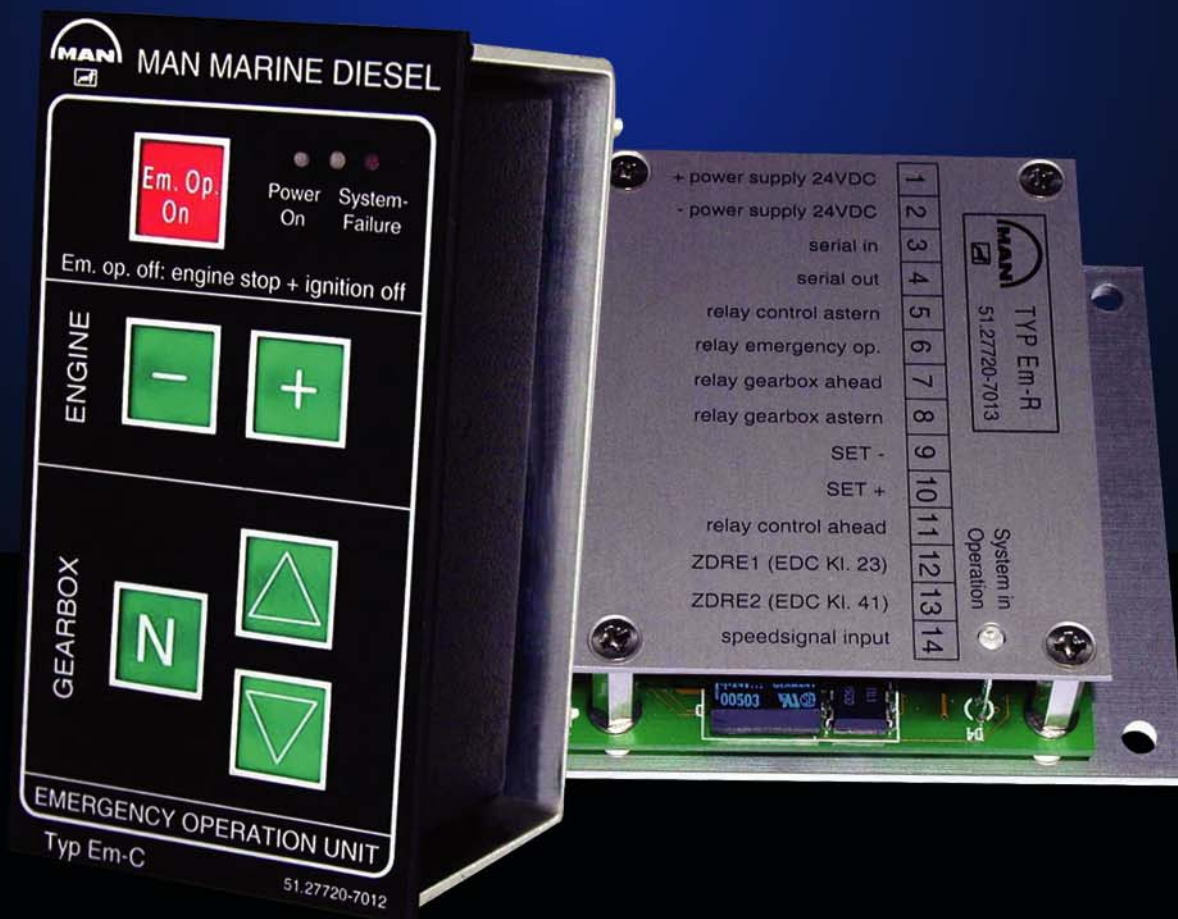


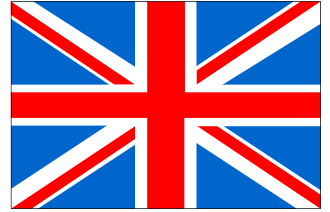


MAN Emergency Unit for D 28 Marine Engines - EDC
MAN Notfahreinheit für D 28 Marinemotoren - EDC
Unidad de marcha de emergencia MAN para motores marinos D 28 - EDC
Unité de service de secours de MAN pour moteurs marins D 28 - EDC
Unità di marcia di emergenza MAN per motori marini D 28 - EDC

Installation, checking, interfaces
Einbau, Überprüfung, Schnittstellen
Montaje, comprobación, interfaces
Intégration, contrôle, interfaces
Installazione, controllo, interfacce



MAN Emergency Unit
for D 28 Marine Engines – EDC





Dear Customer

This manual is intended to help you:

- Familiarize yourself with the components of the MAN emergency running unit
- Recognize the interaction of the individual emergency running unit components
- Install the system correctly in the ship
- Rectify faults and malfunctions

This manual is a supplement to Publication 51.99598–8043 “Electronically Controlled Diesel Injection in Conjunction with MAN Monitoring Diagnostic System (MMDS)”.

This Publication was devised under the assumption that its readers will have the necessary basic knowledge of handling and working with marine engines.

Best regards
MAN Nutzfahrzeuge Aktiengesellschaft
Nuremberg Plant

Since our products are in continuous development, we reserve the right to make technical modifications.

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General

Important safety regulations are summarized in this quick-reference overview and arranged by topic to effectively convey the knowledge necessary to avoid accidents causing injury, damage or environmental hazard.

The engine operating manual contains further information.

