

# Functional Description

Engine Interface Module  
EIM for Series 4000  
Application: Marine

E532284/02E



*Power. Passion. Partnership.*

Printed in Germany

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Subject to alterations and amendments.

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# 1 General Information

## 1.1 Introduction

### **Engine room interfaces, MTU – Third-party systems**

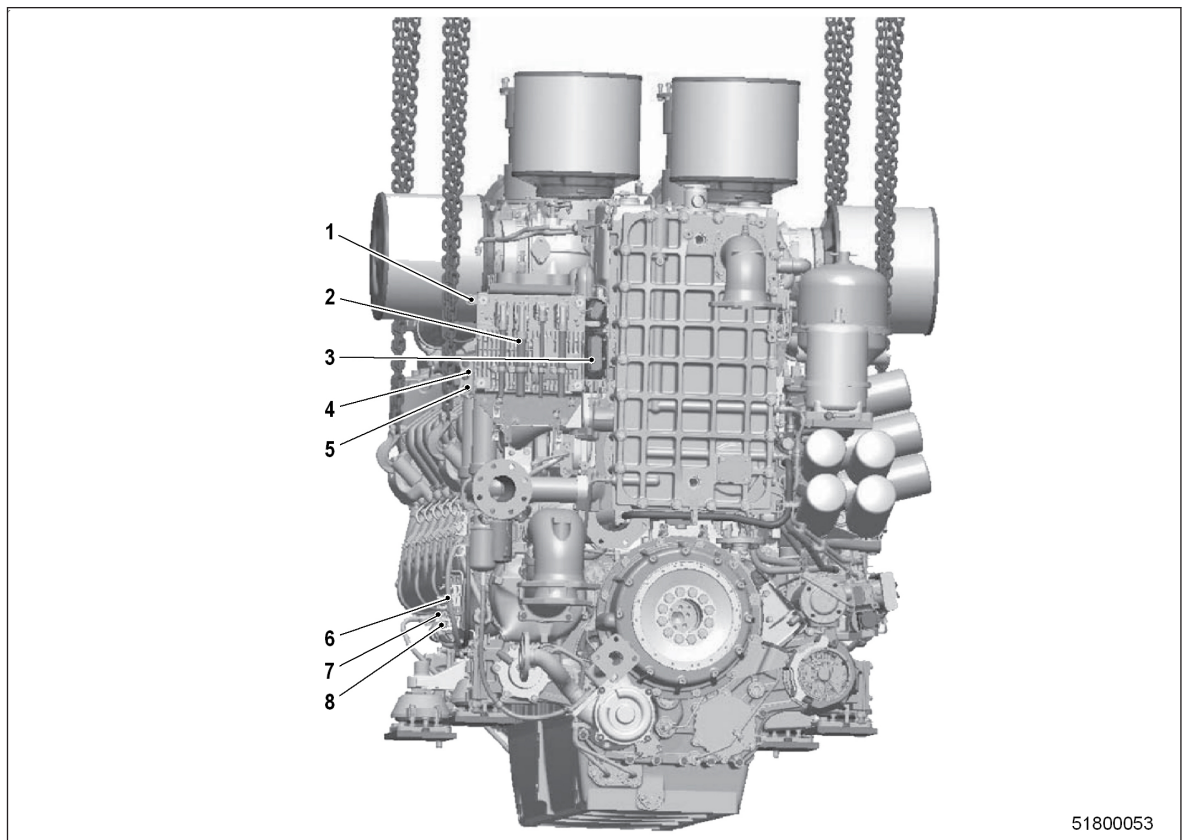
This manual describes the connection between all available interfaces on the engine and systems supplied by third-party manufacturers.

The following connections must be established:

- Plant connector X51 on the Engine Interface Module
- Power supply for EIM
- Power supply(ies) for the starter(s) (for electric starting only)
- If applicable: External starting air pressure sensor (for air starting only)
- If applicable: External coolant level sensor (for external expansion tank only)

### **Installation locations of the various interfaces**

The figure below shows the various interfaces and all other MTU devices installed on the engine.



