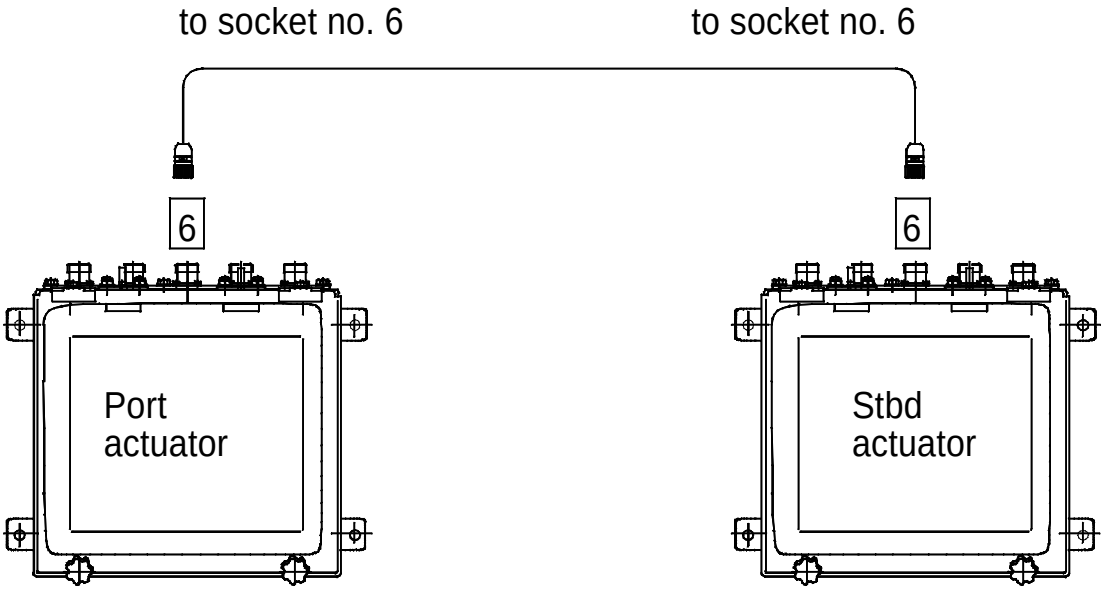
**( For twin engine propulsion only )**

The intercommunication cable serves the internal data transfer between Port and Stbd actuator within twin engine systems.

On the cable's type plate a 10-figure Pc. No. - 894 620 26✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.




The intercommunication cable is always connected to actuator socket No. 6.




Lock connector plugs after plugging in. A loose connection may cause a **control failure**

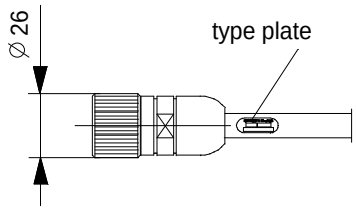
The intercommunication cable is an **absolute requirement**.

## 3.7 Gear Control Cable

This gear control cable serves the connection between the solenoid valve of the hydraulic reversing gear as well as the oil pressure switch ( used as feedback signal ), if existing.
The gear control cable is available as standard device and also as special cable equipped with a *Harting* plug.

## 3.7.1 Standard design

On the cable's type plate a 10-figure Pc. No. - 894 620 29✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.




The gear control cable has to be connected to **actuator socket No. 9**.

Lock connector plugs after plugging in. A loose connection may cause a **control failure**.

At the free cable end there are seven (7) colour-coded wires to be connected with the solenoid valve of the hydraulic reversing gear and with the oil pressure switch ( used as feed back signal ), if existing.

The table below shows the assignment of wires:

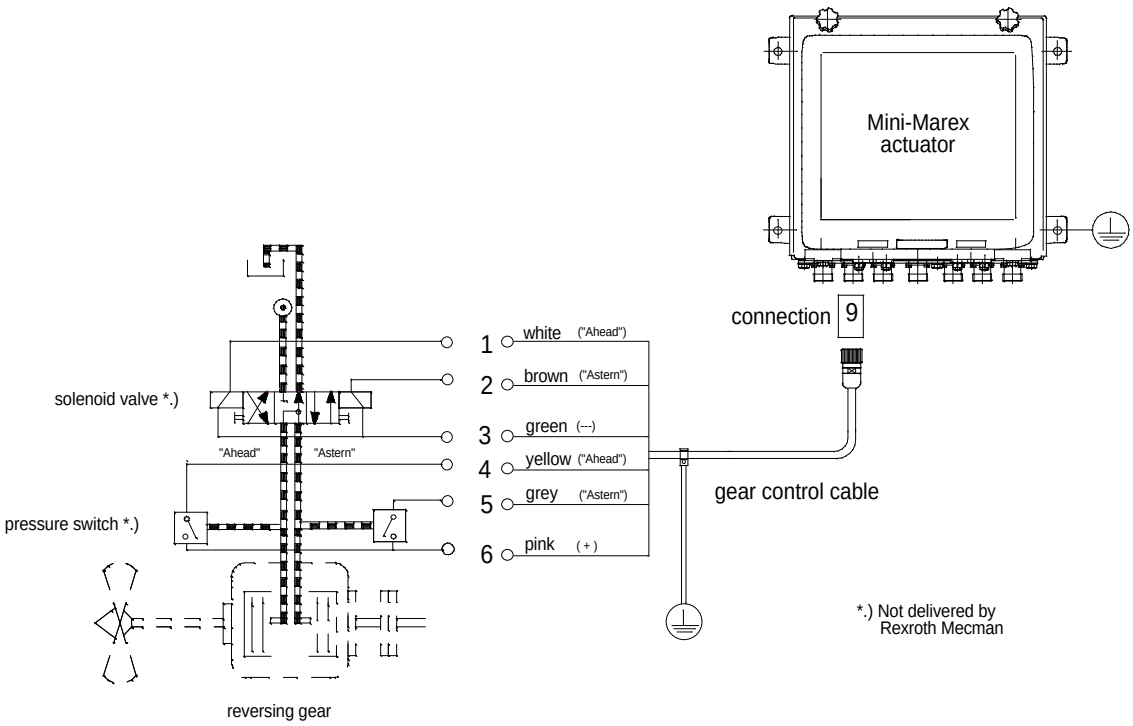
| Wire | Colour | Connection |
|---|---|---|
| 1 | white | (+) signal "Ahead" to solenoid valve |
| 2 | brown | (+) signal "Astern" to solenoid valve |
| 3 | green | 0 V to solenoid valve |
| 4 | yellow | "Ahead" feed back from oil pressure switch |
| 5 | grey | "Astern" feed back from oil pressure switch |
| 6 | pink | (+) supply for oil pressure switch |
| 7 | blue | **not used** |

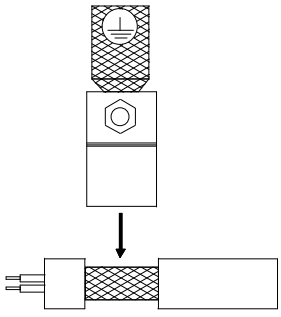
Oil pressure switches are used as an additional safety check feeding back the gear shift position, but they are not absolutely required for the operation of the system.

**Technical requirements:**

| | | |
|---|---|---|
| Solenoid valves: | Voltage: | operating voltage of applied actuator |
| | Current consumption: | max. 3 A ( for each solenoid ) |
| Pressure switch: | Voltage: | operating voltage of applied actuator |
| | Current consumption: | approx. 1...10 mA |

**Connection Gear Control Cable ( Standard design )**



Connect free cable end circumferential to mass

Strip PVC cover and shielding back ring-like and fasten a metallic clamp around the open shield. Connect the clamp directly to mass.
If the metallic clamp can't be connected directly to mass, an ground strip ( see fig. left ) between clamp and mass has to be used.

A long-lasting good grounding contact has to be ensured.
(Dimensioning: see section 5 "grounding").

**Solenoid valve:**

It depends on the used type of valve which solenoid operates the "Ahead" or "Astern" clutch. This has to be cleared on the spot.

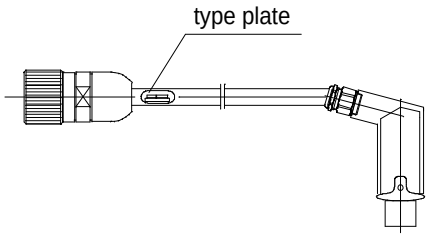
**Oil pressure switch:**

If only one pressure switch for both shift positions is available, it may be connected to the yellow wire or to the grey wire alternatively.

If there is no pressure switch available, the Mini-Marex control operates also without a clutch feedback signal.

## 3.7.2 Special design

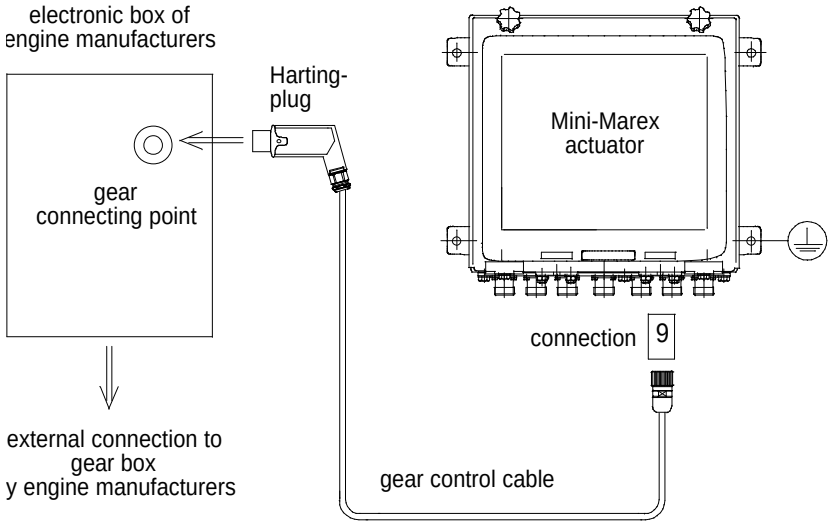
On the gear control cable's type plate a 10-figure Pc. No. - 894 620 21✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.




The gear control cable has to be connected to **actuator socket No. 9**. The other cable end is equipped with a special plug ( Fa. Harting / Typ HAN 8D ) to be connected to a separate gear connecting socket at the engine switch box.

☞ For the matching gear connecting socket ask the engine builder.

**Connection Gear Control Cable ( Special design )**




Lock connector plugs after plugging in. A loose connection may cause a **control failure**.

**Technical requirements:**

| | | |
|---|---|---|
| Solenoid valves: | Voltage: | operating voltage of applied actuator |
| | Current consumption: | max. 3 A ( for each solenoid ) |
| Pressure switch: | Voltage: | operating voltage of applied actuator |
| | Current consumption: | approx. 1...10 mA |

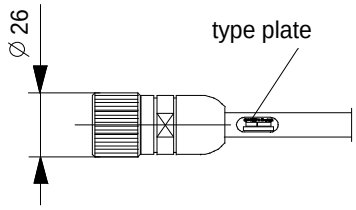
## 3.8 Throttle Control Cable

The throttle control cable serves the connection to an electronic controlled RPM governor. Within this cable also 2 wires are leading the RPM feedback signal, which is needed for the feature “engine speed synchronization”.

The throttle control cable is available as standard device and also as special cable.

### 3.8.1 Standard design

On the cable’s type plate a 10-figure Pc. No. - 894 620 27✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.




The throttle control cable is connected to **actuator socket No. 8.**

Lock connector plugs after plugging in. A loose connection may cause a **control failure**.

The throttle control cable has a free cable end with four (4) colour-coded wires: WH (white), BN (brown), GN (green) and YE (yellow).

The table below shows the assignment of wires:

| Wire | Colour | Connection | Function |
|---|---|---|---|
| 4 | white | (+) signal 4...20mA | Throttle control |
| 5 | brown | (-) 0 V | |
| 6 | green | (+) signal input | RPM feedback signal |
| 7 | yellow | (-) 0 V | |

The connection of the RPM feedback signal is needed for the feature “Synchronization” only.
If the feature “Synchronization“ is not used, the connection RPM feedback signal is not necessary.

For engine speed synchronization of twin engine propulsion plants a RPM feed back signal from each engine is needed.

As RPM pick-ups electric tachometers may be used as well as pulse generators. In many cases the speed feedback signal taken from dynamo terminal “W” meets the technical requirements and a separate RPM pick-up is not necessary.

Because of slip in the dynamo drive synchronization is less precise, if dynamo terminal “W” is used – compared with synchronization based on inductive speed sensoring.

**Technical requirements on feedback signals:**

Frequency range: a) 20 Hz...1300 Hz, sine- or rectangular signal
or b): 200 Hz...13000 Hz, sine- or rectangular signal

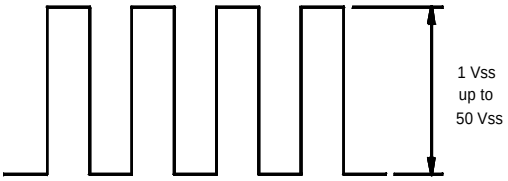
Recommended input frequency at max. engine speed:
130 Hz for frequency range a)
Recommended input frequency at max. engine speed:
6500 Hz for frequency range b)

Signal voltage: min. 1 Vss ★)
max. 50 Vss

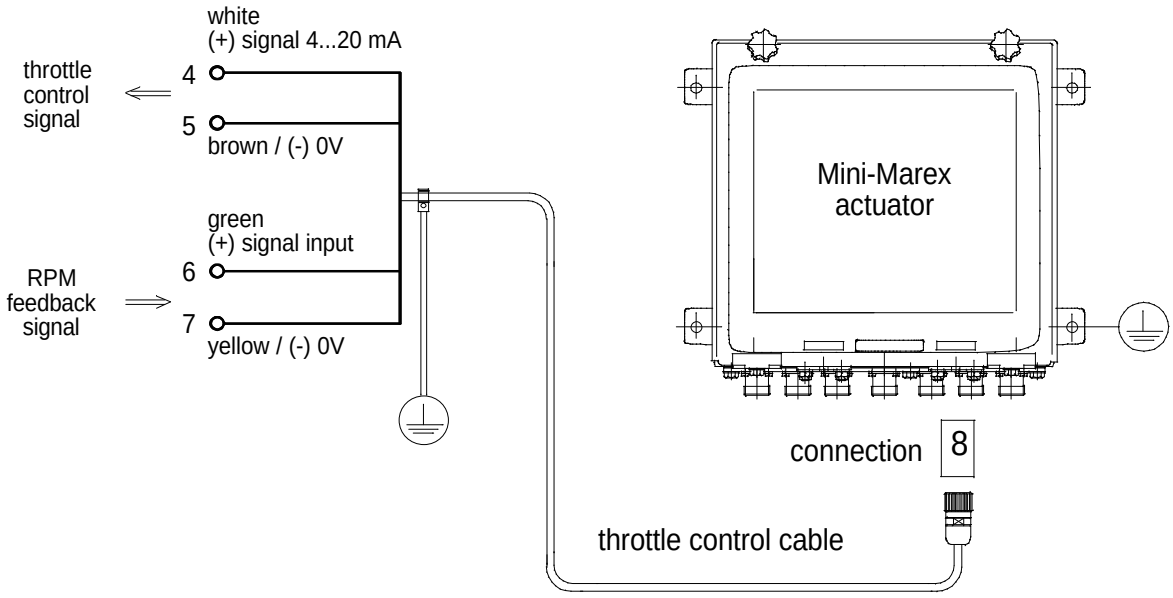
Input impedance: ca. 10 KΩ
( actuator )

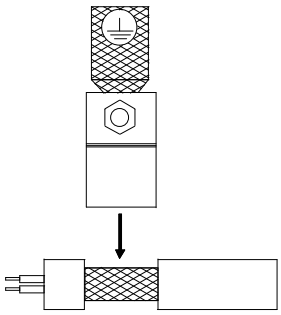
★) "Vss" ( Volt Spitze-Spitze ) stands for voltage of AC signals amplitude from peak to peak

**Example:** rectangular signal




**Connection to throttle control cable ( standard design )**



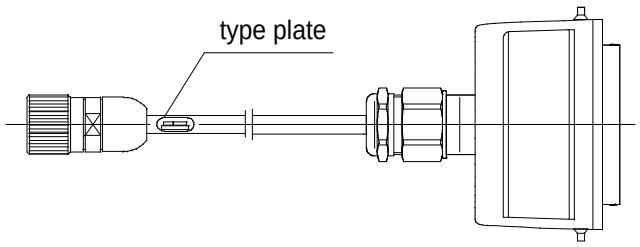
Connect free cable end circumferential to mass:

Strip PVC cover and shielding back ring-like and fasten a metallic clamp around the open shield. Connect the clamp directly to mass.
If the metallic clamp can't be connected directly to mass, an ground strip has to be used ( see fig. On the left ).

A long-lasting grounding contact has to be ensured.
( Dimensioning: see section 3.1 "Grounding" )

## 3.8.2 Special design

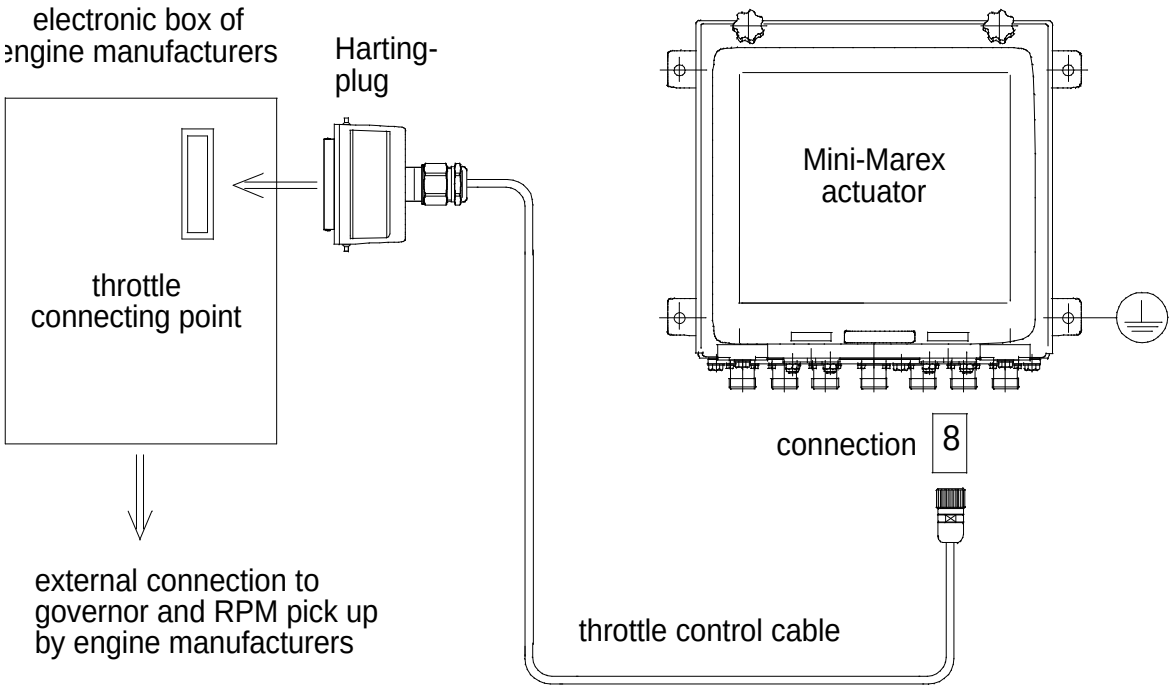
On the throttle control cable's type plate a 10-figure Pc. No. - 894 620 20✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.




The throttle control cable has to be connected to **actuator socket No. 8**. The other cable end is equipped with a special plug ( Fa. Harting / Typ HAN 8D ) to be connected to a separate throttle connecting socket at the engine switch box.

☞ For the matching throttle connecting socket ask the engine builder.

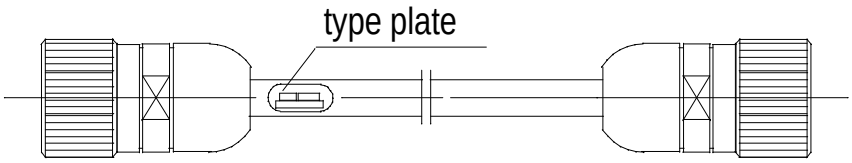
**Connection Throttle Control Cable ( Special design )**



## 3.9 Trolling Control Cable

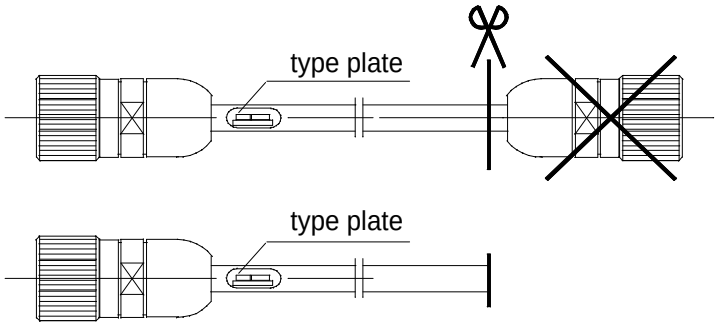
This description refers to **direct electrical controlled trolling gears only.**

**Mechanical controlled trolling gears** which are operated by means of a separate **actuator,** have to be connected in a different manner. **Here a separate description has to be followed.**




On the trolling control cable's type plate a 10-figure Pc. No. - 894 620 22✪ 2 - is stated. At the place marked ✪ a figure is indicating the different cable lengths being available.

**The trolling control cable is equipped with plugs at both cable ends. But for the electrical trolling control at one cable end only a plug is needed ( actuator socket No. 7 ). For the needed free cable end remove the second plug ( best to cut the plug off ).**




The second plug is needed for a mechanical trolling control only applying a separate actuator.

The trolling control cable has to be connected to **actuator socket No. 7**.

Lock connector plugs after plugging in. A loose connection may cause a **control failure**.

At the produced free cable end there are four (4) colour-coded wires.

The table below shows the assignment of wires:

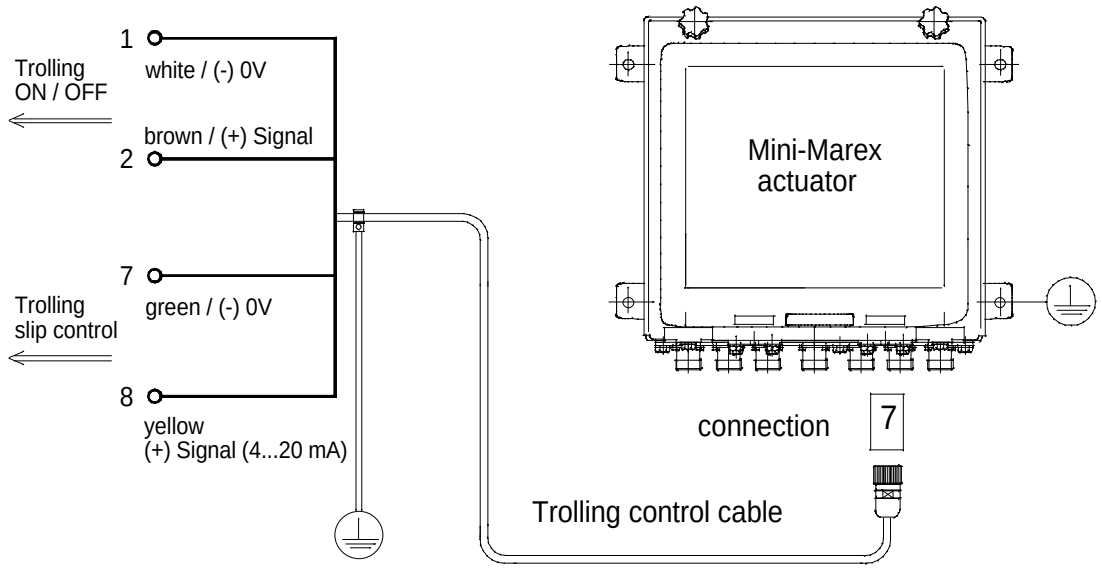
| Wire | Colour | Connection | Function |
|---|---|---|---|
| 1 | white | **+ $U_B$, if trolling is active** | trolling active |
| 2 | brown | **0 V** | |
| 7 | green | (–) 0 V | trolling- |
| 8 | yellow | (+) trolling signal (4...20 mA) | control |

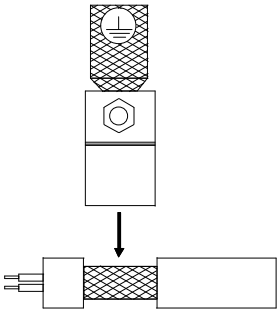
An external relay can be connected with the wires 1 (white) and 2 (brown), which is activated when trolling is active
By means of this relay it is possible to control special trolling devices or to activate the main valve in some gears for the release of trolling mode.

The load of the trolling active output amounts max. 0,5 A. The output voltage between wire 1 and wire 2 amounts $U_B$ - 2V.

In case the trolling active function is not used, the conductor ends 1 ( white) and 2 (brown) have to be isolated properly. Otherwise a short circuit may be the consequence.

**Connection Trolling Control Cable**





Connect free cable end circumferential to mass:

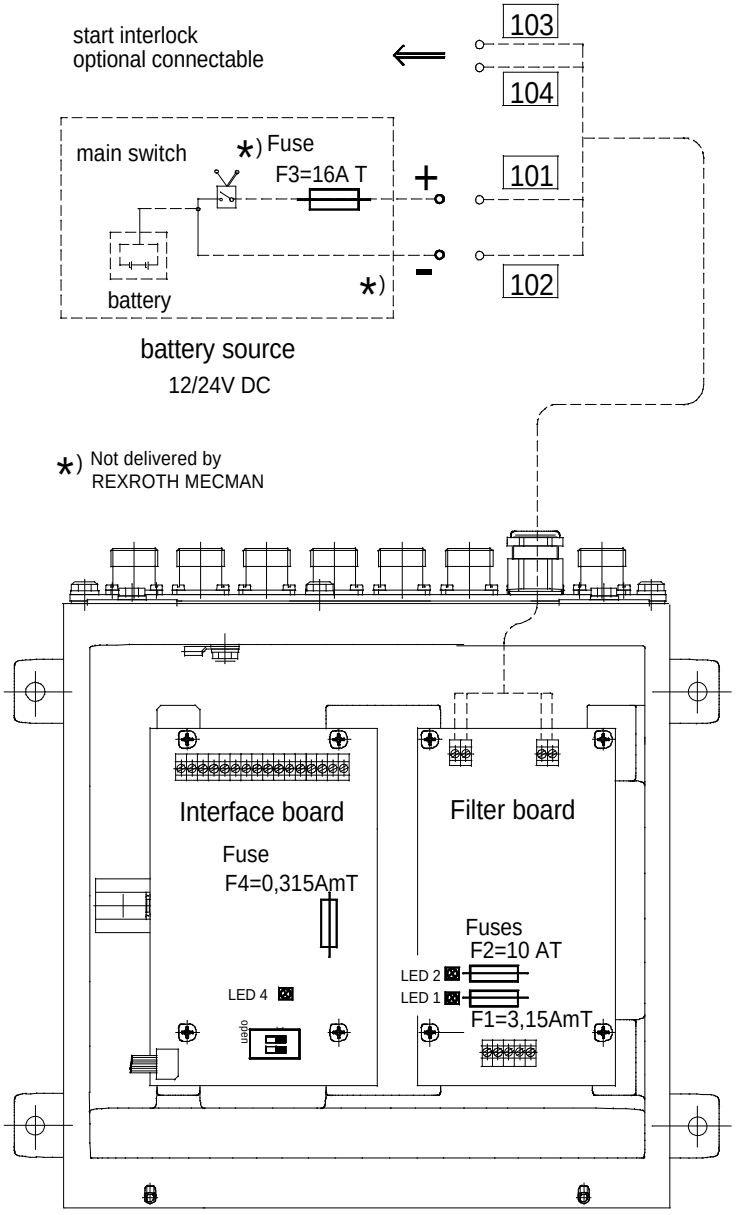
Strip PVC cover and shielding back ring-like and fasten a metallic clamp around the open shield. Connect the clamp directly to mass.
If the metallic clamp can't be connected directly to mass, an ground strip has to be used ( see fig. On the left ).

A long-lasting grounding contact has to be ensured. ( Dimensioning: see section 3.1 "Grounding" )

**Follow the gear manufacturer's instructions !!!**

## 3.10 Internal fuses

Besides the recommended external fuse F3=16A T in line with the **supply voltage** the actuator itself is provided with three (3) fuses. Two (2) fuses F1=3,15A mT and F2=10A mT are located on the **filter board** , whereas the third fuse F4=3,15A mT is arranged on the **interface board**. A green LED (LED1, LED2, LED4) is assigned to each fuse (F1, F2, F4). The LEDs are lighted, if the fuses are in order and when supply voltage has been turned on.



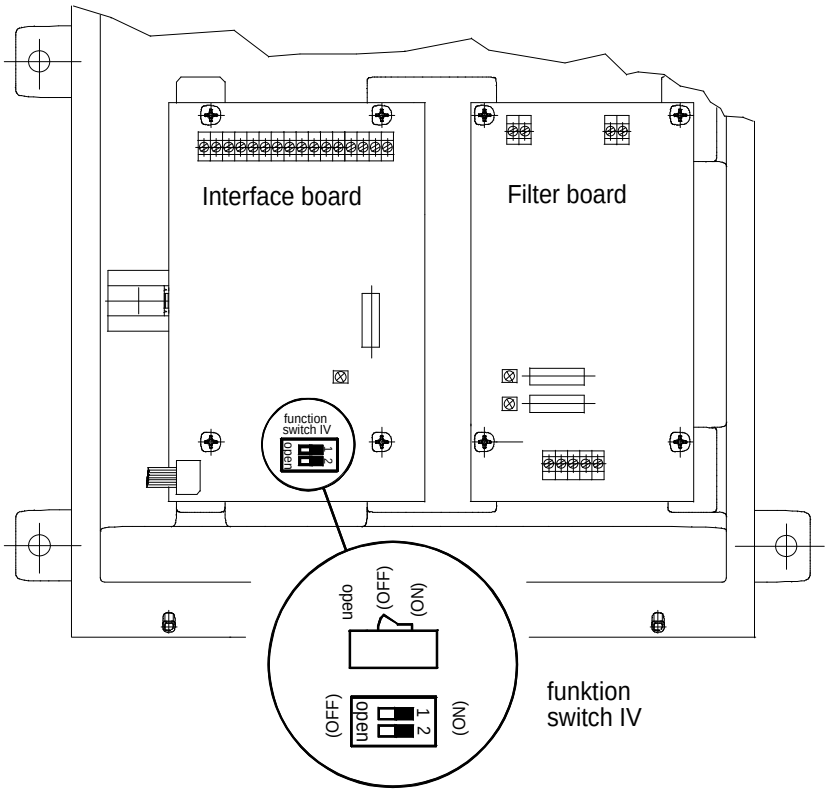

**Filter board** and I**nterface board** are located at the bottom of the actuator. The electronic boards are accessible after the actuator has been opened.

| Fuse | Value | Location | LED |
|---|---|---|---|
| F1 / internal | 3,15A mT | Filter board | LED 1 |
| F2 / internal | 10A T | Filter board | LED 2 |
| F3 / external | 16A T | Power supply | |
| F4 / internal | 315mA mT | Interface board | LED 4 |

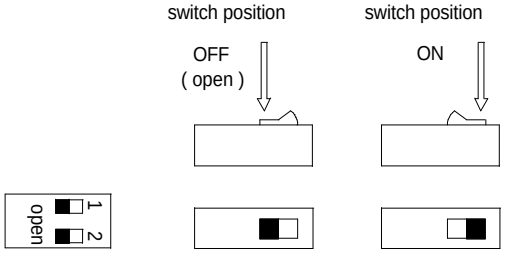
## 4.1 Interface board

The figure below shows the location **function switch IV** on the interface circuit board placed at the bottom of the actuator. The electronic board is accessible after the actuator has been opened.

Depending on the actuator's installation position it might be possible that the interface circuit board is placed upside down contrary to the shown illustration. In this case the location of the adjustment devices is "mirror effected".




## 4.1.1 Function switch-IV (overview)



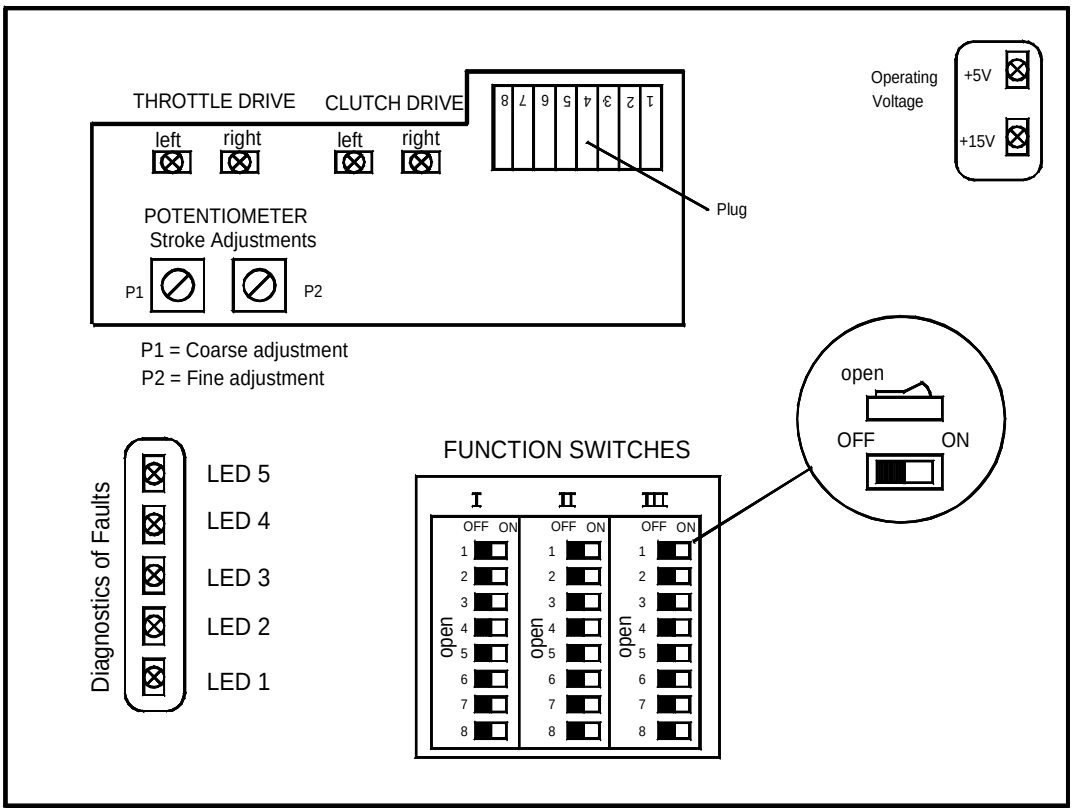

| DIP-switch | OFF | ON |
|---|---|---|
| **IV-1** | Clutch feedback signal is **not connected** | Clutch feedback signal is **connected** |
| **IV-2** | **One (1) common pressure switch is connected, for both shift positions** | **Two (2) pressure switches are connected, one for each shift position.** |

**DIP-switch IV-2 is active only, if switch IV-1 is set to ON**

## 4.2 Main board

The figure below shows the arrangement of the adjustment devices ( function switches I to III and potentiometer P1 and P2 ) on the main circuit board which is located inside the actuator cover. The electronic board is accessible after the actuator has been opened.

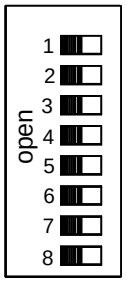
Depending on the actuator's installation position it might be possible that the circuit board is placed upside down contrary to the shown illustration. In this case the location of the adjustment devices is "mirror effected".




The overleaf table shows the various adjustment devices and their related functions.

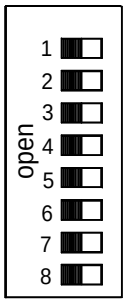
## 4.2.1 Funktion switch I...III (overview)

**Function switch-I**




Slave / Master ( twin engine propulsion systems )
Interlocked / Free station transfer )
20 Hz...1300 Hz / 200 Hz...13000 Hz ( frequency range for synchronization )
not used
mechanical / solenoid operated gear shifting
Operation / Terminal input
Operation / Control head adjustment and release of remote stations
Operation / Release mode for special features

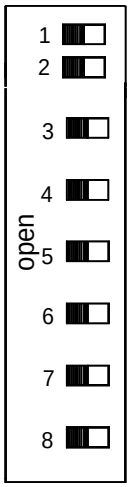
**Function switch-II**




| | |
|---|---|
| 0 / 1 s<br>0 / 0,5 s | T1: Holding time of power boost before clutch engagement |
| 0 / 2 s<br>0 / 1 s | T2: Holding time of power boost after clutch engagement |
| 0 / 6 s<br>0 / 3 s<br>0 / 1,5 s | T3: Delay time before reversing |

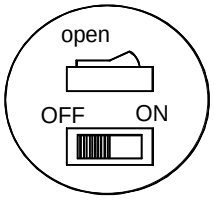
Power boost NO / YES

**Function switch-III**




Operation / Adjustment Mode
Special adjustment (Control Station) / Standard adjustment (Engine Room)

| Position to be adjusted | DIP- Switch III 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|
| Idle speed | OFF | OFF | OFF | OFF | OFF | ON |
| Full speed | OFF | OFF | OFF | OFF | ON | OFF |
| Second idle speed | OFF | OFF | OFF | ON | OFF | OFF |
| maximum speed for Trolling | OFF | ON | OFF | OFF | ON | OFF |
| minimum slip position for Trolling | ON | ON | OFF | OFF | ON | OFF |
| maximum slip position for Trolling | ON | ON | OFF | OFF | OFF | ON |




Switch position

Potentiometer for stroke adjustments

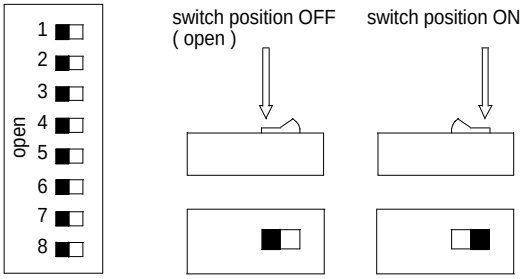

Coarse adjustment Fine adjustment

Potentiometer P1 and P2 are effective in combination with function switch III only

## 4.3 Basic Adjustments

Before basic adjustments are carried out, turn OFF the supply voltage and shut OFF the engine.
Otherwise there is an **accident risk.**

### 4.3.1 Function switch I ( Main board )




**DIP-switch I-1 ( Slave / Master )**

For single engine propulsion: **DIP-switch I-1 in ON position**

For twin engine propulsion: either engine can be „Master“ engine
**DIP-switch I-1 in ON position**

the other engine then must be „Slave“ engine
**DIP-switch I-1 in OFF position**

**DIP-switch I-2 ( Station transfer )**

Procedure of command transfer from one control station to the another station.

**Interlocked** station transfer: **DIP-switch I-2 in OFF position**

With this setting a station transfer to any other control station is possible only, if the operator has moved the transmitter lever either in NEUTRAL position or into the same direction range (AHEAD or ASTERN) as the transmitter in command.

**Free** station transfer: **DIP-switch I-2 in ON position**

With this setting a station transfer is possible at any time without any interlocking. The command is transferred immediately to the requesting station and any possible lever position from there now is transmitted to the control.

If the lever of the transmitter in command is in FULL AHEAD position whereas the lever position of the transmitter gaining command is in FULL ASTERN, a **reversing maneuver** will follow immediately.

**DIP-switch I-3: ( 20Hz...1300Hz / 200Hz...13000Hz )**
( For twin engine propulsion including synchronization option only )

Similarity between the frequency ranges of the actuator's speed sensoring and used RPM pick-up.

Frequency range 20Hz...1300Hz **DIP-switch I-3 in OFF position**
for recommended input frequency of approx. 130Hz at rated engine speed

Frequency range 200Hz...13000Hz **DIP-switch I-3 in ON position**
for recommended input frequency of approx. 6500Hz at rated engine speed

**DIP-switch I-4: not used**

**DIP-switch I-4 in OFF position**

**DIP-switch I-5 ( mechanical / solenoid operated gear shifting )**

Here the kind of gear shifting operation is meant.

Solenoid operated gear shifting **DIP-switch I-5 in ON position**
Mechanical gear shifting **DIP-switch I-5 in OFF position**
**(external actuator)**

**DIP-switch I-6 ( operation / terminal-input )**

This switch is for internal use only.

**DIP-switch I-6 in OFF position**

**DIP-switch I-7 ( operation / control head alignment and release of remote stations )**

The switch position „operation / transmitter alignment and release of remote stations" is described separately in section 4.5. The control head alignment and release of remote stations is carried out after all the other adjustments have been completed.

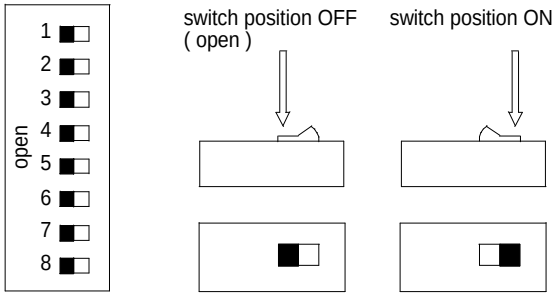
**DIP-switch I-7 in OFF position**

**DIP-switch I-8 ( operation / release of special features )**

This switch is only used for the release of additional special features as „Speed Synchronization" and "Trolling" and is described separately in section 5.1.1 and 5.2.2. The release is carried out after all basic adjustments have been completed.

**DIP-switch I-8 auf OFF**

## 4.3.2 Function switch II ( Main board )




**DIP-switch II-1**
**DIP-switch II-2**

ý **T1: Holding time of power boost before clutch engagement**

„Holding time T1“ ( before clutch engagement ) is active only, if the feature „power boost“ has been selected by means of the DIP switch II-8.

After the control head lever is moved into the 1st detent AHEAD or ASTERN, before clutch engagement the set „holding time T1“ passes by.

„Holding time T1“ is adjustable between 0 and 1.5 seconds by means of the DIP-switches II-1 and II-2.

| DIP-switch II-1 | DIP-switch II-2 | adjusted holding time T1 |
|---|---|---|
| OFF | OFF | 0 seconds |
| OFF | ON | 0,5 seconds |
| ON | OFF | 1,0 second |
| ON | ON | 1,5 seconds |

**DIP-switch II-3**

ý **T2: Holding time of power boost after clutch engagement**

„Holding time T2“ ( after clutch engagement ) is active only, if the feature „power boost“ has been selected by means of the DIP switch II-8.

After clutch engagement ( Ahead or Astern ) the „holding time T2“ passes by, before the control will release a new order given by the control head.

„Holding time T2“ is adjustable between 0 and 3 seconds by means of the DIP-switches II-3 and II-4.

| DIP-switch II-3 | DIP-switch II-4 | adjusted holding time T2 |
|---|---|---|
| OFF | OFF | 0 seconds |
| OFF | ON | 1 second |
| ON | OFF | 2 seconds |
| ON | ON | 3 seconds |

**DIP-switch II-5**
**DIP-switch II-6**
**DIP-switch II-7**

ý **T3: Delay time before reversing**

For a reversing maneuver AHEAD ↔ ASTERN or coming out of a drive position into NEUTRAL the adjusted „delay time T3“ is activated automatically. The pause delays the clutch disengagement.

**Example:**

The transmitter lever is moved from AHEAD to ASTERN ( or reversed). Immediately the throttle setting drops to idle speed, but the gear remains engaged AHEAD ( or ASTERN ) according to the adjusted delay time. This allows to decrease the vessel speed before reversing takes place and speed is built up again.

The real delay time ( delay of disengagement ) is depending on:

→ the adjusted „delay time T3“
→ value and duration of engine speed prior to the reversing maneuver
→ cruising direction

The maximum pause on a straight „Crash Reversing“ is achieved, if the control position was set for more than five (5) times the adjusted „delay time“. With a command period less than five (5) times the adjusted automatically„delay time“, as well as with a decreased engine speed the pause will be shortened by the control. For reversing with idle speed the pause is zero. The delay time from ASTERN to AHEAD in principle is half that for reversing from AHEAD to ASTERN.

The „maximum delay time T3“ is adjustable between 0 and 10.5 seconds by means of the DIP-switches II-5, II-6 and II-7.

| DIP-switch II-5 | DIP-switch II-6 | DIP-switch II-7 | adjusted delay time T3 |
|---|---|---|---|
| OFF | OFF | OFF | 0 seconds |
| OFF | OFF | ON | 1,5 seconds |
| OFF | ON | OFF | 3 seconds |
| OFF | ON | ON | 4,5 seconds |
| ON | OFF | OFF | 6 seconds |
| ON | OFF | ON | 7,5 seconds |
| ON | ON | OFF | 9 seconds |
| ON | ON | ON | 10,5 seconds |

During a later sea trial the most favourable „reversing time T3“ according to the vessel and propulsion system may be found out and adjusted as follows.

1. Move transmitter lever in AHEAD detent position (idle).

2. Move lever in FULL AHEAD position and take the time the engine attains two thirds of its maximum speed.

3. Set the measured time by means of the DIP-switches II-5, II-6 and II-7.

4. Do some more reversals over the complete speed range and determine the most favourable reversing time for propulsion and ship.

Begin the reversals always with low speed and increase the speed easily. Reset and adapt the „delay time T3“ A „crash maneuver“ with a **reversing time too short** may cause **damages to clutch, gear, and engine.**
A **reversing time too long** will **reduce the maneuver capability**

**DIP-switch II-8: power boost NO / YES**

**Power boost NO: DIP-switch II-8 in OFF position**

**Power boost YES: DIP-switch II-8 in ON position**

The setting „power boost YES" activates the following functions and are processed by the control. If „power boost NO“ is set, these functions are not taken in account by the control, even if delay times have been set..

→T1: Holding time of power boost before clutch engagement ( DIP-switch II-1 and II-2 )
→T2: Holding time of power boost after clutch engagement( DIP-switch II-3 and II-4 )
→Second idle speed ( will be set later together with the speed adjustments )

The combination of these three (3) functions shall be explained with the following example.

**Example:**
The transmitter lever is moved from NEUTRAL to the AHEAD detent position ( idle ). The control runs the following steps:

1. Power boost
The engine speed increases up to the adjusted value of the „second idle speed“.

2. Holding time T1
The adjusted holding time T1 insures that the increased engine speed (second idle speed.) is built up before clutch engagement.