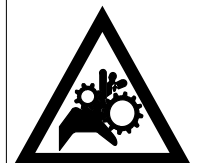
Important:

Should an accident occur despite all precautionary measures, particularly one involving contact with corrosive acid, penetration of fuel under the skin, scalding by hot oil, antifreeze splashing into the eyes etc. **you must seek medical assistance immediately.**

1. Instructions for avoiding accidents likely to cause injury

Only authorized and qualified personnel are permitted to carry out inspection, adjustment and repair work

- Put gearbox of ship into neutral, if necessary unhinging gearshift lever (disconnect via remote control)
- Firmly secure units and assemblies on disassembly
- Only authorized personnel are permitted to start and operate the engine
- Do not stand too close to rotating parts while the engine is running
Wear close-fitting working clothes
- Do not touch the engine with your bare hands while it is at normal operating temperature:
risk of burning
- Keep area surrounding engine, ladders and stairways free of oil and grease. Accidents caused by slipping can have serious consequences
- Only work with tools which are in good condition. Damaged or expanded wrenches will slip: risk of injury!
- Persons must not stand under an engine suspended on a crane hook. Keep lifting gear in perfect condition
- Only open coolant circuit once the engine has cooled down. Follow the instructions given under "Care and Maintenance" in the Operating Manual exactly if it is not possible to avoid opening the coolant circuit with the engine at operating temperature.



- Do not retighten or open pipes and hoses (lube oil circuit, coolant circuit and if necessary downstream hydraulic fluid circuit): risk of injury by escaping fluids!
- Do not place hands under the fuel jet when checking injection nozzles. Do not inhale fuel mist
- Always disconnect battery when working on the electrical system
- Do not use rapid charger to start the engine. Rapid charging of batteries is only permitted with the positive and negative leads disconnected!
- Disconnect batteries only with the ignition turned off
- Follow the manufacturer's instructions for handling batteries.

Caution:

Battery acid is toxic and corrosive. Battery gasses are explosive

- Only use suitable measuring instruments to **measure voltages!** The minimum input resistance of a measuring instrument should be 10 MΩ
- Only disconnect or connect wiring harness plugs on electronic control units with the **ignition turned off!**

Disconnect batteries and connect the positive lead to the negative lead such that they are electrically conductive before carrying out any electric welding work. Earth the welding set as close to the weld as possible. Do not route cable of welding apparatus parallel to electric lines on board the ship.

Refer to the "Welders' Code of Practice" for further accident prevention measures.

- **For painting work** electronic components should only be exposed for brief periods to high temperatures (max. 95°C); at max. 85°C a period of approx. 2 hours is permitted, disconnect batteries



Limitation of liability for parts and accessories

In your own interest, we strongly recommend you use only accessories and original MAN parts expressly approved by MAN for your MAN engine. The reliability, safety and suitability of these parts and accessories have been tested specially for MAN engines. Despite us keeping a constant eye on the market, we cannot assess and be held responsible for these properties in other products, even if they bear TÜV (German testing and inspection institute) approval or any other official approval in any particular case.

Laying up or storage

Special measures must be implemented in accordance with MAN Company Standard M 3069 Part 3 if engines are to be laid up or placed into storage for more than 3 months.

Properties and function of emergency unit

Designations: Em-C: Emergency Controller, Em-R: Emergency Receiver

The emergency running control system is available as an option, it can also be ordered at a later stage and integrated by way of plug connections in the existing system.

An Em-C operation unit can also be connected at a later stage at any point where there is a serial distribution box (see also Publication 51.99598–8054 “MAN Monitoring and Diagnostic System”). Even the engine terminal box is always prepared for subsequent retrofitting of the Em-R control unit.

The emergency running control system enables continued safe operation in the event of failure of the electric throttle lever control system. The system is designed as:

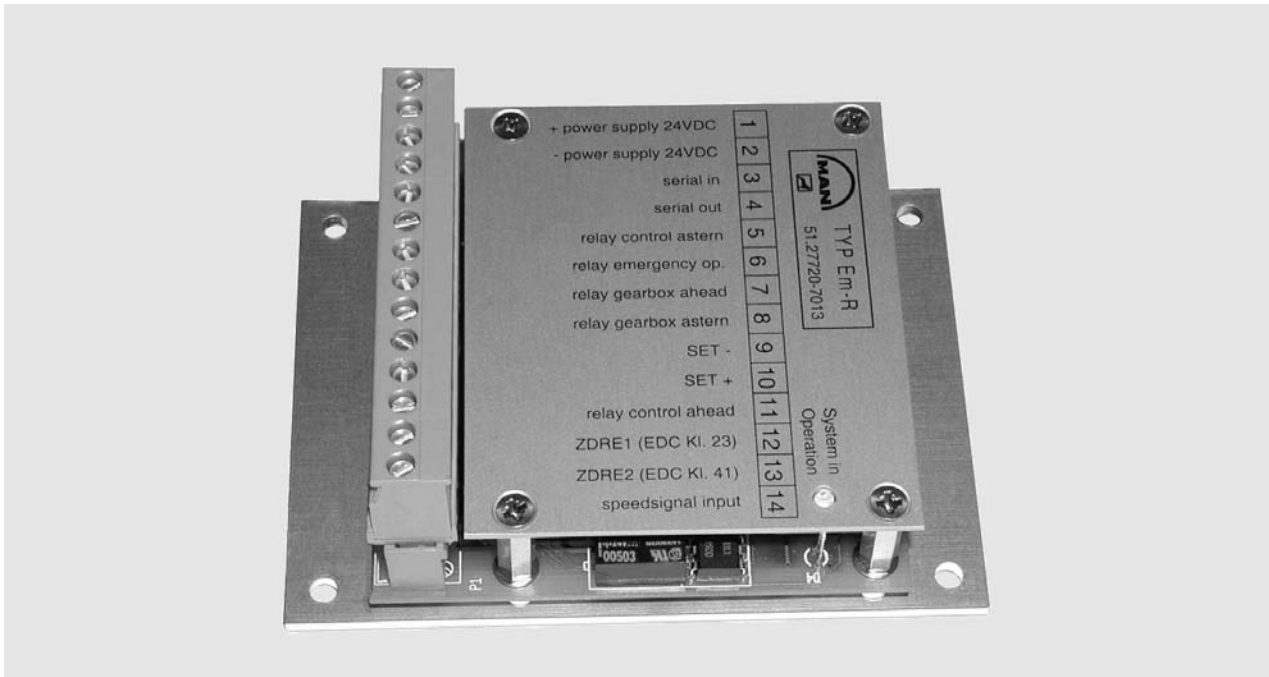
- Engine speed control
- Gearbox control

It consists of two components:

1. Em-C type operation unit on the control stand



2. Em-R control unit (installed in the engine terminal box)



Only one Em-C operation unit can be connected for each engine.