51800053

- |                                                                                                   |                                                                                    |                                           |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------|
| 1 Connector XD1 – Dialog unit                                                                     | 4 Connector XF33 for connection of F33 for external expansion tank                 | 7 Fuese F2 (integrated in wiring harness) |
| 2 ECU – Engine Control Unit: Engine governor                                                      | 5 Connector XB19 for external starting air pressure sensor (for air starting only) | 8 Starter                                 |
| 3 EMU – Engine Monitoring Unit: Auxiliary engine monitoring device; for classifiable systems only | 6 EIM – Engine Interface Module: Interface module with plant connector X51         |                                           |

## Block circuit diagram

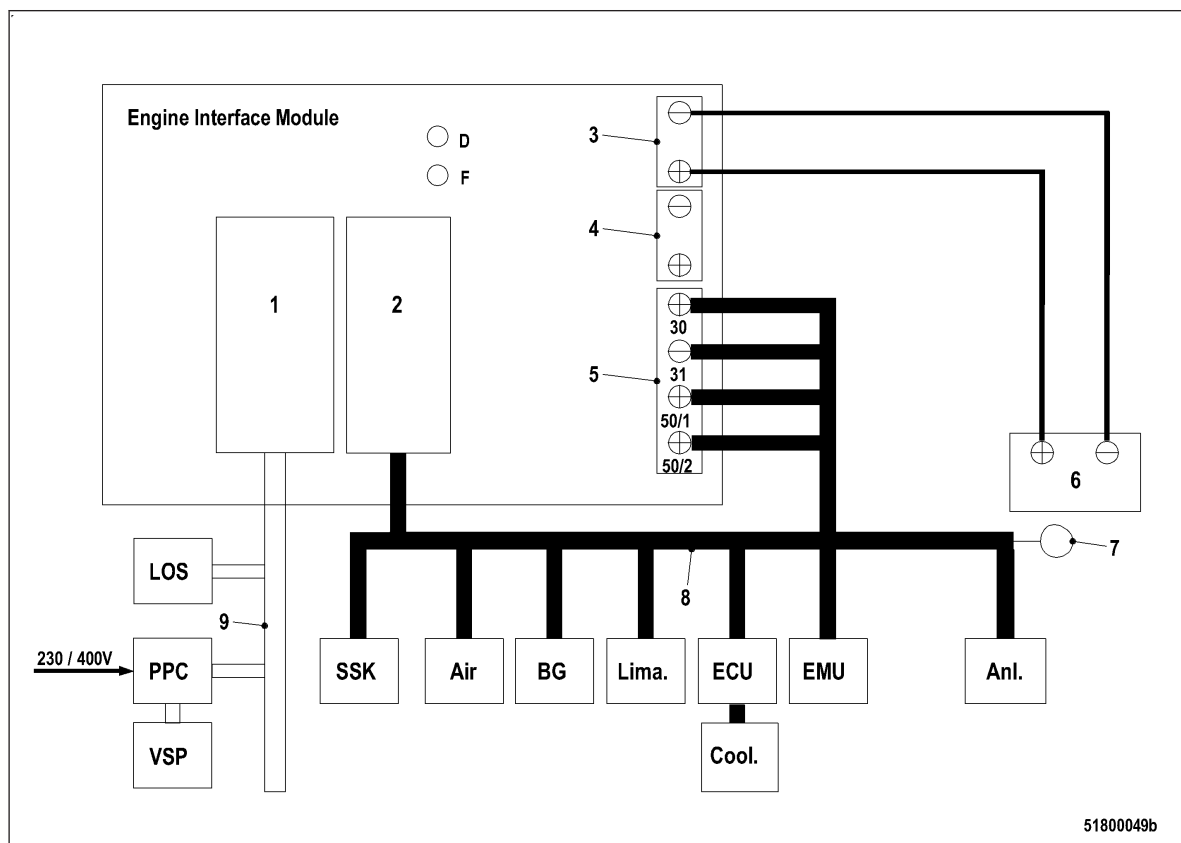
The work boat engine room monitoring system can be designed as a classifiable marine automation system. The maximum scope features numerous elements:

- Higher-level automation system, including but not restricted to:
  - Remote Control System RCS
  - Monitoring and Control System MCS
- Local Operating Station LOS
- Engine Interface Module EIM

However, the minimum scope for one engine comprises only the Engine Control Unit ECU, the starter(s), the battery-charging generator (option), the Engine interface Module EIM and the barring gear.