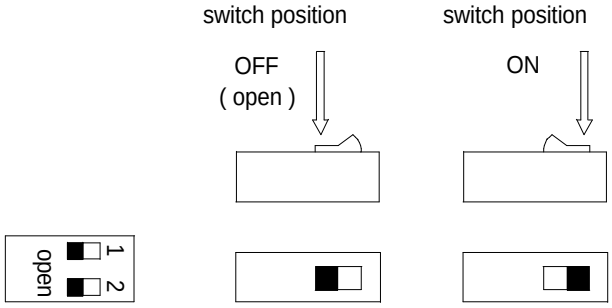
3. Clutch engagement
At the end of holding time T1 the AHEAD clutch is engaged.

4. Holding time T2
The adjusted holding time T2 insures a safe clutch engagement absorbing the propeller's back torque by means of the increased speed (second idle speed ).

5. Idle speed
At the end of holding time T2 the engine speed is set back to idle. In case the transmitter lever was moved to a position with a higher nominal speed value preset, the engine speed is released to that value without dropping to idle before.

If the holding times T1 and/or T2 are needed without power boosting, the second idle speed may be adjusted to the idle value making the power boost ineffective.

## 4.3.3 Funktion switch-IV (Interface board)




**DIP-switch IV-1 ( clutch feedback signal YES / NO )**

The feedback signal is set by means of the oil pressure switches installed to the gears indicating the gear shift position. The control is informed via **DIP-switch IV-1, if a clutch feedback signal is available or not.**

Clutch feedback **is connected:** **DIP-switch IV-1 in ON position**

Clutch feedback **is not connected:** **DIP-switch IV-1 in OFF position**

**DIP switch IV-2 ( one (1) pressure switch / two (2) pressure switches )**
( active only, if DIP switch IV-1 is set to ON )

DIP switch IV-2 has to be set only, if a clutch feed back is connected and DIP switch IV-1 is set into ON position. If no clutch feed back is connected and DIP switch IV-1 is set to OFF position, any setting of DIP switch IV-2 may be adjusted.

Only **one (1) common pressure switch** is connected, for both shift positions ( Ahead and Astern ) **DIP-switch IV-2 in OFF position**

**Two (2) pressure switches** are connected, for each shift position a separate switch **DIP-switch IV-2 in ON position**

**Before further a**djustment works, the setting of **DIP-switch IV-1 in OFF position ( clutch feed back is not connected )** is absolutely necessary, even if a clutch feed back is connected.

Because during adjustment works the engine is shut OFF, no oil pressure can be built up in the clutches. The missing feed back signal would release an alarm.
After completion of **all** necessary adjustments, the DIP-switches IV-1 and IV-2 have to be set according to the actual gear conditions..

## 4.4 Throttle Control Adjustment

The default values for the throttle control of the Mini-Marex are adjusted as follows:

| **output signal for...** | **output value** |
|---|---|
| minimum speed ( Idle speed ) | 4 mA |
| maximum speed ( Full speed ) | 20 mA |
| second idle speed | 4 mA |

Nearly all electronic controlled governors operate within the signal range between 4 mA (Idle speed) and 20 mA (Full speed). For electronic controlled governors using a different control signal (eg. 0...20 mA ), the Mini-Marex offers a possibility to modify the actuator's output signal. (see section 4.4.2 )

Whether throttle control adjustments are necessary or possible at all depends on the connection to the actuator.

1. **Connection via special throttle control cable.**
2. **Connection via standard throttle control cable.**

In the following sections the necessary adjustments for both kind of cables are described.

### 4.4.1 Adjustment when standard throttle cable is used

When using the standard throttle cable it might be necessary to match the output signals of the Mini-Marex-C control with the requirements of the electronic governor. ( see section ”4.4 Throttle control adjustment” )

If the applied electronic governor does not allow the direct engine speed adjustment, possible needed adjustments also can be carried out via the Mini-Marex-C control.

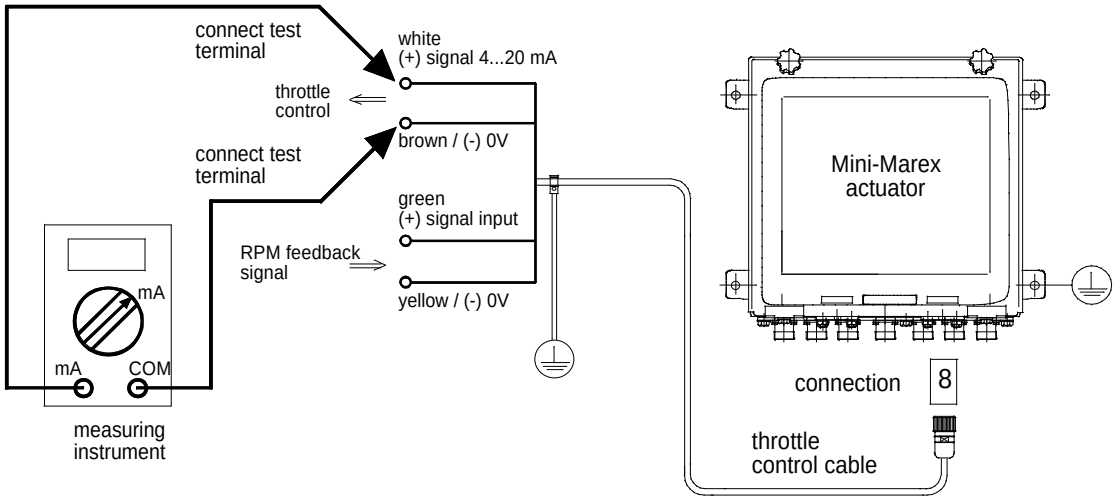
The output signals given from the Mini-Marex-C control can be measured and adjusted, if necessary as follows.

Before any measurements and adjustments **shut off the engine** and **activated control**. Possible misadjustments may cause uncontrolled commands . Danger of **damages to propulsion system and ship**.

Before turning ON the control, it has to be checked that the control is connected correctly and fuse protected. A false supply voltage or false connections may cause **malfunctions** or a **control failure**.

**Turn on the Mini-Marex-C control and take over command at station 1.** The corresponding control head levers have to be positioned in „Neutral“.
The „Turn ON“ of the remote control is described in section 6.3

The figure below shows the measurement set-up. A current ( mA range ) measuring instrument is needed.




**Follow the instrument maker's manual !!!**

Mostly the following procedure is recommended:
1.) move selector switch of the measuring instrument into range mA (DC).
2.) connect test terminal COM-output with the brown wire ( -- 0V ) .
3.) connect test terminal mA-output with the white wire (+ signal ) .

## 4.4.1.1 Idle Speed

(...with standard throttle control cable)

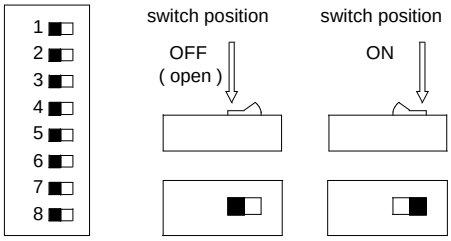
By means of the **function switch-III** and the **potentiometer P1 and P2** located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section “4.2 Main board beginning on page 4-2).

After all preparations according to section 4.4.2 proceed with the measurement and a possible adjustment change of the output signal as follows.

Follow absolutely the **sequence of the individual steps**. Any deviation will not be accepted by the control.

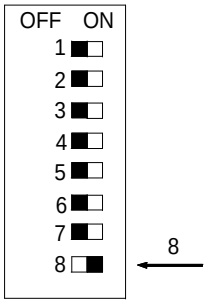
Explanation of switch positions:

Function switch III
DIP switch 1...8



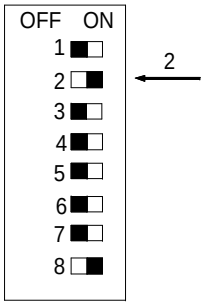
**Step 1**

DIP-switch 8 in ON position



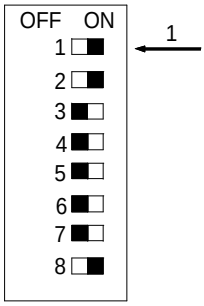

**Step 2**

DIP-switch 2 in ON position



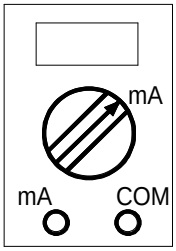

**Step 3**

DIP- switch 1 in ON position




**Step 4**

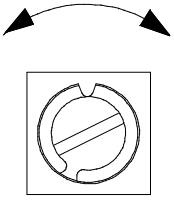
measure output signal




**Step 5**

change output signal, if needed

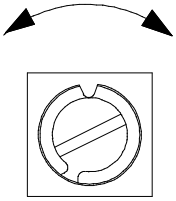
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed

**P2 (fine adjustment)**



Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

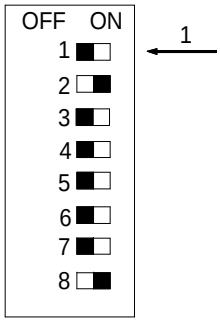
In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.

Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.

After the wanted output signal has been adjusted, exit the adjustment mode as follows.

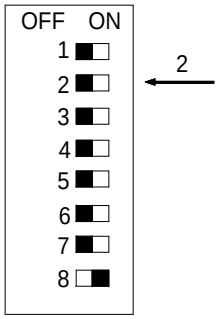
**7. Step:**

DIP-switch 1 in OFF position



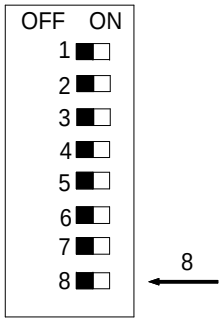

**8. Step:**

DIP- switch 2 in OFF position




**9. Step:**

DIP- switch 8 in OFF position




Now the Mini Marex control is in operating mode again.
.

## 4.4.1.2 Full Speed

**(...with standard throttle control cable)**

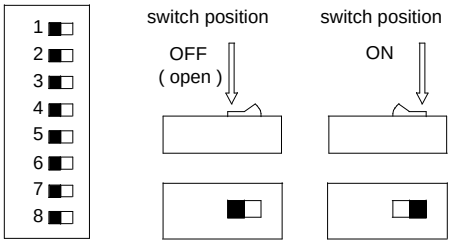
**By means of the** function switch-III **and the** potentiometer P1 and P2 **located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section "4.2 Main board" beginning on page 4-2).**

**After all preparations according to section 4.4.2 proceed with the measurement and a possible adjustment change of the output signal as follows.**

**Follow absolutely the** sequence of the individual steps**. Any deviation will not be accepted by the control.**

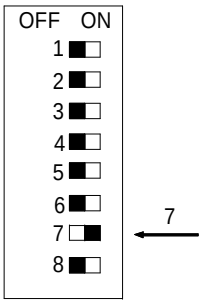
**Explanation of switch positions:**

**Funktion switch III**
**DIP-switch 1...8**



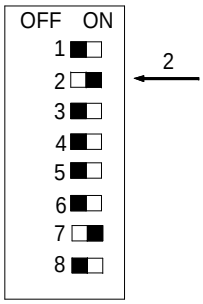
**Step 1**

DIP-switch 7 in ON position



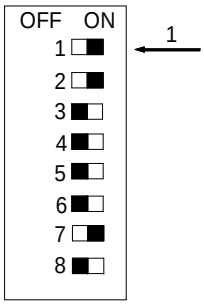

**Step 2**

DIP-switch 2 in ON position



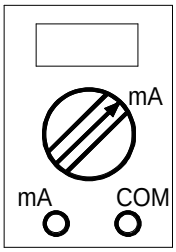

**Step 3**

DIP- switch 1 in ON position



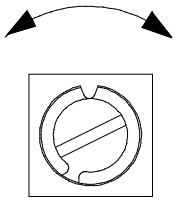

**Step 4**

measure output signal



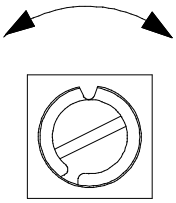

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

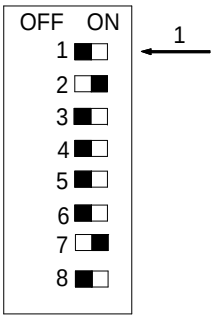
**In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.**

**Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.**

After the wanted output signal has been adjusted, exit the adjustment mode as follows.

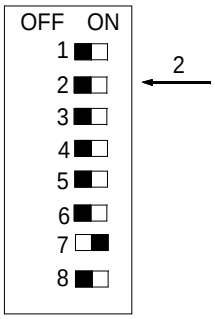
**Step 7**

DIP-switch 1 in OFF position



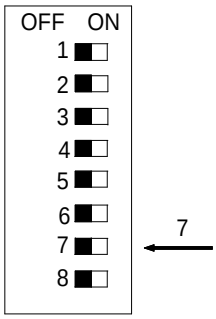

**Step 8**

DIP- switch 2 in OFF position




**Step 9**

DIP- switch 7 in OFF position




Now the Mini Marex control is in operating mode again.

## 4.4.1.3 Second Idle Speed for power boost

**(...with standard throttle control cable)**

If the power boost function ( see page 4-8 ”DIP-switch II-8” ) is not used, the second idle speed adjustment is not necessary.

**Second Idle Speed: NO** ——————— **Adjustment is not needed.**

If the power boost function ( see page 4-8 ”DIP-switch II-8” ) is used, the second idle speed (speed jump ) has to be adjusted.

**Second Idle Speed: YES** ——————— **Adjustment is needed.**

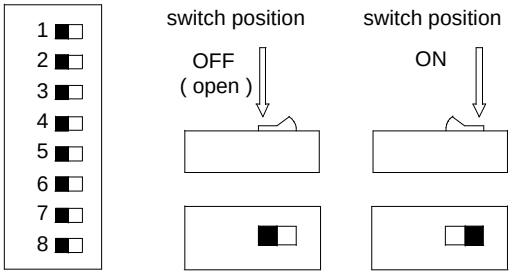
**By means of the function switch-III and the potentiometer P1 and P2 located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section “4.2 Main board” beginning on page 4-2).**

**After all preparations according to section 4.4.2 proceed with the measurement and a possible adjustment change of the output signal as follows.**

**Follow absolutely the** sequence of the individual steps**. Any deviation will not be accepted by the control.**

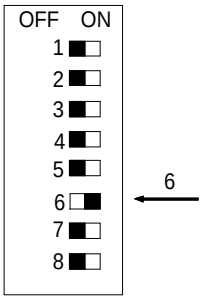
**Explanation of switch positions:**

**Funktion switch III**
**DIP-switch 1...8**



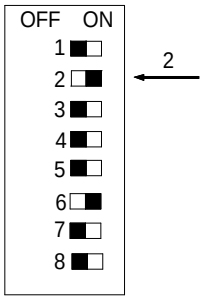
**Step 1**

DIP-switch 6 in ON position



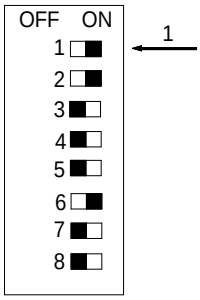

**Step 2**

DIP-switch 2 in ON position



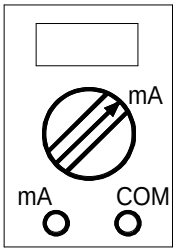

**Step 3**

DIP- switch 1 in ON position



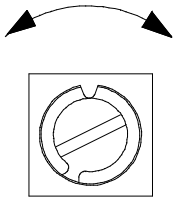

**Step 4**

measure output signal



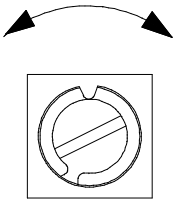

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

**In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.**

Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.

The value of the output signal for the speed jump "second idle speed“ may be determined as follows:

| | | | | | |
|---|---|---|---|---|---|
| Example: | Idle speed | = | 800 RPM | corresponds to output signal | 4 mA |
| | Full speed | = | 2800 RPM | corresponds to output signal | 20 mA |
| | Speed difference | = | 2000 RPM | corresponds to signal difference | 16 mA |

This assumption results in:
A speed increase by 1 RPM corresponds to an increase of the output signal by 16/2000 mA = 0,008 mA.

If the "second idle speed“ should be adjusted to 900 RPM ( 100 RPM above idle speed ), the calculation results in:

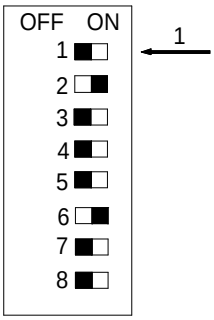
| | | | |
|---|---|---|---|
| A speed increase by 100 RPM | = | 100 x 0,008 mA | corresponds to at signal increase by 0,8 mA |

| | | |
|---|---|---|
| idle speed 800 RPM | = | 4,0 mA |
| plus speed increase by 100 RPM | = | 0,8 mA |
| second idle speed 900 RPM | = | 4,8 mA |

After the wanted output signal has been adjusted, exit the adjustment mode as follows.

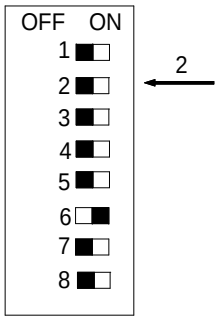
**Step 7**

**DIP-switch 1 in OFF position**



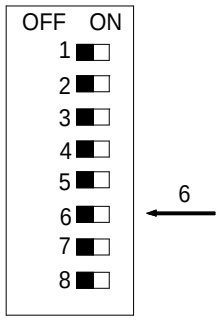

**Step 8**

**DIP- switch 2 in OFF position**



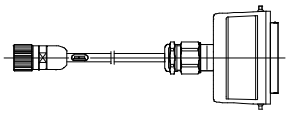

**Step 9**

**DIP- switch 6 in OFF position**




**Now the Mini Marex control is in operating mode again.**

## 4.4.2 Adjustment when special throttle cable is used



The use of throttle control cables in special design is possible only, if the engine is provided with a fully wired switch box including the corresponding throttle connection.

In this case minimum speed ( idle speed) and maximum speed (full speed) are already determined.

## 4.4.2.1 Idle Speed

(...with special throttle control cable)

Already determined by the engine maker
**Not adjustable via the Mini-Marex-C control.**

## 4.4.2.2 Full Speed

(...with special throttle control cable)

Already determined by the engine maker
**Not adjustable via the Mini-Marex-C control.**

## 4.4.2.3 Second Idle Speed for power boost

(...with special throttle control cable)

If the power boost function ( see page 4-8 ”DIP-switch II-8” ) is not used, the second idle speed adjustment is not necessary.

**Second Idle Speed: NO** ———— **Adjustment is not needed**.

If the power boost function ( see page 4-8 ”DIP-switch II-8” ) is used, the second idle speed (speed jump ) has to be adjusted.

**Second Idle Speed: YES** ———— **Adjustment is needed.**

The adjustment can be carried out with the engine turned ON and activated control only.

Before turning ON the control, it has to be checked that the control is connected correctly and fuse protected. A false supply voltage or false connections may cause **malfunctions** or a **control failure**.

1. **Turn on the Mini-Marex-C control and take over command at station 1.** The corresponding control head levers have to be positioned in „Neutral“. The „Turn ON“ of the remote control is described in section 6.3

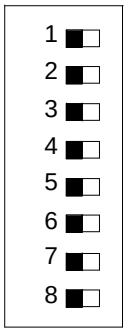
2. After the control is working perfect, turn ON the engine.

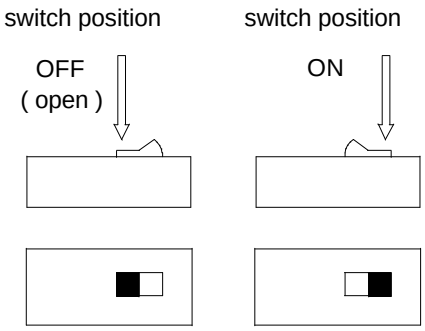
3. By means of the **function switch-III** and the **potentiometer P1 and P2** located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section “4.2 Main board” beginning on page 4-2).

Follow absolutely the **sequence of the individual steps**. Any deviation will not be accepted by the control.

Explanation of switch positions:

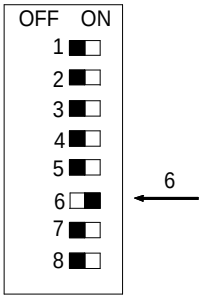
Funktion switch III
DIP-switch 1...8



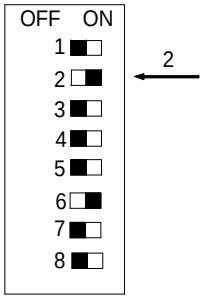

**Step 1**

DIP-switch 6 in ON position



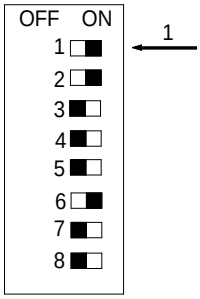

**Step 2**

DIP-switch 2 in ON position



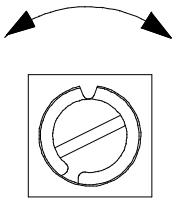

**Step 3**

DIP- switch 1 in ON position



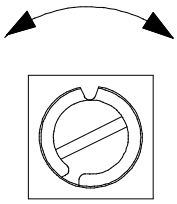

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.

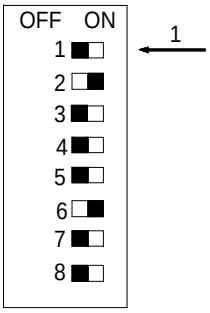
Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

**In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.**

**After the wanted output signal has been adjusted, exit the adjustment mode as follows.**

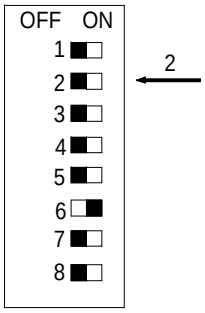
Step 6

**DIP-switch 1 in OFF position**



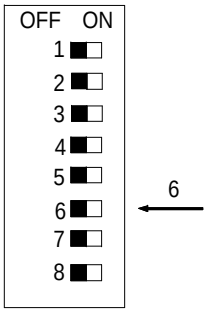

Step 7

**DIP-switch 2 in OFF position**




Step 8

**DIP-switch 6 in OFF position**




Now the Mini Marex control is in operating mode again.

## 4.5 Alignment of control heads and enable remote stations

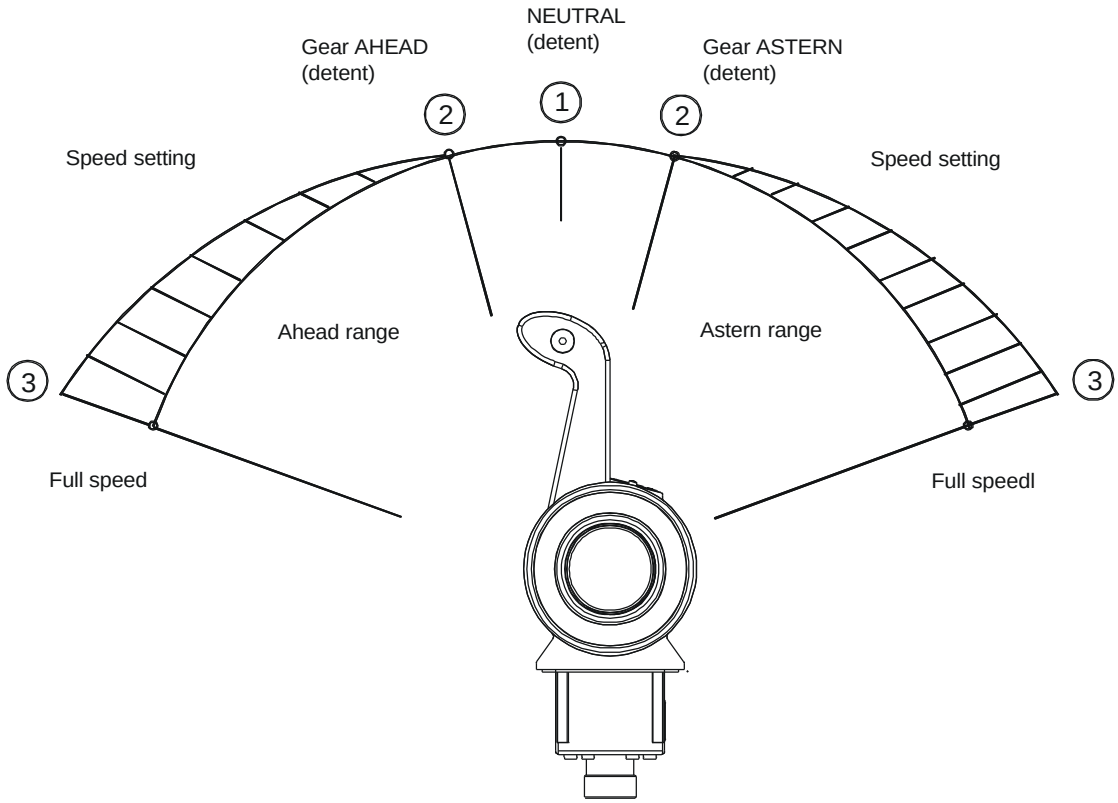
Control head alignment and enabling must be carried out!
Only then the control does acknowledge the connected signal transmitters and clears them for operation!!
The control heads are enabled automatically

Before control head alignment is carried out, shut OFF the engine to provide uncontrolled maneuvering.

This feature is used to align the lever positions

- ❷ Detent „Idle / AHEAD“
- ❸ Stop „Full speed / AHEAD“
- ❷ Detent „Idle / ASTERN“
- ❸ Stop „Full speed / AHEAD“

between control head and actuator. Because of manufacturing tolerances "Full speed" of one control head can be positioned at the lever travel stop, whereas the control head on another station signals "Full speed" some before the stop. Corresponding goes for the other positions.
The alignment ensures that “Full speed” is always positioned at the lever travel stop and “idle speed” in the corresponding detents. This feature helps continuous speed setting without dead lever travel.




**Procedure of control head alignment**

Action: Turn ON the control. Align twin engine systems separately, i.e. turn ON one control at a time.

Move transmitter lever **at all stations into NEUTRAL position**.

Take over command at **control station 1**.

Set actuator DIP-switch I-7 in ON position ( transmitter alignment ).

Result: An permanent buzzer tone sounds at all stations.

All “Indicator light command / lighting of the control head” blinks with low repetition.

Control head to be aligned.

Action: Move control head lever to NEUTRAL”.

Push “station transfer / command" button for approx. 3 seconds.

Result: Buzzer tone at all stations stops.

“Indicator light command / lighting of the control head” to be aligned flashes with high repetition, the lighting of all the other control heads blinks with low repetition.

Action: Move lever in the position to be aligned ( “Idle / Ahead detent”, "Full Speed / Ahead”, “Idle / Astern detent”, “Full speed / Astern” )

Push always “station transfer / command" button.

Result: If the alignment was successful, the buzzer will sound once after 3 seconds.

If the alignment wasn't successful, the buzzer will sound 3 times after 3 seconds. Repeat the alignment procedure.

Action: Align all the other lever positions in the same way.

If there are more remote stations connected, align them as well.

Action Move to the next control station and depress „station transfer / command“ button for 3 seconds until the lighting is flashing with high repetition.
**(For the alignment the control heads must be positioned in NEUTRAL again.)**
In the following carry out the alignment procedure as described above.

**Completion of control head alignment:**

Action: Set actuator DIP switch I-7 back to OFF ( operation ).
Only with setting DIP switch I-7 back to OFF the carried out alignment is stored. If the control was turned off before, the complete alignment procedure has to be repeated.

Result: The remote control has to be initiated again.
The command of control has to be taken over again

## 4.6 Final adjustments

**After completion of all adjustment works set function switch IV on the interface board corresponding to the actual gear conditions (see on pages 4-9 and 4-10).**

# 5.1 Special Features

After the control has been adjusted completely and works perfect in reversing gear mode ( speed setting and gear shifting only ) the following special features can be released.

1. Special feature „engine speed synchronization“ (see section 5.1.1 up)
2. Special feature „trolling“ (control of trolling gear – see section 5.2.1 up)

**After both features have been released, they may be run later on parallel, but not at the same time.**

## 5.1.1 Enable Engine Speed Synchronization

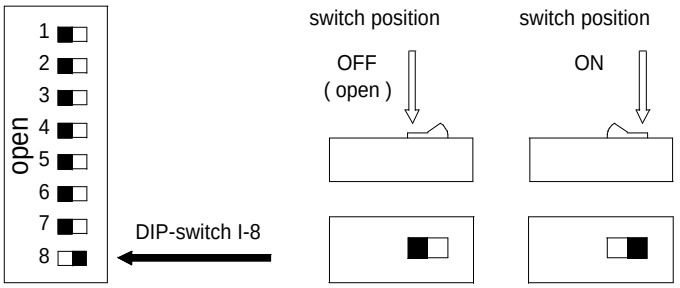
**( for twin engine propulsion only )**

**Precondition for a „speed engine synchronization“ is an existing and connected „speed feedback signal“, see section 3.8, 3.8.1 and 3.8.2**

**Preparation:**
Turn ON the Mini-Marex-C control, take over command at one remote station and position all control head levers in NEUTRAL

**Procedure:**
Enable by means of **function switch I ( DIP switch I-8 ) and function switch III (DIP switch III-8**) located on the main board ( location of the adjustment devices see section „4.2 main board “ page 4-2 up ).

**Step 1: Function switch I**




**DIP switch I-8 (function switch I) in ON position**

The control now is set into mode „enable special function ”

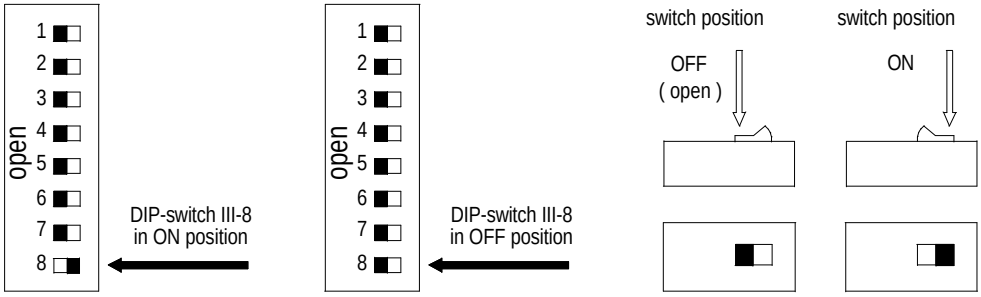
In „enable“ mode the current special feature status is indicated via the fault code

LED 4 is ON: → special feature can be activated or deactivated.
LED 4 is OFF: → special feature cannot be activated or deactivated.

LED 1 is ON: → engine speed synchronization is activated.
LED 1 is OFF: → engine speed synchronization is deactivated.

LED 2 is ON: → trolling is activated.
LED 2 is OFF: → trolling is deactivated.

**Step 2: Function switch III**




**DIP switch III-8 (Function switch III)**

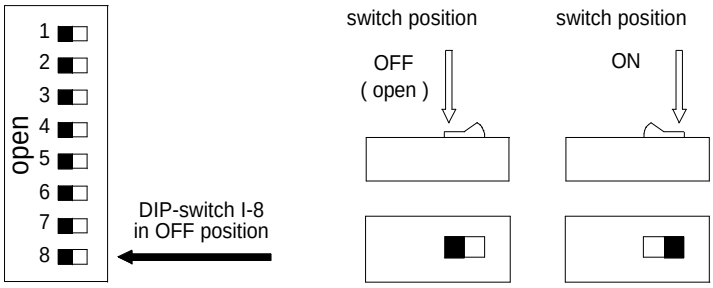
**Set DIP switch III-8 from OFF (open) → to ON**
Check: LED 1 must be lighted

**Set back DIP switch III-8 ® to OFF**
Check: LED 1 must still be lighted

The special feature „engine speed synchronization“ alternatively can be activated or deactivated by means of a selective turning ON or OFF DIP switch III-8.

**Step 3: Function switch I**

Exit the mode „enable special feature“




**DIP switch I-8 back in OFF position**
LED 1 is not lighted any more

The control acts as it is turned ON and the command has to be taken over again.

## 5.1.2 Exceptionals of Engine Speed Synchronization

For twin engine propulsion plants with the „speed synchronization“ some have to be followed.

Because in synchronization mode the „Master“ engine ( see page 4-4 / DIP switch I-1 ) has the lead in speed setting for the „Slave“ engine, both controls have to be adjusted so that the **„Slave“ engine is <u>always be able</u> to follow the „Master“ engine.**

**<u>Full Speed:</u>**

The „Slave” engine speed must be identical or higher than the „Master“ engine speed.

**<u>Idle Speed:</u>**

The „Slave” engine speed must be identical or lower than the „Master“ engine speed.

### Example: Full Speed

The rated (full) speed of the „Master“ engine is 2500 RPMs whereas the rated speed of the „Slave“ engine is only 2450 RPMs. The control tries to synchronize both engines, but because of the lower rated speed of the „Slave“ engine, it is not possible to attain the **„Master“ engine speed. An active speed control** (synchronization) is therefor not possible.

If the „Slave“ engine does not attain the speed value of the „Master“ engine within 20 seconds, the control will cancel the active speed control (synchronization ) and both engines will follow the speed setting by means of the „Master“ control head lever only. Indication is given via the control head LED “Synchro” blinking with high repetition ( 0,2sec ON / 0,2sec OFF ) resp. via the push button . „Special Feature”. Now Full Speed of “Master” engine is 2500 RPMs; Full Speed of “Slave” engine is 2450 RPMs.

### Remedial action:

There are three possibilities to take remedial action:
1. Increase rated speed of „Slave“ engine.
2. Decrease rated speed of „Master“ engine.
3. Status change of „Master“ and „Slave“:

<u>The third possibility is in most cases the easiest way.</u> For both control systems the „Master / Slave“ adjustment has to be changed. Now the slower „Slave“ engine becomes lead status and the faster „Master“ engine becomes following status.

The a.m. also goes for the idle speed.
The “Master“ engine must not idle below the „Slave“ engine.
Otherwise the control will quit the active speed control.

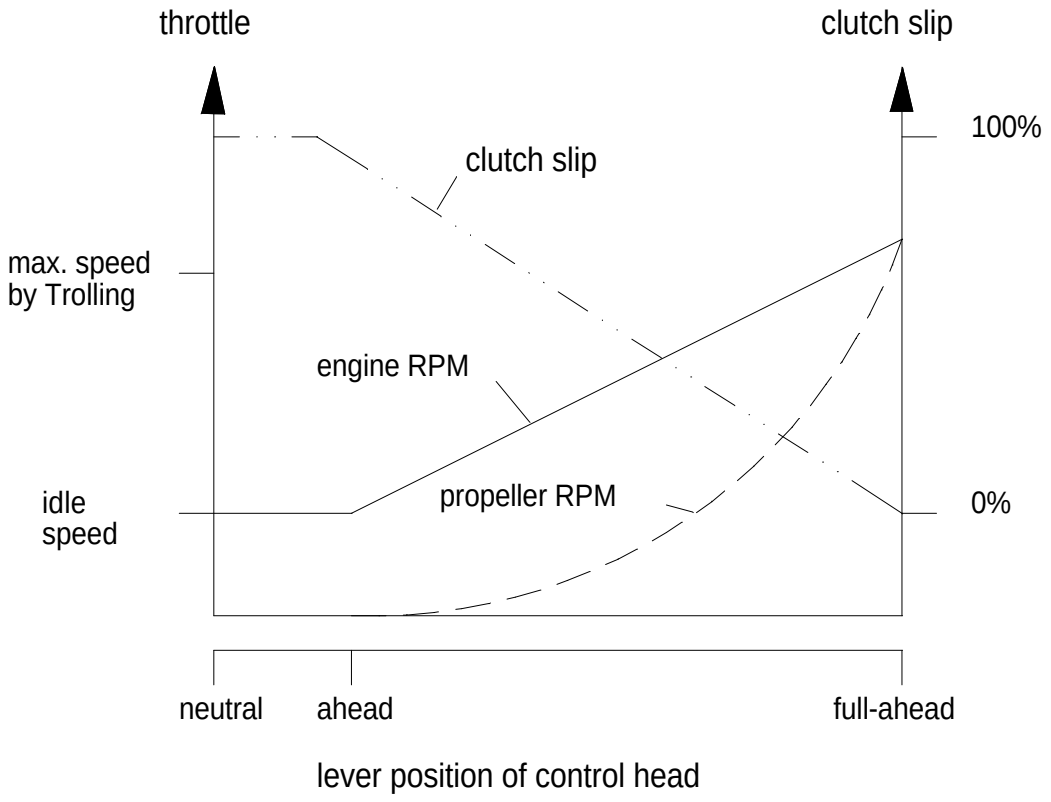
## 5.2.1 Trolling

**Trolling gear:**

The trolling feature offers a controlled slip of clutches and requires a special trolling reverse gear. Besides of the normal gear shifting from “Neutral” to “Ahead” and “Astern” this reverse gear contents an additional control option for an infinitely variable slip of clutches. The gear may be operated in the normal mode of gear shifting as well as in the trolling mode producing lower than normal propeller speeds to enable tolling at selected low speeds with live bait.

**Trolling function:**

In trolling mode the gear is also shifted from “Neutral to “Ahead”, after the control head lever has been moved into the “Ahead” detent. But the clutch slip is that big that the propeller shaft does not rotate (or very slowly) if the engine is idling. Moving the control head lever forward to “Full Ahead” the slip will decrease and the propeller shaft starts rotating faster while the input revs of the engine shaft also increases. This feature facilitates a very smooth control of the propeller revs much below idle speed.




**To avoid overheating of the clutch discs the maximum engine speed in trolling mode has to be limited.**
**Follow absolutely the instructions of the gear or clutch manufacturer.**

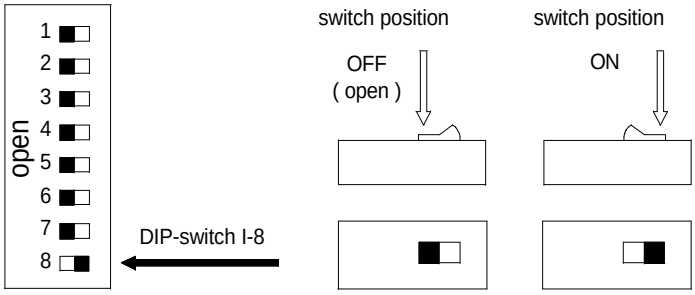
## 5.2.2 Enable Trolling

Precondition for „trolling“ is an existing and connected trolling control cable, see section 3.9 page 3-13 up.

**Preparation:**
Turn ON the Mini-Marex-C control, take over command at one remote station and position all control head levers in NEUTRAL

**Procedure:**
Enable by means of **function switch I ( DIP switch I-8 ) and function switch III ( DIP switch III-7** ) located on the main board ( location of the adjustment devices see section „4.2 main board “ page 4-2 up).

**Step 1: Function switch I**




**DIP switch I-8 (function switch I) in ON position**

**The control now is set to mode „enable special function”**

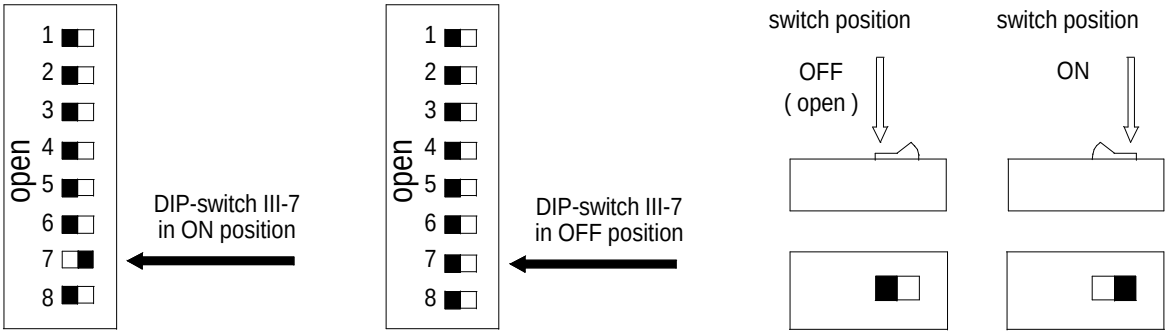
In „enable“ mode the current special feature status is indicated via the fault code

LED 4 is ON: → special feature can be activated or deactivated.
LED 4 is OFF: → special feature cannot be activated or deactivated.

LED 1 is ON: → engine speed synchronization is activated.
LED 1 is OFF: → engine speed synchronization is deactivated.

LED 2 is ON: → trolling is activated.
LED 2 is OFF: → trolling is deactivated.

**Step 2: Function switch III**




**DIP switch III-7 (Function switch III)**

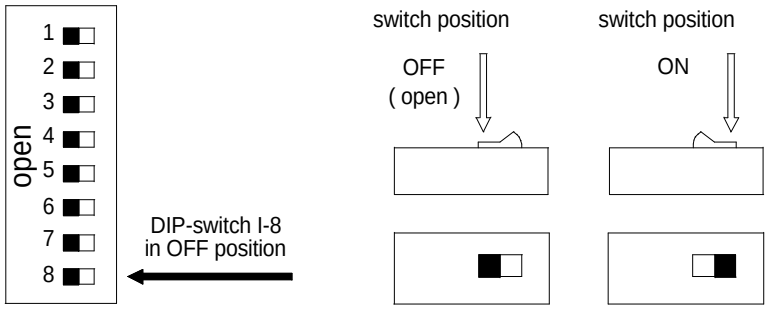
**Set DIP switch III-7 from OFF (open) → to ON**
Check: LED 2 must be lighted

**Set back DIP switch III-8 ® to OFF**
Check: LED 2 must still be lighted

The special feature „trolling“ alternatively can be activated or deactivated by means of a selective turning ON or OFF DIP switch III-7.

**Step 3: Function switch I**

Exit the mode „enable special feature“




**DIP switch I-8 back in OFF position**
LED 2 is not lighted any more

The control acts as it is turned ON and the command has to be taken over again.

## 5.2.3 Trolling Adjustments

The Mini-Marex output signals (default values) for trolling control are set as follows:

| Output signal for... | Value (default) |
|---|---|
| Maximum speed for trolling | 12 mA ✪ |
| Minimum slip position | 20 mA |
| Maximum slip position | 4 mA |

✪ Value corresponds to half speed between idle and full

**Maximum speed in trolling mode:**
The „maximum speed in trolling mode“ limits the engine speed during trolling. The max. admissible engine speed depends on the statements of the gear maker and has to be followed strictly necessary.

**Minimum slip position:**
The „minimum slip position“ defines the control value for a non-positive drive. There is no clutch slip existing any more ( 0% slip ).

**Maximum slip position**
The „maximum slip position“ defines the control value for the greatest possible clutch slip ( 100% / no transmission).

The a.m. three (3) control values have to be checked and to be adjusted according to the instructions of the gear or clutch maker.
**Do not exceed the max. admissible speed during trolling. A false speed adjustment may cause clutch destruction.**

The trolling gear with “warm oil” works different to “cold oil” conditions. If the propeller shaft just only rotates (max. slip position) with cold and still thick oil, it doesn’t rotate any more in the same slip position with warm, thin oil.

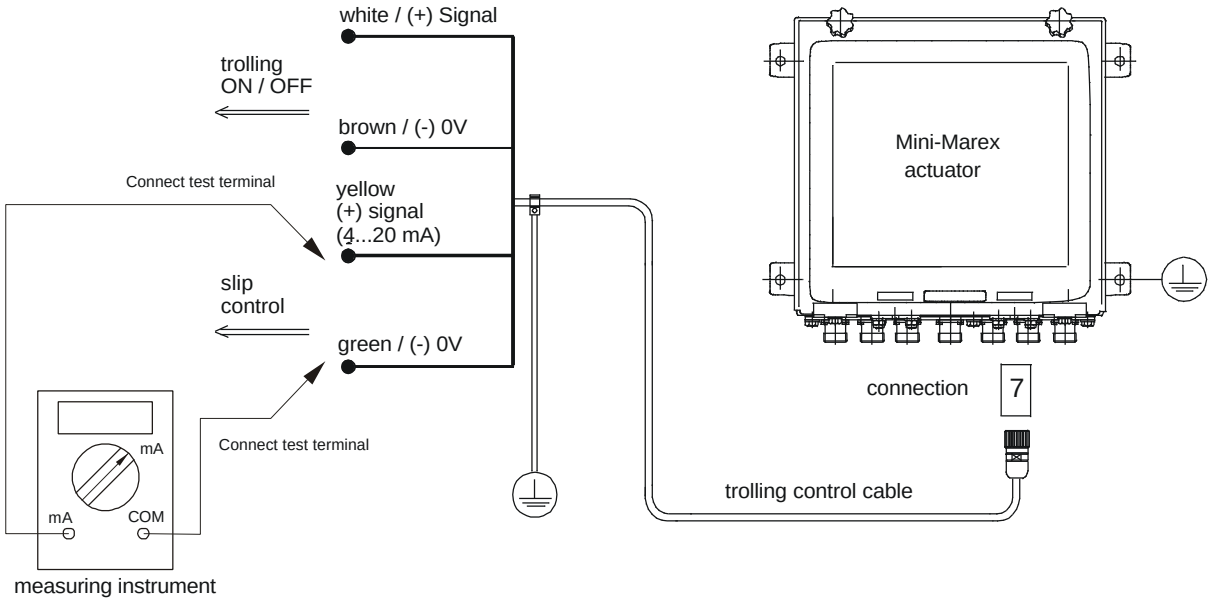
Slip position adjustments should be carried out under “warm oil” conditions.

The output signals given from the Mini-Marex-C control can be measured and adjusted, if necessary as follows.

Before any measurements and adjustments **shut off the engine** and **activated control**. Possible misadjustments may cause uncontrolled commands . Danger of **damages to propulsion system and ship**.

**Turn on the Mini-Marex-C control and take over command at station 1.** The corresponding control head levers have to be positioned in „Neutral“. The „Turn ON“ of the remote control is described in section 6.3

The figure below shows the measurement set-up. A current ( mA range ) measuring instrument is needed.




**Follow the instrument maker's manual !!!**

Mostly the following procedure is recommended:
1.) move selector switch of the measuring instrument into range mA (DC).
2.) connect test terminal COM-output with the green wire ( -- 0V ) .
3.) connect test terminal mA-output with the yellow wire (+ signal ) .

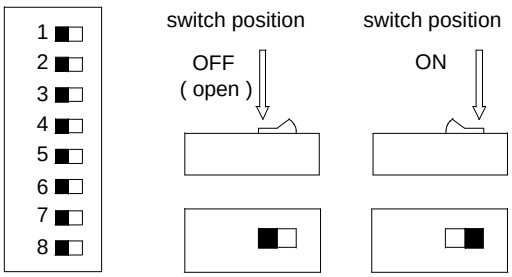
## 5.2.3.1 Maximum Speed for Trolling

By means of the **function switch-III** and the **potentiometer P1 and P2** located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section “4.2 Main board beginning on page 4-2).

Follow absolutely the **sequence of the individual steps**. Any deviation will not be accepted by the control.