The two units of the emergency running system are connected to each other by way of a 4-core bus incl. power supply. The four cores are an integral part of the 7-core cable which is routed from the engine terminal box to the control stand and if necessary to the open bridge (see connection diagram, page 12).

The Em-C operation unit is processor-controlled and enables the transmission of propulsion commands to the Em-R control module integrated in the engine terminal box by means of serial data communication. The electronics is self-monitoring during operation. Two LEDs indicate operational readiness and fault status.

The operation unit for emergency running control is preferably integrated next to the throttle lever in the bridge console. For safe marine operation, the front buttons must be easily accessible. When the ignition is on, emergency running can be activated by way of appropriate function buttons. A green LED indicates operational readiness.

Operation is effected by way of six front buttons, which light up when a requested status is achieved and thus indicate the relevant operating or actual status.

Preconditions for commissioning

- Electrical gearbox activation.
- Gearbox activation of the throttle lever system must be carried out by means of the MAN terminal box, plug X8. An internal starting interlock must be guaranteed in the MAN terminal box.
In exceptional cases, an existing interlock relay of the throttle lever control system can be connected to the MAN terminal box, plug X4.
- Mechanical gearbox activation is not permitted (no interlocking of the "Ahead" or "Astern" propulsion direction signal via relay K6 in the terminal box by the throttle lever control system).
- Necessary check that the "Ahead/Astern" gearbox connection corresponds to the button assignment on the Em-C operation unit.
- Check as to whether the connection is correctly established between the serial distribution box and the operation unit.
- Check as to whether suppressor diodes are connected in parallel to the solenoid valves. If these are not fitted, the Em-R control unit is exposed to the hazard of being destroyed.