An extended monitoring component (the EMU) and a Local Operating Station (LOS) are required for the classifiable applications mentioned above. These individual components are acquired and controlled centrally by the Engine Module Interface EIM on the engine.

All wiring is realized in the engine wiring harness. A Local Operating Station is also required for classified automation solutions.



- |                              |                                            |                                                                                                  |
|------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1 Tyco plant connector X51   | 8 Engine wiring harness                    | ECU Engine control                                                                               |
| 2 Tyco engine connector X52  | 9 Plant cable                              | Cool Coolant level, optional                                                                     |
| 3 Default supply             | LOS Local Operating Station                | EMU Engine Monitoring Unit                                                                       |
| 4 Redundant supply           | SSK Emergency air-shutoff flaps (option)   | PPC Priming Pump Controller (option, only in conjunction with MTU Monitoring and Control System) |
| 5 Electric starter terminals | Air P-Start-Air                            | D Diagnostic lamp                                                                                |
| 6 Default system battery     | BG Barring gear                            | F Fuse lamp                                                                                      |
| 7 DiaSys dialog connector    | Lima. Battery-charging generator, optional |                                                                                                  |

MTU provides a defined interface with all required connection assemblies (male connectors or several cables as option) for applications with customized engine connections to the customer's system.

The Engine Interface Module EIM is the central connection box on the engine. Covers the entire minimum scope of a marine engine. Has no controls or parts requiring maintenance.

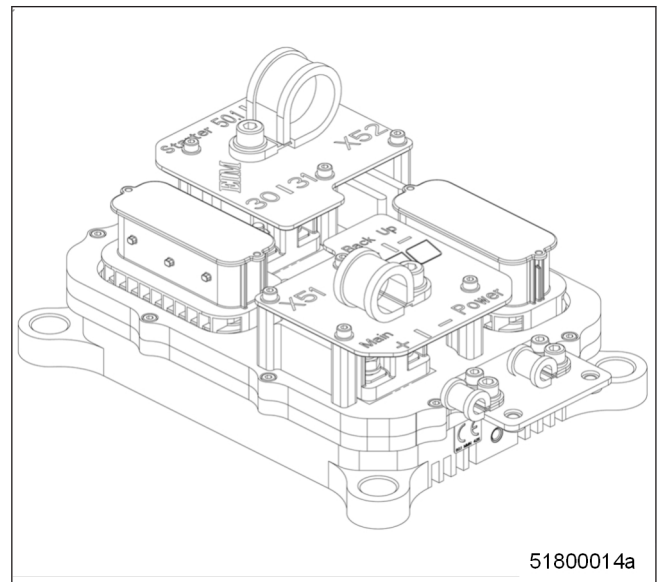
All engine signals integrated in the engine wiring harness.

The following functions are realized by the interface:

- Starter control (start repetition, tooth alignment, starter protection)
- Battery-charging generator monitoring
- Open bus interface to the plant (SAE J1939)
- Emergency stop function with line break monitoring
- Redundant power supply
- Optional control of emergency air-shutoff flaps
- Key switch logic
- Interface to ECU and EMU
- MCS5 dialog interface
- Control of an MTU lube-oil priming pump (power components in separate MTU PPC Box)
- Connection facility for an MTU Local Operating Station (LOS)

## 1.2 Engine Interface Module EIM – Design

### Housing



The EIM comprises a metal housing suitable for mounting directly on the engine.