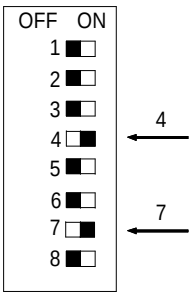
Explanation of switch positions:

Function switch III
DIP switch 1...8



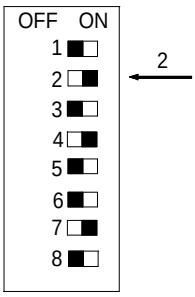
**Step 1**

DIP switch 7 in ON position
DIP switch 4 in ON position



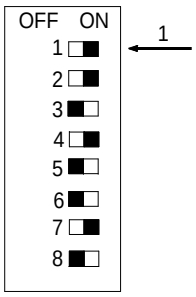

**Step 2**

DIP-switch 2 in ON position



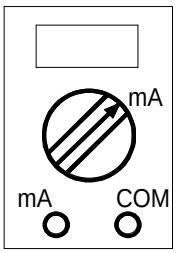

**Step 3**

DIP- switch 1 in ON position



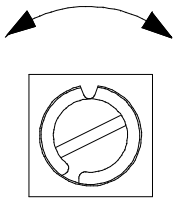

**Step 4**

measure output signal



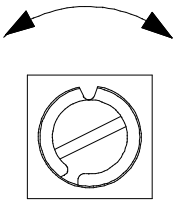

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

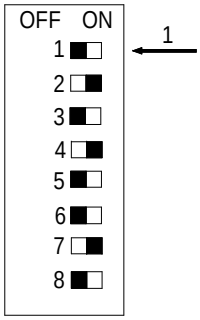
In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.

Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.

**After the wanted output signal has been adjusted, exit the adjustment mode as follows.**

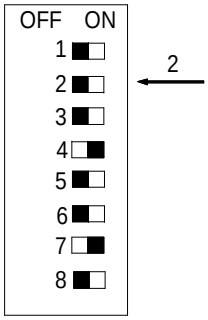
**Step 7**

DIP-switch 1 in OFF position



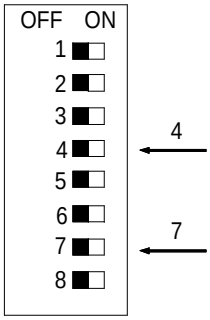

**Step 8**

DIP- switch 2 in OFF position




**Step 9**

DIP switch 4 in OFF position
DIP switch 7 in OFF position




Now the Mini Marex control is in operating mode again.

## 5.2.3.2 Minimum Slip Position

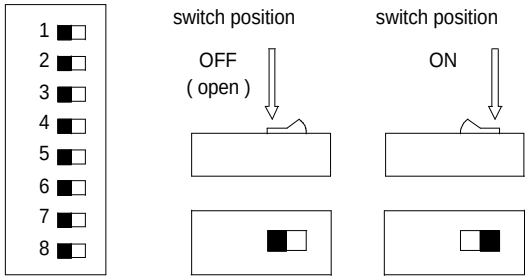
**( non-positive drive )**

**By means of the** function switch-III **and the** potentiometer P1 and P2 **located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section "4.2 Main board" beginning on page 4-2).**

**Follow absolutely the sequence of the individual steps. Any deviation will not be accepted by the control.**

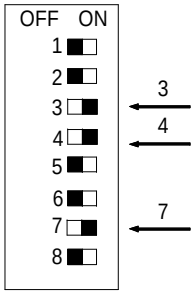
**Explanation of switch positions:**

**Function switch III**
**DIP switch 1...8**



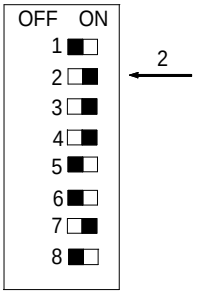

Step 1

**DIP switch 7 in ON position**
**DIP switch 4 in ON position**
**DIP switch 3 in ON position**



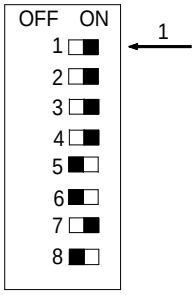

Step 2

**DIP-switch 2 in ON position**



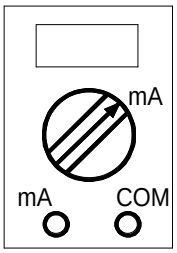

Step 3

**DIP- switch 1 in ON position**



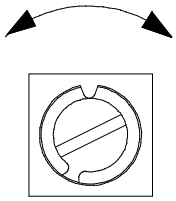
**Step 4**

measure output signal



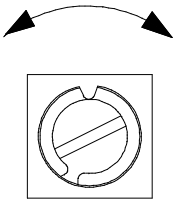

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

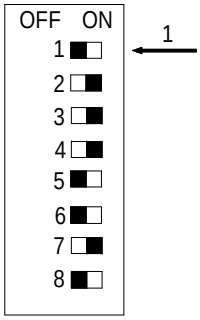
**In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.**

Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.

After the wanted output signal has been adjusted, exit the adjustment mode as follows.

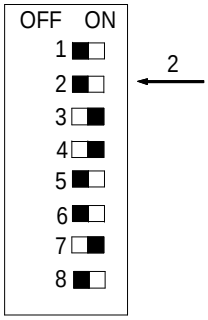
**Step 7**

**DIP-switch 1 in OFF position**



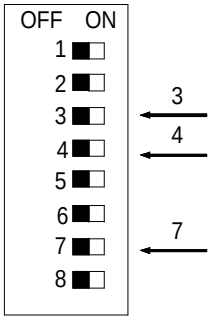

**Step 8**

**DIP- switch 2 in OFF position**




**Step 9**

**DIP switch 3 in OFF position**
**DIP switch 4 in OFF position**
**DIP switch 7 in OFF position**




Now the Mini Marex control is in operating mode again.

## 5.2.3.3 Maximum Slip Position

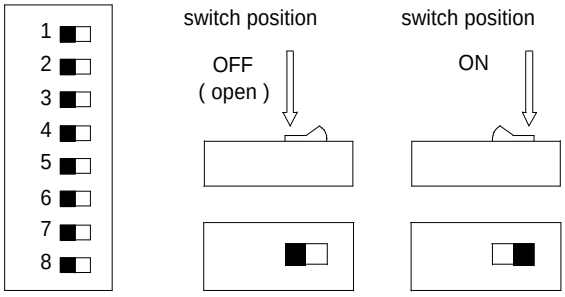
**( hardly transmission )**

**By means of the** function switch-III **and the** potentiometer P1 and P2 **located on the main board measurement and adjustment of the Mini Marex output signals are carried out ( location see section "4.2 Main board" beginning on page 4-2).**

**Follow absolutely the** sequence of the individual steps**. Any deviation will not be accepted by the control.**

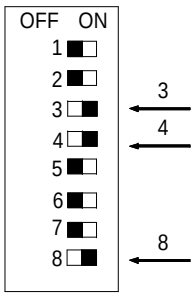
**Explanation of switch positions:**

**Function switch III**
**DIP switch 1...8**



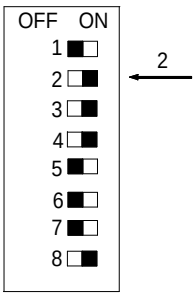

**Step 1**

**DIP switch 8 in ON position**
**DIP switch 4 in ON position**
**DIP switch 3 in ON position**



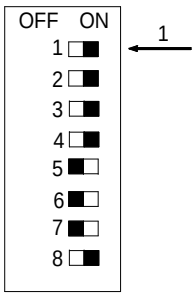

**Step 2**

**DIP-switch 2 in ON position**



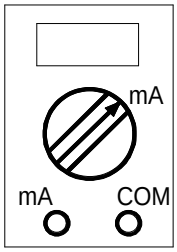

**Step 3**

**DIP- switch 1 in ON position**




**Step 4**

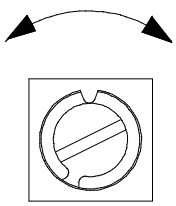
**measure output signal**




**Step 5**

**change output signal, if needed**

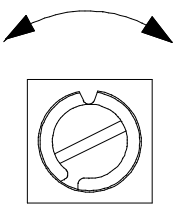
P1 (coarse adjustment)



**Step 6**

**change output signal, if needed**

P2 (fine adjustment)



Before each adjustment, the pots should be set to its mid-position. This will allow sufficient adjustment for both directions.

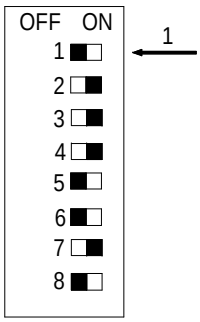
**In case the pot' s adjustment range is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode ( DIP-switch-1 in ON position ), the adjustment may be continued. Do not change the other DIP switches.**

Both potentiometers have a mechanical stop. Don't overwind the potentiometers. In consequence they will be damaged.

After the wanted output signal has been adjusted, exit the adjustment mode as follows.

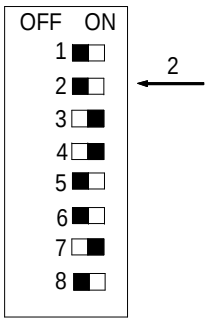
**Step 7**

**DIP-switch 1 in OFF position**



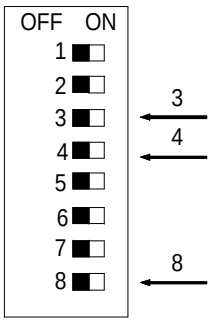

**Step 8**

**DIP- switch 2 in OFF position**



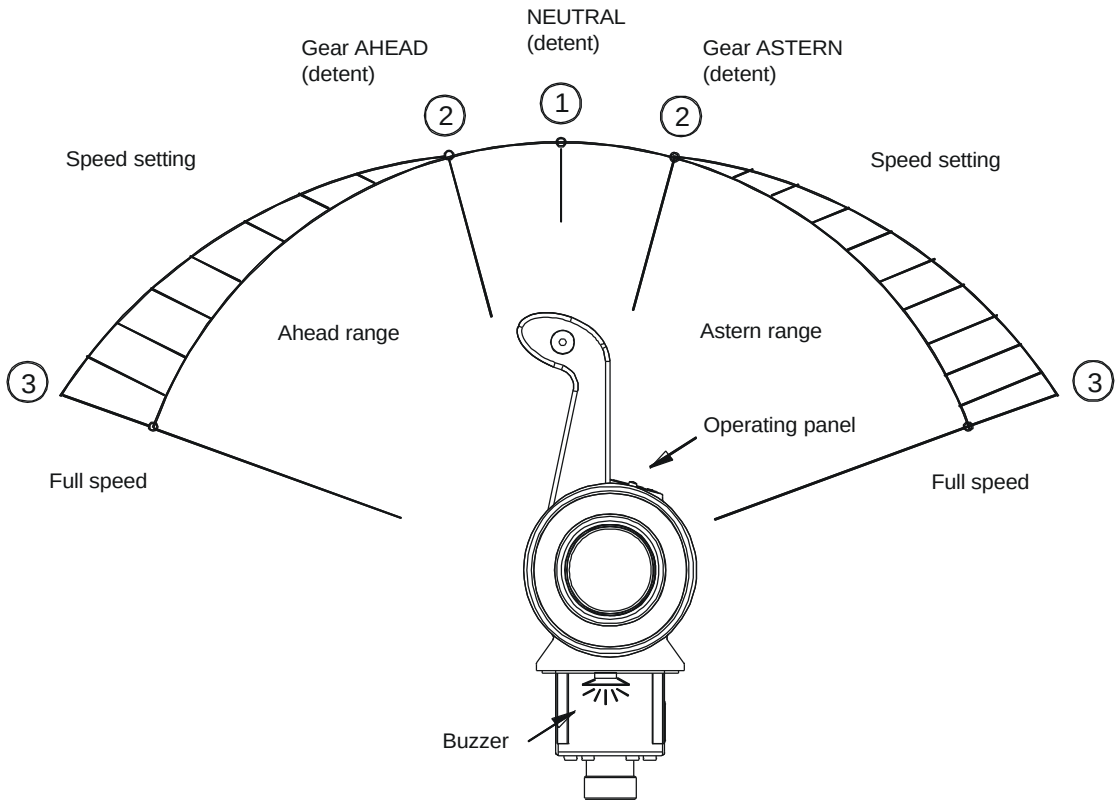

**Step 9**

**DIP switch 3 in OFF position**
**DIP switch 4 in OFF position**
**DIP switch 8 in OFF position**




Now the Mini Marex control is in operating mode again.

## 6.1 Control Head




### 6.1.1 „Neutral" ( Detent ) Position❶

In this position the gear is disengaged and the engine is idling. Each time „Neutral" position" is taken up it is indicated by means of a short „beep" tone.

### 6.1.2 „Ahead / Astern" ( Detent) Position❷

With this lever position two operations are possible.

**1. Standard- operation**

"Ahead" or "Aster" clutch is engaged, the engine is idling.

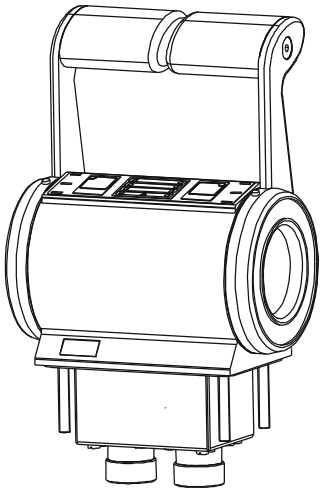
**2. Feature "power boost"**

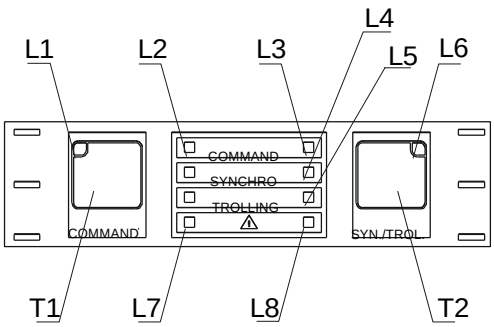
The feature "power boost" has to be selected before by means of DIP-switch II-8 (adjustment and definition see page 31). Engine speed increases before clutch engagement and engine speed drops back to idle after the clutch is fully engaged.
For a safe reversing individual delay times before and after clutch engaging may be adjusted (definition see page 4-6).

### 6.1.3 “Full Speed” Position ❸

In position ❸ “ Full speed - maximum speed” for “Ahead” or “Astern” is set. Between the positions ❷ and ❸ the engine speed can be set continuously with the gears engaged.

## 6.2 Operation field – Control head for twin engine propulsion






### 6.2.1 Push Button „Station Transfer“ T1


The push button „station transfer“ is located at the control head only once. The push button is lighted via LED L1 and indicates that the control is power supplied. The push button is used for the control transfer to the corresponding remote station. The procedure for take over command and station transfer is described on page 6-10 up. Apart from this the push button has two additional functions.

#### 6.2.1.1 Feature „Warming Up"

This option allows warming up a cold engine by speed setting through the total speed range without engaging the clutch in lever position ❷.

**Activate “Warming Up” option:**

The “Warming Up” option can be activated with the transmitter in command and with the lever in “Neutral ❶ ” position only.

1. Move control head lever to position “❶ Neutral”.
2. Depress and hold down push button "Station Transfer".
3. Move lever into detent position “❷ Gear Ahead/Astern”
   "Warming UP" is indicated by means of a short „double beep“ tone and short-termed rhythmical extinguishing transmitter lighting
4. Release push button "Station Transfer".

The engine is idling while the clutch is remaining disengaged. Now the transmitter lever can be moved up to position “❸ Full speed” for speed setting through the total range between the positions ❷ and ❸.

Within twin engine propulsion systems each engine can be operated separately.

**Cancel “Warming Up” option:**

To exit „Warming up“, return the control head lever to position “❶ Neutral. The normal „beep“ tone indicates "Neutral-Position". The control head lighting changes to steady. The „Warming up“ feature is cancelled.

In “Warming Up” mode do not move the control head lever from Ahead to Astern or revers. The “Warming Up” mode would be cancelled, when the lever passes the position “❶ Neutral” and the opposite clutch would be engaged, when it gets to position “❷ Gear Ahead/Astern”.

## 6.2.1.2 Feature „Mute Acoustic Alarm“

The buzzer activated for some alarms may be switched off at the corresponding control panel by depressing push button "Station Transfer".

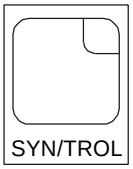
**The alarm will not be cleared by muting the buzzer!**

## 6.2.2 Indicator light „Alarm L7 and L8“

This indicating device is located on the control head twice, one for each control system, i.e. one for Port / one for Stbd.
In case of a failure the alarm lamp will show a red steady light .

After the control is turned ON, the alarm lamp also shows a steady light, but it is turned off after taking over control.

## 6.2.3 Push button „Syn./Trol. T2“




By means of this push button ( steady lighted via LED 6) released special features can be turned ON and OFF

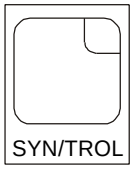
The following special features are available:

1. engine speed synchronization (for twin engine propulsion only)
2. trolling

**By means of push button “Syn./Trol.” both features may be run parallel, but not at the same time.**

### 6.2.3.1 Speed synchronization ( for twin engine propulsion only )

After the special feature „speed synchronization“ has been released, within twin engine propulsion systems the speed of both engines may be synchronized. For the synchronization control a RPM-feedback signal by means of RPM pick-up is required.




Depressing the push button "Syn./Trol." will alternately set the option “synchronization” back and forth between synchronization and normal.
Engine speed synchronization can be activated or deactivated only, when both control head lever in command are in cruise position “Ahead” or the option “Warming-Up” is in operation. Turn off the synchronization mode before leaving the AHEAD range or warming-up mode
As long as the option is effective the LED 4 „SYNCHRO“ shows steady light.

As soon as one of both control heads is moved out of the range “Ahead” without having cancelled “synchronization” before, the control will do it automatically.
In this case the LED „SYNCHRO“ blinks quickly ( on 0,2 sec / off 0,2 sec) and a steady buzzer tone sounds at the station in command.

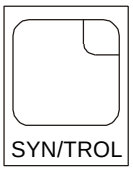
**(This is no failure alarm but a warning)**

To clear the warning condition, move one control head lever to "Neutral" position. As long as the warning is effective, the corresponding engine stays at idle speed.

In synchronization mode the engine of both engines can be controlled jointly only by the “Master” control head (see section „5.1.2 “Special feature Synchronization" / page 5-3). In case of a station transfer the activated “synchronization” function will be transferred also.

## 6.2.3.2 Trolling

After the special feature „trolling“ has been released, for a continuous clutch slip adjustment the trolling mode can be activated by means of the push button „Syn./Trol.“

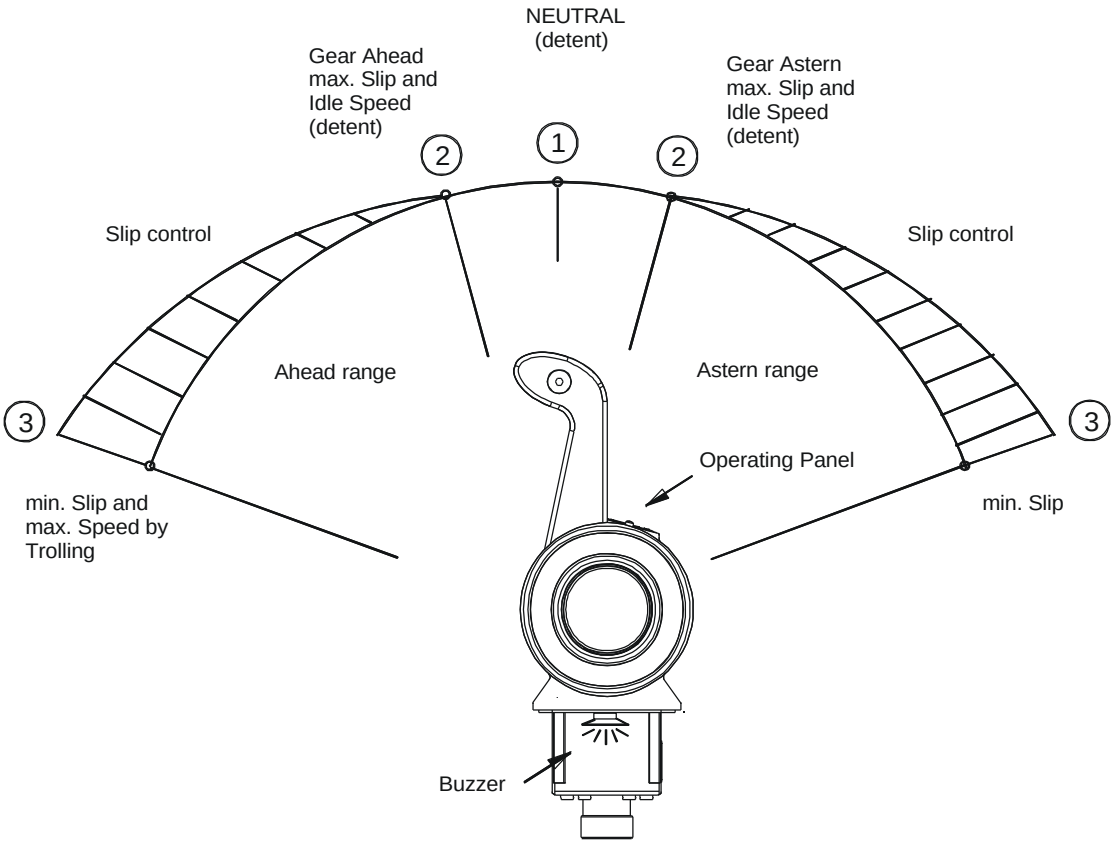



Depressing the push button "Syn./Trol." will alternately set the option “trolling” back and forth between trolling and normal.
Trolling can be activated or deactivated only, when the control head lever in command (both control head levers within twin engine propulsion) is in “Neutral” position. As long as the option is effective the LED 8 „Trolling“ shows steady light.

In case of a station transfer the activated “trolling” function will be transferred also.

**In trolling mode the control head functions will be changed compared to those in the standard reversing gear mode.**

The control head functions in trolling mode are described in the following.



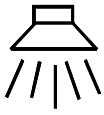
For switching into trolling mode the control head lever must be located in position ❶ „Neutral“ (detent). The engine is idling and the gear is in NEUTRAL.
As soon as the trolling mode is activated, the clutch will be set to maximum slip while the engine is still idling and the gear remains in NEUTRAL.

After moving the control head lever into position ❷ “Gear AHEAD / Astern” (detent) the gear is shifted to “Ahead” or “Astern”. Because of maximum clutch slip (100% slip) the propeller shaft stands still or rotates very slowly only while the engine is still idling.

After moving the control head lever forward to the direction of position ❸ the clutch slip decreases continuously and the engine speed increases at the same time.

In position ❸ the clutch slip is at minimum (0% slip / non-positive drive) and the engine speed has reached the adjusted ”full speed in trolling mode“.

## 6.2.4 Buzzer

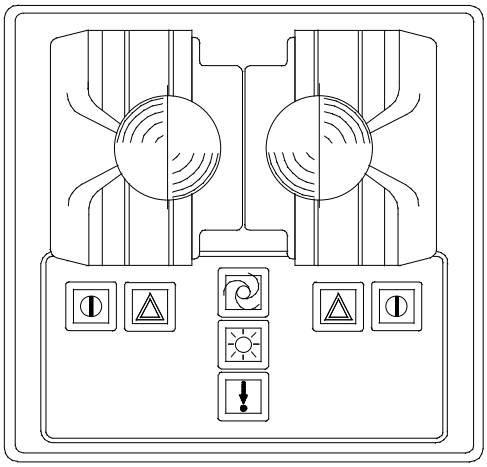


One buzzer for each control is located underneath the control head (one for Port and one for Starboard).
The buzzer supports the visual indicating of transmitter lighting and alarm lamp by acoustic tones. Also each time the transmitter has taken up „Neutral“ position it indicates it with a short „beep“. If the "Warming up" option has been called up, a short "double beep"-tone is produced.

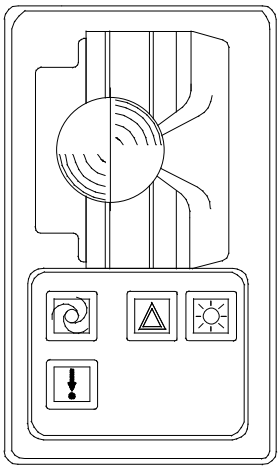
## 6.2.5 Indicator light „Command L2 and L3“


Steady indicator light „Command“ shows which control head has the command at a time. The indicator light „Command“ at the other remote stations is OFF. The indicator light „Command“ blinks when station transfer is requested. If the control head is in "Warming up" mode, this is indicated by means of a short-termed rhythmical extinguishing of the indicator light „Command“.
The indicator light „Command“ is provided for each control (one for Port and one for Starboard).

## 6.3 Control Panel



Twin Engine Control Panel



Single Engine Control Panel

### 6.3.1 Push Button „Station Transfer“ **( lighted button -white- )**

The push button „station transfer“ is located at each control panel only once, even for twin engine systems. The push button is lighted permanently and indicates that the control is power supplied. The push button is used for the control transfer to other stations. The procedure of take over command and station transfer is described on page 48 up. Apart from this the push button has two additional functions.

#### 6.3.1.1 Feature „Warming Up"

This option allows warming up a cold engine by speed setting through the total speed range without engaging the clutch in lever position ❷.

**Activate “Warming Up” option:**

The “Warming Up” option can be activated with the transmitter in command and with the lever in “Neutral ❶ ” position only.

1. Move transmitter lever to position “❶ Neutral”.
2. Depress and hold down push button "Station Transfer".
3. Move transmitter lever into detent position “❷ Gear Ahead/Astern”
   "Warming UP" is indicated by means of a short „double beep“ tone and short-termed rhythmical extinguishing transmitter lighting
4. Release push button "Station Transfer".

The engine is idling while the clutch is remaining disengaged. Now the transmitter lever can be moved up to position “❸ Full speed” for speed setting through the total range between the positions ❷ and ❸.

Within twin engine propulsion systems each engine can be operated separately.

**Cancel “Warming Up” option:**

To exit „Warming up“, return the transmitter lever to position “❶ Neutral. The normal „beep“ tone indicates "Neutral-Position". The transmitter lighting changes to steady. The „Warming up“ feature is cancelled.

In “Warming Up” mode do not move the transmitter lever from Ahead to Astern or revers. The “Warming Up” mode would be cancelled, when the lever passes the position “❶ Neutral” and the opposite clutch would be engaged, when it gets to position “❷ Gear Ahead/Astern”.

## 6.3.1.2 Feature „Mute Acoustic Alarm“

The buzzer activated for some alarms may be switched off at the corresponding control panel by depressing push button "Station Transfer".

**The alarm will not be cleared by muting the buzzer!**

## 6.3.2 Push Button „Alarm / Lamp Test“ **( lighted button -red- )**

**Push button with two functions**

1. Alarm lamp:

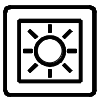
This indicating device is located at each control station, one for each control system, i.e. for twin engine systems two ( one for Port / one for Stbd. ).
In case of a failure the alarm lamp will show a red steady light .

After the control is turned ON, the alarm lamp also shows a steady light, but it is turned off after taking over control.

2. Lamp test:

for this function the push buttons has to be depressed permanently testing the transmitter lighting as well as all lighted lamps and push buttons of the operating panel. As soon as the button is released, the normal condition will appear.

## 6.3.3 Push Button „Dimmer“ **( lighted button -white- )**



By means of this push button it can be selected between a bright control panel lighting (day light) and a darker lighting ( night light / ½ brightness ). Depressing the dimmer button will alternately set the lighting back and forth between bright and dark.

| | | |
|---|---|---|
| Depress push button „Dimmer“ one time | ⇨ | night light |
| Depress push button again | ⇨ | day light |
| Depress push button again | ⇨ | night light |
| ect. | | |

In night light mode the brightness may be dimmed continuously.

Depress and hold down push button "Dimmer". The total range of brightness is run through. As soon as the wanted brightness shows up release the push button. If the control was switched off ( supply voltage was turned off ), the wanted brightness has to be adjusted again.

**Alarm lamp and buzzer are not affected by the dimmer.**

.

## 6.3.4 Push Button „Special Feature“ **( lighted button -yellow )**

By means of this push button released special features can be turned ON and OFF

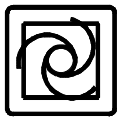
The following special features are available:

1. engine speed synchronization (for twin engine propulsion only)
2. trolling

**By means of push button “Special Feature” both features may be run parallel, but not at the same time.**

## 6.3.4. Speed synchronization ( for twin engine propulsion only )

After the special feature „speed synchronization“ has been released, within twin engine propulsion systems the speed of both engines may be synchronized. For the synchronization control a RPM-feedback signal by means of RPM pick-up is required.



Depressing the push button "Special Feature" will alternately set the option “synchronization” back and forth between synchronization and normal.
Engine speed synchronization can be activated or deactivated only, when both control head lever in command are in cruise position “Ahead” or the option “Warming-Up” is in operation. Turn off the synchronization mode before leaving the AHEAD range or warming-up mode
As long as the option is effective the push button blinks ( on 0,1 sec / off 0,1 sec).

As soon as one of both control heads is moved out of the range “Ahead” without having cancelled “synchronization” before, the control will do it automatically.
In this case the push button blinks quickly ( on 0,2 sec / off 0,2 sec) and a steady buzzer tone sounds at the station in command.

**(This is no failure alarm but a warning)**

To clear the warning condition, move one control head lever to "Neutral" position. As long as the warning is effective, the corresponding engine stays at idle speed.

In synchronization mode the engine of both engines can be controlled jointly only by the “Master” control head (see section „5.1.2 “Special feature Synchronization" / page 5-3). In case of a station transfer the activated “synchronization” function will be transferred also.

## 6.3.4.2 Trolling

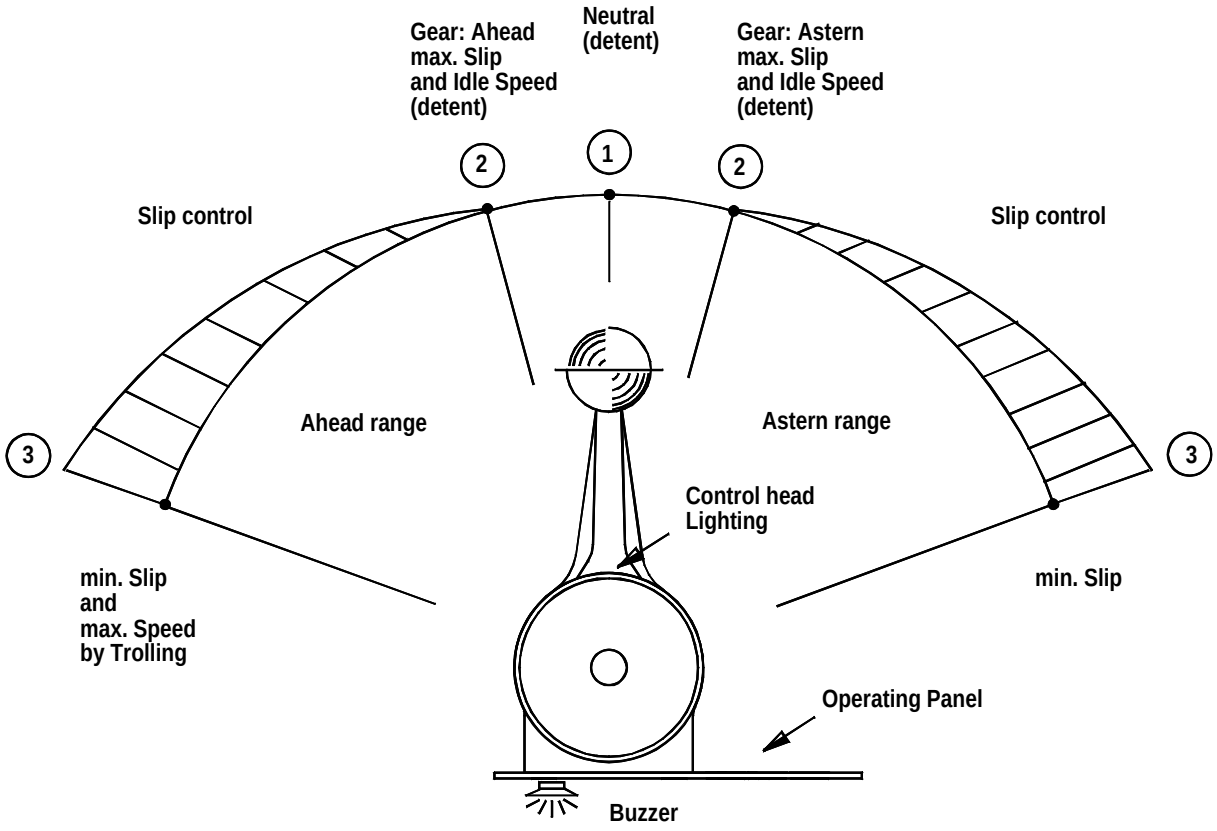
After the special feature „trolling“ has been released, for a continuous clutch slip adjustment the trolling mode can be activated by means of the push button „Special Feature“

Depressing the push button "Special Feature" will alternately set the option “trolling” back and forth between trolling and normal.
Trolling can be activated or deactivated only, when the control head lever in command (both control head levers within twin engine propulsion) is in “Neutral” position. As long as the option is effective the push button "Special Feature" shows steady light.

In case of a station transfer the activated “trolling” function will be transferred also.

**In trolling mode the control head functions will be changed compared to those in the standard reversing gear mode.**

The control head functions in trolling mode are described in the following.



For switching into trolling mode the control head lever must be located in position ❶ „Neutral“ (detent). The engine is idling and the gear is in NEUTRAL.
As soon as the trolling mode is activated, the clutch will be set to maximum slip while the engine is still idling and the gear remains in NEUTRAL.

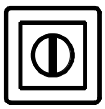
After moving the control head lever into position ❷ “Gear AHEAD / Astern” (detent) the gear is shifted to “Ahead” or “Astern”. Because of maximum clutch slip (100% slip) the propeller shaft stands still or rotates very slowly only while the engine is still idling.

After moving the control head lever forward to the direction of position ❸ the clutch slip decreases continuously and the engine speed increases at the same time.

In position ❸ the clutch slip is at minimum (0% slip / non-positive drive) and the engine speed has reached the adjusted ”full speed in trolling mode“.

## 6.3.5 Indicator Lamp „Remote Control ON“ **( green )**

For twin engine systems only



Two of these indicator lamps are included in control panels for twin engine propulsion systems, one for the Port control and one for Stbd. The indicator lamp shows that the corresponding control is ON. The lamp **does not** indicate which transmitter has the command at a time.

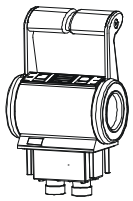
## 6.3.6 Buzzer

One buzzer for each control is located underneath the control panel ( one at single engine panels, at twin engine panels one for Port and one for Starboard).
The buzzer supports the visual indicating of transmitter lighting and alarm lamp by acoustic tones. Also each time the transmitter has taken up „Neutral“ position it indicates it with a short „beep“. If the "Warming up" option has been called up, a short "double beep"-tone is produced.

## 6.3.7 Transmitter Lighting ( green )

The transmitter lighting is carried out as a green point on the transmitter scale at „Neutral“.
Steady light indicates which transmitter has the command at a time. The transmitter lighting at the other station is OFF. The transmitter lighting blinks when station transfer is requested.
If the transmitter is in "Warming up" mode, this is indicated by means of a short-termed rhythmical extinguishing transmitter lighting.

## 6.4.1 Turning ON control (via control heads)



**1. Turn ON control**

Action: ➢Turn ON supply voltage

Folge: ➢Indicator lamp “Alarm” (red) shows steady light at all remote stations
➢Push button „Command” and „Syn./Trol shows steady light at all remote stations (visible at darkness only)
➢Buzzer sounds with low repetition at all remote stations

**2. Requesting control:**

Remote control may be requested at each remote station. The control head lever must be placed in „Neutral“ before.

**“Control head alignments and enable remote stations must have been carried out (section 4.5 page 4-21 up).**
Otherwise command can be taken at station 1 only.

Action: ➢Move control head lever to „Neutral“ .
➢Depress push button „Command“ once.

Result: ➢Indicator lamp „Alarm“ (red) remains steady at all stations.
➢Indicator “Command” blinks with high repetition
➢Buzzer sounds with high repetition at all stations.

If there is still a low repetition lighting and buzzer tone, mostly the control head lever is not placed in „Neutral“.

**3. Taking over control:**

Action: ➢Depress push button „Command“ a second time.

Result: ➢Indicator lamp „Alarm“ (red) at all stations is OFF.
➢Indicator lamp „Command“ at the control head in command shows steady light. Indicator lamps at all other control head are OFF
➢Buzzer tone at all station stops.

The control head with the lighted indicator lamp has the command now. The control is set into service.

## 6.4.2 Station Transfer

The control offers two options for station transfer ( **interlocked** or **free** ) to be selected by means of DIP-switch I-2 ( see page 4-4 ) on the actuator circuit board. Within twin engine systems **both controls must have** identical adjustments.

**"Control head alignments and enable remote stations must have been carried out (section 4.5 page 4-21 up).**
Otherwise station transfer is not possible.

## 6.4.2.1 Interlocked Station Transfer

The control compares the lever position of the control heads involved in the station transfer. To transfer the command from one station to another, the contol head **lever at the station gaining command** must be in „Neutral" position or placed facing in the same direction ( Ahead or Astern ) as the **lever at the station in command**.

The transfer proceeds in two steps.

**1. Step: Requesting for command**

Action:
- Move control head lever into the transfer position ( Neutral or same direction as lever in command).
- Depress push button „Command" once.

Result:
- Buzzer sounds with high repetition.
- Indicator light "Command" blinks with high repetition

The command now is requested at this new station and the control has released the take over of command shown by light and tone with high repetition.

If there is a low repetition lighting and tone, the station transfer will not be executed. In this case check that the control head levers are placed in the right position. Or there is a control failure.

**2. Step: Take over command**

Action:
- Depress push button „Command" one more time.

Result:
- Buzzer tone stops.
- Indicator light "Command" becomes steady.

The station transfer is completed. The command is given to this station.

## 6.4.2.2 Free Station Transfer

With this option, on request the station transfer takes place disregarding the lever positions of the transmitters involved. The transfer proceeds in one step only.

**Taking over command.**

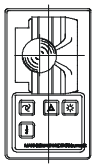
Action: ➢Depress push button „Command“ once.

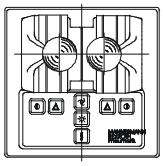
Result: Indicator light “Command” becomes steady immediately.

The station transfer is completed and the control **carries out immediately** the set lever position of the control head just has taken over the command.

**With this option carelessness may cause an unintentional crash reversal**
Example: The lever of the control head in command is in „Full Ahead“ position, whereas the lever of the control head gaining command is in „Full Astern“ position. In case of a station transfer now an immediate straight reversing maneuver would take place.

## 6.5.1 Turning ON control (via control panel)





**1. Turn ON control**

Action: ➢Turn ON supply voltage

Result: ➢Indicator lamp „Alarm“ (red) shows steady light at all stations.
➢Push button „station transfer“ (white) shows steady light at all stations.
➢Buzzer sounds with low repetition at all stations.
➢For twin engine systems only: indicator lamp „Remote Control ON“ (green) shows steady light at all stations.

**2. Requesting control:**

Remote control may be requested at each remote station. The control head lever must be placed in „Neutral“ before.

**“Control head alignments and enable remote stations must have been carried out (section 4.5 page 4-21 up).**
Otherwise command can be taken at station 1 only.

Action: ➢Move control head lever to „Neutral“ .
➢Depress push button „station transfer“ (white) once.

Result: ➢Indicator lamp „Alarm“ (red) remains steady at all stations.
➢Push button „station transfer“ (white) shows steady light at all stations.
➢Buzzer sounds with high repetition at all stations.
➢For twin engine systems only: indicator lamp „Remote Control ON“ (green) shows steady light at all stations.
➢Transmitter lighting (green) blinks with high repetition.

If there is still a low repetition lighting and buzzer tone, mostly the control head lever is not placed in „Neutral“.

**3. Taking over control:**

Action: ➢Depress push button „station transfer“ (white) a second time.

Result: ➢Indicator lamp „Alarm“ (red) at all stations is OFF.
➢Push button „station transfer“ (white) shows steady light.
➢Buzzer tone at all station stops.
➢For twin engine systems only: indicator lamp „Remote Control ON“ (green) shows steady light at all stations.
➢Lighting (green) of control head in command becomes steady. The lighting of all the other control heads is OFF

The lighted control head now has the command. The control is set into service.

## 6.5.2 Station Transfer

The control offers two options for station transfer ( **interlocked** or **free** ) to be selected by means of DIP-switch I-2 ( see page 4-4 ) on the actuator circuit board. Within twin engine systems both controls **must have** identical adjustments.

**"Control head alignments and enable remote stations must have been carried out (section 4.5 page 4-21 up).**
Otherwise station transfer is not possible.

## 6.5.2.1 Interlocked Station Transfer

The control compares the lever position of the control heads involved in the station transfer. To transfer the command from one station to another, the control head **lever at the station gaining command** must be in „Neutral" position or placed facing in the same direction ( Ahead or Astern ) as the **lever at the station in command**.

The transfer proceeds in two steps.

**1. Step: Requesting for command**

Action:
- Move control head lever into the transfer position ( Neutral or same direction as lever in command).
- Depress push button „Station transfer" (white) once.

Result:
- Buzzer sounds with high repetition.
- Control head lighting blinks with high repetition

The command now is requested at this new station and the control has released the take over of command shown by light and tone with high repetition.

If there is a low repetition lighting and tone, the station transfer will not be executed. In this case check that the control head levers are placed in the right position. Or there is a control failure.

**2. Step: Take over command**

Action:
- Depress push button „station transfer" (white) one more time.

Result:
- Buzzer tone stops.
- Control head lighting becomes steady.

The station transfer is completed. The lighted transmitter has the command.

## 6.5.2.2 Free Station Transfer

With this option, on request the station transfer takes place disregarding the lever positions of the control heads involved. The transfer proceeds in one step only.

**Taking over command.**

Action: ➢Depress push button „Station transfer“ (white) once.

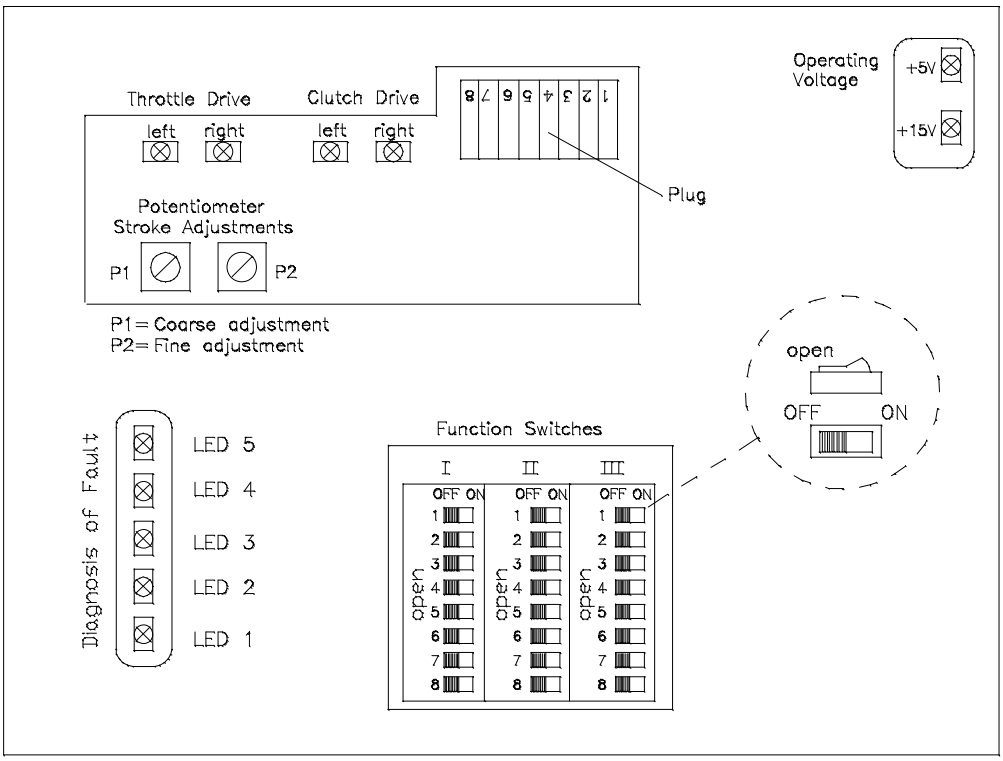
Result: Control head lighting becomes steady immediately.

The station transfer is completed and the control **carries out immediately** the set lever position of the control head just has taken over the command.

**With this option carelessness may cause an unintentional crash reversal**
Example: The lever of the control head in command is in „Full Ahead“ position, whereas the lever of the control head gaining command is in „Full Astern“ position. In case of a station transfer now an immediate straight reversing maneuver would take place.

# 7.1 Fault Code

The Mini-Marex control comprises an extensive fault analysis program for identification, evaluation, and indication of faults. A fault realised by the control is indicated via the alarm lamp at the station in command. In some cases the visual alarm is supported by means of the buzzer.
The type of fault is indicated by five (5) LED's arranged on the circuit board which is located inside the actuator cover. They are visible through a cut-out in the circuit board's protective plate, after the actuator has been opened. The exact location of the LED's is shown in the figure below.




Via the LED's all faults realised by the control are indicated as fault No. in binary code. The table below assists converting the binary code into decimal fault Nos.

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Valence | 1 | 2 | 4 | 8 | 16 |

To each LED a definite valence is assigned, the valence sum of the lighted LED's results in the fault No.

**Examples:**

LED 1 and LED 4 are ON
1 (valence of LED 1) + 8 (valence of LED 4) = 9 (fault No.)

LED 2, LED 3 and LED 5 are ON
2 (valence of LED 2) + 4 (valence of LED 3) + 16 (valence of LED 5) = 22 (fault No.)

The fault indication is active only as long as the fault condition lasts. As soon as the fault is cleared the LED will be OFF. The possible cause of fault then can't be recalled any more.

All faults the Mini-Marex control is able to realise are described on the following pages in the order of their fault Nos.
In case several faults arise at the same time, always the fault with the highest fault No. is indicated, until all faults have been cleared.
The buzzer activated by some alarm reports may be stopped by pushing the „station transfer“ button at the corresponding control station. But because of this the alarm is not cancelled.