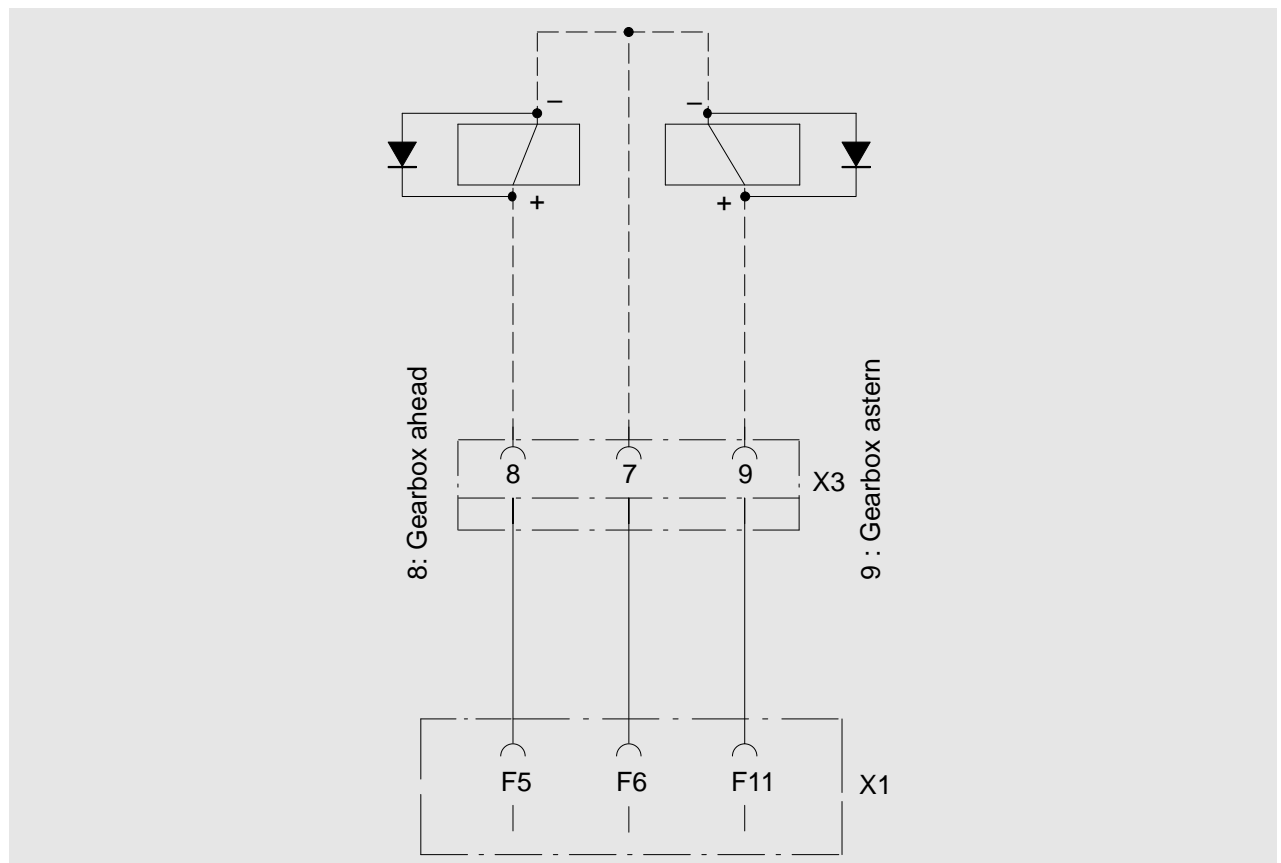
Commissioning

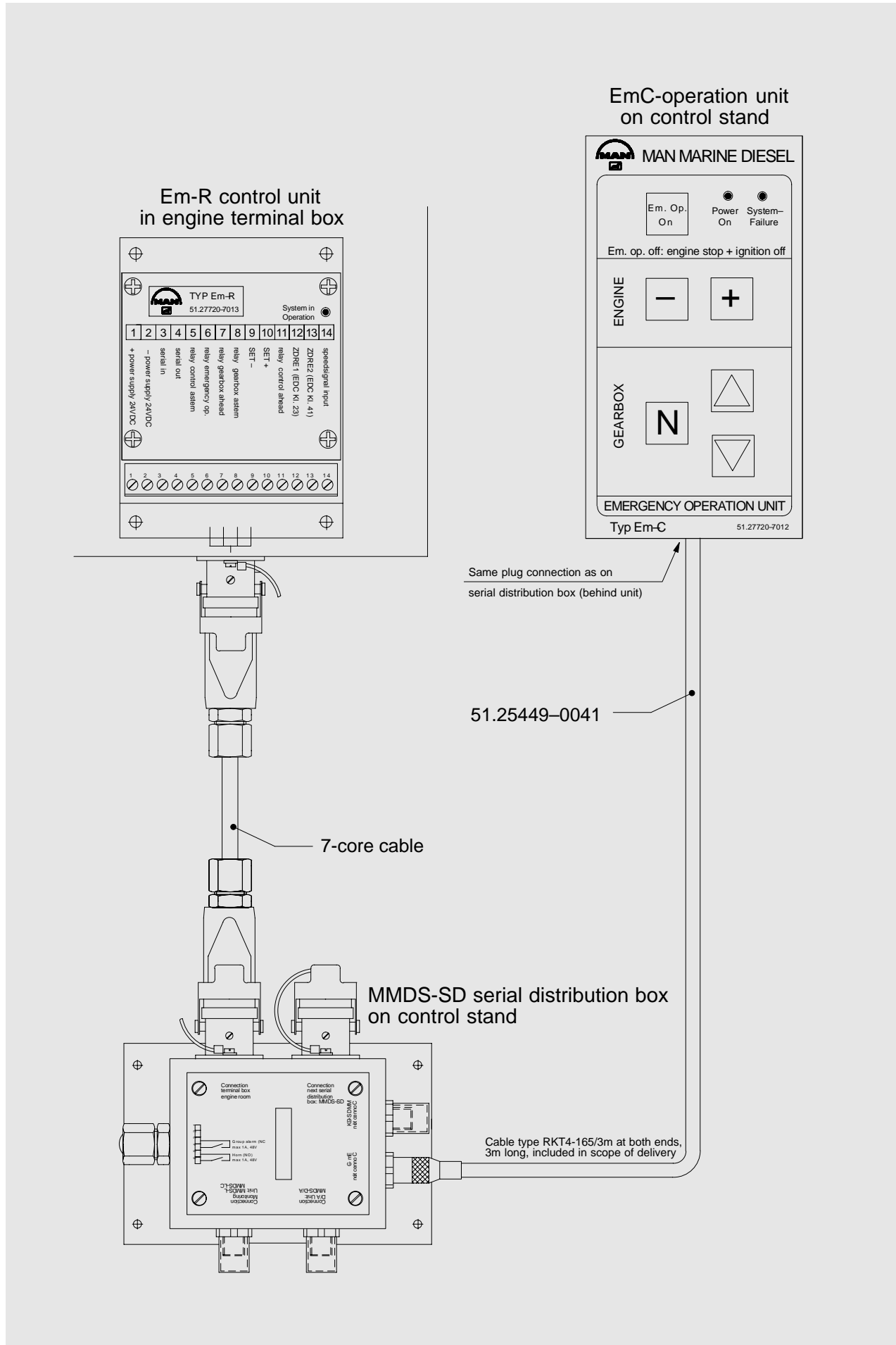
- When the ignition is turned on, the green LED (Power On) is on and the red LED (Failure) is off. If this is not the case, check again that all the components are present and correctly installed.
- If the LEDs are correctly lit, fully check the emergency running system once while the engine is running. Refer to the section headed "Activating / operating emergency unit" on Page 15.

If a marine engine is equipped with the MMDS model series for monitoring, diagnosing and displaying engine data, then it will also have at least one MMDS-SD serial distribution box, which is normally located on the main control stand (see connection diagram, Page 12).

This ensures that no additional cabling is necessary between the control stand and the engine terminal box even when the emergency running system is installed at a later stage.