Connection to the engine is established via connector X52. No other connecting work is necessary (with the exception of the starter) at the engine. Furthermore, the connectors for the two sensors F33 and B19 must be plugged in (if applicable). The connectors are already pre-assembled.

Connection to the plant is established via connector X51.

A suitable plant connector is delivered together with the EIM.

A cable with plug and open end or a prefabricated cable are available on an optional basis.

### Plant interface

Tyco connector, 62-pole:

- Basic supply for higher-level MTU automation system
- combined plant signals from the ECU (connector X52) and additional signals
  - For RCS: Disengagement for RCS
  - For MCS: Engine Start signal and FB Local Active
- CAN interface (3-fold)
- Redundant gearbox monitoring
- Priming pump control
- Emergency stop interface
- Key switch
- On-board current supply PIM
- Spare supply
- Serial RS422 interface for diagnosis
- Jumper to detect BDM server functionality for MTU automation systems

### High current contacts (M threaded pin)

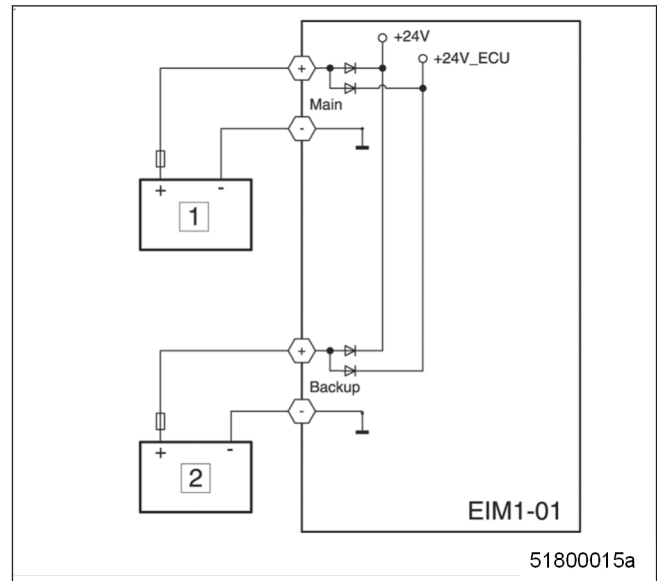
- Default positive supply
- Default negative supply
- Redundant positive supply
- Redundant negative supply

## 2 Functions

### 2.1 Power supply concept

#### Batteries

- 1 Default system battery (main battery)
- 2 Redundant system battery (backup battery)