**Fault-No. 1:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ○ | ○ |

alarm lamp: steady light

Cause of fault: exceeded range of voltage
supply voltage out of range 8,4...31,2 Volts, DC

Delay: alarm ON: 1sec. / alarm OFF: 0.5sec.

Fault exit: correct supply voltage

**Fault-No. 2:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ○ | ○ |

alarm lamp: steady light

Cause of fault: when turning ON control, DIP-switch I-6 is set in ON position (terminal input)

Consequence: no intercommunication via serial interface within twin engine systems;
both controls operate separately;
maneuvering is possible

Delay: none

Fault exit: set DIP-switch I-6 in OFF position (operation)

**Fault-No. 3:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ○ | ○ |

alarm lamp: steady light

Cause of fault: programming fault:
for the wanted adjustment switch settings III-3 to III-8 inadmissible, or when turning ON control, switch III-1 is set in ON position (adjustment mode)

Consequence: value input is not possible

Delay: none

Fault exit: set DIP-switch III-1 in OFF position (operation);
check switch positions and correct, repeat programming

**Fault-No. 4:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ○ | ○ |

alarm lamp: steady light
button„special feature“ or LED “Synchro” blinks quickly
( on 0,2 sec / off 0,2 sec )

Cause of fault: in synchronization mode speed range has been exceeded:
sensored speed not within control’s admissible frequency range
possible causes: RPM pick-up doesn’t fulfil requirements; contact fault at cable plugs; wire break; defective actuator

Consequence: synchronization is cancelled, both engines follow speed setting of master transmitter, active speed control (synchronization) is not possible any more

Delay: alarm ON: 1sec / alarm OFF 1.5sec

Fault exit switch OFF synchronization, correct cause of fault

**Fault-No. 5:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ○ | ○ |

alarm lamp: steady light
buzzer: steady tone
transmitter lighting or indicator light “Command” blinks with low repetition

Cause of fault: station gaining command is defective or wire break at station gaining command:
possible causes: defective potentiometer or micro switch; pot value doesn’t match with switch signal; contact fault at plugs; wire break or short circuit at control station, connecting cable, or actuator.

Consequence: station transfer is not possible; station in command keeps control.

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: after approx. 30sec requesting the command is cancelled and following fault indication automatically is cleared;
correct cause of fault.

**Fault-No. 6:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ✸ | ○ | ○ |

alarm lamp: steady light

Cause of fault: poor storage of programming

Consequence: new adjusted value can’t be stored in memory of control unit;
prior value remains valid

Delay: none

Fault exit: set DIP-switch III-1 in OFF position (operation); repeat programming

**Fault-No. 7:**

**Actuator Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ✸ | ○ | ○ |

**Control Station Indication**

Buzzer: steady tone
LED “Synchro” “ blinks quickly ( on 0,2 sec / off 0,2 sec)

Cause of fault: unusual ending of synchronization
a) caused by moving control head lever out of „Ahead“ or „Warming-Up“ range without switching off synchronization mode
b) second control has realised a fault

Consequence: a) speed is set to idle
b) both controls react corresponding to the realised fault

Delay: none

Fault exit: move control head lever in command to „Neutral“;
correct causeof fault

**Fault-No. 8:**

**Actuator Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ○ | ✸ | ○ |

**Control Station Indication**

alarm lamp: steady light

Cause of fault: wire break or short circuit at intercommunication cable between the actuators:
possible cause: contact fault at plugs; wire break or short circuit at connection cable or at one of the two actuators

Consequence: synchronization OFF; avoiding unforced speed variation fault No.7 is set, if synchronization was activated before,
maneuvering is still possible; both controls operate separately

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: correct cause of fault

**Fault-No. 9:**

**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ✸ | ○ |

alarm lamp: steady light
buzzer: steady tone

Cause of fault: plausibility fault within twin engine systems:
possible cause: different type of actuators are applied for Port and Starboard;
false Master / Slave adjustment (DIP-switch I-1);
different adjustment for mode of station transfer (DIP-switch I-2);
different adjustment of DIP-switch II-8

Consequence: synchronization OFF; speed runs to idle or stays idling; gear can be shifted to „Neutral“ one time only or can’t be moved out of „Neutral“; station transfer is not possible

Delay: none

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 10**

**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ✸ | ○ |

alarm lamp: steady light
buzzer: steady tone

Cause of fault: potentiometer fault at station in command:
possible cause: defective potentiometer; contact fault at plugs; wire break or short circuit at station in command, connection cable, or actuator

Consequence: synchronization OFF; speed runs to idle or stays idling; gear can be shifted to „Neutral“ one time only

Delay: none

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 11**

**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ✸ | ○ |

alarm lamp: steady light
buzzer: steady tone

Cause of fault: potentiometer fault at station in command:
analogue value doesn’t match with Stop signal of micro switch.
possible cause: potentiometer defective or misadjusted; contact fault at plugs, connection cable, or actuator

Consequence: speed stays idling; gear can’t be shifted out of „Neutral“
maneuvering is not possible.

Delay: Alarm ON 1sec / Alarm OFF 1.5sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault.

**Fault-No. 12**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at potentiometer for RPM feed back

Consequence: synchronization OFF; speed runs to the mechanical stop at idle position (speed crash maneuver); gear can be shifted

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 13**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at potentiometer for clutch feed back

Consequence: synchronization OFF; speed runs to idle position; gear can’t be shifted any more

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 14**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: false feed back from interface circuit board used for electrical gear shifting: possible cause: gear doesn’t shift; pressure switch defective or not connected (but activated from interface board); contact fault at connector plugs; wire break or short circuit between actuator and gear switches; defective interface board or defective ICs on main circuit board

Consequence: synchronization OFF; if synchronization was active before, for the slave control fault No. 7 is set additionally, but the set speed remains.

Delay: Alarm ON: 4s / Alarm OFF: 2s
By means of special terminal inputs the delay times can be brought into the range from 0 sec to 15 sec.

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 15**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at interface circuit board used for electrcal gear shifting
possible cause: wire break or short circuit between gear interface board and main board of the control

Consequence: synchronization OFF; if synchronization was active before, for the slave control fault No. 7 is set additionally, but the set speed remains.

Delay: Alarm ON: 1sec / Alarm OFF: 1.5 sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 16**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of throttle drive in one direction:
possible cause: jam or heavy moving of throttle lever, push-pull cable, or actuator drive; defective ICs on electronic board

Consequence: control synchronization OFF; if synchronization was activated before, for the slave fault No.7 is set granting speed setting only, after the control head lever has been brought to „Neutral“;
speed variation into the blocked direction is not possible;
gear can be shifted

Delay: none

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 17**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of gear shift drive in one direction:
possible cause: jam or heavy going of gear shift lever, push-pull cable, or actuator drive; defective ICs on electronic board

Consequence: synchronization OFF;
speed runs to idle; gear shifting into the direction not blocked is possible

Delay: none

Fault exit: operate gear shift lever into direction not blocked;
correct cause of fault

**Fault-No. 18**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of throttle drive in both directions:
possible cause: jam or heavy going of throttle lever, push-pull cable, or actuator drive; defective ICs on electronic board

Consequence: speed setting is not possible any more; gear can be shifted one time to „Neutral“

Delay: none

Fault exit: locate defect and correct ; initiate control again

**Fault-No. 19**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of gear shift drive in both directions:
possible cause: jam or heavy going of gear shift lever, push-pull cable, or actuator drive; defective ICs on electronic board

Consequence: speed runs to idle; gear shifting is not possible any more

Delay: none

Fault exit: locate defect and correct ; initiate control again

**Fault-No. 20**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: false gear operation has been adjusted
although actuator has solenoid operated gear shifting device, DIP-switch I-5 is set in OFF position (mechanical gear shifting)

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: set DIP-switch I-5 in ON position (electrical operated); initiate control again

**Fault-No. 21**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: DC motor control failure:
possible cause: hardware failure or short circuit in motor control; blown fuse protecting the actuator

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct defect and initiate control again

**Fault-No. 22**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: inadmissible software modification in EEPROM

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct fault and initiate control again

**Fault-No. 23**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: sum check fault in EEPROM
e.g. unusual ending of control head alignment

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: set DIP-switch I-7 in ON position (control head alignment), afterwards in OFF position (operation) again; sum check now is corrected; the control acts like after a new initiation

**Fault-No. 24**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: functions of EEPROM and EPROM don't match

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: apply matching EEPROM and EPROM and initiate control again

**Fault-No. 25**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: EEPROM is not installed or false version

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: apply matching EEPROM and EPROM and initiate control again

**Fault-No. 26**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: defective external RAM

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct fault and initiate control again

**Fault-No. 27**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: defective EPROM

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct fault and initiate control again

**Fault-No. 28**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: defective watchdog

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct defect and initiate control again

**Fault-No. 29**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ✸ | ✸ |

alarm lamp: steady light

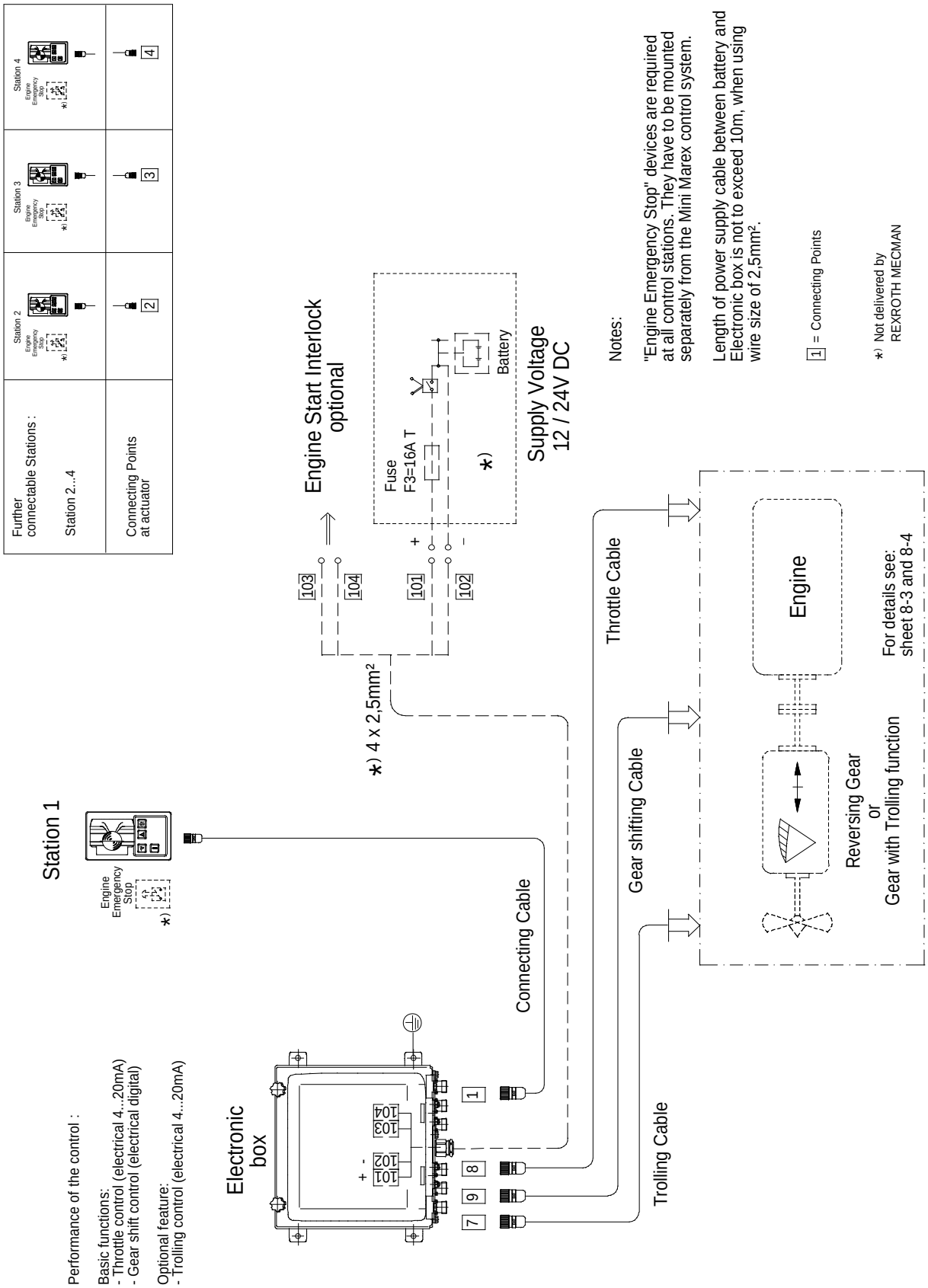
Cause of fault: internal fault (defective CPU or defective internal RAM)

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

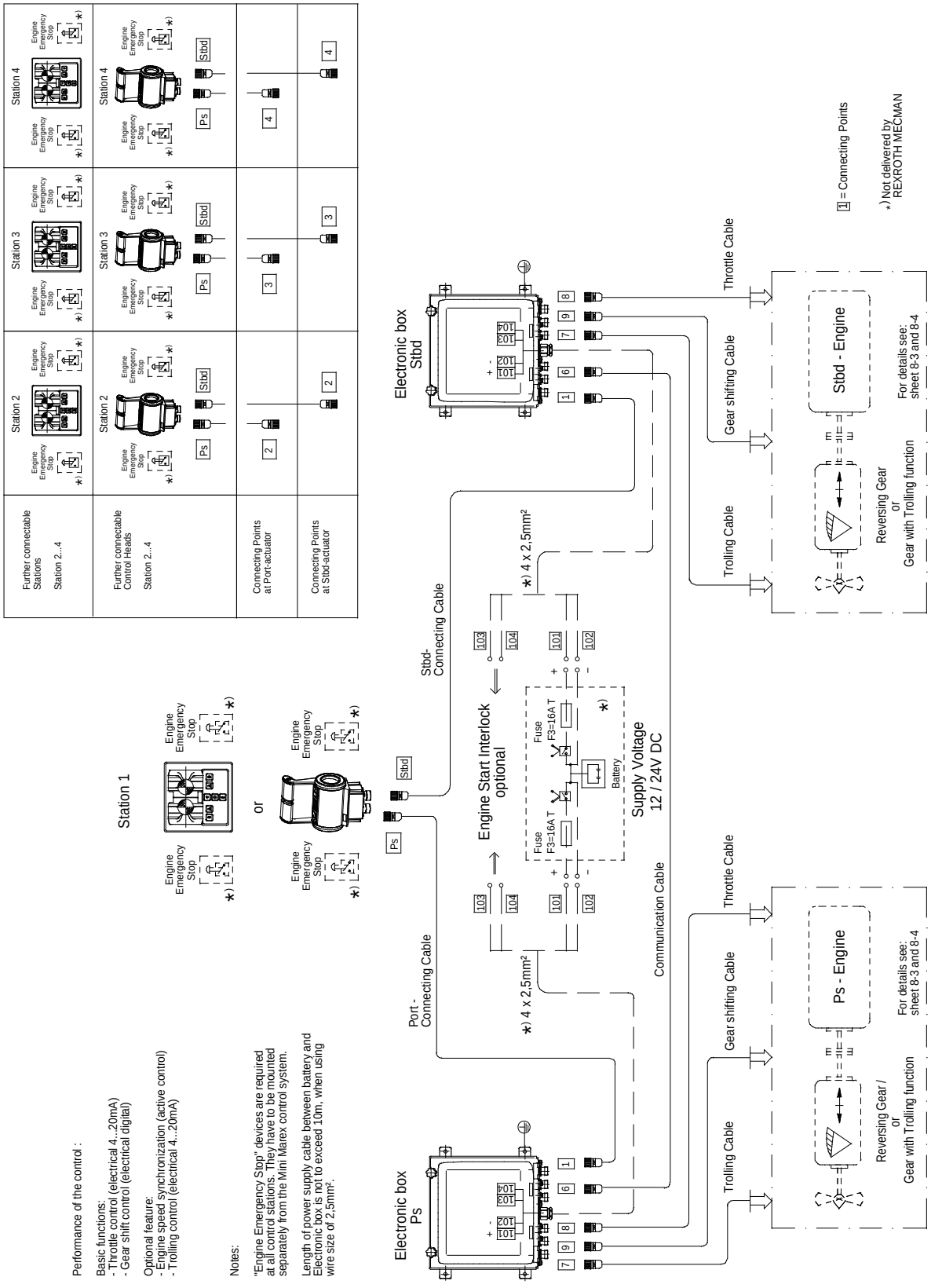
Delay: none

Fault exit: locate defect and correct; initiate control again

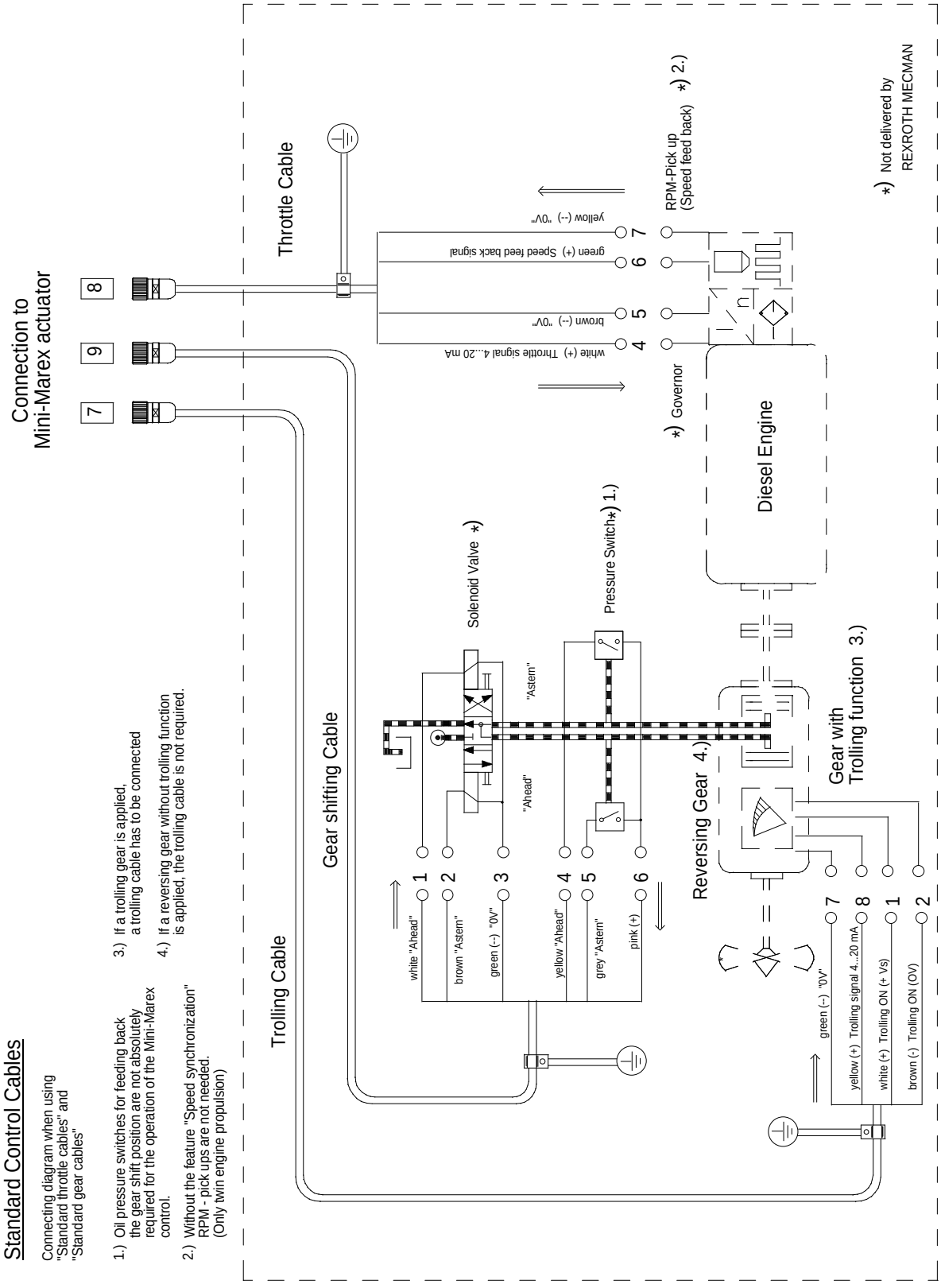
# 8.1 Single Engine Propulsion



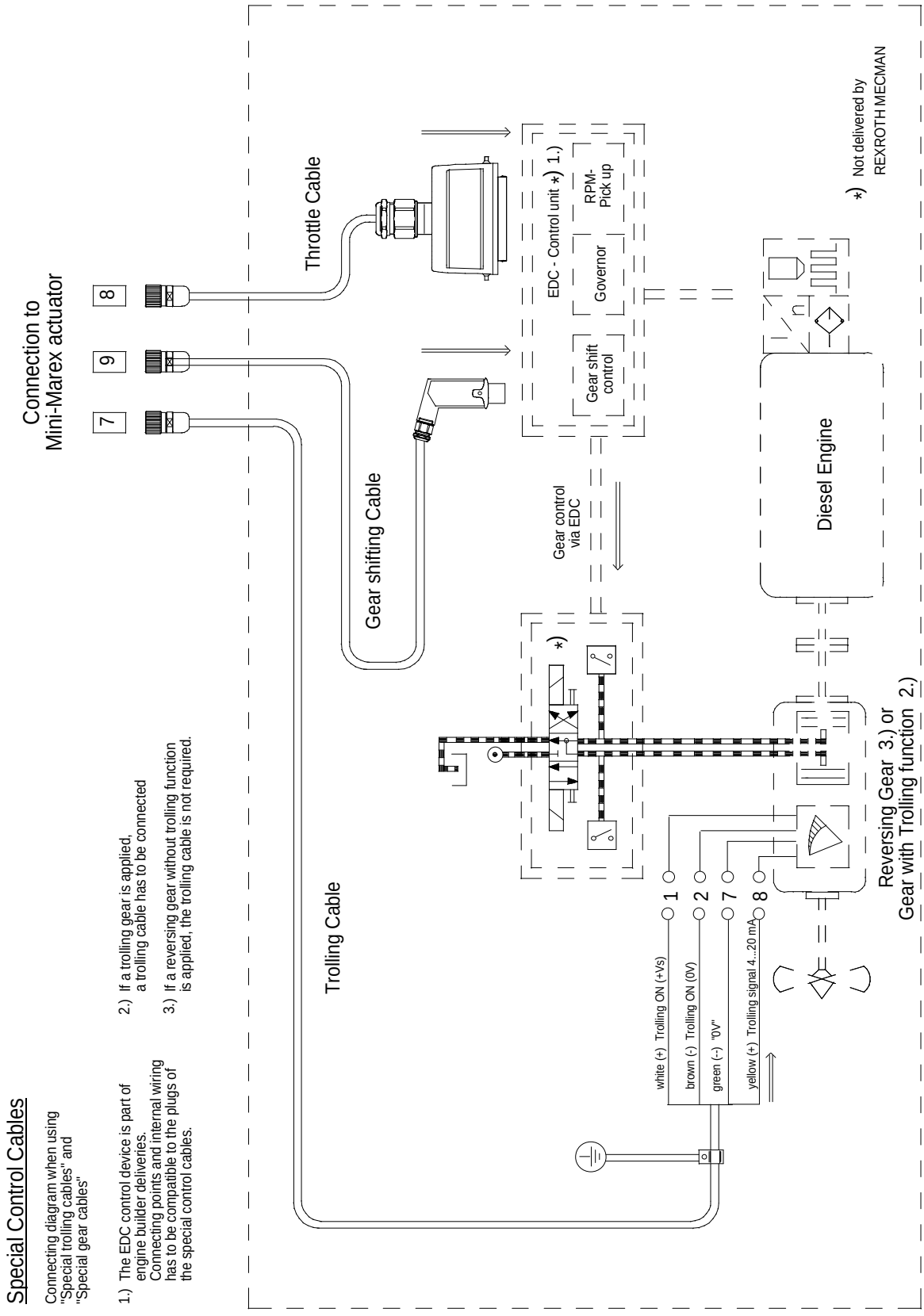
## 8.2 Twin Engine Propulsion



## 8.3 Connection with Standard Control Cables



## 8.4 Connection with Special Control Cables



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Order no. 883 890 039 3 / 02.2000

# User’s Manual

## Mini-Marex-System

For systems with actuator

323 699 448 0

## Imprint:



The diagrams and drawings used in this manual are for guidelines only and are not to be used for the actual design.



Order No.: 883 890 068 3 / 01.2002

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## 1.1 Explanation of: Symbols and Signs

Some passages within this user's manual are marked with symbols opposite. To these passages attention has to be paid in particular.

This sign is to be found where there is potential danger to safety, operating and function of the control system which could affect the safety of the ship and its crew.

This sign is to be found where special advice and tips are given to the system operator.

## 1.2 Safety Instructions:

Before installing and testing the system, the following instructions must be strictly observed.

Non-observance will cause the loss of any warranty claims on Rexroth Mecman GmbH.

The control system and its components have to be installed and put into service in accordance with the instructions of this user's manual only.

The system is designed for the control of Diesel engines. If gas engines are applied, the system components must be located away from areas with danger of explosion. The regulations regarding dangerous explosive areas have to be followed.

For operating the remote control, a separate 'emergency stop'-push-button at each station is an absolute requirement.

Cables belonging to the system and in accordance with the instructions of this user's manual may be used only.

The power supply has to be turned OFF before installation work is started. In this case, the supply voltage has to be secured against turning ON again.

During operation, prevention against reaching inside the actuator and putting in objects has to be provided, there is an injury danger.

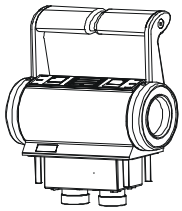
The supply voltage must correspond to the details on the type plates of actuator and supply unit.

The admissible cable length between battery and supply unit must not exceed 10 m if wire size 2.5mm² is used.

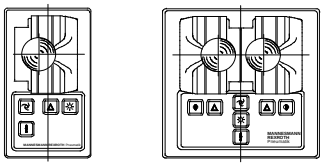
## 1.3 System set-up

The Mini-Marex-System has been designed for electrical / mechanical speed setting and gear control of marine Diesel propulsion engines with reversing gears. It is applied mainly on pleasure boats, yachts and small workboats.

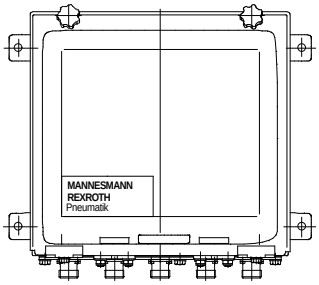
The system consists of the following pre-assembled components:



Elegant control head for twin-engine propulsion systems including all necessary components such as indicators and keys.

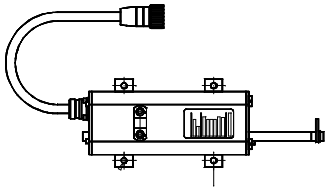


Operating panels for single or twin-engine-systems including all necessary components such as control heads, indicating lamps, keys and dimmer.

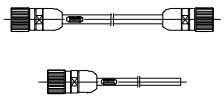



Actuator with integrated electronics to control speed and gearing electrically for all logical operations. Up to 4 control stations connectable.

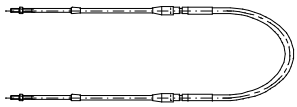
Optional features:
Active speed synchronisation for twin-engine propulsion systems and / or electrical slip control for trolling gears.



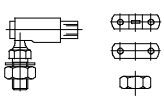
Actuator for mechanical speed setting and gear shifting



Connecting and supply cables for easy connection of the system components



Push-/Pull-cables for mechanical speed setting and gear shifting



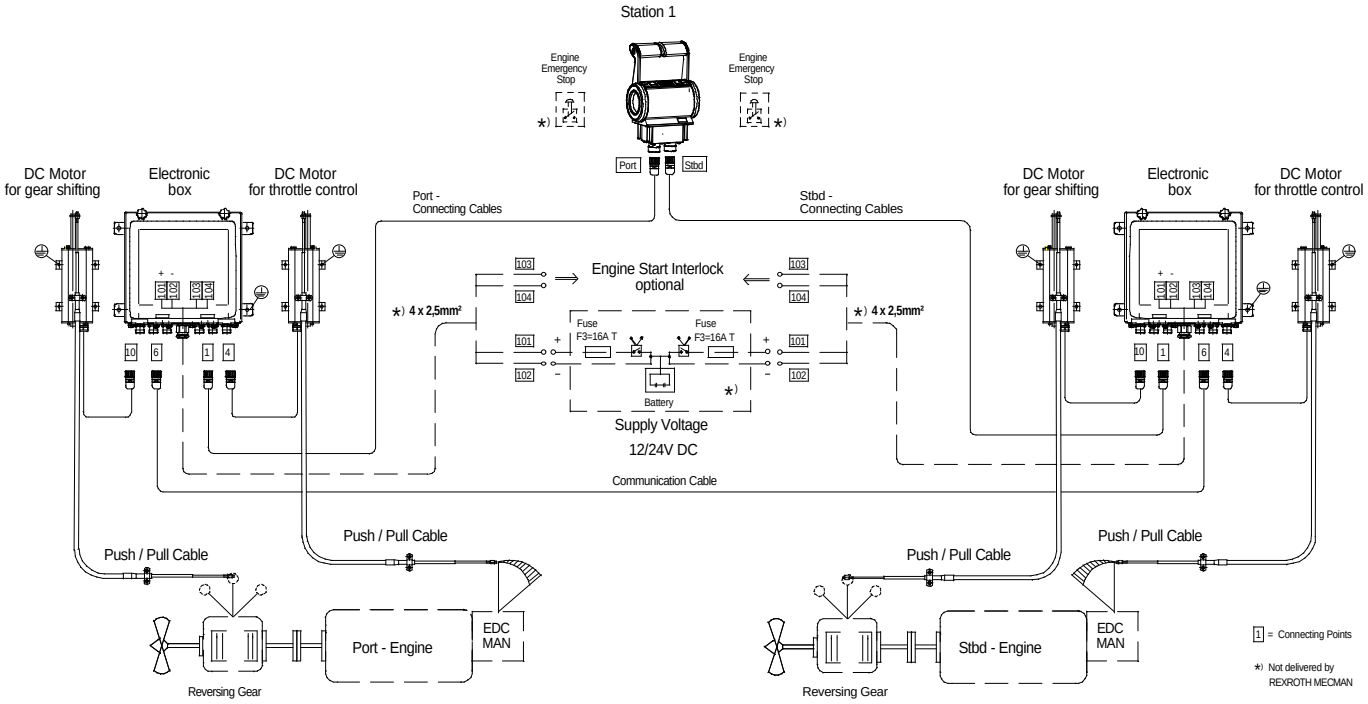
Mounting kit to connect the push-/pull-cable (socket joint, hexagon nut, clamp and sheet metal). One mounting kit is required for every push-/pull-cable.

For command setting, the control head shown above or one of the control panels may be applied alternatively.

The following block diagram shows **by way of example** a basic configuration of a twin engine system with one control station (mechanical engine control and gear shifting / no special functions).

The system components and the way the cables are connected are clearly visible.

For further block diagrams see section 8 'Block Diagrams'.




A separate 'Engine Emergency Stop'-device for each engine must be provided at each control station.

The admissible length of the power supply cable between battery and actuator must not exceed 10 m if wire size 2.5mm² is used.

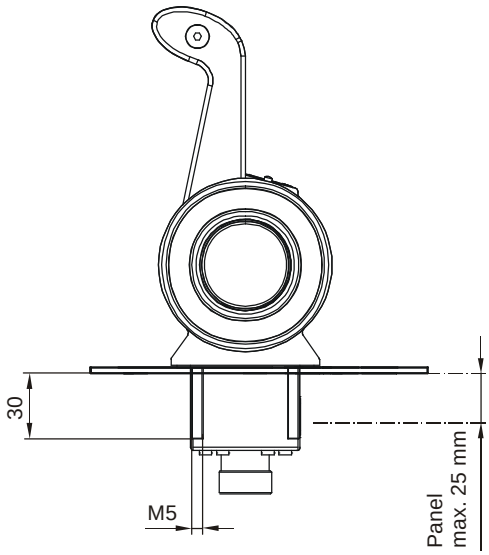
## 2.1 Control head

When mounting the control head, enough space must be provided below the console to plug the electrical cables for the control stations. After being connected, the cables must be strain relieved by the shipyard.

The corresponding panel cut-out is shown overleaf.

The control head is mounted on the console surface by hexagon nuts M5 and flat washers included.

For the installation of the control head, the mounting surface must not exceed 25 mm thickness.

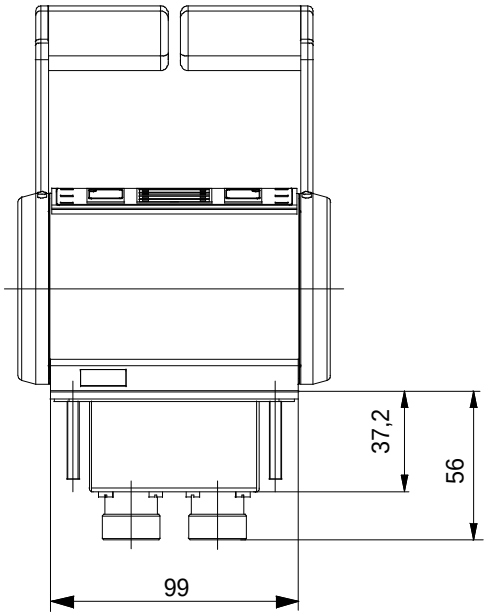


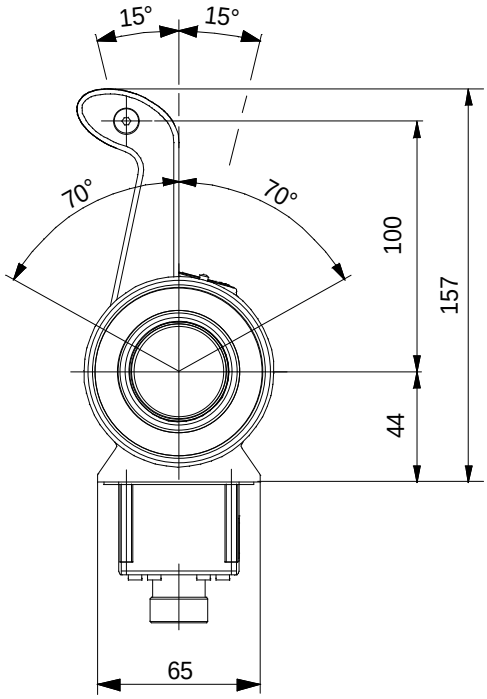

To prevent water penetrating between console surface and control head, a circulating form seal is fixed on the underside of the control panel.

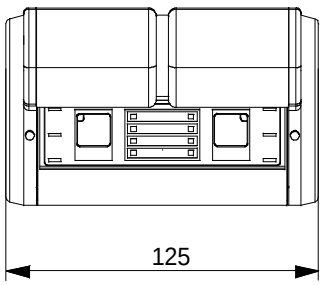
Check the form seal for damage and take care for a proper sealing between console and control head, especially on exterior control stations.
**Protection IP 66 above and below the console panel**.

## 2.1.1 Outline dimensions

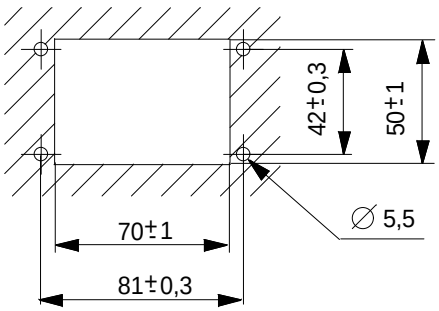
Control head for
Twin Engine Propulsion




Panel Cut-out



## 2.2 Control panel

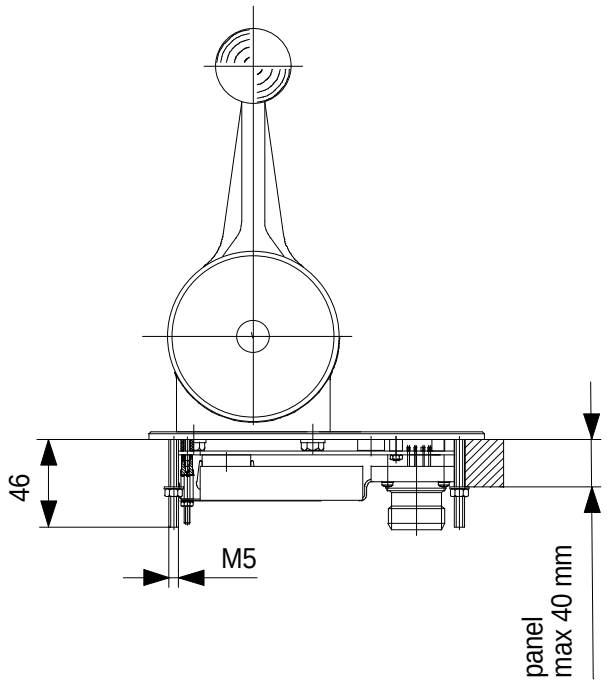
When mounting the control panel, enough space must be provided below the console to plug the electrical cables for the control stations. After being connected, the cables must be strain relieved by the shipyard.

The corresponding panel cut-out is shown overleaf.

The control panel is mounted on the console surface by the hexagon nuts M5 and flat washers included.

The electronic board of the control panel must be protected from contact with other parts below the console. Otherwise **damages** to the circuit board or **malfunctions may cause**.

For the installation of the control panel the mounting surface must not exceed 40 mm thickness.
If the mounting surface is less than 12 mm thick, the enclosed intermediate pieces are to be used to prevent damages to the electronic board during installation.



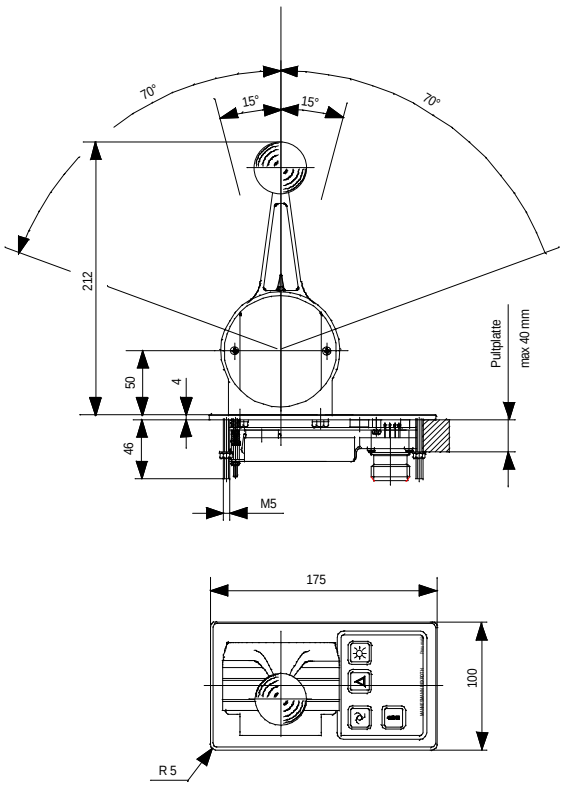

To prevent water penetrating between console surface and control head, a circulating form seal is fixed on the underside of the control panel.

Check the form seal for damage and take care for a proper sealing between console and control panel, especially on exterior control stations.
**Protection IP 66 above console panel**.

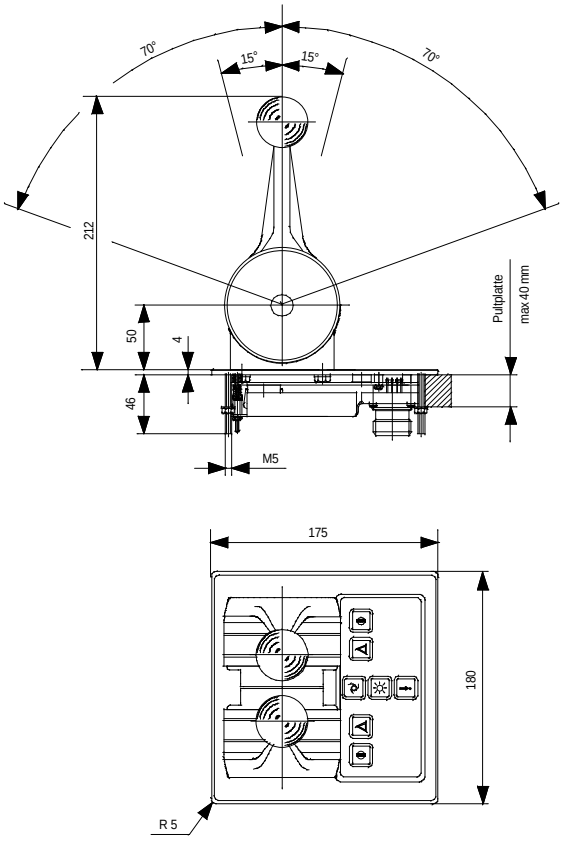
Penetration of water may cause failures and can destroy electronic components.

## 2.2.1 Outline Dimensions

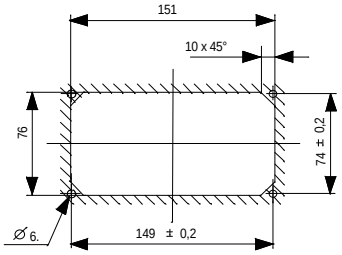
**Control Panel for Single Engine Propulsion:**



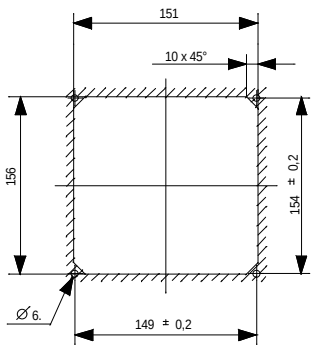

**Control Panel for Twin Engine Propulsion:**




**Panel cut out:**



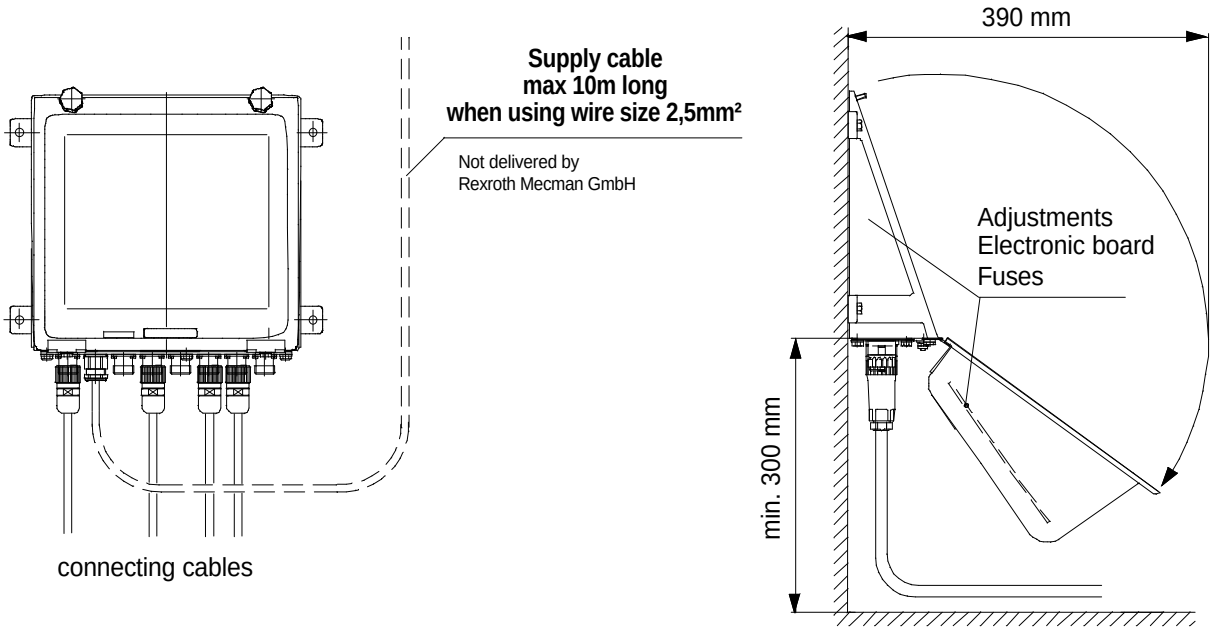

**Panel cut out:**



## 2.3 Actuator

The actuator and supply unit are fastened with 4 screws M8 each. Mounting holes and outline dimensions of the actuator are shown in the drawing overleaf. Bulkhead mounting with the cable connections and push-/pull-cables directed downwards is preferred according to the drawing below.

The devices should be installed in the engine room avoiding vibration as far as possible. Also, they should be located away from direct engine heat (admissible temperature range 248 K ... 333 K corresponding to –25° C...+ 60° C).



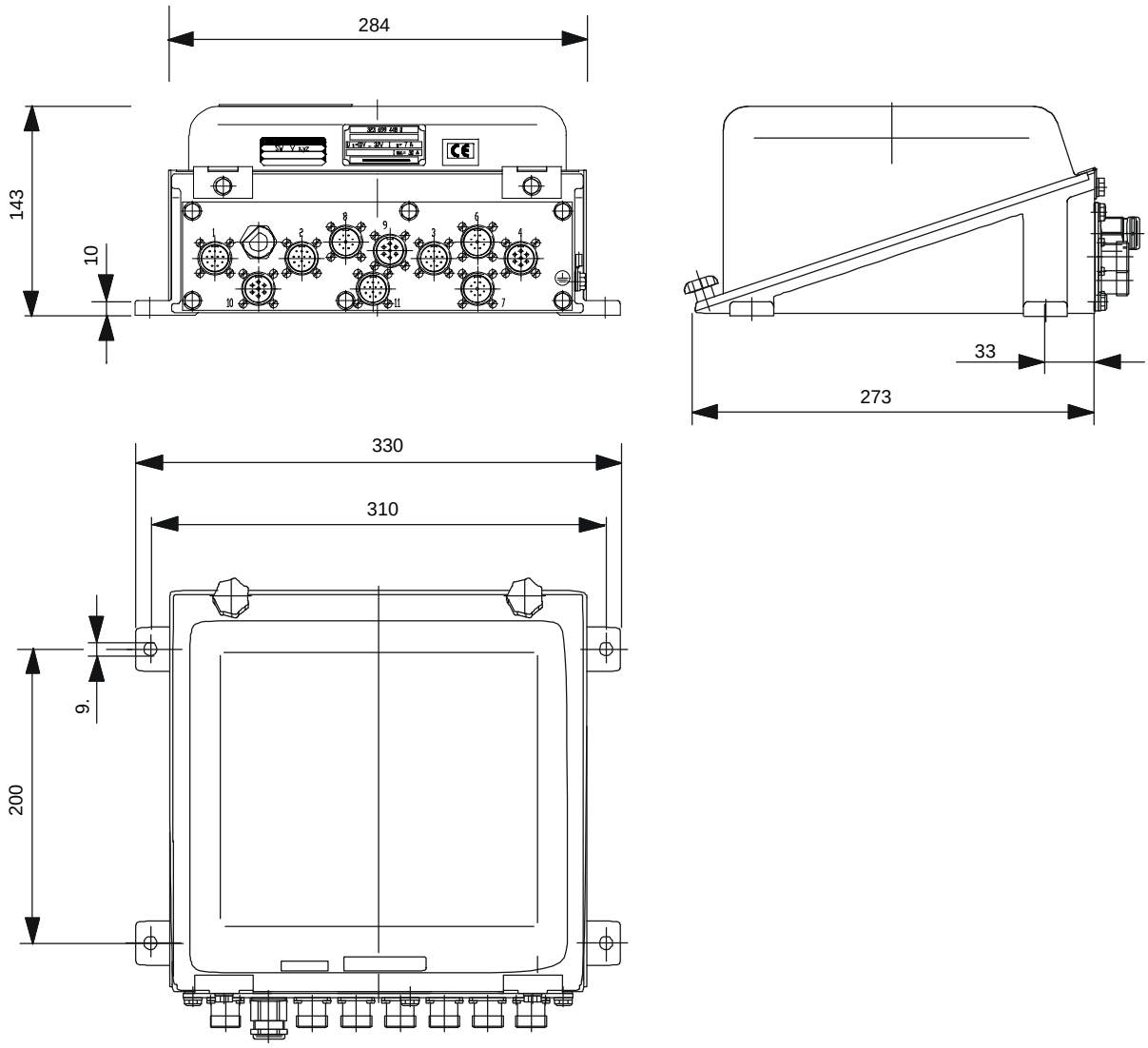

Provide sufficient space to be accessible for the electrical cable installations.
After mounting the actuator, the cover has to open completely. For the control set-up or adjustment modifications, all devices for adjustments placed on the electronic board have to be accessible without restriction.