Suppressor diodes connected in parallel to solenoid valves

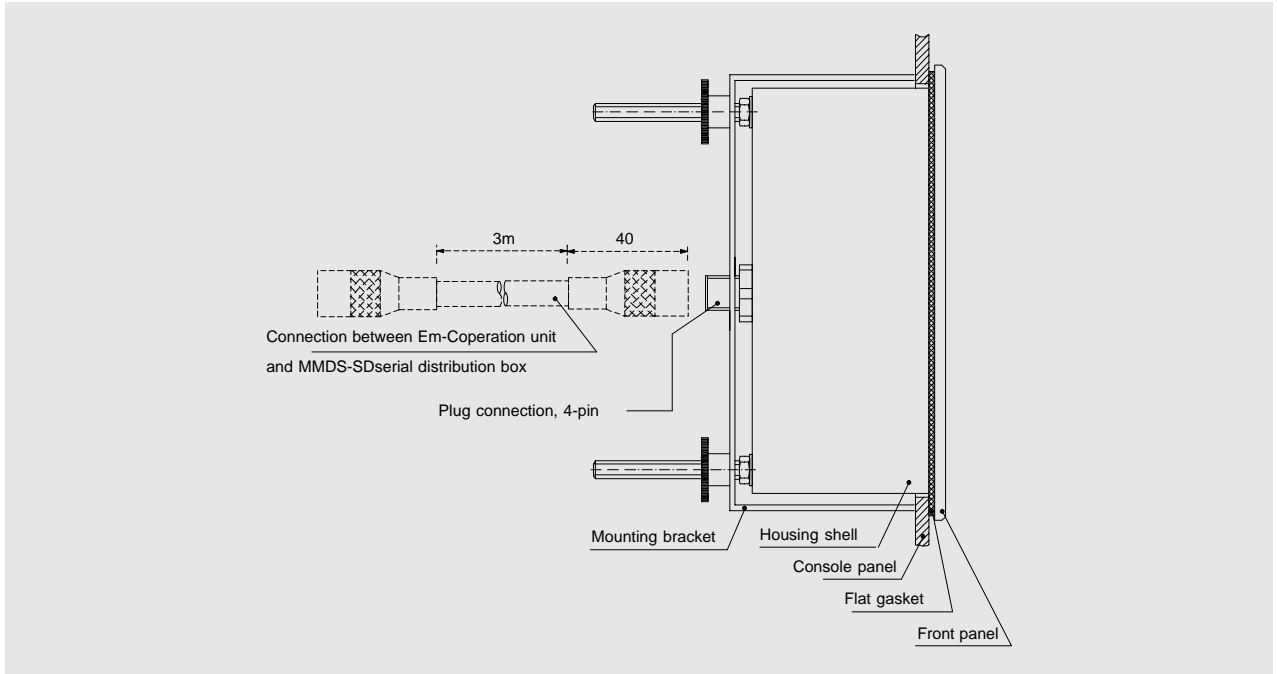




Design and installation

The operation unit is a built-in control panel device with the front dimensions of 70mm x 130mm and an installation depth of 107mm.

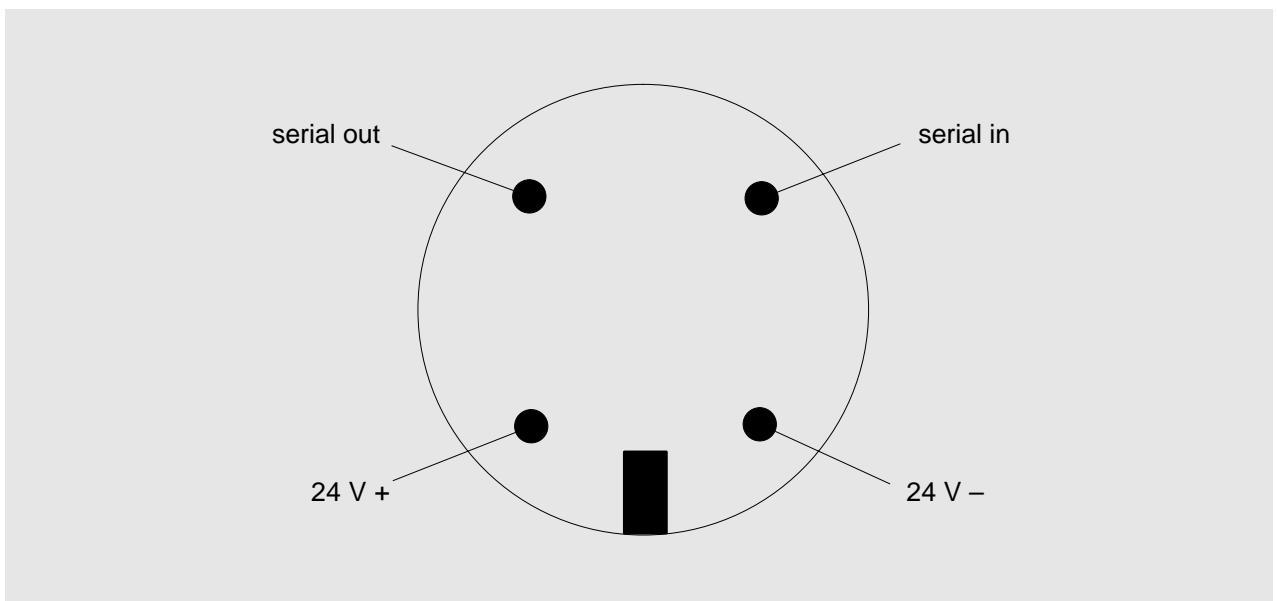
The front panel is made from a black anodized aluminium alloy (AlMg1) and has a pressed-on plastic film which is clearly transparent in the area of the buttons and indicating elements. This film and the flat gasket attached from the rear achieve degree of protection IP66 for the front of the unit when installed.



The electronic components are located in the housing shell, which is also made from AlMg1. This shell is also sealed with the above-mentioned flat gasket from the rear against the front panel. The unit thereby achieves degree of protection IP54 for the rear.

A stable U-shaped aluminium bracket acts as the mounting when the unit is installed. A 4-pin connecting socket is provided at the bottom on the housing shell for connection to the MMDS-SD serial distribution box.

Connection diagram (view of plug connection, rear side of housing)



Technical data of Em-C type operation unit

Power supply:	11–35 VDC, internally fused
Current consumption:	max. 0.1 A
Serial interface:	1 x bidirectional current loop (optocoupler)
Perm. ambient temperature:	0–70°C
Perm. relative air humidity:	99%
Console cutout:	116.5 mm x 56.5 mm
Console panel thickness:	max. 30 mm
Protection:	IP66 front, IP54 rear
Weight:	0.45 kg
Connections:	4-pin socket with screw thread



Preconditions for operation / activation / shutdown

- Operation of the emergency running control system is only permitted when the command initiators of the throttle lever system are in neutral.
- The emergency running control system should be only activated while the engine is running. Otherwise the “System Failure” LED flashes to indicate there is no engine speed signal.
- The engine should be shut down via the ignition lock.

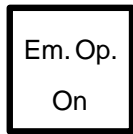
When the emergency stop button is pressed, the “System Failure” LED on the Em-C operation unit lights up when the ignition is simultaneously on as the active systems EDC engine control and emergency running unit are shut down by the emergency stop.

Safety note: Once the emergency running system has been activated, it is only possible to switch back to normal throttle lever mode by shutting down the engine (ignition “OFF” for at least 3 seconds)! The “System Failure” LED goes out after the emergency stop button has been released.