Fuses placed on filter and interface board inside the actuator have to be accessible as well.

The actuator unit is designed for the control of Diesel engines. If gas engine propulsion systems are used, locate the components outside the explosive area. The regulations regarding explosive areas have to be followed.

## 2.3.1 Outline Dimensions

The actuator has to be fastened by means of four (4) mounting screws M8.



## 3.1 Grounding

The actuator has to be grounded according to the conditions on-the-spot.

The actuator has to be grounded directly to one of the four mounting screws of each device. If a direct grounding (connection to the ship's mass) is not possible, the grounding has to be carried out by means of flexible earth leads or earth strips (see tables below).

Dimensioning of flexible earth leads

| length up to | size |
|---|---|
| 50 mm | 6 mm² |
| 100 mm | 10 mm² |
| 150 mm | 25 mm² |
| 200 mm | 70 mm² |

Dimensioning of earth strips (0.2 mm or thicker)

| length up to | size |
|---|---|
| 100 mm | 20 mm |
| 200 mm | 50 mm |
| 300 mm | 75 mm |
| 500 mm | 125 mm |

The above said goes also for data cables especially marked in the operating manual and diagrams.

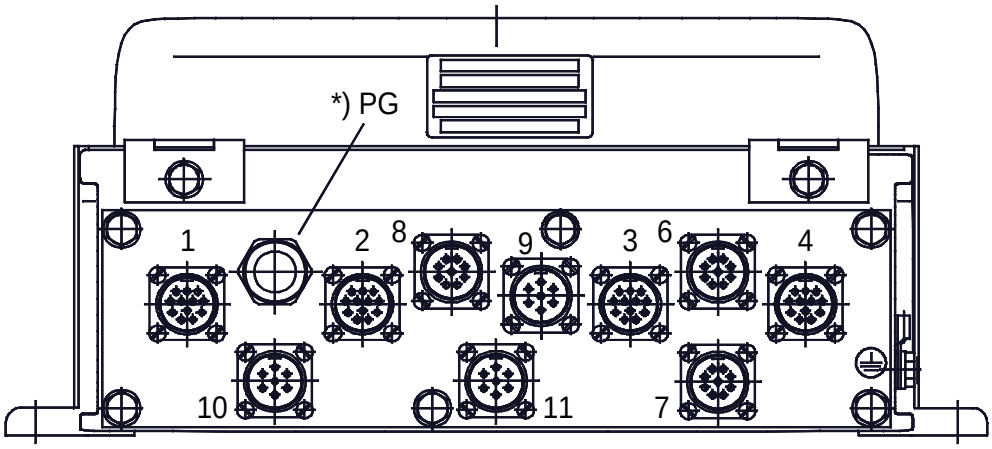
A permanent, good grounding contact has to be ensured.

For twin engine systems, a sufficient potential equalisation between both propulsion plants has to be provided.

## 3.2 Arrangement of actuator sockets

The following figure shows the socket arrangement of the actuator and their assignment.

**<u>Sockets which are not used must be sealed by the protective plugs included. Otherwise, the actuator's protection will be diminished.</u>**




| Socket No. | Connection to ... |
|---|---|
| **1** | Operating panel - station 1 |
| **2** | Operating panel - station 2 |
| **3** | Operating panel - station 3 |
| **4** | DC-motor - speed |
| ***) Pg** | Voltage supply and start interlock |
| **6** | Communication cable between actuators for twin-engine propulsion |
| **7** | Trolling control cable |
| **8** | Throttle control cable and RPM feedback signal |
| **9** | Gear control cable and clutch feedback signal |
| **10** | DC-motor - gearing |
| **11** | Station 4 |

## 3.3 Power supply

The control system requires (continuously) a DC-voltage supply between 9.6 V minimum and 32 V maximum with a load capacity of 10 A at least.

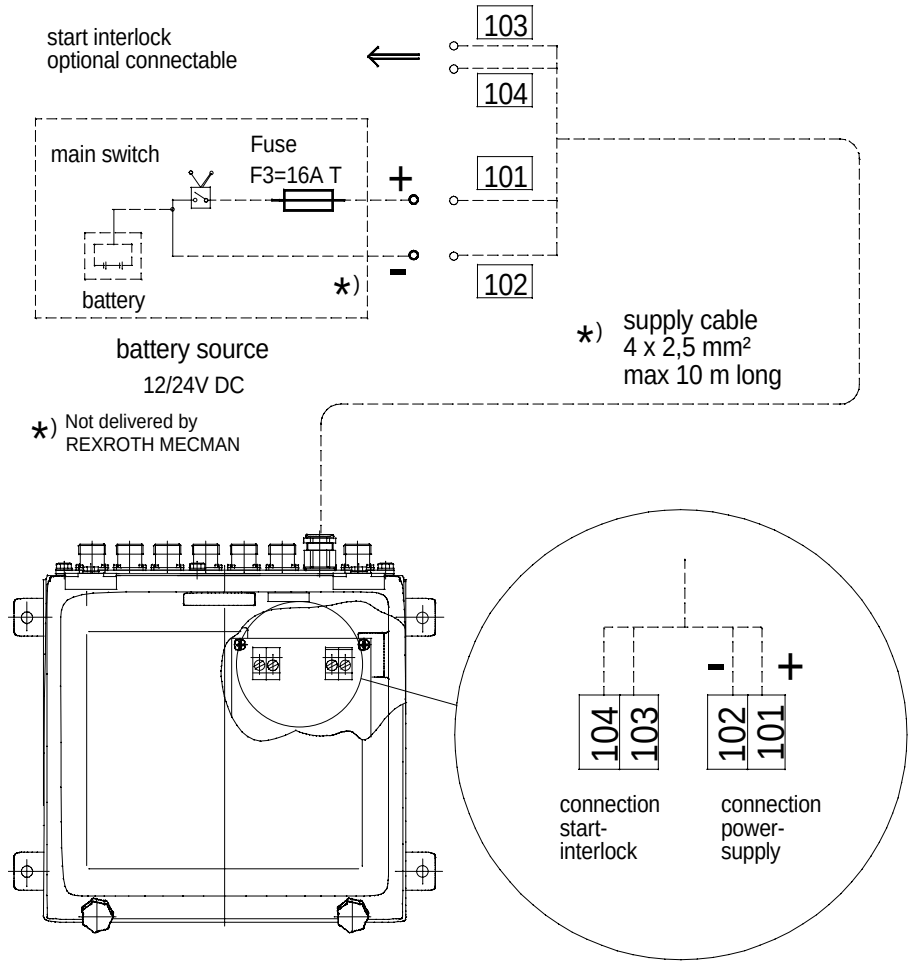
## 3.4 Power supply cable and engine start interlock

For the connection of the voltage supply and engine start interlock, a cable gripper is provided at the actuator. It is located above socket No. 10 and suitable for a cable diameter of 8 – 12 mm.
Cables with 4 or 2 wires and a size of 2.5 mm may be used, depending on if engine start interlock is applied or not.
This cable needs no shielding, but, if wanted, can be connected to the cable gripper included.
In the actuator, the wires are connected to the terminal blocks 101/102 for power supply and 103/104 for the engine start interlock at the filter board (see drawing below).

| Terminal | Connection to |
|---|---|
| 101 | ( + ) voltage supply |
| 102 | ( – ) voltage supply |
| 103 | engine start interlock |
| 104 | engine start interlock |

### 3.4.1 Connection to power supply

The connection is made according to the diagram below.



The supply voltage must correspond to the details on the actuator's type plate. Inadmissible supply voltage will cause **function failures** or **destroy the device**.

The cable length must not exceed 10 m if wire size 2.5 mm² is used. **Function failure**.

To protect the electronics of the actuator, it is recommended to install an **external fuse F3 = 16 A T.**

## 3.4.2 Connection of engine start interlock

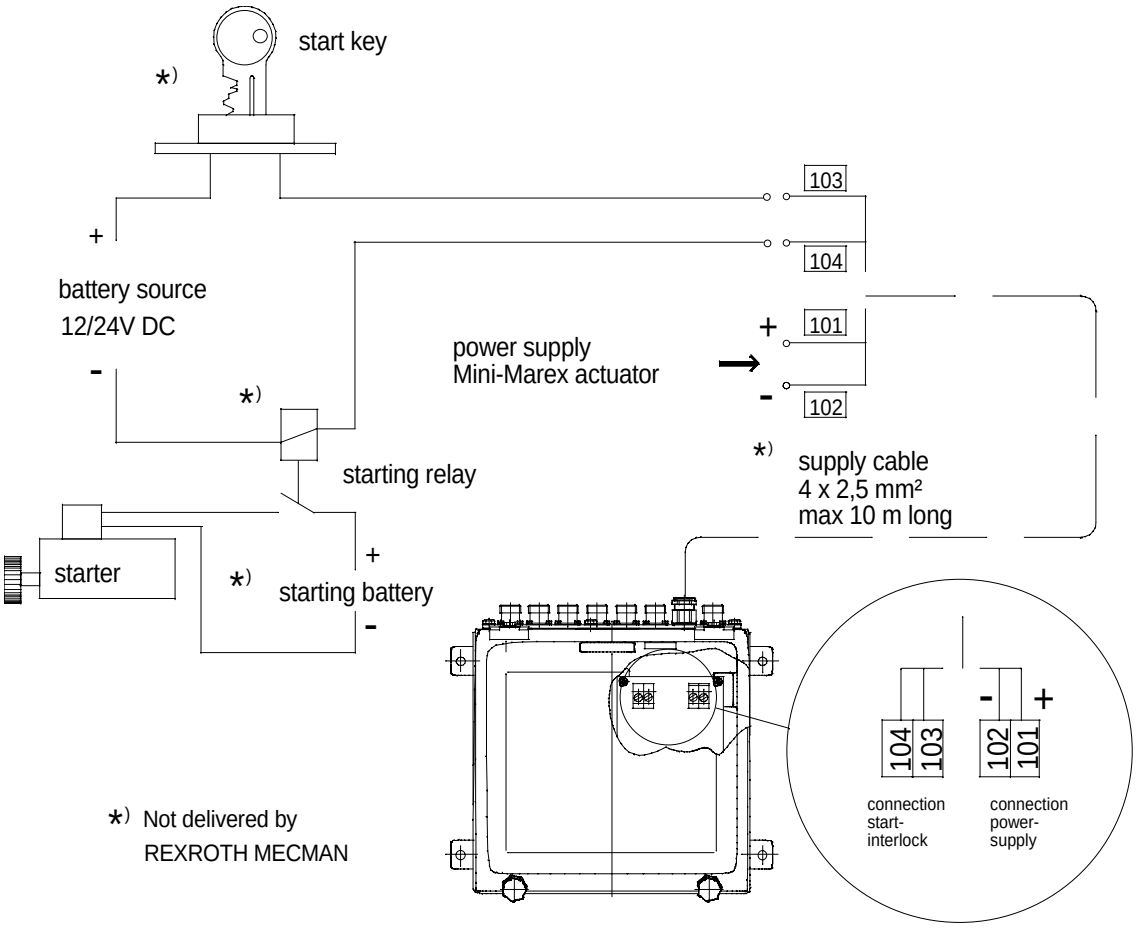
An engine start interlock may be connected using terminals 103 and 104 of the filter board. These two terminals are linked internally to a potential-free relay contact. The engine can then be started only under defined conditions:

**→ The remote control must be ON.**
**→ One control station must have taken command.**
**→ The active control head must be in Neutral or Warming-UP-position.**

The relay contact interrupts the connection between key start (key switch, start push-button or others) and the start solenoid relay.

The maximum load for the relay contact of the engine start interlock is 32 V DC / 2A maximum. Higher loads may destroy the relay. For higher loads, provide an external relay.

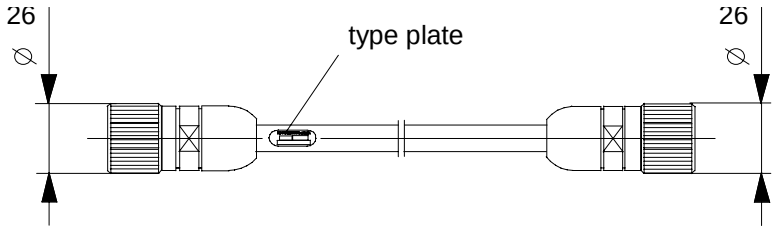
**Connecting diagram for engine start interlock:**




## 3.5 Connection of control panel cable

These connecting cables are used between the control panels and the actuator.

On the cable's type plate, a 10-digit-partnumber 894 620 24✪ 2 is stated. At the place marked ✪, a figure is indicating the different cable lengths available.




**Single engine propulsion**

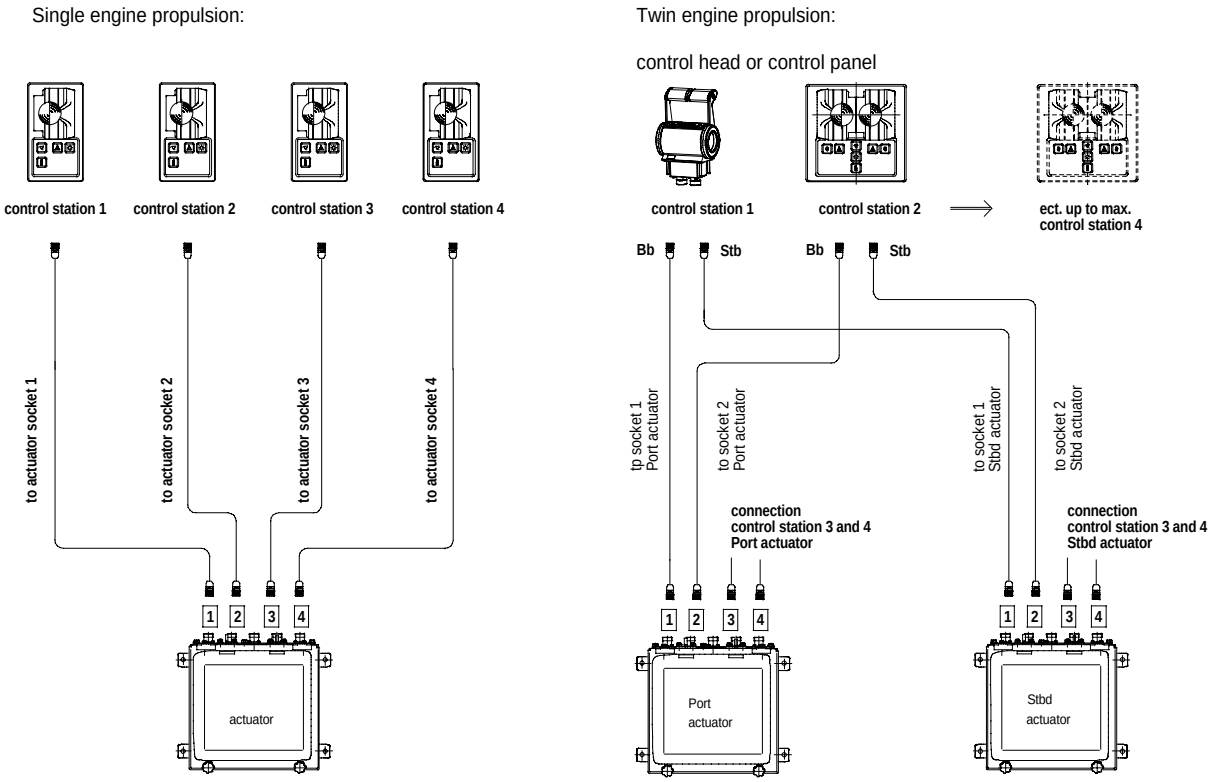
For **single engine propulsion** systems one (1) female connector plug at the underside of the control panel is provided for connecting the cable to the control panel.

Connection: Control panel 1 to be connected to actuator socket 1.
Control panel 2 to be connected to actuator socket 2.
Control panel 3 to be connected to actuator socket 3.
Control panel 4 to be connected to actuator socket 11.

**Twin engine propulsion:**

For twin engine propulsion systems two (2) female connector plugs at the underside of the control panel are provided for connecting the cables to the control panels; one each for port and starboard.

The connection is done in the same way as for single engine systems, but separately for port and starboard.



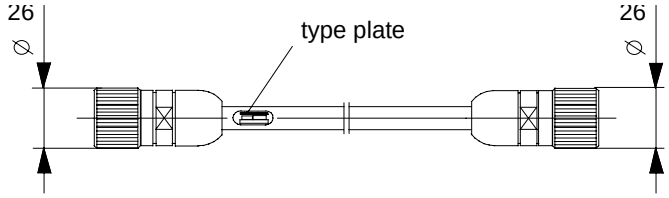

Lock the connector plugs after plugging in. A loose connection may cause a **control failure**.

## 3.6 Connection of communication cable

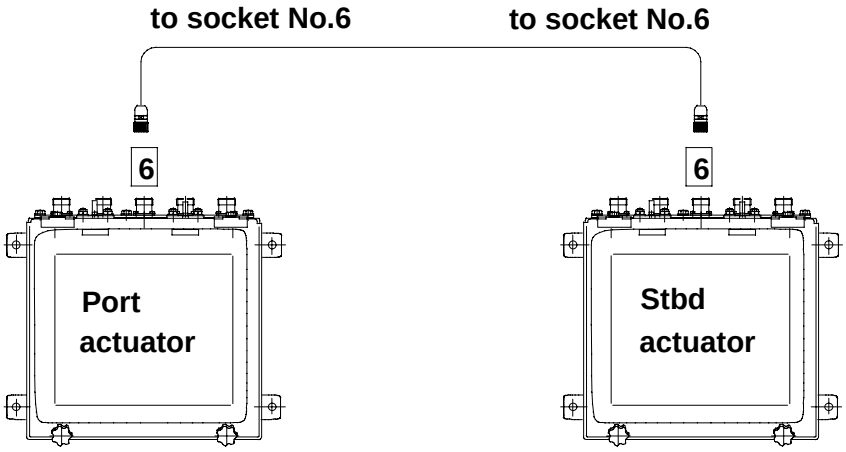
(for twin engine propulsion only)

The communication cable serves for the internal data transfer between port- and starboard-actuators within twin engine systems.

On the cable's type plate, a 10-digit-partnumber 894 620 26✪ 2 is stated. At the place marked ✪, a figure is indicating the different cable lengths available.




The communication cable is always connected to **actuator socket No. 6.**



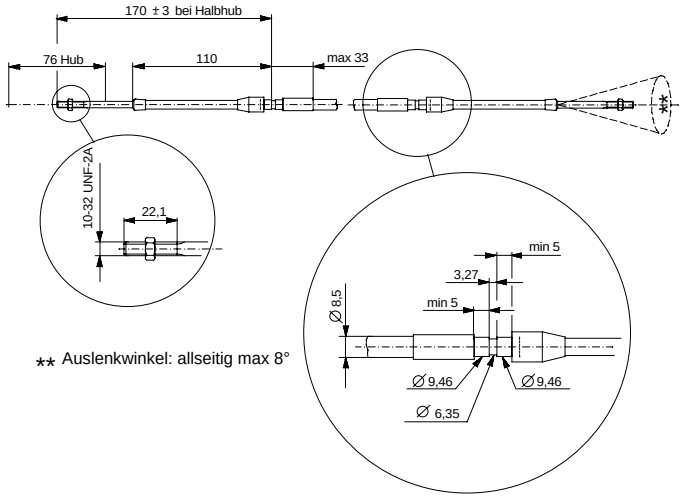

Lock the connector plugs after plugging in. A loose connection may cause a **control failure**.

The communication cable is an **absolute requirement**.

## 3.7 Speed setting and gear shifting

### 3.7.1 Push-/Pull-cables

The mechanical connections between actuator and the lever for speed setting or gear shifting at the engine is realised by mechanical push-/pull-cables **type 33 C**.




| | |
|---|---|
| Maximum bending radius: | 200 mm |
| Pull force: | max. 700 N |
| Push force: | max. 350 N |

When laying push-/pull-cables, avoid turns whenever possible because every turn will reduce the efficiency of the cables.
Turning angle 90° → efficiency 82%
Turning angle 360° → efficiency 55%

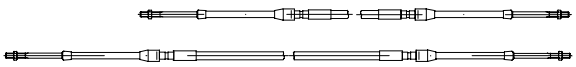
### 3.7.2 Mounting the actuator

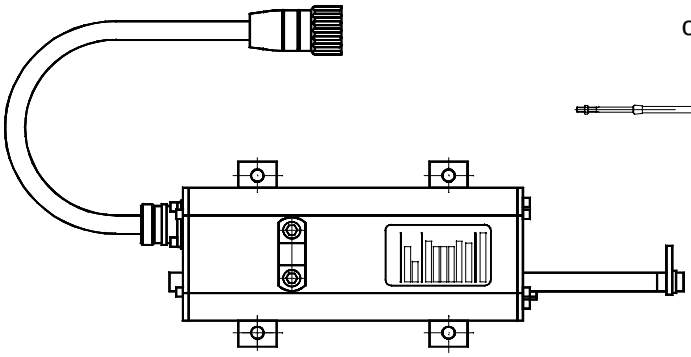
Mounting work may be done only when the actuator is voltage-free. **Injury risk.**

## 3.7.3 Connection of the actuator to the Mini-Marex control unit

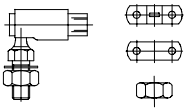
Mechanical gear shifting and / or speed setting

1x push - / pull-cable
2m long 323 699 415 2
or 3m long 323 699 416 2





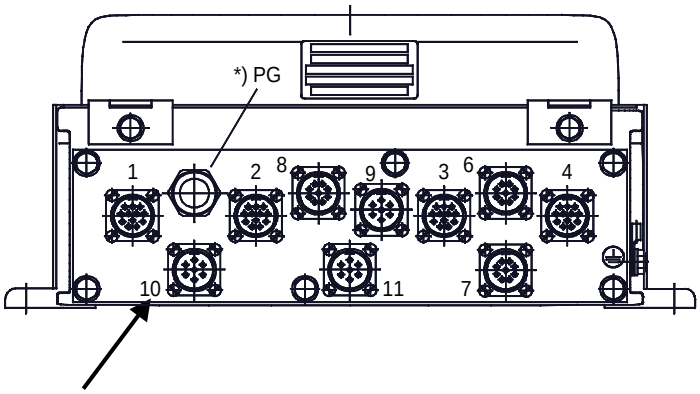
1x mounting kit for push - / pull-cable
323 699 006 2

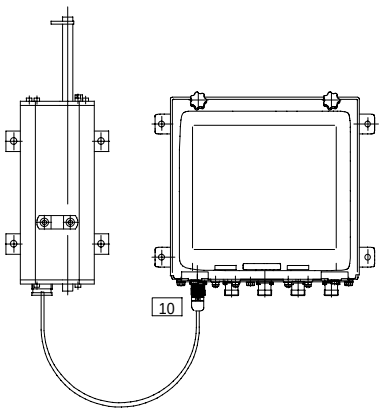


1x DC actuator 323 698 000 0

# Mechanical gear shifting: Connection

Control Unit: 323 699 446

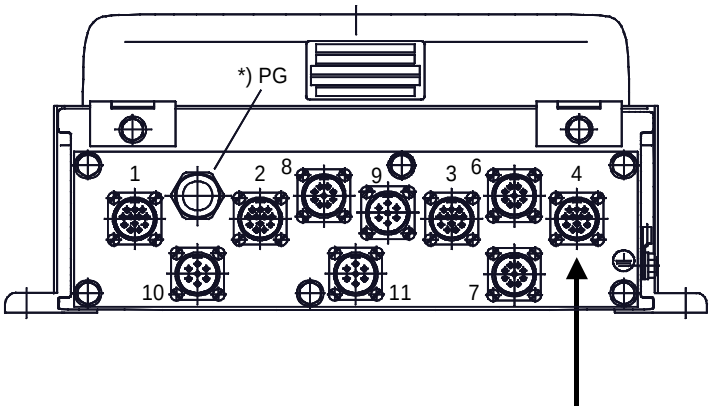


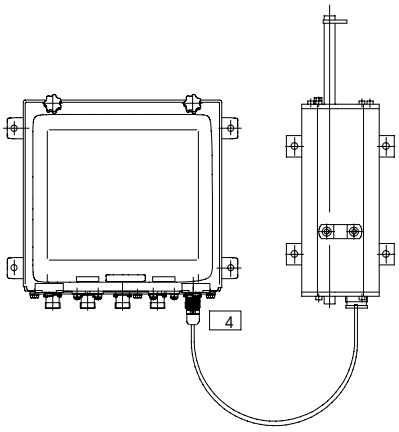




Connect DC Servomotor 323 698 000 0
to socket No.10

# Mechanical throttle control: Connection

Control Unit: 323 699 448 0

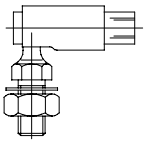


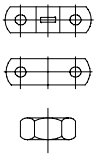

Connect DC Servomotor 323 698 000 0
to socket No.4

## 3.7.4 Connection of cables at the lever for speed setting or gear shifting

For connecting the cables at the lever for speed setting or gear shifting, a mounting kit (No. 323 699 006 2) is available. The mounting kit contains one piece of each of the following parts:



ball joint



cable clamp

shim

hex nut 10-32 UNF

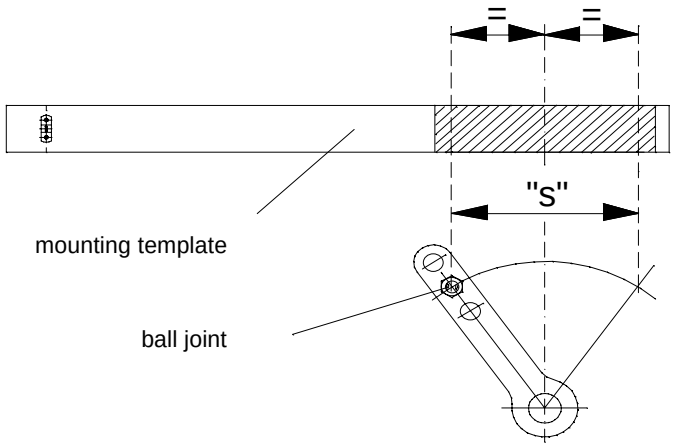
.
Every push/pull-cable requires one mounting kit.

The travelling range of the actuator for speed setting or gear shifting is 70 mm max. Within this range, each set point (idle speed, maximum speed, gears ahead, gears astern, gears neutral) is continuously, electrically adjustable.

A travelling range of about 60 mm is recommended. Longer strokes restrict the adjusting possibilities considerably, shorter strokes reduce the accuracy of adjustment.

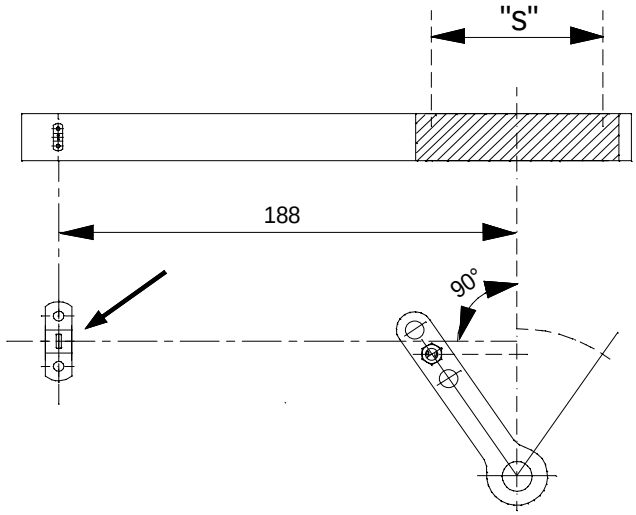
With every actuator, a mounting template is supplied to facilitate the connection of the cables.

The ball head of the joint must be fastened at the lever for speed setting or gear shifting in such a way that the travelling range "s" (appr. 60 mm) is situated in the middle of the adjustable stroke-range (hatched part of the mounting template) between the end positions (idle ↔ max. speed / gears ahead ↔ gears astern).

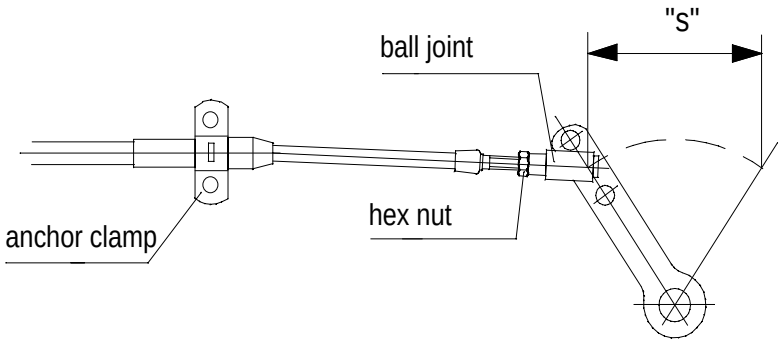


Fasten the counter bearing (clamp, sheet metal) in such a way that the cable is fixed in an angle of 90° related to the center line of the lever's travel range. Mark the distance to the fastening of the counter bearing using the mounting template or measure a space of 188 mm.

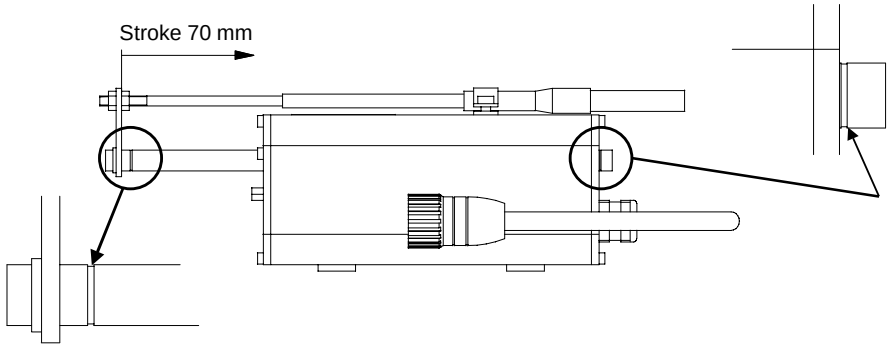
During the arc-shaped travel of the lever, the flexible conduit should be moved as steadily as possible out of the axial direction of the cable. The maximum angle for the radial excursion out of the cable's axial direction is ± 8°. Wider angles may **disturb the function** of the actuator.




Screw nut and ball joint onto the cable and fix the joint with the nut. Plug the ball joint of the push-/pull-cable into the ball head of the adjusting lever.




The lever travel (stroke) must be adjusted in such a way that, in the end positions, both markings are visible.
The lever travel must not be limited by mechanical stoppers on the exterior. Improper adjustment can block and destroy the engines.

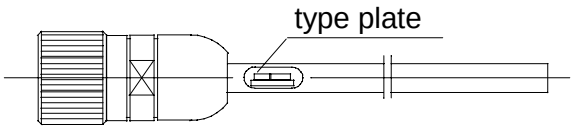


## 3.8 RPM feedback signal

RPM feedback needs to be connected only if the function "synchronisation" is applied.

### 3.8.1 Throttle control cable

On the cable's type plate, a 10-digit-partnumber 894 620 27✪ 2 is stated. At the place marked ✪ a figure is indicating the different cable lengths available.




The throttle control cable is connected to **actuator socket No. 8.**

Lock connector plugs after plugging in. A loose connection may cause a control failure.

The throttle control cable has a free cable end with four (4) colour-coded wires: WH (white), BN (brown), GN (green) and YE (yellow).

The table below shows the assignment of wires:

| Wire | Colour | Connection | Function |
|---|---|---|---|
| 4 | white | not used | |
| 5 | brown | not used | |
| 6 | green | (+) signal input | RPM feedback signal |
| 7 | yellow | (–) 0 V | |

For engine speed synchronisation of twin engine propulsion plants an RPM feedback signal from each engine is needed.

As RPM pick-ups electric tachometers maybe used as well as pulse generators. In many cases, the speed feedback signal taken from dynamo terminal "W" meets the technical requirements and a separate RPM pick-up is not necessary.

Because of the slip in the dynamo drive, synchronisation is less precise if dynamo terminal "W" is used – compared with synchronisation based on inductive speed sensoring.

**Technical requirements on feedback signals**

Frequency range: a) 20 Hz ... 1,300 Hz, sine- or rectangular signal
or b) 200 Hz ... 13,000 Hz, sine- or rectangular signal

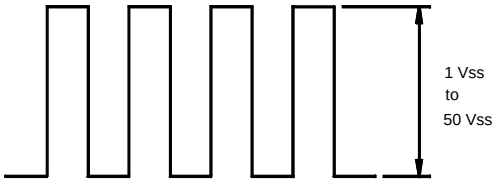
Recommended input frequency at max. engine speed:
130 Hz for frequency range a)
Recommended input frequency at max. engine speed:
6,500 Hz for frequency range b)

Signal voltage: min. 1 Vss ★)
max. 50 Vss

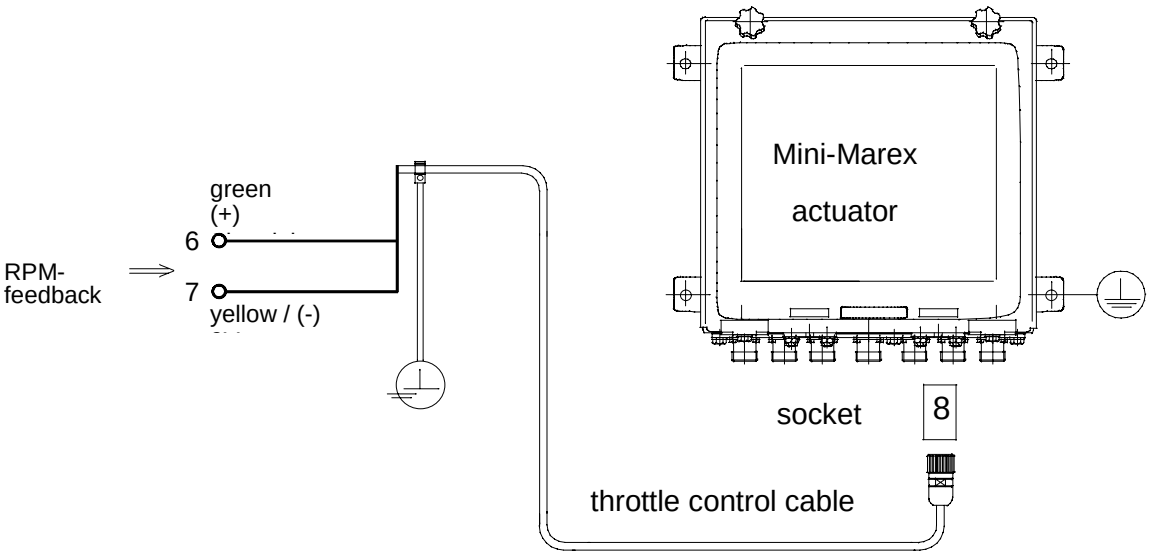
Input impedance: appr. 10 KΩ
(actuator)

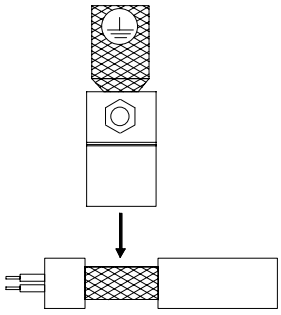
★) "Vss" ( Volt Spitze-Spitze ) stands for voltage of AC signals amplitude from peak to peak

**Example:** rectangular signal




**Connection to throttle control cable**



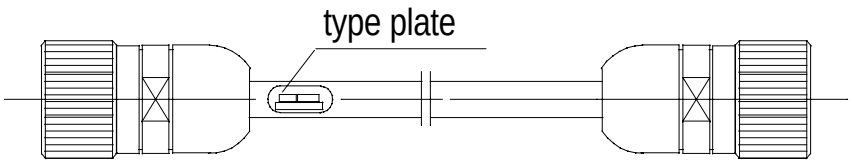



Connect free cable end circumferential to mass:

Strip PVC-cover and shielding back ring-like and fasten a metallic clamp around the open shield. Connect the clamp directly to mass.
If the metallic clamp can't be connected directly to mass, a ground strip has to be used (see fig. on the left).

A permanent, good grounding contact has to be ensured.
(Dimensioning: see section 3.1 "Grounding")

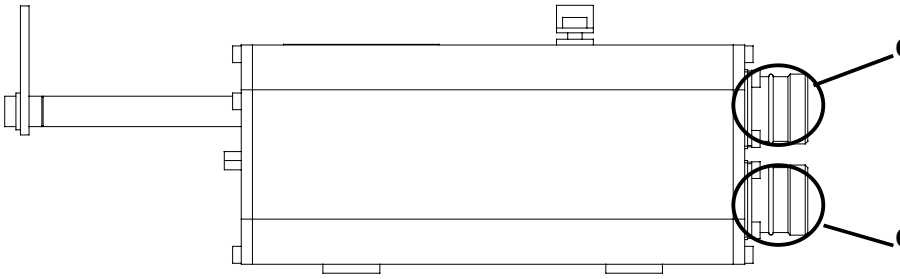
## 3.9 Trolling control cable



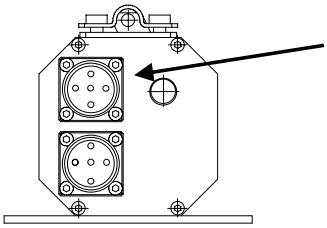

On the type plate of the trolling control cable a 10-digit-partnumber 894 620 22✪ 2 is stated. At the place marked ✪ a figure is indicating the different cable lengths available.

### Mechanical slip control (Trolling): Connection

DC Servomotor 323 698 100 0




The DC Servomotor 323 698 100 0 have 2 connectors



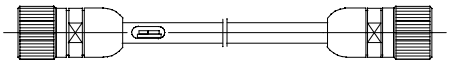
View from the right side

Connector 1: Connection between DC Servomotor and Mini Marex Control Unit via Trolling control cable.

Connector 2: Connection for Voltage Supply Cable. This DC Servomotor needs a separate voltage supply.

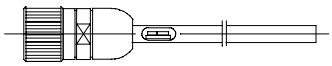
**Voltage Supply: 24V DC**

### Equipment for mechanical control of slip (Trolling)



1x DC trolling- control cable

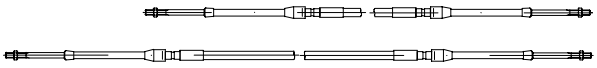
| | | |
|---|---|---|
| | 894 620 229 2 | 2m long |
| or | 894 620 221 2 | 5m long |
| or | 894 620 220 2 | 10m long |
| or | 894 620 222 2 | 15m long |

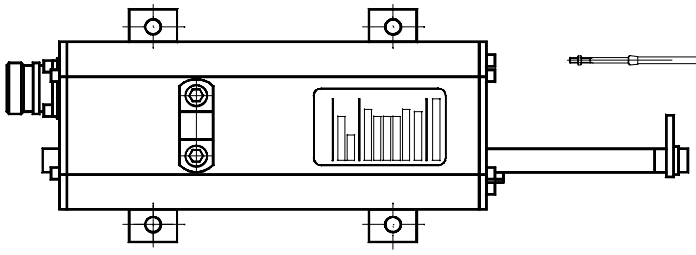


1x DC voltage supply cable
894 620 250 2 10m long

1x Push - / Pull-Cable

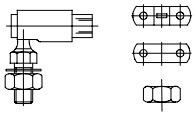
| | | |
|---|---|---|
| | 2m long | 323 699 415 2 |
| or | 3m long | 323 699 416 2 |





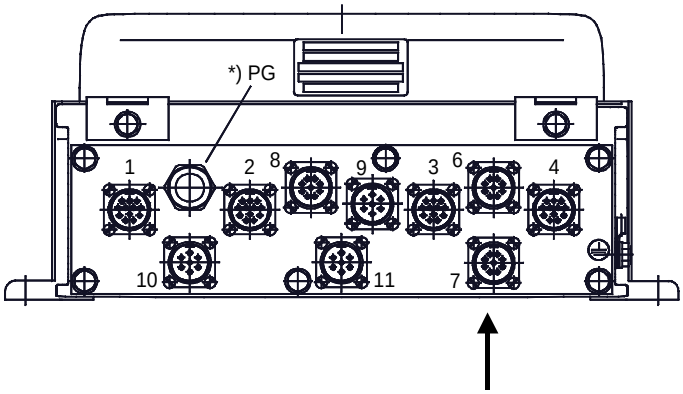
1x DC-motor 323 698 100 0

1x mounting kit for
Push - / Pull-Cable 323 699 006 2

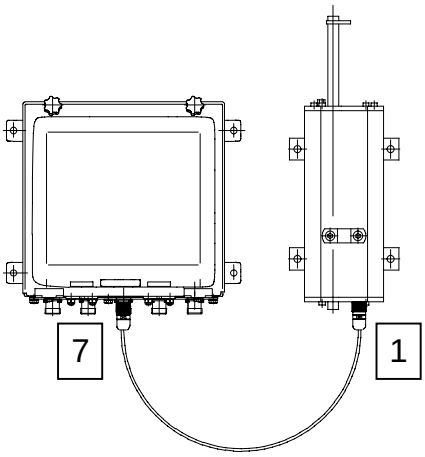


# Mechanical slip control (Trolling): Connection

Control Unit: 323 699 446 0
323 699 450 0
323 699 448 0

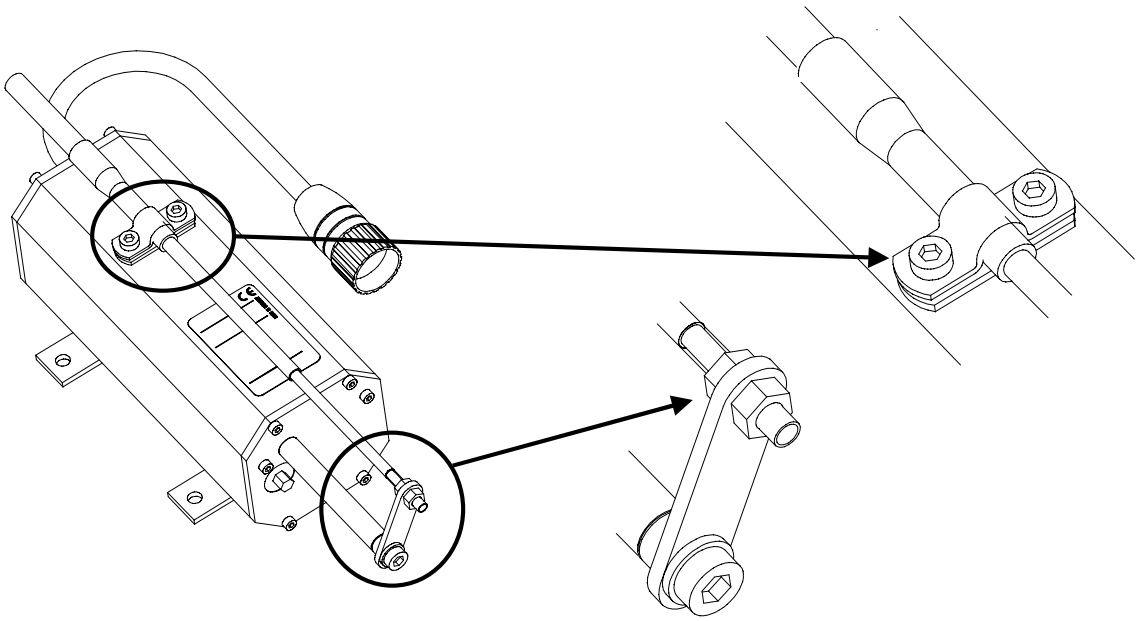



Connect DC Servomotor 323 698 100 0
to socket No.7



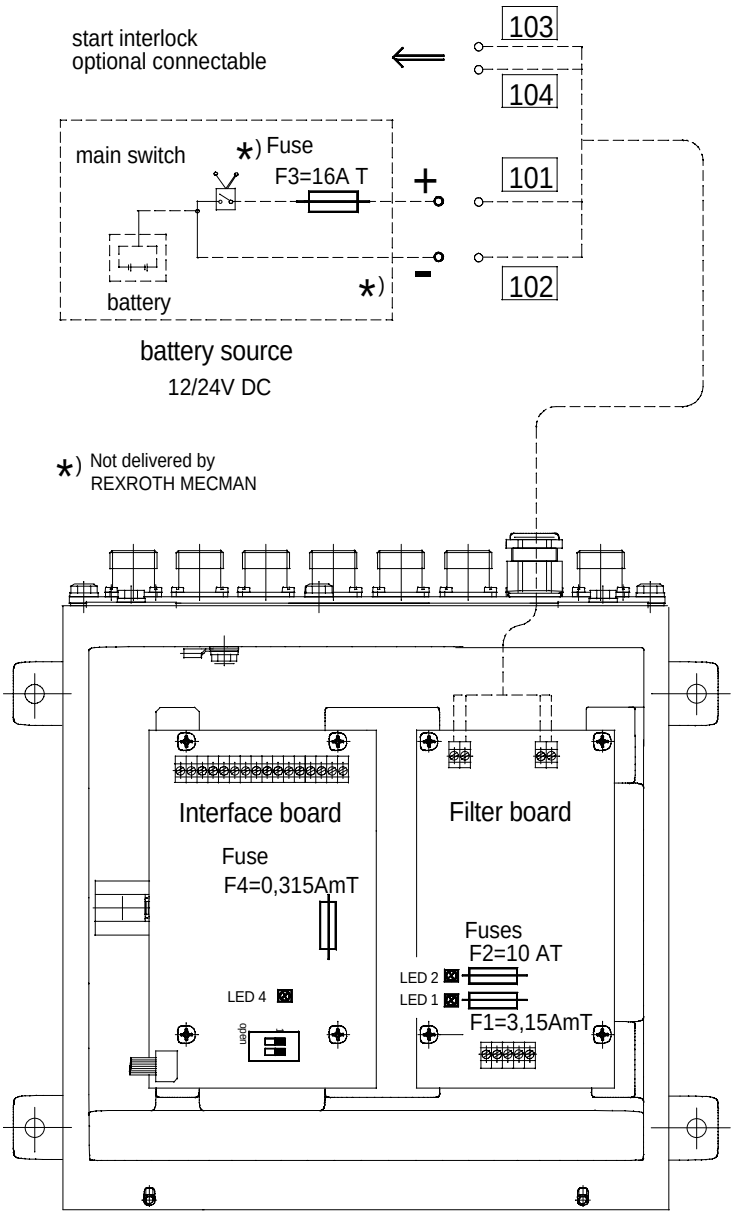

Trolling control cable

# Installation: Push / Pull cable ⇔ DC Servomotor



## 3.10 Internal fuses

Besides the recommended external fuse F3 = 16A T in line with the **supply voltage,** the actuator itself is provided with three (3) fuses. Two (2) fuses F1=3,15A mT and F2=10A mT are located on the **filter board**, whereas the third fuse F4=3,15A mT is arranged on the **interface board.** A green LED (LED1, LED2, LED4) is assigned to each fuse (F1, F2, F4). The LEDs are lighted when the fuses are in order and supply voltage has been turned on.