With emergency running control active, the operator can always return to the safe neutral mode by pressing the “N” button (speed at 600 rpm and gearbox in neutral).

Activating / operating emergency running unit

Button



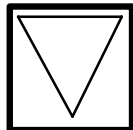
Activate emergency running command



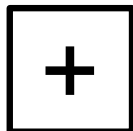
Engage gearbox in neutral



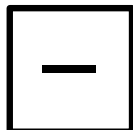
Engage gearbox ahead



Engage gearbox astern



Increase engine speed



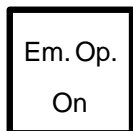
Reduce engine speed

Power On LED indicates available supply voltage with ignition on

System Failure LED indicates failure status by flashing or being permanently lit

The system is ready for operation once the ignition has been turned on. This is indicated by the green **Power On LED**.

The red LED (Failure) must not light up. The emergency running system can now be activated by pressing the **EM. Op. On** twice:



Pressing the button for the first time request emergency running mode. The button flashes cyclically for approx. 6 seconds and an acoustic signal is issued.

During this time, the request must be acknowledged by pressing the button for a second time. The button lights up permanently once the changeover to emergency running mode has taken place.

If there is no acknowledgement by pressing the button for a second time, the system returns to the initial setting (operational readiness).

Safety note: Once the emergency running system has been activated, it is only possible to switch back to normal throttle lever mode by shutting down the engine (ignition "OFF" for at least 3 seconds)!

Gearbox control

When emergency running mode is active, the gearbox is engaged in the neutral, ahead or astern positions by means of 3 button functions:

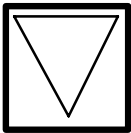
Button



Engage gearbox in neutral



Engage gearbox ahead



Engage gearbox astern

Gearbox reversal will only take place when the engine speed is in the idle range.

It is advisable always to engage the gearbox in neutral first prior to a reversal operation.

If however the operator requests a reversal e.g. from ahead directly to astern (or vice versa) and the engine is at a higher speed, the engine is automatically set to idle speed prior to each active reversal operation.

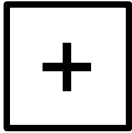
The relevant button pressed flashes for as long as the desired status is not reached.

It goes out when another control command is given or lights up permanently to indicate that gearbox reversal has taken place (indication of actual status).

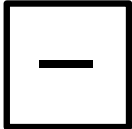
Speed control

Once the gearbox is engaged in the ahead or astern position, the current engine speed can be increased or reduced by means of 2 button functions:

Button



Increase engine speed



Reduce engine speed

The engine speed is altered continuously as long as the + or – button is pressed. The increase or alteration rate is 50 revolutions / second.

Each individual short pressing of a button brings about a speed change of 10 engine revolutions.

The speed is restricted downwards to idle speed and upwards as follows:

Rated speed	Max. emerg. running speed
2300 rpm	2050 rpm
2200 rpm	1950 rpm
2100 rpm	1850 rpm

Deactivating emergency running mode

Emergency running mode is always deactivated only after the engine has been shut down, it is necessary for the ignition to have been turned off for at least 3 seconds.

When the ignition is turned on again, normal throttle lever mode is always activated first, i.e. the emergency running system must be reactivated as required.

Description

The Em-R control unit is installed in the engine terminal box (see connection diagram, Page 20). When the ignition is on, a green LED in the cover plate of the electronics unit indicates operational readiness.

Inputs

The electronics module has two binary inputs for recording the gearbox status and one frequency input for measuring the engine speed:

Terminal 11	Checkback contact from gearbox switch "Ahead"
Terminal 5	Checkback contact from gearbox switch "Astern"
Terminal 14	Speed signal from engine control unit (EDC-TDS)

All the inputs are current-controlled with optocouplers. A positive signal (e.g. battery plus) must be applied to the gearbox inputs.

The speed signal requires a negative pulse (e.g. open collector output to battery minus).

Outputs

All the necessary shift operations for controlling the gearbox or the engine speed are triggered via 7 relay contacts:

Terminal 6	Changeover to active emergency running mode	(Gearbox in neutral)
Terminal 7	Shift command gearbox ahead	(Gearbox shift relay ahead)
Terminal 8	Shift command gearbox astern	(Gearbox shift relay astern)
Terminal 12	Regulate engine speed at idle	(Engine control unit EDC-23)
Terminal 13	Enable speed control via SET inputs	(Engine control unit EDC-41)
Terminal 9	Reduce engine speed	(Engine control unit SET-)
Terminal 10	Increase engine speed	(Engine control unit SET+)

All the output contacts are already internally connected on one side to battery plus. The relevant current path must therefore always lead to battery minus.

The switch for activating emergency running mode (terminal 6) is additionally isolated via an internal diode.

Control logic

Gearbox reversal may only take place at idle or close to idle speed.

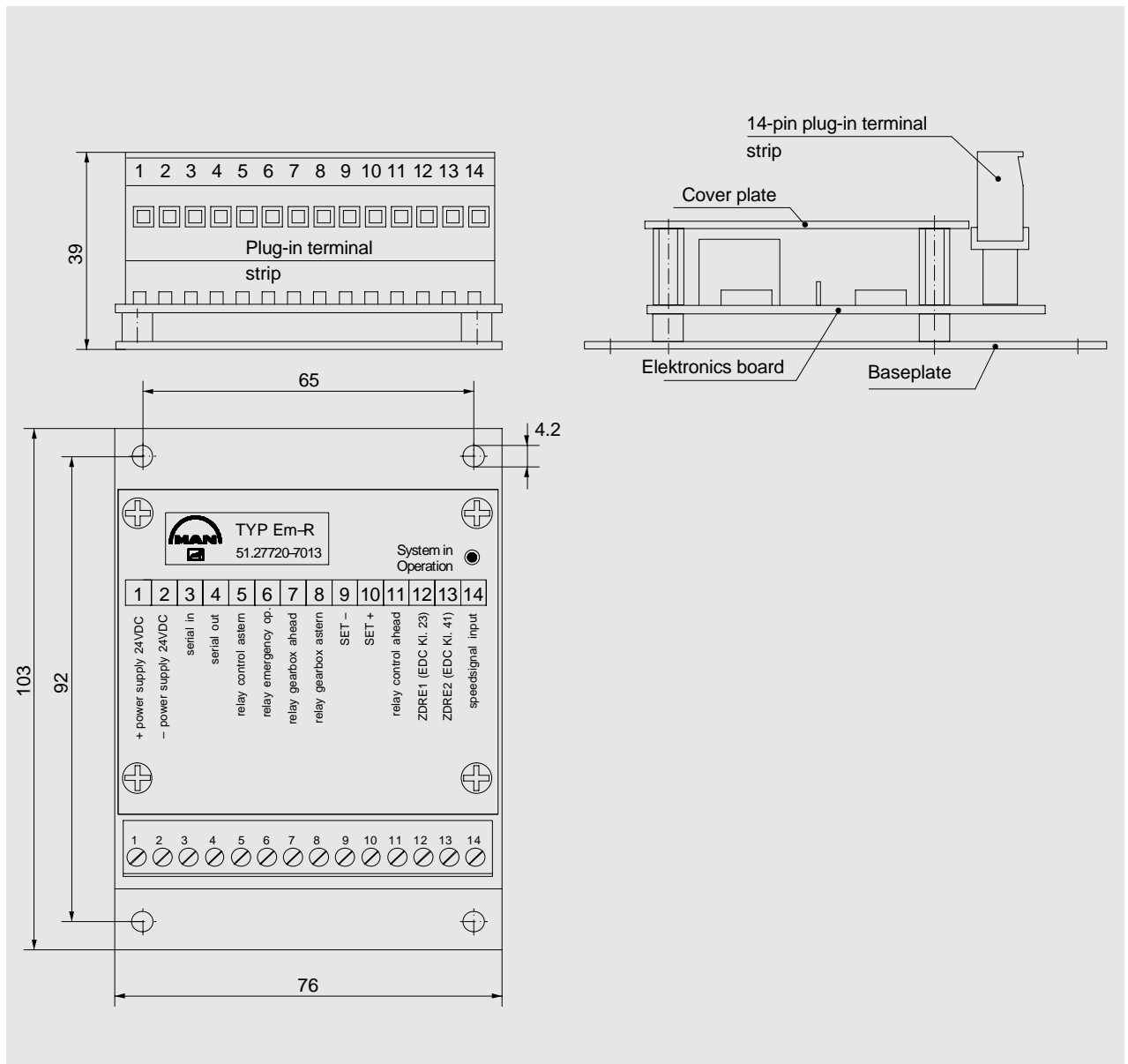
For this reason, the current engine speed is measured and a speed < 760 rpm is determined as being close to idle.

In the event of a reversal request above this speed, the engine is first reduced to idle speed via the EDC speed control inputs (EDC-21, EDC-41). This process is indicated by the operator button flashing. If there is no speed signal, gearbox reversal always takes place with a delay of 6 seconds. A failure indication is also output.

The checkback inputs for the gearbox control relays serve to monitor the actual status. If there is no checkback signal within 1 second after a shift operation, the system automatically returns to the neutral position and a failure indication is output.

Design and installation

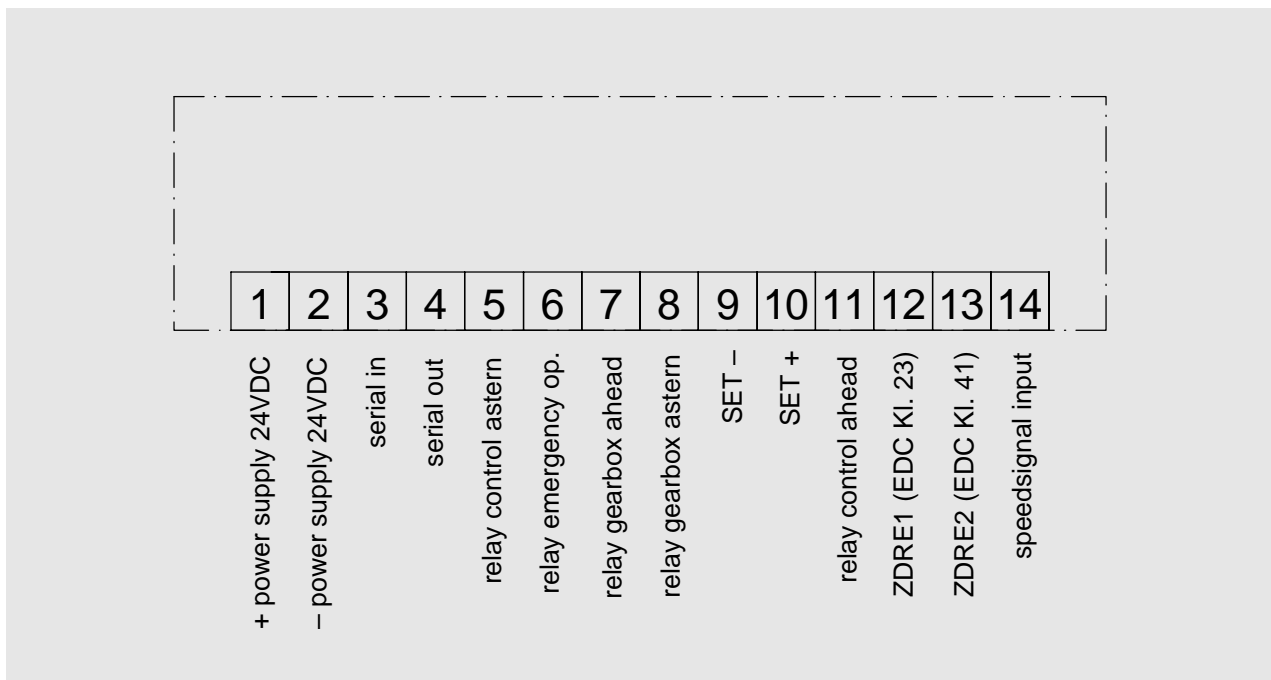
The Em-R control unit consists of a baseplate with bores for screw mounting, the electronics board and a cover plate attached on top. The connections are made via a plug-in 14-pin terminal strip. Because the module is not enclosed in a sealed housing (degree of protection IP00), it has to be installed in a corresponding terminal box.