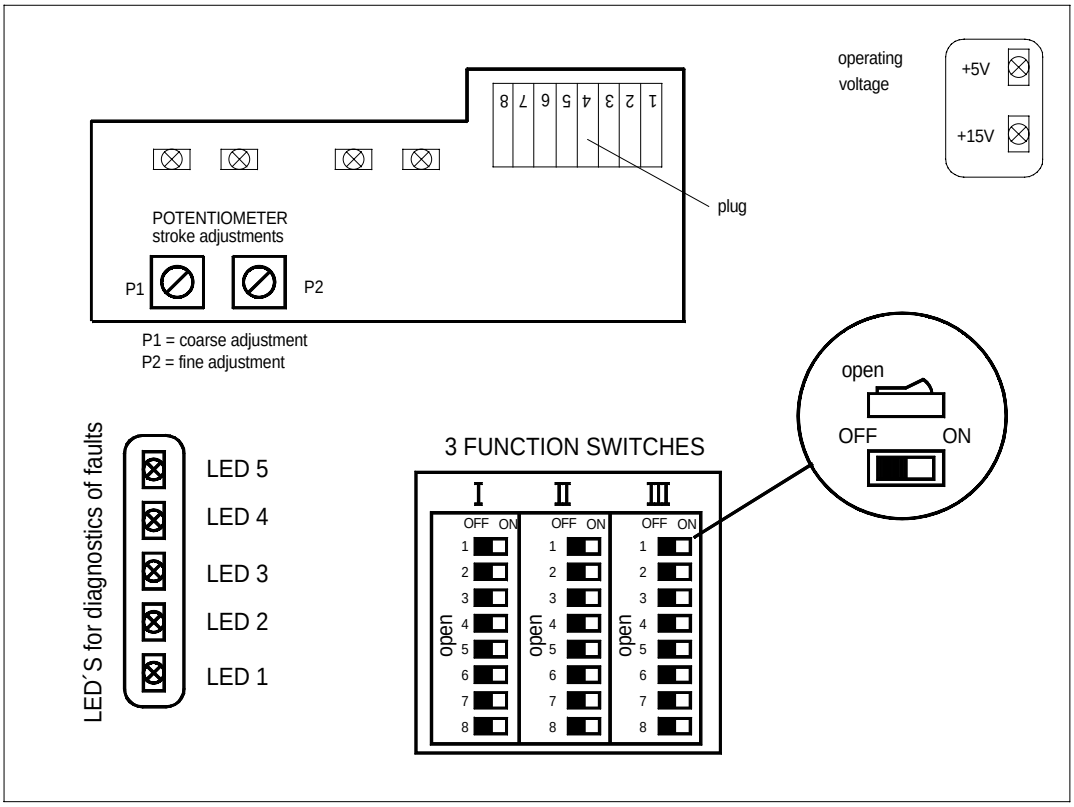

**Filter board** and **interface board** are located at the bottom of the actuator. The electronic boards are accessible after opening the actuator.

| Fuse | Value | Location | LED |
|---|---|---|---|
| F1 / internal | 3,15A mT | Filter board | LED 1 |
| F2 / internal | 10 A T | Filter board | LED 2 |
| F3 / external | 16 A T | Voltage supply | |
| F4 / internal | 315 mA mT | Interface board | LED 4 |

## 4.1 Main circuit board

The figure below shows the arrangement of the adjustment devices (function switches I to III and potentiometers P1 and P2) on the main circuit board which is located on the inside of the actuator cover. The electronic board is accessible after the actuator has been opened.

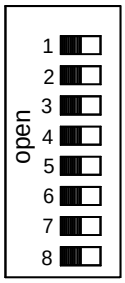
Depending on the actuator's installation position, it might be possible that the circuit board is placed upside down contrary to the shown illustration. In this case, the location of the adjustment devices is "mirror effected".




The table overleaf shows the different adjustment devices and the functions related.

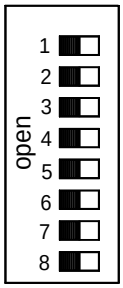
## 4.1.1 Function switch I...III (overview)

### Function switch -I




Slave / Master (twin engine propulsion systems)
Interlocked / Free station transfer
20 Hz...1,300 Hz / 200 Hz...13,000 Hz (frequency range for synchronisation)
not used
mechanical / solenoid operated gear shifting
Operation / Terminal input
Operation / Control head adjustment and release of remote stations
Operation / Release mode for special features

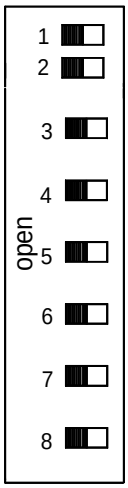
### Function switch -II




| | |
|---|---|
| 0 / 1 s<br>0 / 0,5 s | T1: Delay time of power boost before clutch engagement |
| 0 / 2 s<br>0 / 1 s | T2: Delay time of power boost after clutch engagement |
| 0 / 6 s<br>0 / 3 s<br>0 / 1,5 s | T3: Delay time before reversing |

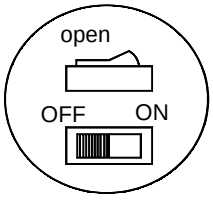
Power boost NO / YES

### Function switch -III




Operation / Adjustment mode
Special adjustment (control station) / Standard adjustment (ECR)

| Position to be adjusted | DIP- switch III-3 | III-4 | III-5 | III-6 | III-7 | III-8 |
|---|---|---|---|---|---|---|
| minimum speed | OFF | OFF | OFF | OFF | OFF | ON |
| maximum speed | OFF | OFF | OFF | OFF | ON | OFF |
| second idle speed | OFF | OFF | OFF | ON | OFF | OFF |
| maximum speed for trolling | OFF | ON | OFF | OFF | ON | OFF |
| minimum slip position for trolling | ON | ON | OFF | OFF | ON | OFF |
| maximum slip position for trolling | ON | ON | OFF | OFF | OFF | ON |




Switch position

Potentiometer for stroke adjustments

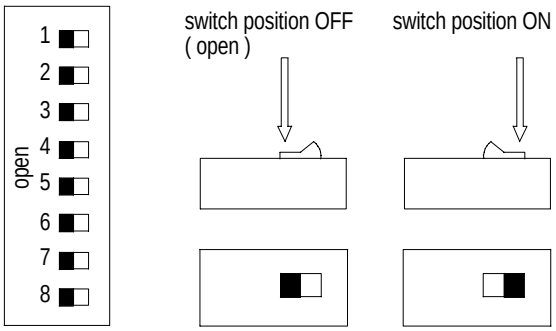

Coarse adjustment fine adjustment

Potentiometers P1 and P2 are effective in combination with function switch III only

## 4.2 Basic adjustment

Before carrying out basical adjustments, turn OFF the supply voltage.

## 4.2.1 Function switch I (main board)




**DIP-switch I-1 ( Slave / Master )**

For single engine propulsion: **DIP-switch I-1 in ON-position**

For twin engine propulsion: **Select one engine as "Master".**
**DIP-switch I-1 in ON-position**

**Switch the other engine to "Slave".**
**DIP-switch I-1 in OFF-position**

**DIP-switch I-2 (interlocked / free )**

Procedure of command transfer from one control station to another station.

Interlocked station transfer (recommended) **DIP-switch I-2 in OFF-position**

With this setting, a station transfer to any other control station is possible only, if the operator has moved the control head lever either in NEUTRAL-position or into the same direction range (ahead or astern) as the control head in command.

Free station transfer: **DIP-switch I-2 in ON-position**

With this setting, a station transfer is possible at any time without interlocking. The command is transferred immediately to the requesting station and any possible lever position from there now is transmitted to the control.

If the lever of the control head in command is in FULL AHEAD-position, whereas the lever-position of the control head gaining command is FULL ASTERN, a **reversing maneuver** will follow immediately!

**DIP-switch I-3: ( 20Hz...1,300Hz / 200Hz...13,000Hz )**
(For twin engine propulsion including synchronisation option only)

Similarity between the frequency ranges of the actuator's speed sensoring and used RPM-pick-up.

Frequency range 20Hz...1,300Hz **DIP-switch I-3 in OFF-position**
For recommended input frequency of appr. 130 Hz at rated engine speed.

Frequency range 200Hz...13,000Hz **DIP-switch I-3 in ON-position**
For recommended input frequency of appr. 6500 Hz at rated engine speed.

**DIP-switch I-4: not used.**

**DIP-switch I-4 toOFF-position**

**DIP-switch I-5 (solenoid operated gear shifting)**

Here the kind of gear shifting operation is meant.

Solenoid operated gear shifting **DIP-switch I-5 in ON-position**
Mechanical gear shifting **DIP-switch I-5 in OFF-position**
**(external actuator)**

**DIP-switch I-6 (operation / terminal-input)**

This switch is for internal use only.

**DIP-switch I-6 in OFF-position**

**DIP-switch I-7 (operation / control head alignment and release of control stations)**

The switch-position "operation/control head alignment and release of control stations" is described separately in section 4.5. The control head alignment and release of remote stations is carried out after all the other adjustments have been completed.

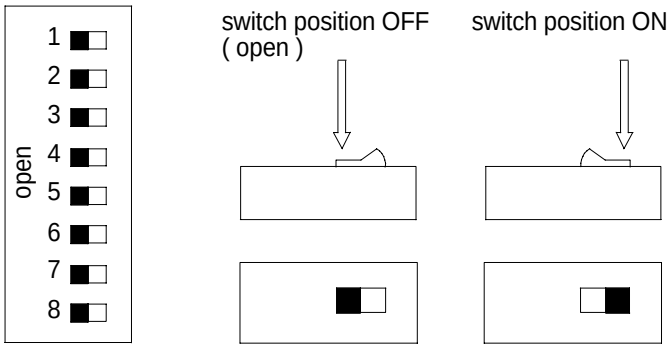
**DIP-switch I-7 in OFF-position**

**DIP-switch I-8 ( operation / release of special features )**

This switch is only used for the release of additional special features as "speed synchronisation" and "trolling" and is described separately in section 5.1.1. and 5.2.2. The release is carried out after all basic adjustments have been completed.

**DIP-switch I-8 in OFF-position**

## 4.2.2 Function switch II (main board)




**DIP-Switch II-1**
**DIP-Switch II-2**

**T1: Delay time of power boost before clutch engagement**

Delay time T1 (before clutch engagement) is active only if the feature "power boost" has been selected by means of the DIP-switch II-8.

After a command for clutch engagement (ahead or astern), the delay time set expires before the clutch is engaged.

Delay time T1 is adjustable between 0 and 1.5 seconds by means of the DIP-switches II-1 and II-2.

| DIP-switch II-1 | DIP-switch II-2 | adjusted delay time T1 |
|---|---|---|
| OFF | OFF | 0 sec |
| OFF | ON | 0.5 sec |
| ON | OFF | 1 sec |
| ON | ON | 1,5 sec |

**DIP-switch II-3**
**DIP-switch II-4**

**T2: Delay time of power boost after clutch engagement**

Delay time T2 (after clutch engagement) is active only if the feature "power boost" has been selected by means of the DIP-switch II-8.

After clutch engagement (ahead or astern) the delay time T2 passes by before the control will release a new order given by the control head.

Delay time T2 is adjustable between on and 3 seconds by means of the DIP-switches II-3 and II-4.

| DIP-switch II-3 | DIP-switch II-4 | adjusted delay time T2 |
|---|---|---|
| OFF | OFF | 0 sec |
| OFF | ON | 1 sec |
| ON | OFF | 2 sec |
| ON | ON | 3 sec |

**DIP-switch II-5**
**DIP-switch II-6 T3:** } **Reversing delay time**
**DIP-switch II-7**

After the reversing delay time T3 has been set, it will become active automatically when the Neutral-position is reached in a cruising command or when a reversing maneuver (ahead ↔ astern) is made. The pause delays the clutch disengagement.

**Example:**

When the control head lever is placed in a position for cruising and then moved from "ahead" to "astern" (or vice-versa), the speed will be reduced to idle first. The clutch remains engaged for a certain "delay time" in order to slow down the ship's cruising speed effectively (against the slowly turning propeller). Only after the delay time has expired, all further actions – reversing the gears, accelerating the speed – will be carried out.

The real delay time (delay of disengagement) is depending on:

→ the adjusted delay time T3
→ value and duration of engine speed prior to the reversing maneuver
→ cruising direction

The maximum pause on a straight "crash reversing" would be achieved, if the control position was set for more than five (5) times the adjusted delay time. With a command period less than (5) times the adjusted delay time as well as with a decreased engine speed the pause will be shortened by the control. For reversing with idle speed the pause is zero. The delay time from Astern to Ahead in principle is half that for reversing from Ahead to Astern.

The maximum delay time T3 is adjustable between 0 and 10.5 seconds by means of the DIP-switches II-5, II-6 and II-7.

| DIP-switch II-5 | DIP-switch II-6 | DIP-switch II-7 | adjusted delay time T3 |
|---|---|---|---|
| OFF | OFF | OFF | 0 sec |
| OFF | OFF | ON | 1.5 sec |
| OFF | ON | OFF | 3 sec |
| OFF | ON | ON | 4.5 sec |
| ON | OFF | OFF | 6 sec |
| ON | OFF | ON | 7.5 sec |
| ON | ON | OFF | 9 sec |
| ON | ON | ON | 10.5 sec |

During a later sea trial, the most favourable reversing delay time T3 for the vessel and propulsion system may be found out and adjusted as follows:

1. Move the control head lever in the 1st detent Ahead and engage the clutch.

2. Move lever in Full Ahead-position and take the time until the engine has attained two thirds of its maximum speed.

3. Set the measured times by means of the DIP-switches II-5, II-6 und II-7.

4. Do some more reversing maneuvers over the complete speed range and determine the most favourable reversing time for propulsion and ship.

Begin the reversals always with low speed and increase the speed gently. Reset and adapt the delay time T3. A "crash maneuver" with a too short reversing time may harm clutch, gear and engine.
A too long reversing time will reduce the maneuver capability.

**DIP-switch II-8: power boost NO / YES**

**Power boost NO:** **DIP-switch II-8 in OFF-position**

**Power boost YES:** **DIP-switch II-8 in ON-position**

The setting "power boost YES" activates the following functions which are processed by the control. If "power boost NO" is set, these functions will not be taken into account by the control, even if delay times have been set.

→T1: Delay time of power boost before clutch engagement ( DIP-switches II-1 and II-2 )
→T2: Delay time of power boost after clutch engagement ( DIP-switches II-3 and II-4 )
→Second idle speed (Setting of power boost → section 4.3.2, page 4-14)

The combination of these three functions shall be explained with the following example.

**Example:**
When the control head lever is moved from Neutral to Ahead (idle), the control carries out the following steps:

1. Power boost
The engine speed increases up to the adjusted value of the second idle speed.

2. Delay time T1
The adjusted delay time ensures that the increased engine speed (second idle speed) is built up before clutch engagement.

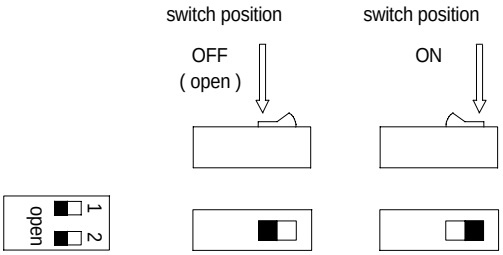
3. Clutch engagement
At the end of delay time T1, the clutch is engaged in Ahead direction.

4. Delay time T2
The adjusted delay time T2 ensures a safe clutch engagement absorbing the propeller's back torque by means of the increased speed (second idle speed).

5. Idle speed
At the end of delay time T2, the engine speed is set back to idle. In case the control head lever was moved to a position with a higher nominal speed value preset, the engine speed is released to that value without dropping to idle before.

If the delay times T2 and/or T2 are needed without power boosting, the second idle speed may be adjusted to the idle value making the power boost ineffective.

## 4.2.3 Function switch -IV (interface board)




**DIP-switch IV-1 (clutch feedback signal YES/NO)**

The feedback signal is set by means of the oil pressure switches installed at the gearbox indicating the gear shift position. The control is informed via **DIP-switch IV-1, if a clutch feedback signal is available or not.**

Clutch feedback is connected : **DIP-switch IV-1 in ON-position**

Clutch feedback is not connected: **DIP-switch IV-1 in OFF-position**

**DIP-switch IV-2 (one (1) pressure switch/two (2) pressure switches)**
(Active only if DIP-switch IV-1 is set to ON.)

DIP-switch IV-2 has to be set only if a clutch feedback is connected and DIP-switch IV-1 is set in ON-position. If no clutch feedback is connected and DIP-switch IV-1 is set in OFF-position, any setting of DIP-switch IV-2 may be selected.

Only one (1) common pressure switch is connected for both shift positions (Ahead and Astern) **DIP-switch IV-2 in OFF-position**

Two (2) pressure switches are connected, for each shift position a separate switch. **DIP-switch IV-2 in OFF-position**

**Before further** adjustment works, the setting of the **DIP-switch IV-1 in OFF-position (clutch feedback is not connected)** is absolutely necessary, even if a clutch feedback is connected.

Because during adjustment works the engine is shut off, no oil pressure can be built up in the clutches. The missing feedback signal would release an alarm.
After completion of **all** necessary adjustments, the DIP-switches IV-1 and IV-2 have to be set according to the actual gear conditions.

## 4.3 Adjustment of travel positions

By function switch III and potentiometers P1 and P2, the values for gear shifting for

⇒ ahead
⇒ neutral
⇒ astern

are adjusted.

So are the values for the throttle control:

⇒ min. speed (idle speed)
⇒ max. speed (full speed)
⇒ second idle speed

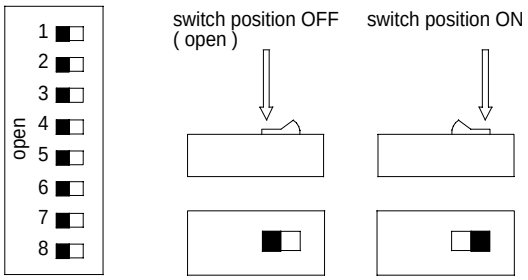
The adjustments must only be made when the engines are OFF. Improper adjustments may result in uncontrolled cruising commands. **Risk of damaging propulsion and ship.**

During the adjustment work, the push-/pull-cables must be disconnected at engine speed governor and lever for gear shifting. The cables must be able to extract and return without obstruction. Obstructing the movement of the push-/pull-cables will lead to **function disturbances** and can **damage** cable, lever or actuator.

To carry out the adjustments, the remote control must be switched on at first and control station 1 (main station) must take over the command. The control head levers must be in Neutral position. How to activate the remote control is explained in the section "Operating Instructions", pages 6-15 and 6-18.

Check if the control has been connected and fuse-protected properly before switching it on. Inadmissible supply voltage or connections can cause **malfunctions** or control failures.

## Function switch III




**DIP-switch III-1: Operation / Adjusting mode**
By this switch, it is possible to select between operating mode and adjusting mode for setting the travel distances (see table below for the setting procedure).

**DIP-switch III-2: Special adjustments (control station) / standard adjustment (ECR)**
All adjustments are made in the standard adjusting mode.
**DIP-switch III-2 always in ON-position**

**DIP-switches III-3 to III-8:**
By DIP-switches 3 to 8, the different positions of the push-/pull-cable are determined. The table below shows the combination of DIP-switch positions for the different positions of the cable. Every line corresponds to one position. The switch positions read from left to right.

| Position | DIP-switch | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 |
| Gears „AHEAD“ | ON | OFF | OFF | OFF | OFF | ON |
| Gears „ASTERN“ | ON | OFF | OFF | OFF | ON | OFF |
| Gears „NEUTRAL“ | ON | OFF | OFF | ON | OFF | OFF |
| Minimum speed | OFF | OFF | OFF | OFF | OFF | ON |
| Maximum speed | OFF | OFF | OFF | OFF | ON | OFF |
| Second idle speed | OFF | OFF | OFF | ON | OFF | OFF |
| Maximum speed for trolling✪ | OFF | ON | OFF | OFF | ON | OFF |
| Minimum slip position for trolling✪ | ON | ON | OFF | OFF | ON | OFF |
| maximale Schlupfposition for trolling✪ | ON | ON | OFF | OFF | OFF | ON |

e.g. "gears NEUTRAL"

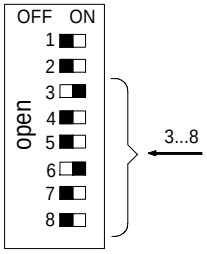
DIP-switch -3 to ON
DIP-switch -4 to OFF
DIP- switch -5 to OFF
DIP- switch -6 to ON
DIP- switch -7 to OFF
DIP- switch -8 to OFF

✪ valid only for special function "Trolling" / separate user's manual

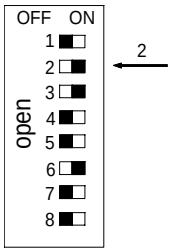
The setting procedure is done according to a definite operational chart which must be followed strictly. If not, the control will not accept the adjustments.

## Operational chart (Example: gears "Neutral" )

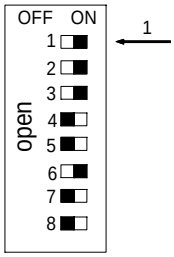
**1.)** Set DIP-switches 3 to 8




**2.)** Set DIP-switch 2 in ON leave it there.

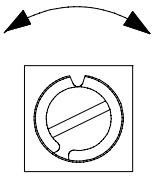



**3.)** DIP-switch 1 in ON

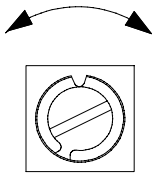



After shifting DIP-switch 1 in ON-position, the control is in adjusting mode and sets the position which has been stored last in this mode.

**4.)**
Use potentiometer P1 **(coarse adjustment)** to adjust the desired position approximately.



**5.)**
Use potentiometer P2 **(fine adjustment)** to set the desired position exactly.



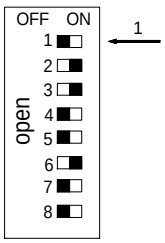
By means of the potentiometers, every position to be set can be transferred to any point on the adjusting range. The position "minimum speed" (idle speed) can be transferred from the retracted position of the actuator to its extracted position. Consequently, the position "maximum speed" (full speed) is transferable to the retracted position of the actuator (reversal of actuating direction). In the same way, the positions for "gears AHEAD" and "gears ASTERN" can be interchanged.

The potentiometers should be set to their mid-position before each adjustment. This will allow sufficient adjustment for both directions.

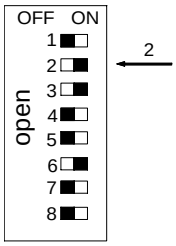
In case the potentiometer's range is **not sufficient** for reaching the desired travel position, the adjustment procedure has to be interrupted (DIP-switch 1 in OFF). After the potentiometer has been set back and alternated to adjustment mode (DIP-switch 1 in ON-position), the adjustment may be continued. Do not change the other DIP-switches.

Both potentiometers have a mechanical stop. Do not overwind the potentiometers or they will be damaged.

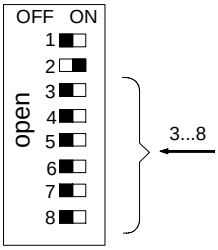
**6.)**
DIP-switch 1 in OFF.




**7.)**
DIP-switch 2 in ON and leave it there.




**8.)**
DIP-switches 3...8 in OFF




After DIP-switch 1 has been set in OFF-position, the control will store this setting for the selected position and go in "neutral position" (for gear shifting) or in "idle speed" (for speed setting).

Afterwards, the next position can be set in the same way. From the table, select the corresponding switch positions of the travel position to be adjusted and follow steps 1. to 8. of the operational chart.

## 4.3.1 Gear positions

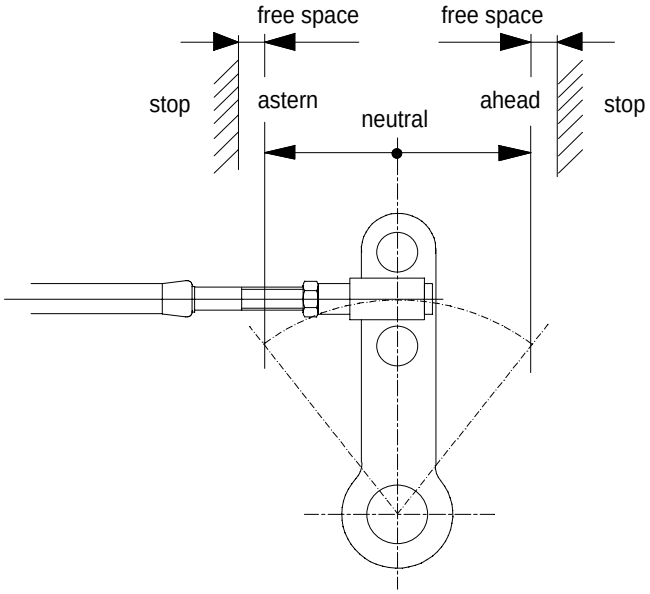
**⇒ Ahead**
**⇒ Neutral**
**⇒ Astern**

For the following adjustments, the experience has shown that it is useful to ask a second person for assistance. While one person does the adjustments as described in section 4.3 (Adjustment of travel positions), the second person can control the performance directly at the gear shifting lever.

Bring the gear shifting lever manually in the position which shall be adjusted (gears AHEAD, gears ASTERN, gears NEUTRAL) and adjust the actuator for the gearing until the push-/pull-cable can be connected easily to the gear shifting lever in the positions selected (section 4.3 adjustment of travel positions)

Allow a space of 0.5 mm towards the mechanical stops of the gear shifting lever to avoid that the actuator moves the shifting lever against the stop where it can get blocked.

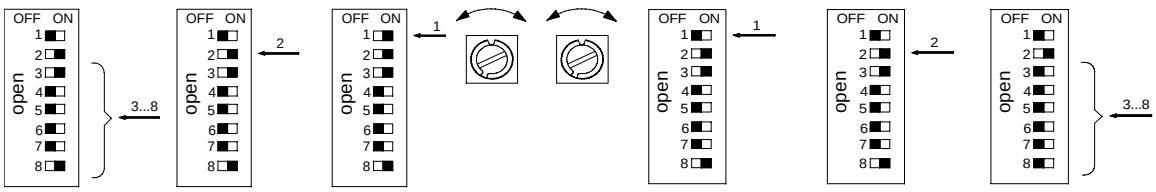
**Function failure, fire hazard.**




The travelling range for the gear shifting between the positions "ahead" and "astern" is 70 mm maximum. For the adjustment, a stroke between 50 and 60 mm is recommended. Longer strokes restrict the adjusting possibilities considerably, shorter strokes reduce the accuracy of adjustment.

Brief example for operational chart "gears AHEAD"

| Position | DIP-switch | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 |
| Gears „AHEAD“ | ON | OFF | OFF | OFF | OFF | ON |



## 4.3.2 Throttle control adjustment

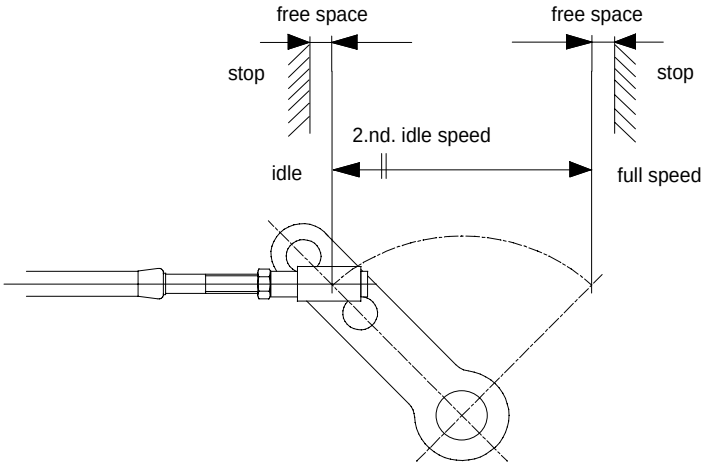
⇒ **Idle speed**
⇒ **Max. speed**
⇒ **2. idle speed**
(for power boost)

For the following adjustments, the experience has shown that it is useful to ask a second person for assistance. While one person does the adjustments as described in section 4.3 "Adjustment of travel positions", the second person can control their performance directly at the throttle control lever.

Bring the throttle control lever manually in the position to be adjusted ("idle speed", "maximum speed", "2nd idle speed") and adjust the actuator for throttle control until the push-/pull-cable can be connected easily to the throttle control lever in the positions selected (section 4.3 "Adjustment of travel positions).

Allow a space of 0.5 mm towards the mechanical stops of the throttle control lever to avoid that the actuator moves the lever against the stop where it can get blocked.

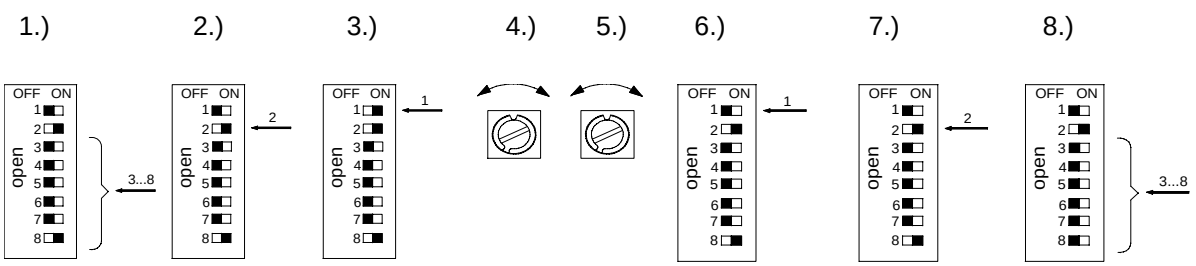
**Function failure, fire hazard.**




The travelling range for the throttle control between the positions "idle speed" and "maximum speed" is 70 mm maximum. For the adjustment, a stroke between 50 and 60 mm is recommended. Longer strokes restrict the adjusting possibilities considerably, shorter strokes reduce the accuracy of adjustment.

Brief example for operational chart "minimum speed" (idle speed)

| Position | DIP-switch | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 |
| minimum speed | OFF | OFF | OFF | OFF | OFF | ON |



## 4.4 Alignment of control heads and enable remote stations

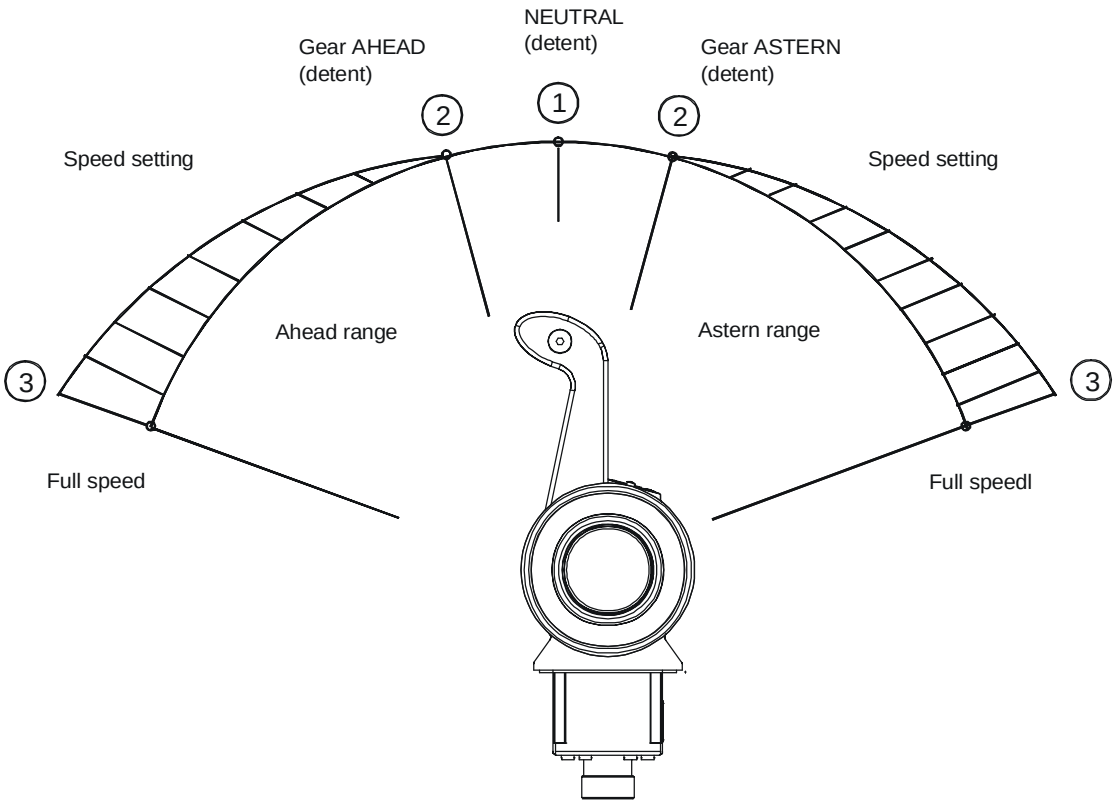
The control head alignment and enabling must be carried out! Only then the control does acknowledge the connected control heads!!!! The control heads are enabled automatically after the control head alignment.

**Before aligning the control heads, shut OFF the engine to prevent uncontrolled maneuvering.**

During this procedure, the lever positions

- ❷ detent ”Idle speed / gears AHEAD”
- ❸ stop ”Maximum speed / AHEAD”
- ❷ detent ”Idle speed / gears ASTERN”
- ❸ stop ”Maximum speed / ASTERN”

are aligned between control head and actuator. Because of manufacturing tolerances, "maximum speed" of one control head can be located at the stop of the lever travel, whereas the control head on another station signals "maximum speed" a little before the stop. The same goes for the other positions. The alignment ensures that "maximum speed" is always located at the stop of the lever travel and "idle speed" at the corresponding detents. This feature helps to set speed continuously without dead lever travel.




**How to perform the control head alignment**

Action: Turn the control ON. Align twin engine systems separately, i. e. turn ON one control at a time.

Move control head levers **at all stations into NEUTRAL-position.**

Take over command **at control station 1**.

Set actuator DIP-switch I-7 in ON-position (control head alignment).

Result: A permanent buzzer tone sounds at all stations.

All indicator lights command flash or the lighting of the control head flashes at low repetition.

At the control head to be aligned.

Action: Move control head lever into NEUTRAL-position.

Push "station transfer / command"-button for about 3 secs.

Result: Buzzer tone stops at all stations.

Indicator lights command flash / lighting of the control head to be aligned flashes at high repetition, the lighting of all other control heads flash slowly.

Action: Move control head lever in a position that shall be aligned (idle speed / gears AHEAD, maximum speed / AHEAD, idle speed / gears ASTERN, maximum speed / gears ASTERN)..

For every position, push "station transfer / command"-button.

Result: If the alignment is successful, the buzzer will sound once after 3 secs.
If it is not, after 3 secs the buzzer will sound 3 times. Do then repeat the alignment procedure.

Action: Align all other lever positions in the same way.

If more remote stations are connected, align them as well.

Action Go to the next control station and push the "station transfer / command"-button for 3 seconds until the lighting flashes at high repetition.
**(For the alignment, the control heads must be placed in NEUTRAL again.)**
Do then carry out the alignment procedure as described above.

**Completion of control head alignment:**

Action: Set actuator DIP-switch I-7 back in OFF (operation).
Only after resetting DIP-switch I-7 to OFF, the alignment will be stored. If the control is turned OFF before, the complete alignment procedure has to be repeated.

Result: The remote control has to be initiated again. The command of control has to be taken over again.

## 4.5 Final adjustments

**After completion of all adjustments do not forget to reset function switch IV on the interface board according to the actual gearing conditions (see page 4-9).**

# 5.1 Special Features

After the set-up of the control has been completed and it works perfectly in reversing gear mode (speed setting and gear shifting only), the following special features can be released at the actuator:

1. Special feature „engine speed synchronization“ (see section 5.1.1 up)
2. Special feature „trolling“ (control of trolling gear – see section 5.2.1 up)

**After both features have been released, they may be run later on parallel, but not at the same time.**

## 5.1.1 Enable Engine Speed Synchronization

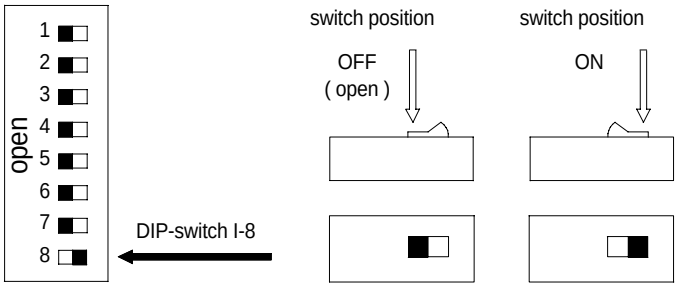
**(for twin engine propulsion only)**

**Before "speed engine synchronization“ can be activated, a feedback signal for speed must be activated, see sections 3.8, 3.8. and 3.8.1.**

**Preparation:**
**Turn ON the Mini-Marex-C control, take over command at one remote station and position all control head levers in NEUTRAL.**

**Procedure:**
Enable by means of **function switch I ( DIP switch I-8 ) and function switch III (DIP switch III-8**) located on the main board (location of the adjustment devices see section „4.2 main board “ page 4-2 up).

**Step 1: Function switch I**




**DIP switch I-8 (function switch I) in ON position**

The control now is set into mode „enable special function”.

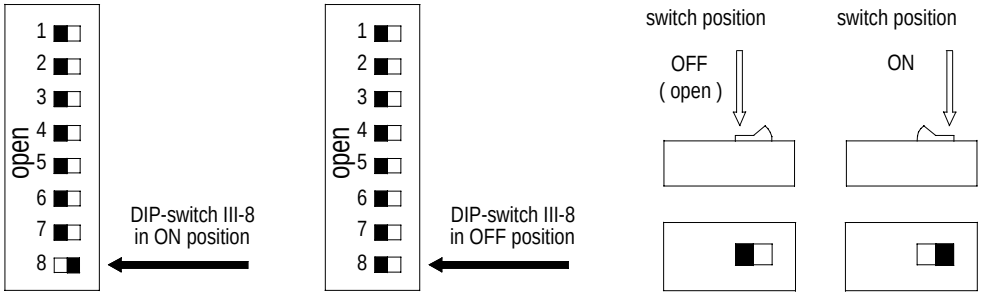
In „enable“-mode, the current special feature status is indicated via the fault code.

LED 4 is ON: → Special feature can be activated or deactivated.
LED 4 is OFF: → Special feature cannot be activated or deactivated.

LED 1 is ON: → Engine speed synchronization is activated.
LED 1 is OFF: → Engine speed synchronization is deactivated.

LED 2 is ON: → Trolling is activated.
LED 2 is OFF: → Trolling is deactivated.

**Step 2: Function switch III**




**DIP-switch III-8 (Function switch III)**

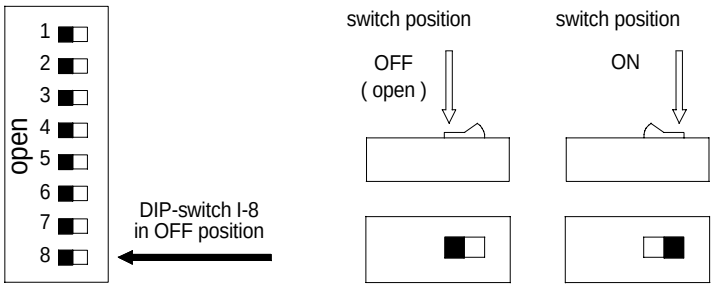
**Set DIP-switch III-8 from OFF (open) → to ON**
Check: LED 1 must be lighted.

**Set back DIP-switch III-8 → to OFF**
Check: LED 1 must still be lighted.

By switching DIP-switch III-8 from OFF to ON-position and back to OFF-position, the special function "engine speed synchronization“ can be activated. For deactivation, carry out the same procedure.

**Step 3: Function switch I**

Abandoning the mode „enable special feature“




**DIP switch I-8 back in OFF position**
LED 1 is not lighted any more

The control behaves in the same way as after the initialisation and the command has to be taken over again.

## 5.1.2 Peculiarities of engine speed synchronization

For twin engine propulsion plants with speed synchronization some peculiarities have to be noted.

Because in synchronization mode the "Master“-engine (see page 4-4 / DIP switch I-1 ) presets the speed of the „Slave“-engine, the set-up of both, "Master"- and "Slave"-control must allow that the **"Slave“-engine is <u>always able</u> to follow the "Master“-engine.**

**<u>Maximum speed:</u>**
The "Slave"-engine must run at the same or a higher speed as the "Master"-engine.

**<u>Idle speed:</u>**
The "Slave"-engine must run at the same or a lower speed as the "Master"-engine.

### Example: Maximum speed

The rated (full) speed of the "Master“-engine is 2,500 RPM, whereas the rated speed of the "Slave“-engine is only 2,450 RPM. The control tries to synchronise both engines, but because of the lower rated speed of the "Slave“-engine, it is not possible to attain the speed of the **"Master“-engine. An active speed control** (synchronisation) is therefore not possible.

If the "Slave“-engine does not attain the speed value of the "Master“-engine within 20 seconds, the control will cancel the active speed control (synchronisation) and both engines will follow the speed setting by means of the "Master“-control head lever only. Indication is given by the control head LED “Synchro” which flashes at high repetition (0.2 secs ON / 0.2 secs OFF) or, respectively, by the push-button "Special Feature”. Now, the full speed of the “Master”-engine will be 2,500 RPM, the full speed of “Slave”-engine being 2,450 RPM.

### Remedial action:

There are three possibilities to take remedial action:
1. Increase the rated speed of the "Slave“-engine.
2. Decrease the rated speed of the "Master“-engine.
3. Interchange the status of "Master“ and "Slave“.

<u>The third possibility is the easiest way in most cases.</u> For both controls, the system set-up as "Master" or "Slave" has to be interchanged. Then, the slower "Slave“-engine will become "Master" and the faster "Master“-engine "Slave".

The a.m. also goes for idle speed also.
The “Master“-engine must not idle below the „Slave“-engine.

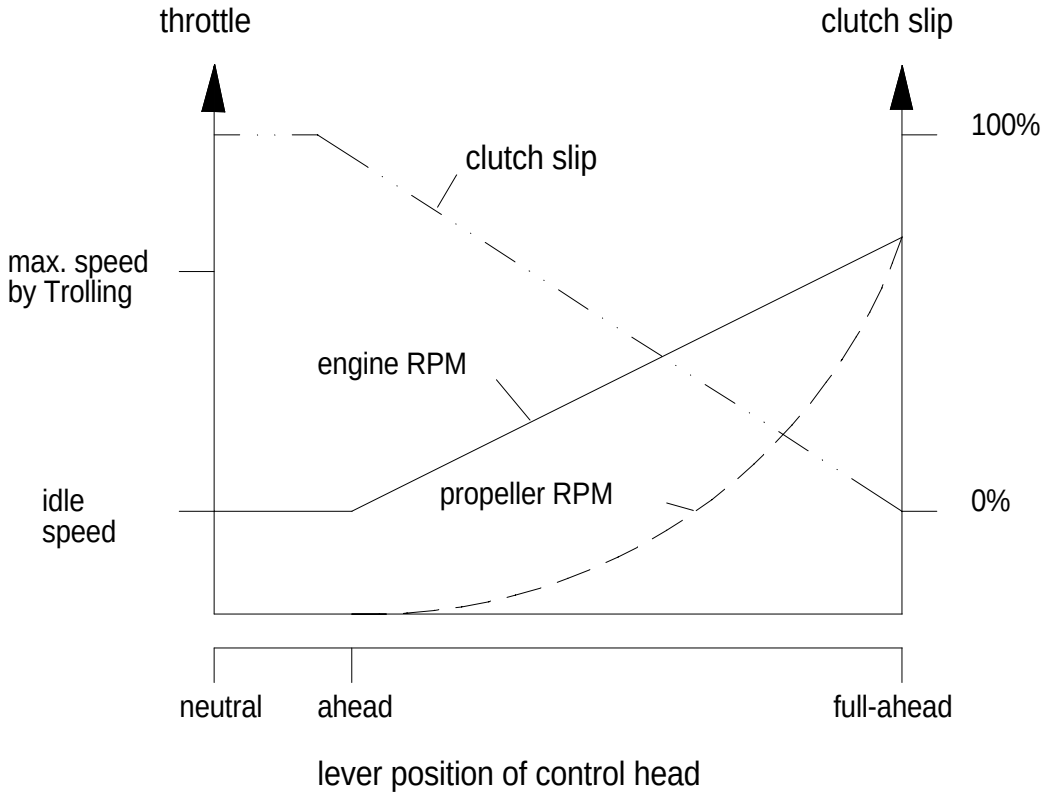
## 5.2.1 Trolling

**Trolling gear:**

The trolling feature offers a controlled slip of clutches and requires a special trolling reverse gear. Besides the normal gear shifting from “Neutral” to “Ahead” and “Astern”, this reverse gear includes an additional control option for an infinitely variable slip of clutches. The gear may be operated in the normal mode of gear shifting as well as in the trolling mode producing lower than normal propeller speeds to enable trolling at selected low speeds with live bait.