Technical data

Power supply:	18–35 VDC
Current consumption:	max. 0.1A
Serial interface:	1 x bidirectional current loop (optocoupler)
Inputs:	2 x optocoupler binary input for gearbox checkback 1 x frequency measurement (EDC speed signal)
Shift outputs:	7 x relay contact, NO contact on one side with applied supply voltage, max. contact load 35V, 1A
Perm. ambient temperature:	0–70°C
Perm. relative air humidity:	99%
Protection:	IP 00
Weight:	0.2 kg
Connections:	Terminal strip, 14-pin plug-in

Connection diagram



Terminal description for service measurements:

1 and 2:	24V DC if EDC main relay K1 picked up, i.e. ignition on (receiver voltage supply)
3 and 4:	Serial data bus (communication between operation unit and receiver)
5 and 2:	24V DC if relay K5 picked up, green LED on relay lit (checkback gearbox astern) – Measurement can take place with engine running or – ignition on (no shift oil pressure here)
6 and 2:	24V DC if emergency running activated by Em. Op. On button on operation unit. This results in relay K6 picking up (green LED on relay lit). – Measurement can take place with engine running or – ignition on
7 and 2:	24V DC if propulsion direction “ahead” is selected. Relay K4 picks up, green LED on relay lit
8 and 2:	24V DC if propulsion direction “astern” is selected. Relay K5 picks up, green LED on relay lit.
9 and 2:	24 V DC if Engine “ – ” button on operation unit is pressed Condition: ahead or astern is selected (engine speed reduction).
10 and 2:	24 V DC if Engine “+” button on operation unit is pressed Condition: ahead or astern is selected (engine speed increase).
11 and 2:	24V DC if relay K4 picked up, green LED on relay lit (checkback gearbox ahead) – Measurement can take place with engine running or – ignition on (no shift oil pressure here)
12 and 2:	24V DC if emergency running selected, engine set to idle speed (checkback to EDC tm. 23, ZDR 1)
13 and 2:	24V DC if ahead or astern selected, EDC is ready for speed control (checkback to EDC tm. 41, ZDR 2)
14 and 2:	60 Hz at engine idle speed (600 rpm) Frequency increases as engine speed increases, e.g. 70 Hz at 700 rpm 80 Hz at 800 rpm etc. (speed checkback from EDC control unit) Important: to be measured against terminal 1 (+24 V)

Failure indications

Two LEDs on the Em-C operation unit (green “Power On” LED and red “Failure” LED) are used to differentiate between various failure states:

Green LED off and red LED off

Ignition off or no supply voltage (emergency running mode not possible)

Check:

- Voltage supply (24 V present at receiver terminals 1 and 2)
- Voltage supply (24 V at operation unit, see connection diagram, see Page 13)
- All plug connections (operation unit, serial distribution box, receiver)
- Main relay of EDC K1 picked up

Remedy:

- Turn on ignition
- Check that all connections are tightly in place

Green LED on, red LED flashes without another operator button also flashing

Drop-out of internal speed signal (function with delayed reversal times nevertheless still possible)

Check:

- EDC speed signal (voltage measurement at receiver unit at pin 14 to 1).
Approx. 22 V DC or frequency at 600 rpm approx. 60 Hz
- Check EDC speed recording (speed indication in LCD display or at tachometer)

Remedy:

- Replace EDC control unit
- Replace EDC speed sensor

Green LED on, red LED flashes together with ahead button

Failure after gearbox reversal into ahead direction (this propulsion direction can no longer be activated)

Check:

- Relay K4 in terminal box must be picked up (green LED on relay lit)
- 24 V to terminal 2 (–) must be applied at terminal 11 of receiver unit (checkback gearbox ahead).
- Relay K6 must be picked up (green LED on relay lit)

Remedy:

- Relay faulty or not correctly inserted in socket
- Check why there is no voltage applied at relay coil

Green LED on, red LED flashes together with astern button

Failure after gearbox reversal into astern direction (this propulsion direction can no longer be activated)

Check:

- Relay K5 in terminal box must be picked up (green LED on relay lit)
- 24 V to terminal 2 (–) must be applied at terminal 5 of receiver unit (checkback gearbox astern).
- Relay K6 must be picked up (green LED on relay lit)

Remedy:

- Relay faulty or not correctly inserted in socket
- Check why there is no voltage applied at relay coil

Green LED and red LED permanently on

System failure or no communication between Em-C (operation unit) and Em-R (receiver). Emergency running mode not possible

Check:

- All plug connections (operation unit, serial distribution box, receiver)
- Voltage supply to EM-C and EM-R (see connection diagrams)
- Check serial data line from EM-C via serial distribution box to EM-R for continuity (see connection diagrams, Pages 13 and 20)

Remedy:

- Replace receiver unit (EM-R)
- Replace operation unit (EM-C)
- Replace serial data line

When the engine terminal box is open, a further LED on the Em-R control unit is accessible for service purposes (green LED, "System in Operation").

With the ignition on, this indicates through its inactive status the following potential faults:

No supply voltage, Em-C operation unit not connected, general system failure or no communication between Em-C and Em-R. (Emergency running mode not possible)

Failure states which are indicated by flashing on the Em-C operation unit must be cancelled with the **(N) button** after the fault has been rectified. The failure indications continues to flash until it is cancelled.



Notes

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Notes

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