**Trolling function:**

In trolling mode, the gear is also shifted from “Neutral to “Ahead”, after the control head lever has been moved into the “Ahead” detent. But the clutch slip is that big that the propeller shaft does not rotate (or very slowly) when the engine is idling. When moving the control head lever forward to “Full Ahead”, the slip will decrease and the propeller shaft starts rotating faster while the input revs of the engine shaft also increase. This feature permits a very smooth control of the propeller revs much below idle speed.




**To avoid overheating the clutch discs, the maximum engine speed in trolling mode has to be limited.**
**Follow absolutely the instructions of the gear or clutch manufacturer.**

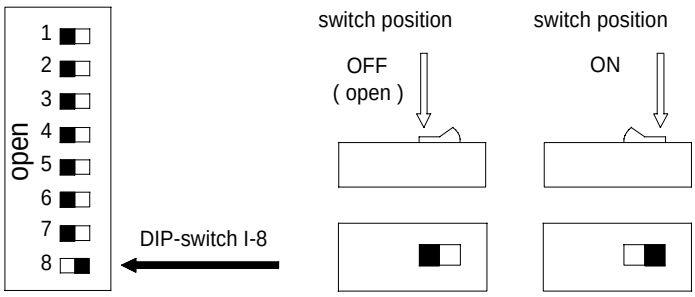
## 5.2.2 Enable Trolling

For „Trolling“, a "Trolling"-control cable is needed, see section 3.9 page 3-13 up.

**Preparation:**
**Turn ON the Mini-Marex-C control, take over command at one remote station and position all control head levers in NEUTRAL.**

**Procedure:**
Enable by means of **function switch I (DIP-switch I-8) and function switch III (DIP-switch III-7**) located on the main board (location of the adjustment devices see section „4.2 main board “ page 4-2 up).

**Step 1: Function switch I**




**DIP-switch I-8 (function switch I) in ON position**

**The control now is set to mode "enable special function”.**

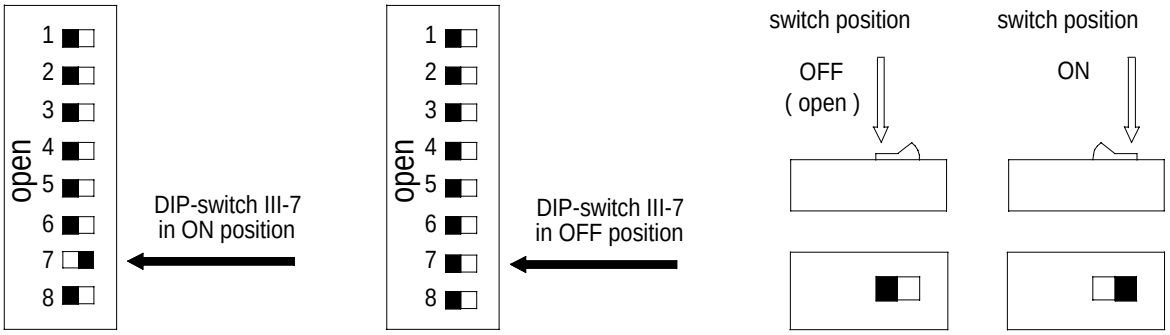
In "enable“-mode, the current special feature status is indicated via the fault code

LED 4 is ON: → Special feature can be activated or deactivated.
LED 4 is OFF: → Special feature cannot be activated or deactivated.

LED 1 is ON: → Engine speed synchronization is activated.
LED 1 is OFF: → Engine speed synchronization is deactivated.

LED 2 is ON: → Trolling is activated.
LED 2 is OFF: → Trolling is deactivated.

**Step 2: Function switch III**




**DIP-switch III-7 (Function switch III)**

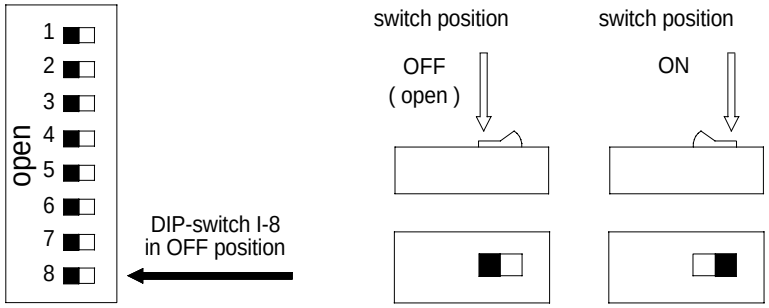
**Set DIP-switch III-7 from OFF (open) → to ON**
Check: LED 2 must be lighted.

**Set back DIP-switch III-8 → to OFF**
Check: LED 2 must still be lighted.

By switching DIP-switch III-7 from OFF to ON-position and back to OFF, the special function "Trolling" can be activated. For deactivating, carry out the same procedure.

**Step 3: Function switch I**

Abandoning the mode „enable special feature“




**DIP-switch I-8 back in OFF-position**
LED 2 is not lighted any more

The control behaves in the same way as after initialising and the command has to be taken over again.

## 5.2.3 Trolling adjustments

The Mini-Marex-output signals (default values) for the trolling control are set as follows:

| Output signal for... | Value (default) |
|---|---|
| Maximum speed for trolling | 12 mA ✪ |
| Minimum slip position | 20 mA |
| Maximum slip position | 4 mA |

✪ Value corresponds to half speed between idle and full

**Maximum speed in trolling mode:**
The „maximum speed in trolling mode“ limits the engine speed during trolling. The max. admissible engine speed depends on the instructions of the gear-manufacturer and has to be strictly observed.

**Minimum slip position:**
The „minimum slip position“ defines the control value for a non-positive drive. There is no clutch slip existing any more ( 0% slip ).

**Maximum slip position**
The „maximum slip position“ defines the control value for the greatest possible clutch slip ( 100% / no transmission).

The a.m. three (3) control values have to be checked and adjusted according to the instructions of the gear or clutch maker. **Do not exceed the max. admissible speed during trolling. Inadmissible speed can destroy the clutch.**

With warm oil, the trolling gear behaves differently than under “cold oil”-conditions. While with cold oil, still thick, the propeller shaft will just only rotate (max. slip position), it will not rotate at all if the oil is warm and thin-bodied in the same slip position.

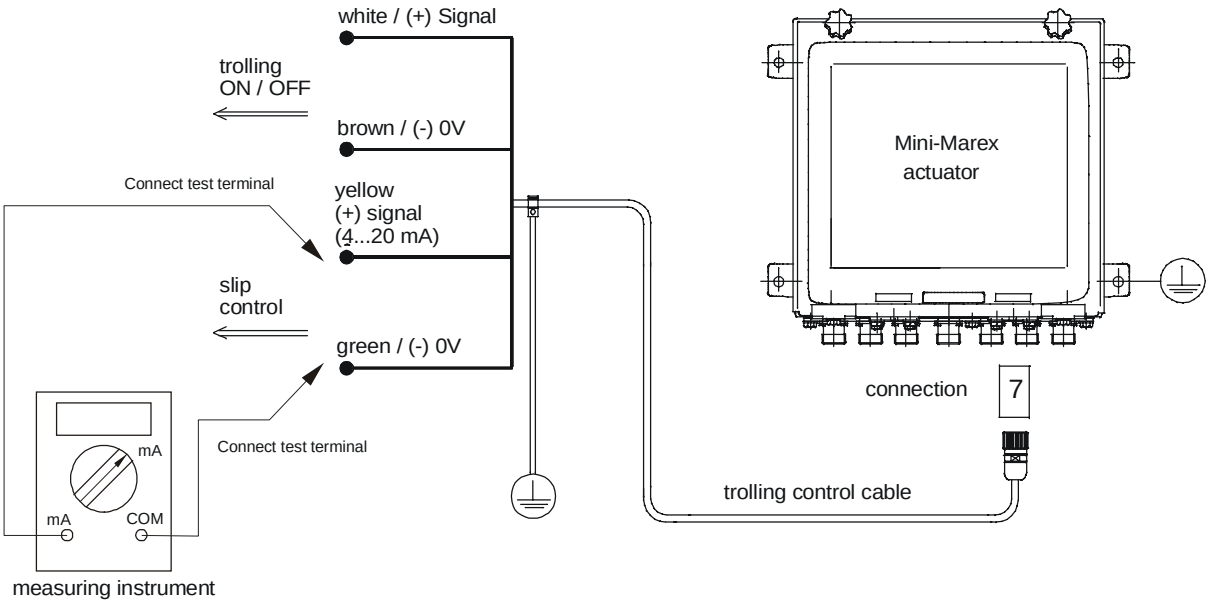
Slip position adjustments should be carried out under “warm oil”-conditions.

The output signals given from the Mini-Marex-control can be measured and adjusted as follows:

Before any measurements and adjustments **shut off the engine** and **activate the control**. Possible misadjustments may cause uncontrolled commands . Danger of **damages to propulsion system and ship**.

**Turn on the Mini-Marex-C control and take over command at station 1.** The corresponding control head levers have to be positioned in „Neutral“. How to activate the remote control is described in section 6.3.

The set-up for the measurements can be seen in the following figure. A current (mA-range) measuring instrument will be needed.




**Follow the instrument maker's manual !!!**

Mostly, the following procedure is recommended:
1.) Move selector switch of the measuring instrument into range mA (DC).
2.) Connect test terminal COM-output to the green wire ( -- 0V ) .
3.) Connect test terminal mA-output to the yellow wire (+ signal ) .

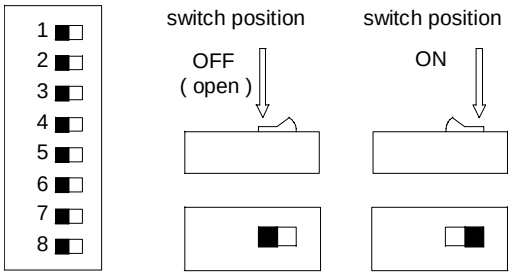
## 5.2.3.1 Maximum speed for Trolling

The Mini-Marex-output signals are measured and adjusted by means of the **function switch-III** and the **potentiometer P1 and P2** located on the main board (for location see section “4.2 Main board, from page 4-2).

Follow absolutely the **sequence of the individual steps**. Any deviation will not be accepted by the control.

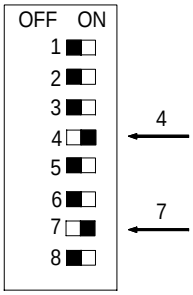
Explanation of switch positions:

Function switch III
DIP switch 1...8



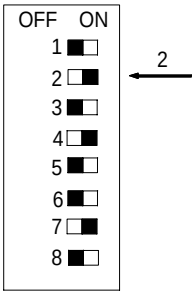
**Step 1**

DIP switch 7 in ON position
DIP switch 4 in ON position



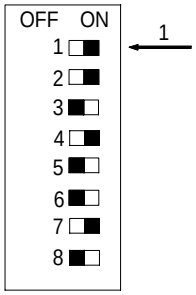

**Step 2**

DIP-switch 2 in ON position



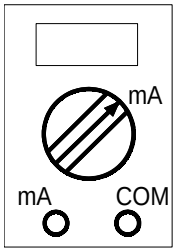

**Step 3**

DIP- switch 1 in ON position



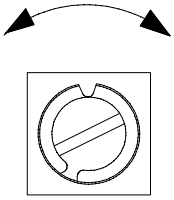

**Step 4**

measure output signal



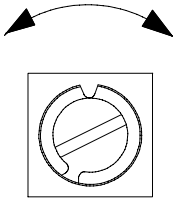

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



**Before each adjustment, the potentiometers should be set to their mid-position. This will allow sufficient adjustment for both directions.**

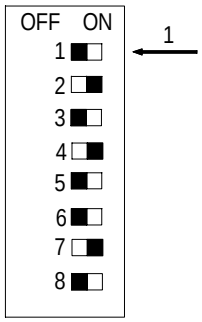
**In case the adjustment range of a potentiometer is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted ( DIP-switch-1 on OFF ). After the potentiometer is set back and alternated to adjustment mode (DIP-switch-1 in ON position), the adjustment may be continued. Do not change the other DIP-switches.**

Both potentiometers have a mechanical stop. Do not overwind the potentiometers or they will be damaged.

**After the wanted output signal has been adjusted, exit the adjustment mode as follows:**

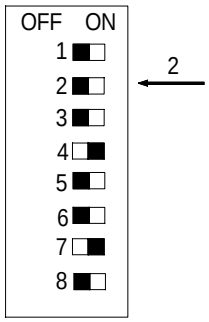
Step 7

**DIP-switch 1 in OFF position**



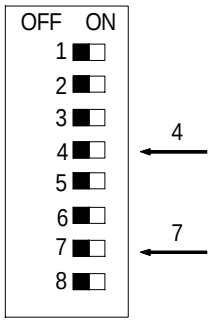

Step 8

**DIP- switch 2 in OFF position**




Step 9

**DIP switch 4 in OFF position**
**DIP switch 7 in OFF position**




**Now, the Mini-Marex control is in operating mode again.**

## 5.2.3.2 Minimum slip position

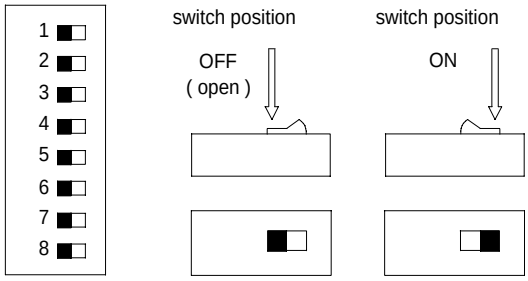
( non-positive drive )

The output signals of the Mini-Marex are measured and adjusted by means of the **function switch-III** and the **potentiometer P1 and P2** located on the main board (for location see section “4.2 Main board” from page 4-2).

Follow absolutely the sequence of the individual steps. Any deviation will not be accepted by the control.

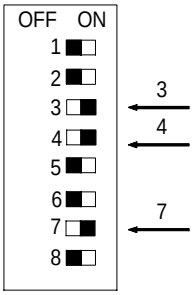
Explanation of switch positions:

Function switch III
DIP switch 1...8



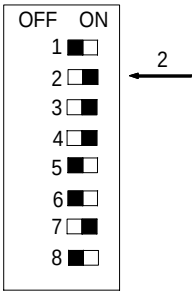

**Step 1**

DIP switch 7 in ON position
DIP switch 4 in ON position
DIP switch 3 in ON position



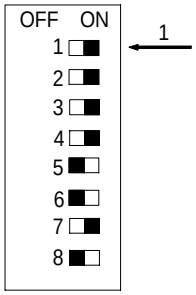

**Step 2**

DIP-switch 2 in ON position



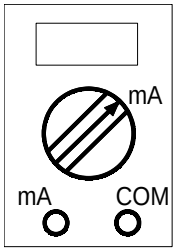

**Step 3**

DIP- switch 1 in ON position



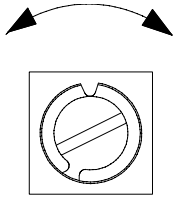
**Step 4**

measure output signal



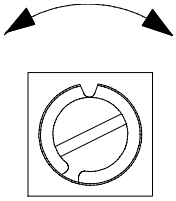

**Step 5**

change output signal, if needed
**P1 (coarse adjustment)**



**Step 6**

change output signal, if needed
**P2 (fine adjustment)**



**Before each adjustment, the potentiometers should be set to their mid-position. This will allow sufficient adjustment for both directions.**

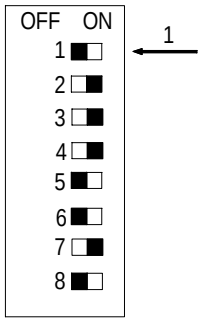
In case the adjustment range of a poteniometer is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted (DIP-switch-1 on OFF). After the potentiometer is set back and alternated to adjustment mode (DIP-switch-1 in ON position), the adjustment may be continued. Do not change the other DIP switches.

**Both potentiometers have a mechanical stop. Do not overwind the potentiometers or they will be damaged.**

**After the wanted output signal has been adjusted, exit the adjustment mode as follows:**

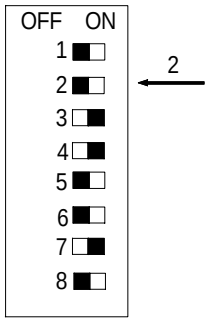
**Step 7**

**DIP-switch 1 in OFF position**



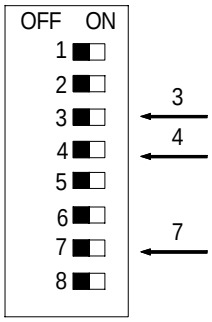

**Step 8**

**DIP- switch 2 in OFF position**




**Step 9**

**DIP-switch 3 in OFF position**
**DIP-switch 4 in OFF position**
**DIP-switch 7 in OFF position**




Then the Mini-Marex control will be in operating mode again.

## 5.2.3.3 Maximum slip position for Trolling

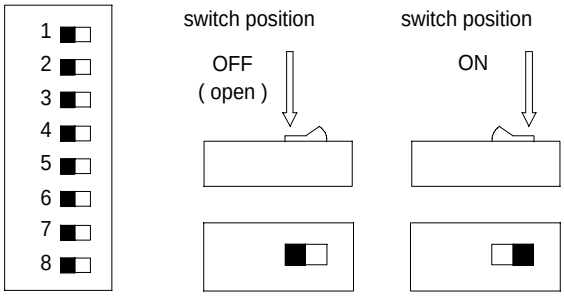
(almost no transmission)

The output signals of the Mini-Marex are measured and adjusted by means of the **function switch-III** and the **potentiometer P1 and P2** located on the main board (for location see section “4.2 Main board” from page 4-2).

Follow absolutely the **sequence of the individual steps**. Any deviation will not be accepted by the control.

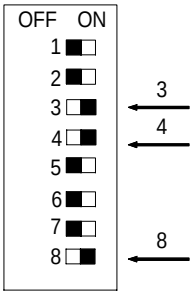
Explanation of switch positions:

Function switch III
DIP switch 1...8



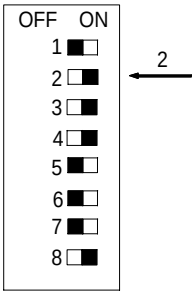

Step 1

DIP-switch 8 in ON position
DIP-switch 4 in ON position
DIP-switch 3 in ON position



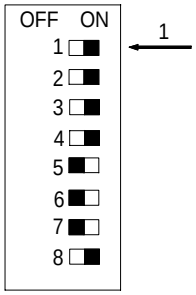

Step 2

DIP-switch 2 in ON position



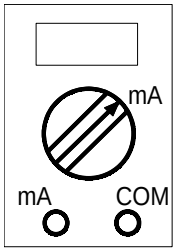

Step 3

DIP-switch 1 in ON position



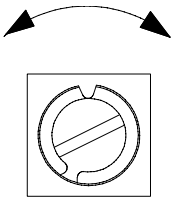

Step 4

measure output signal



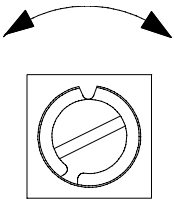

Step 5

change output signal, if needed
**P1 (coarse adjustment)**



Step 6

change output signal, if needed
**P2 (fine adjustment)**



**Before each adjustment, the potentiometers should be set to their mid-position. This will allow sufficient adjustment for both directions.**

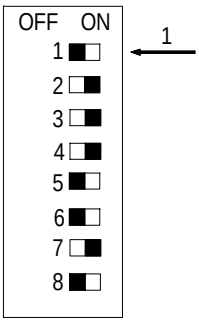
In case the adjustment range of a potentiometer is not sufficient for getting the wanted travel position, the adjustment procedure has to be interrupted (DIP-switch-1 on OFF). After the potentiometer is set back and alternated to adjustment mode (DIP-switch-1 in ON position), the adjustment may be continued. Do not change the other DIP-switches.

Both potentiometers have a mechanical stop. Do not overwind the potentiometers or they will be damaged.

After the wanted output signal has been adjusted, abandon the adjustment mode as follows:

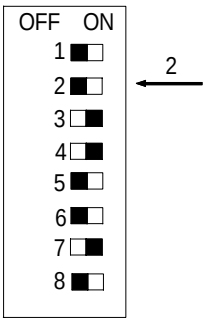
**Step 7**

**DIP-switch 1 in OFF position**



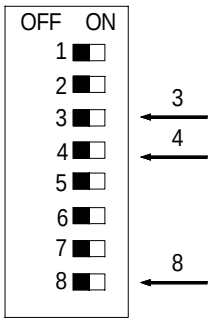

**Step 8**

**DIP- switch 2 in OFF position**



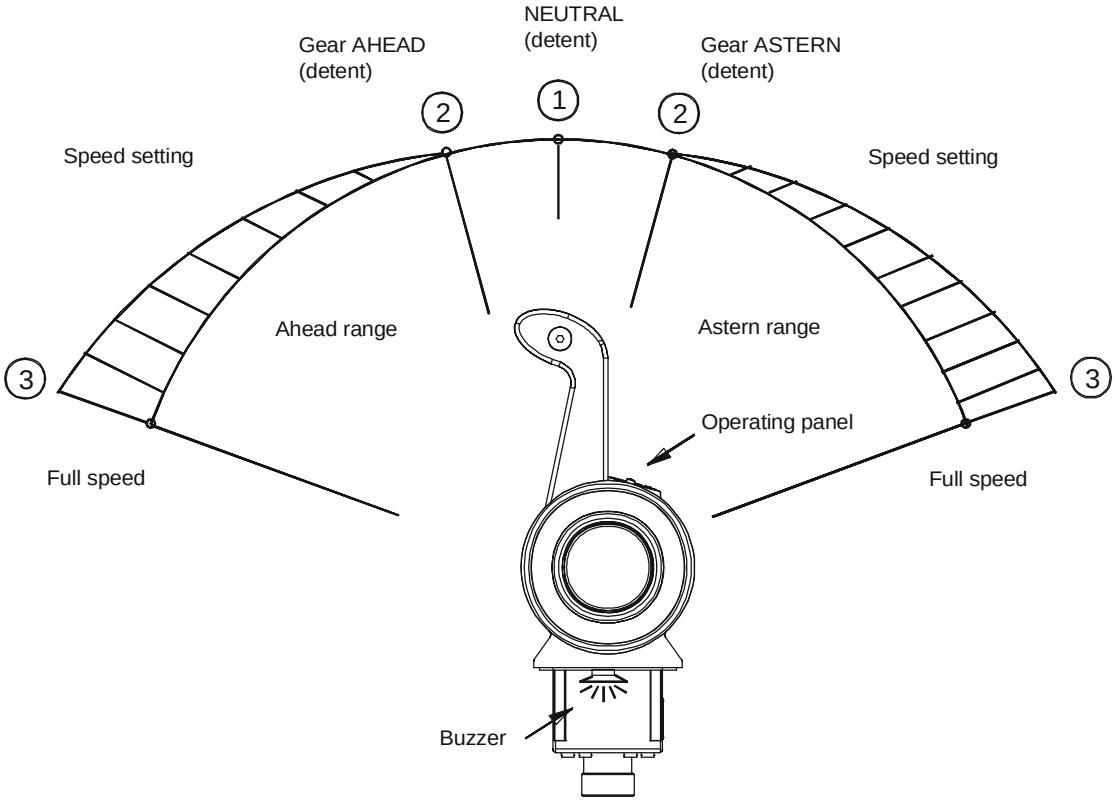

**Step 9**

**DIP-switch 3 in OFF position**
**DIP-switch 4 in OFF position**
**DIP-switch 8 in OFF position**




Then, the Mini-Marex control will be in operating mode again.

## 6.1 Control Head




### 6.1.1 "Neutral"- (Detent-) Position❶

In this position the gears are disengaged, and the engine is idling. Each time "Neutral"-position is taken up, this is indicated by means of a short "beep"-tone.

### 6.1.2 "Ahead- / Astern-" ( Detent-) Positions❷

In this lever position, two operations are possible.

**1. Standard-operation**

The gears are shifted in "Ahead" or "Astern"-direction, the engine is idling.

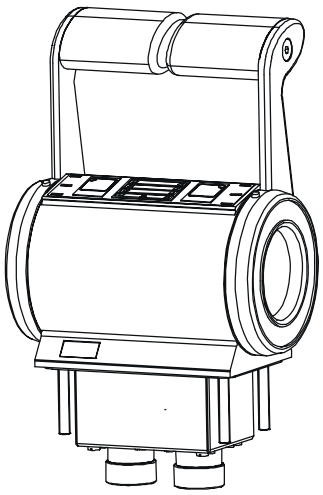
**2. Feature "power boost"**

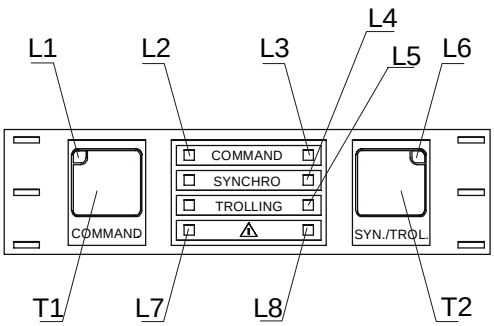
The feature "power boost" has to be selected before by means of DIP-switch II-8 (for setting and definition see page 4-7). The engine speed increases before clutch engagement and drops back to idle after the clutch has been fully engaged.
For a safe reversing, individual delay times before and after clutch engagement may be set (definition see page 4-6).

### 6.1.3 “Maximum speed”-position ❸

In position ❸ “ Full speed - maximum speed” for “Ahead” or “Astern” is set. Between the positions ❷ and ❸, the engine speed can be set continuously with the gears engaged.

## 6.2 Operation field – control head for twin engine propulsion






### 6.2.1 Push-button "station transfer" T1


There is one push-button for "station transfer“ on the control head. The push-button is lighted by LED L1 and indicates that the control is power-supplied. The push-button is used to take over the command at the respective remote station. The procedure for take-over of command and station transfer is described on page 6-10 up. Apart from this, the push-button has two additional functions.

### 6.2.1.1 Feature "Warming Up"

With the control head lever in position ❷, this function permits to warm a cold engine up by accelerating it over the complete speed-range without engaging the clutch.

**How to activate the “Warming Up”-function:**

The “Warming Up”-function can be activated only at a commanding control head in “Neutral ❶ ” position.

1. Move the control head lever into position ❶ "Neutral”.
2. Push and hold down the push-button "Station Transfer".
3. Move the control head lever into detent position ❷ "Gear Ahead/Astern”
   "Warming Up" will be signalled by two short beep tones and a short-term flashing of the control head illumination.
4. Release the push-button "Station Transfer".

The engine is idling while the clutch is remaining disengaged. Now the control head lever can be moved on to position “❸ Full speed” for speed-setting through the total range between the positions ❷ and ❸.

For twin engine propulsion systems each engine can be operated separately.

**How to abandon the “Warming Up”- function:**

To abandon "Warming Up“, return the control head lever to position “❶ Neutral. The normal "beep“ tone indicates "Neutral"-position. The control head illumination stays on. The „Warming Up“-feature is cancelled.

If the control head lever is moved from "Ahead" to "Astern" or vice versa in "Warming Up"-mode, the "Warming Up"-function will be abandoned automatically when the lever passes position ❶. The clutch would engage after the lever has reached position ❷ - "Gears Ahead/Astern" again.

## 6.2.1.2 Feature „Mute Acoustic Alarm“

The buzzer activated for some alarms may be switched off at the corresponding control panel by Pressing push-button "Station Transfer".

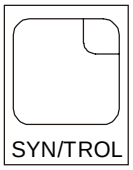
**The alarm will not be cleared by muting the buzzer!**

## 6.2.2 Indicator light „Alarm L7 and L8“

Two of these indicating devices are located on the control head: one for the port-system, one for the starboard-system.
In case of a failure, a red alarm lamp will light permanently.

After the control has been turned ON, the alarm lamp will be on as well, but will turn off after the command has been taken over.

## 6.2.3 Push-button "Syn./Trol. T2"




By means of this push-button (permanently lighted by LED 6) special functions can be turned ON and OFF which have been released before at the actuator.

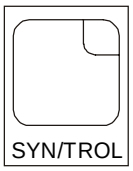
The following special functions are available:

1. engine speed synchronisation (for twin engine propulsion only)
2. trolling

By means of the push-button “Syn./Trol.”, both features may be run in a parallel way, but not at the same time.

## 6.2.3.1 Speed synchronisation (for twin engine propulsion only)

After the special feature "speed synchronization“ has been released, the speed of both engines may be synchronised for twin engine propulsion systems. For the synchronisation control a RPM- feedback signal by means of RPM pick-up is required.




The function "synchronisation" can be switched on by pushing the button "Syn./Trol." once. Pushing it a second time will switch off the function.

It can be activated or deactivated only, if both commanding control head levers are in cruising position “Ahead” or if the function “Warming Up” is in operation. Turn off the synchronisation mode before leaving the AHEAD-range or Warming Up mode. As long as the function is effective, the LED 4 "SYNCHRO“ will be ON.

As soon as one of both control heads is moved out of the range “Ahead” without having cancelled “synchronisation” before, the control will do it automatically.
In this case the LED "SYNCHRO“ flashes quickly (on 0.2 secs/off 0.2 secs) and a steady buzzer tone sounds at the station in command.

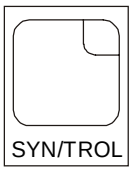
(This is no failure alarm, but a warning only.)

To clear the warning condition, move one control head lever to "Neutral"-position. As long as the warning is effective, the corresponding engine runs at idle speed.

In synchronisation mode the speed of both engines can be controlled only by the “Master”-control head (see section „5.1.2 Special feature "Synchronisation" / page 5-3). In case of a station transfer, the activated “synchronization”-function will be transferred also.

## 6.2.3.2 Trolling

**After the special feature "Trolling" has been released, for a continuous clutch slip adjustment the trolling mode can be activated by means of the push button "Syn./Trol."**



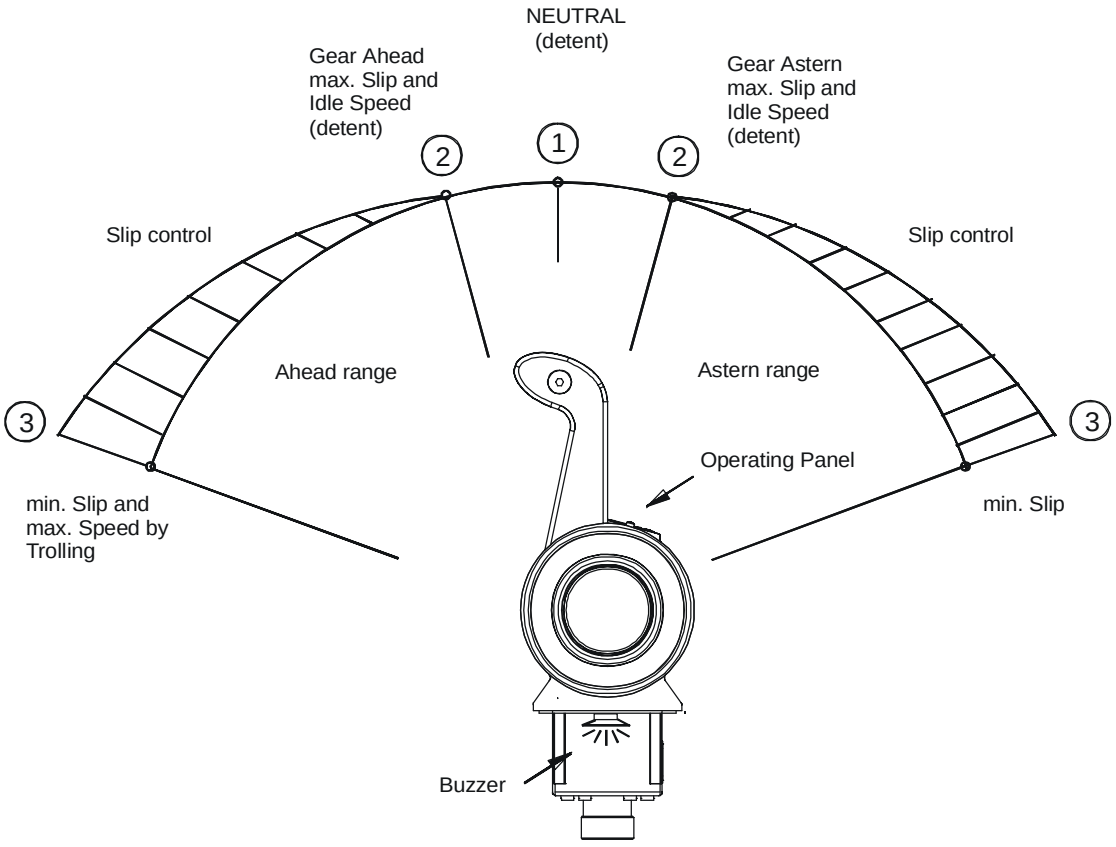

By pushing the button "Syn./Trol." the function "Trolling" is switched on. By pushing it a second time, "Trolling" is switched off.

Trolling can be activated or deactivated only, if the commanding control head lever (both control head levers within twin engine propulsion) is in "Neutral"-position. As long as the function is effective, the LED 8 „Trolling" will stay on.

In case of a station transfer the activated "trolling"-function will be transferred also.

In the Trolling-mode the control head functions are different compared to those in the standard reversing gear-mode.

The control head functions in the Trolling-mode are described in the following:



To change to the Trolling-mode, the control head lever must be located in position ❶ „Neutral“ (detent). The engine is idling and the gears are in NEUTRAL.

As soon as the Trolling-mode is activated, the clutch will be set to maximum slip while the engine is still idling and the gears remain in NEUTRAL.

After moving the control head lever into position ❷ “Gears AHEAD / Astern” (detent) the gears are shifted to “Ahead” or “Astern”. Because of maximum clutch slip (100% slip) the propeller shaft stands still or rotates very slowly only while the engine is still idling.

After moving the control head lever forward towards position ❸, the clutch slip decreases continuously and the engine speed increases at the same time.

In position ❸ the clutch slip is at minimum (0% slip / non-positive drive) and the engine speed has reached the adjusted full speed in Trolling-mode.

## 6.2.4 Buzzer

One buzzer for each control is located underneath the control head (one for port and one for starboard).

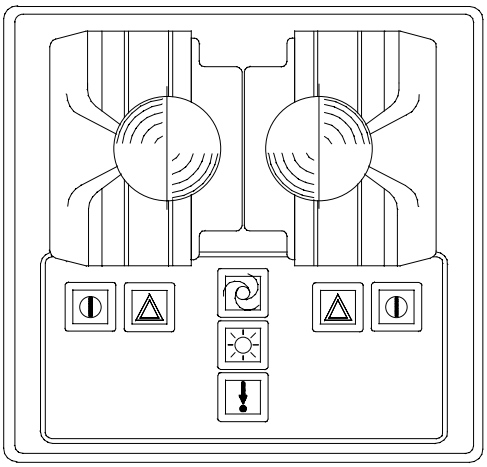
By acoustic signals, the buzzer will support the visual indications of the control head illumination and the alarm lamp. Furthermore, every time lever is placed in "Neutral“-position, the buzzer will signal it by a short "beep". If the "Warming-Up"-function has been called, two short "beep"-tones are produced.

## 6.2.5 Indicator light „Command L2 and L3“

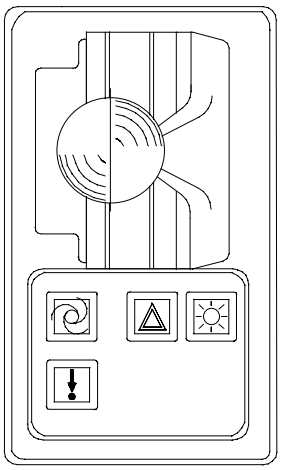

A permanent light at "Command" indicates which control head is active at the time given. The indicator light "Command“ at the other remote stations is OFF. The light flashes when a station transfer has been requested. If the control head is in "Warming Up"-mode, the light at "Command“ will flash.

**There is one indicator light "Command“ for each control (one for the port and one for the starboard system).**

## 6.3 Control Panel



Twin Engine Control Panel



Single Engine Control Panel

### 6.3.1 Push-button "Station Transfer" **(lighted button -white-)**

There is only one push-button „station transfer“ on every control panel, even for twin engine systems. The push-button is lighted permanently indicating that the control is power-supplied. The push-button is used for the command transfer to other stations. The procedure how to take the command over and transfer station is described on page 48 up. Apart from this, the push-button has two additional functions.

#### 6.3.1.1 Feature „Warming Up"

In lever position ❷, this function permits to warm a cold engine up by accelerating it over the total speed-range without engaging the clutch.

**Activate “Warming Up” option:**

The “Warming Up” option can be activated with the transmitter in command and with the lever in “Neutral ❶ ” position only.

1. Move transmitter lever to position “❶ Neutral”.
2. Depress and hold down push button "Station Transfer".
3. Move transmitter lever into detent position “❷ Gear Ahead/Astern”
   "Warming UP" is indicated by means of a short, double "beep"-tone and a short-term flashing fo the transmitter lighting
4. Release push button "Station Transfer".

The engine is idling while the clutch is remaining disengaged. Now the transmitter lever can be moved up to position “❸ Full speed” for speed setting through the total range between the positions ❷ and ❸.

Within twin engine propulsion systems each engine can be operated separately.

**Cancel “Warming Up” option:**

To abandon „Warming up“, return the transmitter lever to position “❶ Neutral. The normal „beep“ tone indicates "Neutral-Position". The transmitter lighting stops flashing. The "Warming up“-feature is cancelled.

In the “Warming Up”-mode, do not move the transmitter lever from Ahead to Astern or vice versa. The “Warming Up” mode would be cancelled when the lever passes the position ❶ "Neutral” and the opposite clutch would be engaged, when it reaches position ❷ "Gear Ahead/Astern”.

## 6.3.1.2 Feature „Mute Acoustic Alarm“

The buzzer activated for some alarms may be switched off at the corresponding control panel by depressing push button "Station Transfer".

**The alarm will not be cleared by muting the buzzer!**

## 6.3.2 Push-button "alarm / lamp-test“ **(lighted button – red -)**

**Push-button with two functions**

1. Alarm lamp:

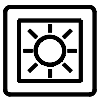
One of these indicating devices is on each control station, one for the port system, one for the starboard system.
In case of a failure, the red alarm lamp will be permanently lighted.

After the control has been turned ON, the alarm lamp is on as well, but will turn off after the command has been taken over.

2. Lamp-test:

As soon as the button is pushed down and held, the control head illumination and all lamps on the control panel will turn on. As soon as the button is released, the normal condition will appear.

## 6.3.3 Push-button "Dimmer" **(lighted button -white-)**



By means of this button, the operator can choose between a bright control panel lighting (daylight) and a darker lighting (night illumination/ ½ brightness).

| | | |
|---|---|---|
| Push button "Dimmer“ once | ⇨ | night illumination |
| Push button again | ⇨ | day illumination |
| Push button again for a short time | ⇨ | night illumination |
| and so on | | |

The night illumination may be dimmed continuously.

Push and hold down the "Dimmer"-button. The total range of brightness is run through. As soon as the desired state of illumination is reached, release the push button. When the control has been switched off (supply voltage turned off), the brightness has to be adjusted again.

**Alarm lamp and buzzer are not affected by the dimmer.**

.

## 6.3.4 Push-button "Special Feature" **(lighted button – yellow – )**

By means of this push-button released special features can be turned ON and OFF.

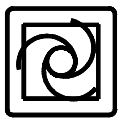
The following special features are available:

1. Engine speed synchronisation (for twin engine propulsion only)
2. Trolling

By means of push button “Special Feature” both features may be run in a parallel way, but not at the same time.

## 6.3.4.1 Speed synchronization (for twin engine propulsion only)

After the special feature "speed synchronisation“ has been released, the speed of both engines may be synchronised. For the synchronisation control, a RPM- feedback signal by means of RPM pick-up is required.



The function is turned on by pushing the button "Special Feature" once. Pushing it a second time will turn synchronisation off.
Engine speed synchronisation can be activated or deactivated only, when both commanding control head levers are in cruising position “Ahead” or the function “Warming Up” is in operation. Turn off the synchronisation-mode before leaving the AHEAD-range or warming up mode.
As long as the function is effective, the push-button will flash (on 0.1 secs/ off 0.1 secs).

As soon as one of both control heads is moved out of the range “Ahead” without having cancelled “synchronisation” before, the control will do it automatically.
In this case the push-button light will flash quickly (on 0.2 secs/off 0.2 secs) and a steady buzzer tone will sound at the station in command.

(This is no failure alarm, but a warning only.)

To clear the warning condition, move one control head lever to "Neutral"-position. As long as the warning is effective, the corresponding engine will idle.

In synchronisation-mode the speed of both engines can be controlled only by the “Master”-control head (see section „5.1.2 “Special feature Synchronization" / page 5-3). In case of a station transfer, the activated “synchronisation” -function will be transferred also.

## 6.3.4.2 Trolling

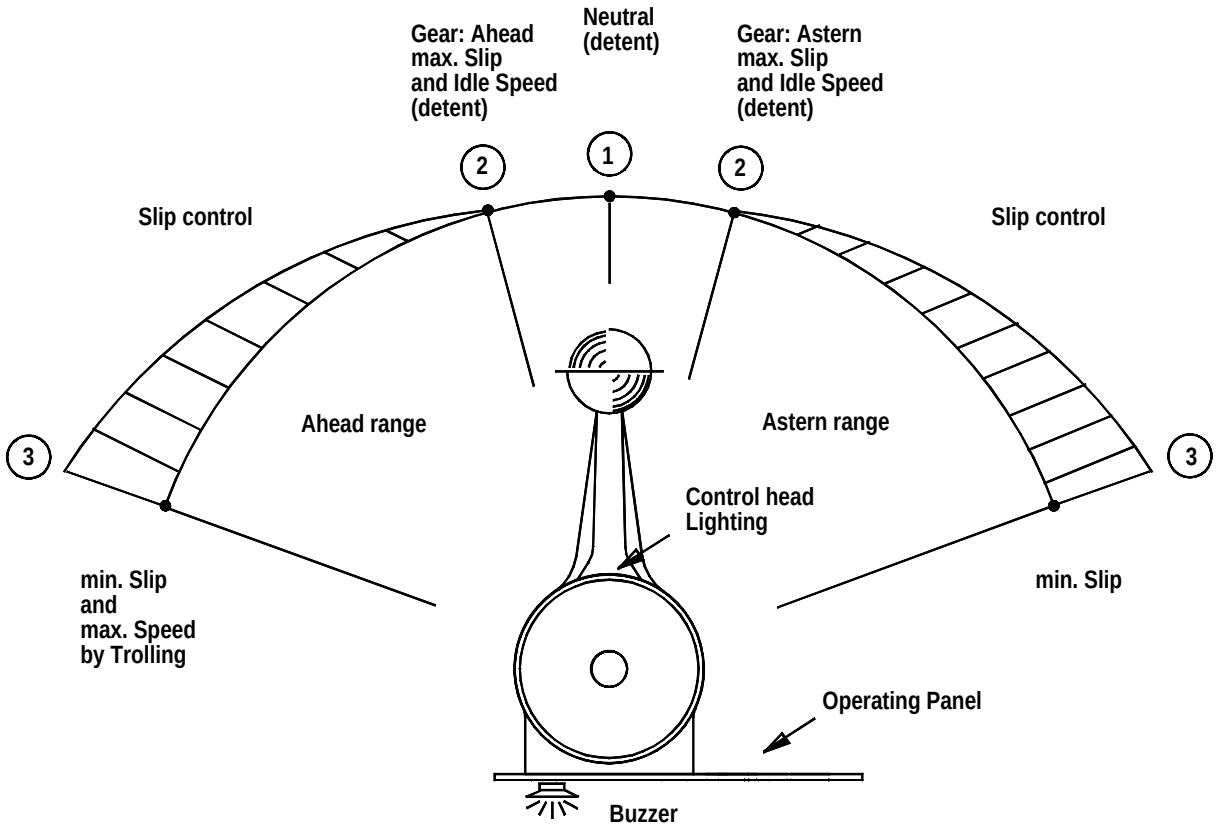
**After the special feature "Trolling" has been released, the trolling mode can be activated for a continuous clutch slip adjustment by means of the push-button "Special Feature".**

Pushing the "Trolling"-button once will switch on the function, pushing the button a second time will switch it off.
Trolling can be activated or deactivated only, when the control head lever in command (both control head levers for twin engine propulsion) is in "Neutral"-position. As long as the function is effective, the push-button "Special Feature" is lighted.

In case of a station transfer, the activated "Trolling"-function will be transferred also.

In the Trolling-mode, the control head functions will be different compared to those in the standard reversing gear mode.

The control head functions in Trolling-mode are described in the following:



To change to Trolling-mode, the control head lever must be located in position ❶ "Neutral“ (detent). The engine is idling, and the gears are in NEUTRAL.

As soon as the Trolling-mode is activated, the clutch will be set to maximum slip while the engine is still idling and the gears remain in NEUTRAL.

After moving the control head lever into position ❷ “Gears AHEAD / Astern” (detent) the gear is shifted to “Ahead” or “Astern”. Because of maximum clutch slip (100% slip), the propeller shaft stands still or rotates very slowly only while the engine is still idling.

After moving the control head lever towards position ❸ the clutch slip decreases continuously and the engine speed increases at the same time.

In position ❸ the clutch slip is at minimum (0% slip / non-positive drive) and the engine speed has reached the adjusted ”full speed in trolling mode“.

## 6.3.5 Indicator Lamp „Remote Control ON“ **(green)**

For twin engine systems only

Two of these indicator lamps are included in control panels for twin engine propulsion systems, one for the port control and one for stbd. The indicator lamp shows that the corresponding control is ON. The lamp **does not** indicate which transmitter has the command at a time.

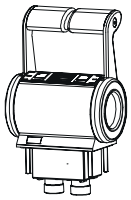
## 6.3.6 Buzzer

A buzzer for each control is located underneath the control panel (one at single engine panels, at twin engine panels one for port and one for starboard).

By acoustic signals, the buzzer supports the control head illumination and alarm lamp. Also, every time the lever is placed in "Neutral"-position, the buzzer will signal this by a short "beep". If the "Warming Up" –function has been called, the buzzer will sound twice at a short interval.

## 6.3.7 Control head lighting (green)

The control head lighting is a green point on the control head scale at „Neutral“.
Steady light indicates which transmitter has the command at a time. The control head lighting at the other station is OFF. It flashes when station transfer is requested.
When the control head is in "Warming Up"-mode, the control head illumination flashes.



## 6.4.1 Turning the control ON (via control heads)

**1. Turn ON control**

Action: ➢Turn ON supply voltage

Folge: ➢Indicator lamp “Alarm” (red) shows steady light at all remote stations
➢Push-button „Command” and „Syn./Trol shows steady light at all remote stations (visible at darkness only).
➢Buzzer sounds with low repetition at all remote stations.

**2. Requesting control:**

Remote control may be requested at any remote station. The control head lever must be placed in „Neutral“ before.

**“Control head alignment" and "enable remote stations"-procedures must have been carried out (section 4.5 page 4-21 up).**
Otherwise, the command can be taken at station 1 only.

Action: ➢Move control head lever to "Neutral“.
➢Push "Command“-button once.

Result: ➢Indicator lamp „Alarm“ (red) remains steady at all stations.
➢Indicator “Command” flashes at high repetition
➢Buzzer sounds at high repetition on all stations.

When both, lighting and buzzer continue to signal at long intervals, one of the control head levers is probably not in "Neutral"-position.

**3. Taking over command:**

Action: ➢Press button „Command“ a second time.

Result: ➢Indicator lamp „Alarm“ (red) at all stations is OFF.
➢Indicator lamp „Command“ at the control head in command shows steady light. Indicator lamps at all other control head are OFF
➢Buzzer tone stops at all stations.

The control head is now in command. The control system is ready for operation.

## 6.4.2 Station Transfer

The control offers two options for station transfer (**interlocked** or **free**) to be selected by means of DIP-switch I-2 ( see page 4-4 ) on the actuator circuit board. Within twin engine systems **both controls must have** identical adjustments.

**“Control head alignment" and "enable remote stations" must have been carried out (section 4.5 page 4-21 up).**
Otherwise station transfer is not possible.

## 6.4.2.1 Interlocked Station Transfer

The control compares the lever position of the control heads involved in the station transfer. To transfer the command from one station to another, the contol head **lever at the station gaining command** must be in „Neutral“ position or placed facing in the same direction ( Ahead or Astern ) as the **lever at the station in command**.

The transfer is made in two steps.

**1. Step: Requesting command**

Action:
- ➢Move control head lever into the transfer position (Neutral or same cruising direction as lever in command).
- ➢Depress push button „Command“ once.

Result:
- ➢Buzzer sounds at high repetition.
- ➢Indicator light “Command” flashes at high repetition

The new station now requests the command and the control has released the transfer indicating it by light and tone at high repetition.

If there is a low repetition lighting and tone, the station transfer will not be executed. In this case, the control head levers might not be placed in the right position or the system is disturbed.

**2. Step: Take the command over**

Action:
- ➢ Depress push button „Command“ one more time.

Result:
- ➢Buzzer tone stops.
- ➢Indicator light “Command” stays on.

The station transfer has been completed. The new station is now in command.

## 6.4.2.2 Free station transfer

With this feature, the command can be transferred to another station without considering the lever positions of the control heads involved. Only one action is necessary to do so.

**Taking the command over.**

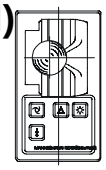
Action: ➢Push button "Command“ once.

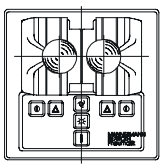
Result: Without delay, “Command” is permanently illuminated.

**The station transfer is completed and the control** carries out immediately **the set command of the control head which just has taken over the command.**

**Carelessness with this feature may cause uncontrolled cruising.**
Example: The lever of the control head in command is in „Full Ahead“ position, whereas the lever of the control head gaining command is in „Full Astern“-position. In case of a station transfer now an immediate straight reversing maneuver would take place.

## 6.5.1 Turning the control ON (via control panel)





**1. Turn ON control**

Action: ➢Turn ON supply voltage

Result:
- ➢Indicator lamp „Alarm“ (red) is on at all stations.
- ➢Push button "station transfer“ (white) is lighted at all stations.
- ➢Buzzer sounds at low repetition at all stations.
- ➢For twin engine systems only: indicator lamp "Remote Control ON“ (green) is on at all stations.

**2. Requesting control:**

Command may be requested at any remote station. The control head lever must be placed in "Neutral“ before.

**“Control head alignment" and "enable remote stations" must have been carried out (section 4.5 page 4-21 up).**
Otherwise, the command can be taken at station 1 only.

Action:
- ➢Move control head lever to "Neutral“ .
- ➢Push button "station transfer“ (white) once.

Result:
- ➢Indicator lamp "Alarm“ (red) stays on at all stations.
- ➢Push button „station transfer“ (white) is lighted at all stations.
- ➢Buzzer sounds at high repetition at all stations.
- ➢For twin engine systems only: indicator lamp "Remote Control ON“ (green) is on at all stations.
- ➢Control head lighting (green) flashes with high repetition.

When both, lighting and buzzer continue to signal at long intervals, often one of the control head levers is not in "Neutral"-position.

**3. Taking the command over:**

Action: ➢Push button "station transfer“ (white) a second time.

Result:
- ➢Indicator lamp "Alarm“ (red) at all stations is OFF.
- ➢Push button „station transfer“ (white) shows steady light.
- ➢Buzzer tone at all station stops.
- ➢For twin engine systems only: indicator lamp „Remote Control ON“ (green) shows steady light at all stations.
- ➢Lighting (green) of control head in command becomes steady. The lighting of all the other control heads is OFF

The lighted control head now has the command. The control is set into service.

## 6.5.2 Station Transfer

The control offers two options for station transfer ( **interlocked** or **free** ) to be selected by means of DIP-switch I-2 ( see page 4-4 ) on the actuator circuit board. Within twin engine systems both controls **must have** identical adjustments.

**“Control head alignment" and "enable remote stations" must have been carried out (section 4.5 page 4-21 up).**
Otherwise, station transfer is not possible.

## 6.5.2.1 Interlocked station transfer

The control compares the lever positions of the control heads involved in the station transfer. To transfer the command from one station to another, the control head lever **at the station to which the command shall be transferred** must be in „Neutral“ position or set in the same cruising direction (Ahead or Astern) as the **commanding lever**.

The transfer is done in two steps.

**1. Step: Requesting command**

Action:
- ➢Move the control head lever into the transfer position (Neutral or same direction as lever in command).
- ➢Push button „station transfer“ (white) once.

Result:
- ➢Buzzer sounds at high repetition.
- ➢Control head lighting flashes at high repetition

The station is now in condition of requesting command. The control has released the command transfer indicating it by by light and tone signals at high repetition.

If there is a low repetition lighting and tone, the station transfer will not be executed. In this case, the control head levers might not be placed in the right position or the system is disturbed.

**2. Step: Take command over**

Action:
- ➢ Push button "station transfer“ (white) one more time.

Result:
- ➢Buzzer tone stops.
- ➢Control head lighting stays on.

The station transfer is completed. The lighted control head has the command.

## 6.5.2.2 Free Station Transfer (without comparision of lever positions)

With this feature, the command can be transferred to another station without considering the lever positions of the control heads involved. Only one action is necessary to do so.

**Taking the command over**

Action: ➢Push button „station transfer“ (white) once.

Result: Without delay, the control head of the selected station is illuminated permanently.

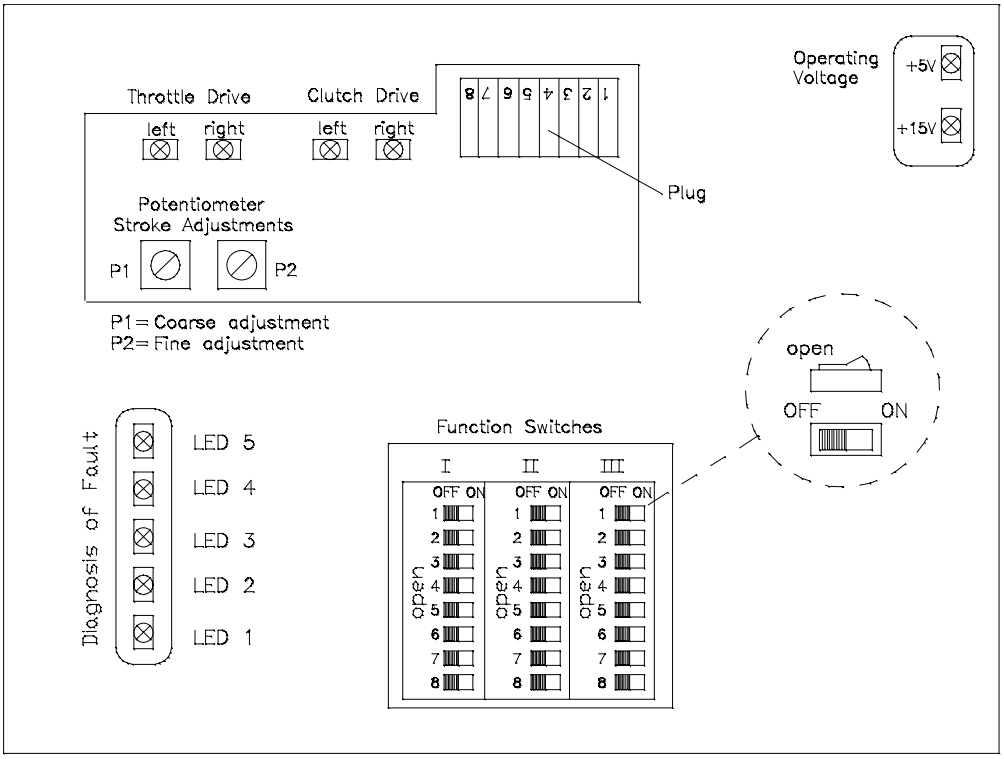
The station transfer is completed and the control **carries out immediately** the set command of the control head which has just has taken over the command.

**Carelessness with this feature may cause uncontrolled cruising.**

Example: The lever of the control head in command is in „Full Ahead“ position, whereas the lever of the control head gaining command is in „Full Astern“ position. In case of a station transfer now an immediate straight reversing maneuver would take place.

# 7.1 Fault Code

The Mini-Marex-control comprises an extensive fault analysis program for identification, evaluation, and indication of faults. A fault realised by the control is indicated via the alarm lamp at the station in command. In some cases the visual alarm is supported by the buzzer.
The type of fault is indicated by five (5) LED's arranged on the circuit board which is located inside the actuator cover. They are visible through a cut-out in the circuit board's protective plate, after the actuator has been opened. The exact location of the LED's is shown in the figure below.




Via the LED's all faults realised by the control are indicated as fault No. in binary code. The table below assists converting the binary code into decimal fault Nos.

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Valence | 1 | 2 | 4 | 8 | 16 |

To each LED a definite valence is assigned, the valence sum of the lighted LED's results in the fault No.

**Examples:**

LED 1 and LED 4 are ON
1 (valence of LED 1) + 8 (valence of LED 4) = 9 (fault No.)

LED 2, LED 3 and LED 5 are ON
2 (valence of LED 2) + 4 (valence of LED 3) + 16 (valence of LED 5) = 22 (fault No.)

The fault indication is active only as long as the fault condition lasts. As soon as the fault is cleared the LED will be OFF. The possible cause of fault then can't be recalled any more.

All faults the Mini-Marex control is able to realise are described on the following pages in the order of their fault Nos.

In case several faults arise at the same time, always the fault with the highest fault No. is indicated, until all faults have been cleared.

The buzzer activated by some alarm reports may be stopped by pushing the "station transfer“-button at the corresponding control station. But this does not cancel the alarm.

**Fault-No. 1:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ○ | ○ |

alarm lamp: steady light

Cause of fault: exceeded range of voltage
supply voltage out of range 8,4...31,2 Volts, DC

Delay: alarm ON: 1sec. / alarm OFF: 0.5sec.

Fault exit: correct supply voltage

**Fault-No. 2:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ○ | ○ |

alarm lamp: steady light

Cause of fault: when turning ON control, DIP-switch I-6 is set in ON position (terminal input)

Consequence: no intercommunication via serial interface within twin engine systems;
both controls operate separately;
maneuvering is possible

Delay: none

Fault exit: set DIP-switch I-6 in OFF position (operation)

**Fault-No. 3:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ○ | ○ |

alarm lamp: steady light

Cause of fault: programming fault:
for the wanted adjustment switch settings III-3 to III-8 inadmissible, or when turning control ON, switch III-1 is set in ON position (adjustment mode)

Consequence: value input is not possible

Delay: none

Fault exit: set DIP-switch III-1 in OFF position (operation);
check switch positions and correct, repeat programming

**Fault-No. 4:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ○ | ○ |

alarm lamp: steady light
button„special feature“ or LED “Synchro” blinks quickly
(on 0.2 sec / off 0.2 sec)

Cause of fault: in synchronization mode speed range has been exceeded:
sensored speed not within control’s admissible frequency range
possible causes: RPM pick-up doesn’t fulfil requirements; contact fault at cable plugs; wire break; defective actuator

Consequence: synchronization is cancelled, both engines follow speed setting of master control head, active speed control (synchronization) is not possible any more.

Delay: alarm ON: 1sec / alarm OFF 1.5sec

Fault exit switch OFF synchronization, correct cause of fault

**Fault-No. 5:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ○ | ○ |

alarm lamp: steady light
buzzer: steady tone
transmitter lighting or indicator light “Command” blinks with low repetition

Cause of fault: station gaining command is defective or wire break at station gaining command:
possible causes: defective potentiometer or micro switch; pot value doesn’t match with switch signal; contact fault at plugs; wire break or short circuit at control station, connecting cable, or actuator.

Consequence: station transfer is not possible; station in command keeps control.

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: after approx. 30sec requesting the command is cancelled and following fault indication automatically is cleared;
correct cause of fault.

**Fault-No. 6:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ✸ | ○ | ○ |

alarm lamp: steady light

Cause of fault: poor storage of programming

Consequence: new adjusted value can’t be stored in memory of control unit;
prior value remains valid

Delay: none

Fault exit: set DIP-switch III-1 in OFF position (operation); repeat programming

**Fault-No. 7:**

**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ✸ | ○ | ○ |

Buzzer: steady tone
LED “Synchro” “ blinks quickly ( on 0,2 sec / off 0,2 sec)

Cause of fault: unusual ending of synchronization
a) caused by moving control head lever out of „Ahead“ or „Warming-Up“ range without switching off synchronization mode
b) second control has realised a fault

Consequence: a) speed is set to idle
b) both controls react corresponding to the realised fault

Delay: none

Fault exit: move control head lever in command to „Neutral“;
correct causeof fault

**Fault-No. 8:**

**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ○ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at intercommunication cable between the actuators:
possible cause: contact fault at plugs; wire break or short circuit at connection cable or at one of the two actuators

Consequence: synchronization OFF; avoiding unforced speed variation fault No.7 is set, if synchronization was activated before,
maneuvering is still possible; both controls operate separately

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: correct cause of fault

**Fault-No. 9:**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ✸ | ○ |

alarm lamp: steady light
buzzer: steady tone

Cause of fault: plausibility fault within twin engine systems:
possible cause: different type of actuators are applied for Port and Starboard;
false Master / Slave adjustment (DIP-switch I-1);
different adjustment for mode of station transfer (DIP-switch I-2);
different adjustment of DIP-switch II-8

Consequence: synchronization OFF; speed runs to idle or stays idling; gear can be shifted to „Neutral“ one time only or can’t be moved out of „Neutral“; station transfer is not possible

Delay: none

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 10**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ✸ | ○ |

alarm lamp: steady light
buzzer: steady tone

Cause of fault: potentiometer fault at station in command:
possible cause: defective potentiometer; contact fault at plugs; wire break or short circuit at station in command, connection cable, or actuator

Consequence: synchronization OFF; speed runs to idle or stays idling; gear can be shifted to „Neutral“ one time only

Delay: none

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 11**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ✸ | ○ |

alarm lamp: steady light
buzzer: steady tone

Cause of fault: potentiometer fault at station in command:
analogue value doesn’t match with Stop signal of micro switch.
possible cause: potentiometer defective or misadjusted; contact fault at plugs, connection cable, or actuator

Consequence: speed stays idling; gear can’t be shifted out of „Neutral“
maneuvering is not possible.

Delay: Alarm ON 1sec / Alarm OFF 1.5sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault.

**Fault-No. 12** **Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at potentiometer for RPM feed back

Consequence: synchronization OFF; speed runs to the mechanical stop at idle position (speed crash maneuver); gear can be shifted

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 13**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at potentiometer for clutch feed back

Consequence: synchronization OFF; speed runs to idle position; gear can’t be shifted any more

Delay: alarm ON: 1sec / alarm OFF: 1.5sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 14**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: false feed back from interface circuit board used for electrical gear shifting: possible cause: gear doesn’t shift; pressure switch defective or not connected (but activated from interface board); contact fault at connector plugs; wire break or short circuit between actuator and gear switches; defective interface board or defective ICs on main circuit board

Consequence: synchronization OFF; if synchronization was active before, for the slave control fault No. 7 is set additionally, but the set speed remains.

Delay: Alarm ON: 4s / Alarm OFF: 2s
By means of special terminal inputs the delay times can be brought into the range from 0 sec to 15 sec.

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 15**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ✸ | ✸ | ○ |

alarm lamp: steady light

Cause of fault: wire break or short circuit at interface circuit board used for electrcal gear shifting
possible cause: wire break or short circuit between gear interface board and main board of the control

Consequence: synchronization OFF; if synchronization was active before, for the slave control fault No. 7 is set additionally, but the set speed remains.

Delay: Alarm ON: 1sec / Alarm OFF: 1.5 sec

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 16**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of throttle drive in one direction:
possible cause: jam or heavy moving of throttle lever, push-pull cable, or actuator drive; defective lCs on electronic board

Consequence: synchronization OFF; if synchronization was activated before, for the slave control fault No.7 is set granting speed setting only, after the control head lever has been brought to „Neutral“;
speed variation into the blocked direction is not possible;
gear can be shifted

Delay: none

Fault exit: move control head lever in command to „Neutral“
correct cause of fault

**Fault-No. 17**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of gear shift drive in one direction:
possible cause: jam or heavy going of gear shift lever, push-pull cable, or actuator drive; defective lCs on electronic board

Consequence: synchronization OFF;
speed runs to idle; gear shifting into the direction not blocked is possible

Delay: none

Fault exit: operate gear shift lever into direction not blocked;
correct cause of fault

**Fault-No. 18**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of throttle drive in both directions:
possible cause: jam or heavy going of throttle lever, push-pull cable, or actuator drive; defective ICs on electronic board

Consequence: speed setting is not possible any more; gear can be shifted one time to „Neutral“

Delay: none

Fault exit: locate defect and correct ; initiate control again

**Fault-No. 19**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: blocking of gear shift drive in both directions:
possible cause: jam or heavy going of gear shift lever, push-pull cable, or actuator drive; defective ICs on electronic board

Consequence: speed runs to idle; gear shifting is not possible any more

Delay: none

Fault exit: locate defect and correct ; initiate control again

**Fault-No. 20**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: false gear operation has been adjusted
although actuator has solenoid operated gear shifting device, DIP-switch I-5 is set in OFF position (mechanical gear shifting)

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: set DIP-switch I-5 in ON position (electrical operated); initiate control again

**Fault-No. 21**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: DC motor control failure:
possible cause: hardware failure or short circuit in motor control; blown fuse protecting the actuator

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct defect and initiate control again

**Fault-No. 22**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: inadmissible software modification in EEPROM

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct fault and initiate control again

**Fault-No. 23**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ✸ | ○ | ✸ |

alarm lamp: steady light

Cause of fault: sum check fault in EEPROM
e.g. unusual ending of control head alignment

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: set DIP-switch I-7 in ON position (control head alignment), afterwards in OFF position (operation) again; sum check now is corrected; the control acts like after a new initiation.

**Fault-No. 24**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: functions of EEPROM and EPROM don't match

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: apply matching EEPROM and EPROM and initiate control again

**Fault-No. 25**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: EEPROM is not installed or false version

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: apply matching EEPROM and EPROM and initiate control again

**Fault-No. 26**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ✸ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: defective external RAM

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct fault and initiate control again

**Fault-No. 27**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ✸ | ○ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: defective EPROM

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct fault and initiate control again

**Fault-No. 28**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ○ | ○ | ✸ | ✸ | ✸ |

alarm lamp: steady light

Cause of fault: defective watchdog

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

Delay: none

Fault exit: correct defect and initiate control again

**Fault-No. 29**
**Actuator Indication** **Control Station Indication**

| LED | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | ✸ | ○ | ✸ | ✸ | ✸ |

alarm lamp: steady light

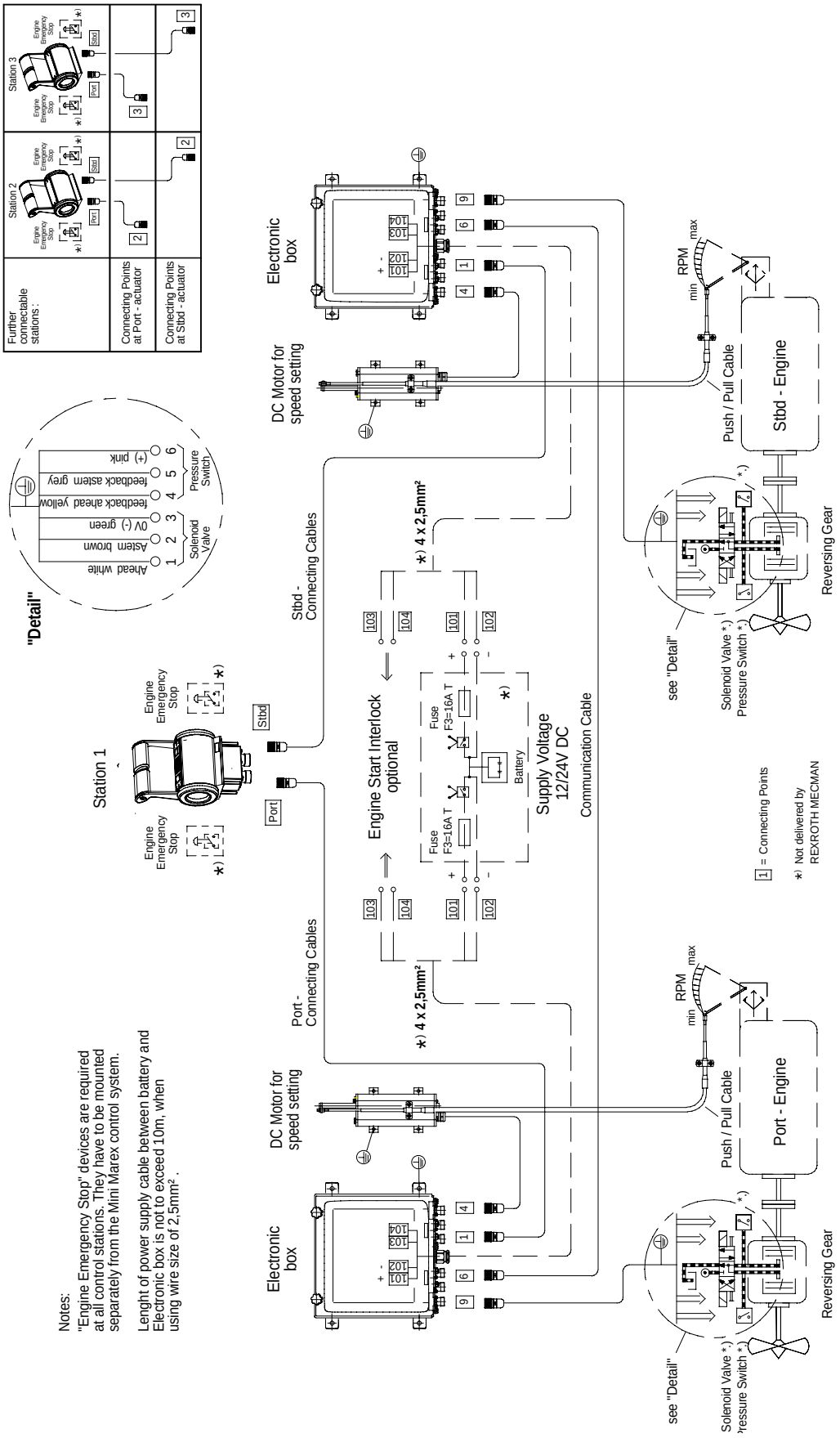
Cause of fault: internal fault (defective CPU or defective internal RAM)

Consequence: synchronization OFF; speed setting OFF; gear shifting OFF;
within twin engine systems intercommunication is interlocked, this keeps the other control operating

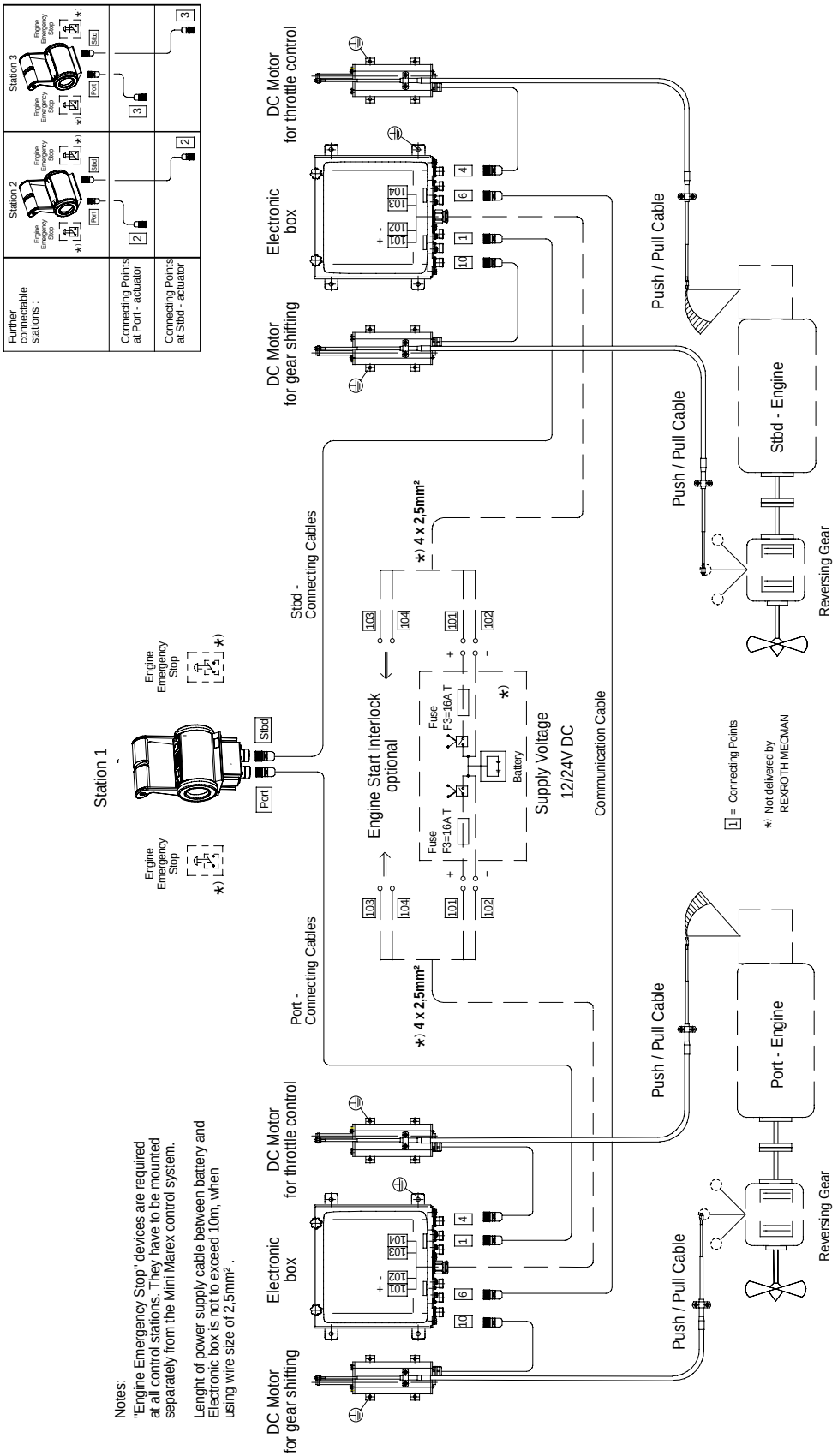
Delay: none

Fault exit: locate defect and correct; initiate control again

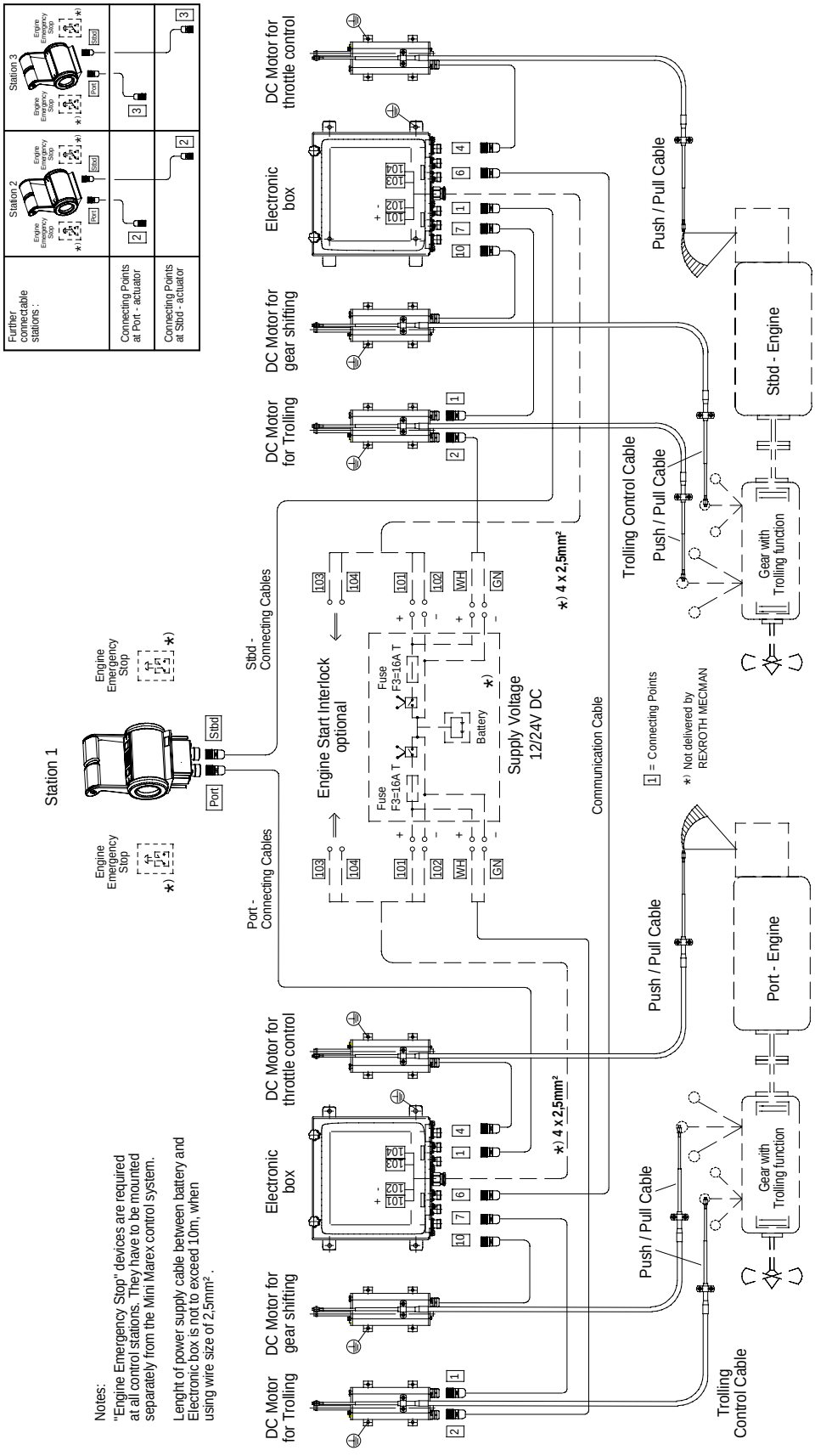
# 8.1 Mechanical speed setting Electrical gear shifting



## 8.2 Mechanical speed setting / Mechanical gear shifting



## 8.3 Mechanical speed setting / Mechanical gear shifting/ Mechanical trolling control



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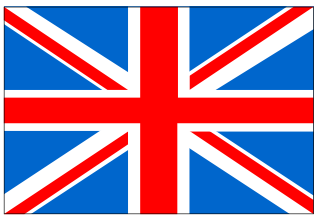
**Order no. 883 890 068 3 / 01.02**

# Mini-Marex-E

Actuator

323 699 452 0 . . . . . .



Rexroth
Bosch Group

# Mini-Marex *E*
# Stellgerät / Actuator
# 323 699 452 0

Deutsch / English

**Zusatzhandbuch zu / Additional Manual to**
**323 699 446 0**

**Marine**

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## Inhaltsverzeichnis



## Table of Contents

## General Information

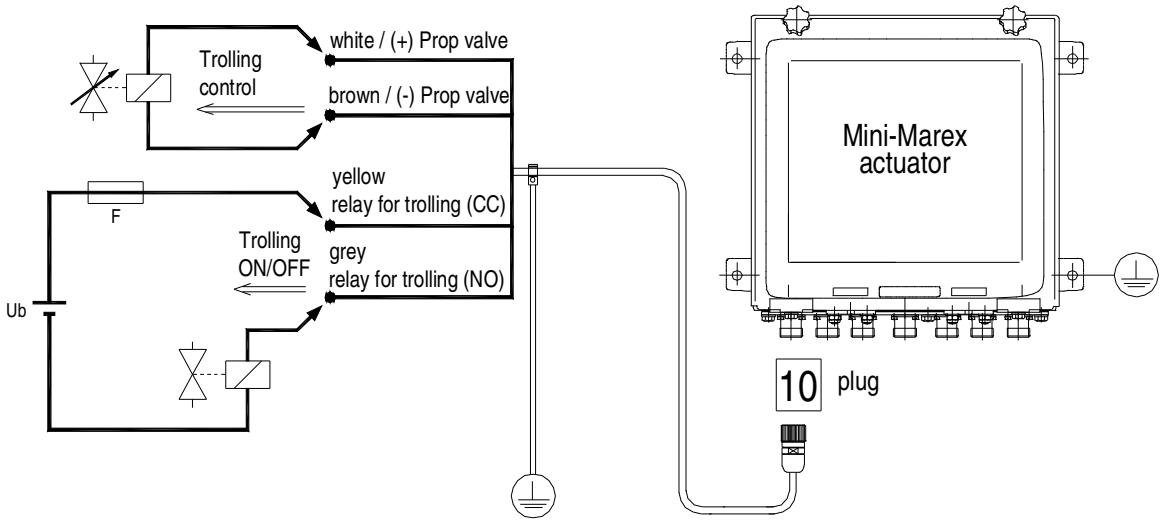
The actuator 323 699 452 0 differs from actuator 323 699 446 0 mainly in the design of the trolling output, which is not designed as a 4 – 20 mA interface, but as a pulse-width modulated signal (PWM) for direct activation of a proportional valve.

Only electric components can be connected because the output for the gear-actuating drive is required for activation of the proportional valve. Dip switch I.5 for selection of “gears: push-pull cable/electric‘ is ineffective. Electrical activation is always selected automatically.

In addition, the start relay as potential-free contact is assigned with the function “trolling on” and therefore can no longer be used for engine start interlock without more ado. This output may be used for gears that have besides the proportional valve another valve for activation of the trolling function.

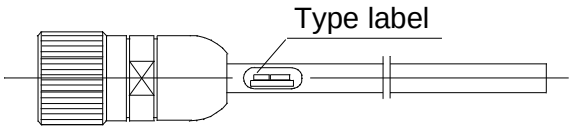
The PWM signal will be adapted to fluctuations of the operating voltage so that the voltage at the proportional valve remains constant on average. Variations of the oil pressure in the gear can thus only be caused by changes in temperature or leakage.

## Connection to Trolling Gears




The proportional valve may only be connected in the way shown in the above drawing.
It has to be potential-free.
Should the proportional valve be electrically connected, i.e. to the solenoid valves for ahead or astern in the gear terminal box or elsewhere, it has to be disconnected.

For trolling connection 10 is used, to which the cables 894 620 29✪ 2 are connected. The symbol ✪ signifies also a figure, which only refers to the different available cable lengths.
Connection 7 does not have any function in this actuator.



## State of Delivery

In the state of delivery almost every electric controlled trolling-gearbox by ZF Padova, in the following called *ZF-P,* is supported at the time of this document's printing.

ZF-P's gearbox models
ZF 650, ZF W 650, ZF 650 A, ZF 650 V,
ZF 660, ZF 660 A, ZF 660 V,
ZF 670, ZF 670 A, ZF 670 V,
as well as the gears by ZF Friedrichshafen, Reintjes and other companies cannot be operated directly with the adjustments made in the state of delivery.
In any case the proportional valve's nominal voltage and current have to be adjusted as described below.

Even if there is no need to adapt the state of delivery, the limits fixed by the producer have to be checked in any case and have to be adapted, if necessary.
Disregarding this aspect can destroy the gearbox!

The key data of the *ZF-P* gears and the pre-adjustments for trolling operation are listed in the following table:

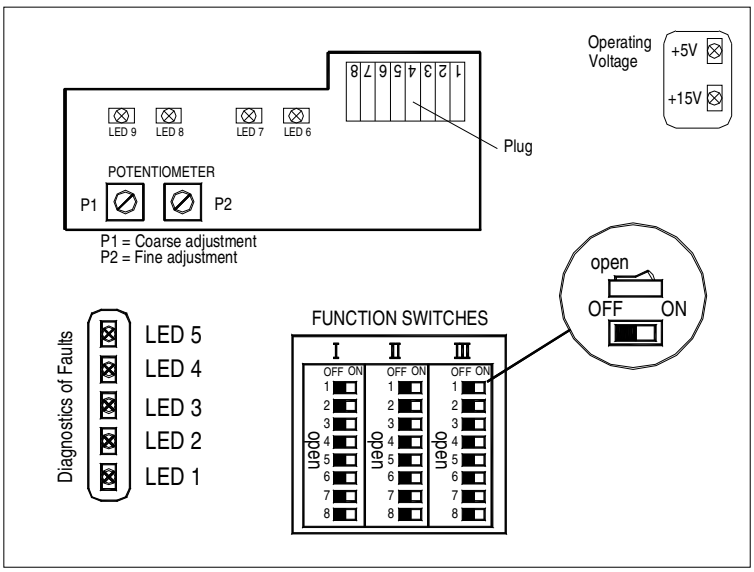
| | Instruction by ZF | Pre-adjustments of the Mini-Marex |
|---|---|---|
| $I_{PROP,Min}$ | ~ 200 mA | 200 mA |
| $I_{PROP,Max}$ | 300 mA $^{+10mA}$ | 300 mA |
| $I_{PROP,trolling\ off}$ | 0 mA | 0 mA |
| $U_{PROP,nominal}$ | 12 V | 12 V |
| $R_{Prop}$ | 9.8 Ω | |
| $P_{oil,max}$ | 4 bar | |

The *ZF-P* gearboxes do not have any additional valve, by which the gear is switched between trolling and reversing gear operation. This switching occurs automatically, if the current to the proportional valve is switched off.

## Selection of the Proportional Valve's Nominal Voltage

Often 12 V types of proportional valves are applied in 24 V systems. In order to protect the proportional valve the maximum output voltage can be limited to 12 V.
The applied nominal voltage of the proportional valve (12 V/24 V) is set under number 191 in the parameter memory.

With the help of the function switches I and III, the adjusting potentiometers P1 and P2, the LEDs for error diagnosis, LED 1 to 5, and the LEDs above the adjusting potentiometers, LED 6 to 9 the parameters from number 60 on may be changed.
There is a separate description of this procedure. In the following it is described how to adapt parameter 191 for selection of the proportional valve's nominal voltage.



Parameter 191 can be changed in the following way:

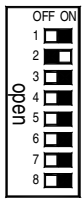
(1) As for the release of special functions (see manual of the actuator 323 699 446 0) the control has to be in stop position or in the state of non-initialisation (still no control station active).

(2) Set function switch I.8 to ON. Now the released special functions will be indicated at LEDs 1 to 4 as follows:

| | |
|---|---|
| LED 1 | synchronizing |
| LED 2 | trolling |
| LED 3 | modulation |
| LED 4 | sync. and troll. can be alternatively activated[2] |

(3) Set function switch I.2 from OFF to ON. LEDs 1 to 5 are now flashing in intervals of 0.2 s indicating that parameter changes are possible.

(4) Now at function switch III parameter 191 is selected in binary form.




(5) By switching function switch I.2 anew from OFF to ON the value of the selected parameter is indicated by LEDs 1 to 4 and 6 to 9. The LEDs then have the following value:

| **LED** | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| **Value** | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |

(6) By means of the adjusting potentiometers P1 (coarse) and P2 (fine) the parameter can now be modified within its limits.
In case of parameter 191 only the following indications are possible:

| **LED 1** | **Signification for the proportional valve's nominal voltage** |
|---|---|
| off | 12 V |
| on | 24 V |

(7) The changed parameter will only be stored when function switch I.2 is reset to OFF. In case it shall not be changed, the entering can be aborted by changing one switch of the function switch panel III and the latest adjusted parameter value will be reproduced. In both cases the LEDs' indication returns to the flashing of LEDs 1 to 5.

(8) If any further parameters are to be modified, then continue with item (4).

(9) The parameter adjustment will be completed when function switch I.8 is set to OFF again. The parameter checksum will be adapted and subsequently, the control program is restarted.

## Adjustment of the Proportional Valve's Current

By means of function switches III and potentiometers P1 and P2 the turn on time of the PWM signal and in this way the minimum and maximum current through the proportional valve can be changed. This is done in an analogue way to the trolling adjustment for the slip, as described in the manual of actuator 323 699 446 0.

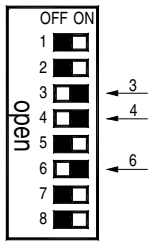
This adjustment has been extended by a value for the trolling output, when trolling is inactive. This function is required for gears, e. g. by ZF Padova, which need an interruption of the proportional valve's current when trolling is inactive.

[2] By setting function switch III.8 from OFF to ON the release mode for synchronising and by III.7 that for trolling can be changed.

For this, dip switches III.6, III.4, and III.3 must be set to ON in step 1 of the adjusting instructions.

**1st step:**

Set dip switch 6 to ON
Set dip switch 4 to ON
Set dip switch 3 to ON



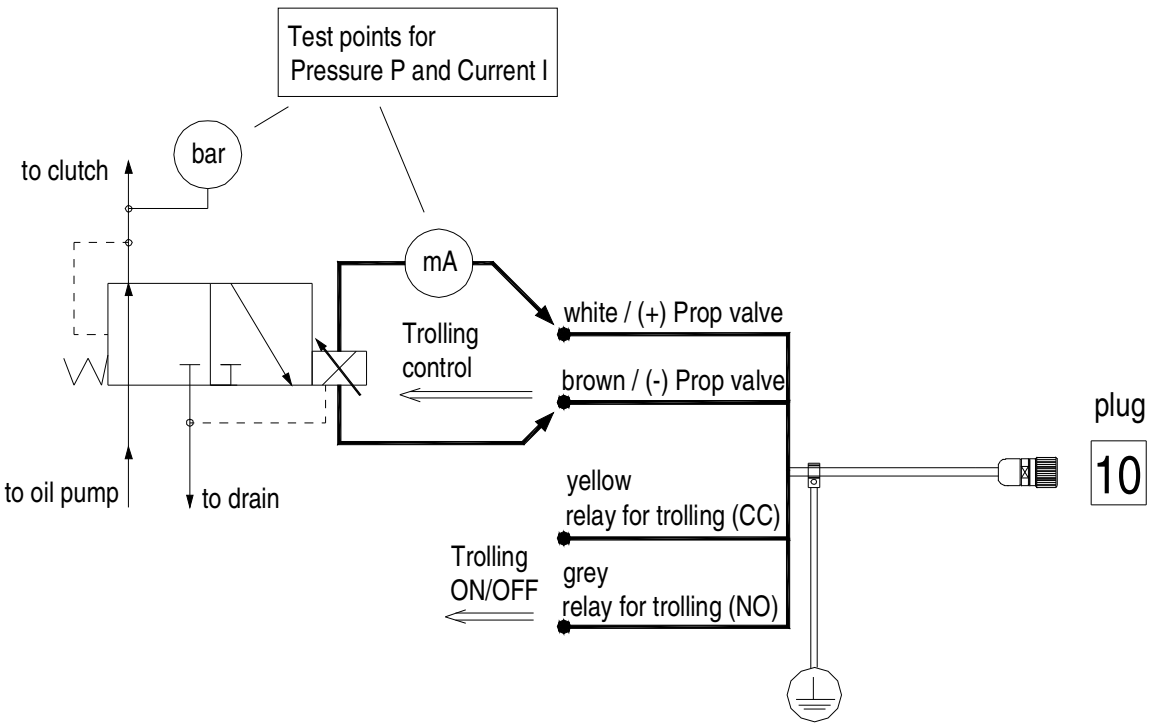

**2nd step – 9th step:**

Steps 2 to 8 then have to be carried out as described in the manual of actuator 323 699 446 0. In step 9 the dip switches of step 1 have to be reset to OFF.

For checking the proportional valve's current an appropriate multimeter has to be connected in series to the valve. As measuring type "direct current (DC)" is to be selected.

For securing the gears' allowed working range in trolling operation the gear producer's instructions have to be respected in any case. For this it is recommendable to check aside from the proportional valve's current also the gear oil pressure with the help of a pressure gauge.
In addition to the maximum propulsion speed, the proportional valve's minimum and maximum current as well as the maximum admissible gear oil pressure for trolling operation, are given by the gearbox producer.

It has to be ensured that the limit values given by the gear producer are neither exceeded in cold nor warm state of the gears.
Disregarding this aspect can destroy the gearbox!



## Technical Data of the Proportional Valve's Output

| ***Data*** | ***Values*** | ***Remark*** |
|---|---|---|
| Voltage | 24 V + 30 %<br>12 V - 25 % | |
| Current | max. 3 A | |
| Short-circuit breaking | > 30 A | Currents above 3 A are only admissible for some microseconds. |
| Operating mode | | Pulse width modulated (PWM) |
| Frequency | 500 Hz | |
| Resolution | 10-bit | |
| Type of connection | | The proportional valve has to be potential-free and contacted to both conductors of connection 10. |

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