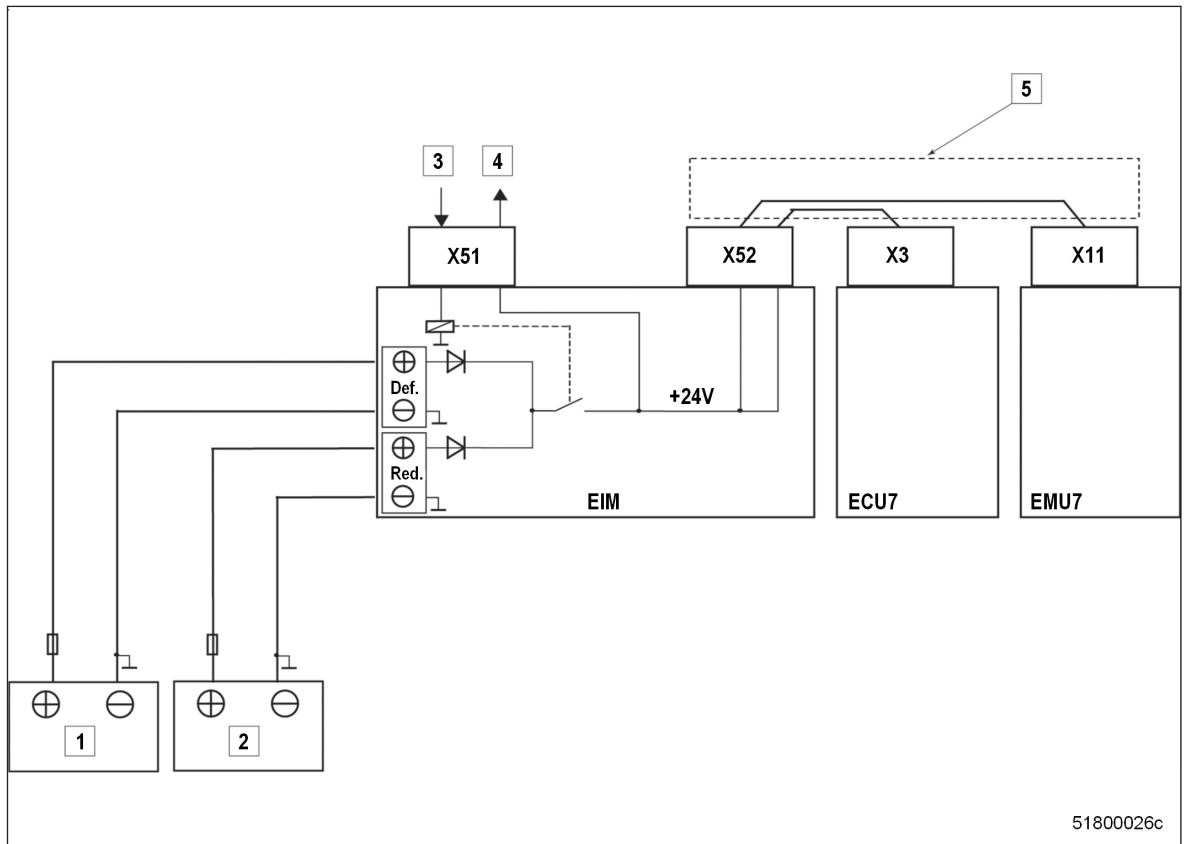
The EIM can be supplied by two separated voltage sources. This redundant supply enables the system to remain ready for operation should one of the supply voltages fail. The two power supply inputs are each monitored separately for failure.

The redundant supply voltage must always be connected for this reason.

The two negative battery terminals must be connected to ground to protect the internal EIM connections from circulating currents.

The EIM and all devices connected to it are switched on by a key switch which can be connected to the EIM.

## Internal power distribution



- 1 Default system battery
- 2 Redundant system battery
- 3 Key switch
- 4 Basic supply (plant, display, (max. 6A))

- 5 Engine wiring harness
- X51 Plant interface
- X52 Engine interface
- X3 Plug-in connection

- X11 Plug-in connection
- EIM Engine Interface Module EIM

The various supply voltages for the individual devices and EIM-internal functions are provided from the main supply supplied by the batteries by means of an internal matrix. Protection is afforded by electronic fuses (monitored PROFET fuses). The PROFET is switched off to limit the current in case of an inadmissible current increase. The figure depicts the principle distribution of voltages.

## Supplied devices and protection

The following devices are supplied from the Engine Interface Module:

- ECU supply with max. 30A
- EMU supply with max. 6A
- Control supply with max. 6A

The starter circuit is supplied directly by the starter battery. The Engine Interface Module does not supply the starter circuit with current, it merely activates the output for the engagement signal.

- Starter with max. 60A

The EIM also provides the following supplies as required:

- Air starter with max. 1A
- 2 x emergency air-shutoff flap with max. 6A respectively

Furthermore, the following outputs are separately supplied, protected and monitored by the Engine Interface Module:

- Barring gear supply with max. 1A
- Starting air pressure sensor supply with max. 1A
- Emergency stop input supply (plant) with max. 1A
- Key switch supply with max. 1A
- SDAF1+2 feedback supply with max. 1A
- PIM supply with max. 1A
- Spare supply with max. 1A

The outputs are protected to safeguard the cabling against thermal overloading and short-circuit. All fuses are electronic. The fuse does not restore itself once tripped. Fuses must be reset. Tripping of device fuses is monitored and an alarm is signaled.

An LED indicates that the current was switched off due to an inadmissible increase and a CAN message signals an alarm.

# 2.2 Diagnosis

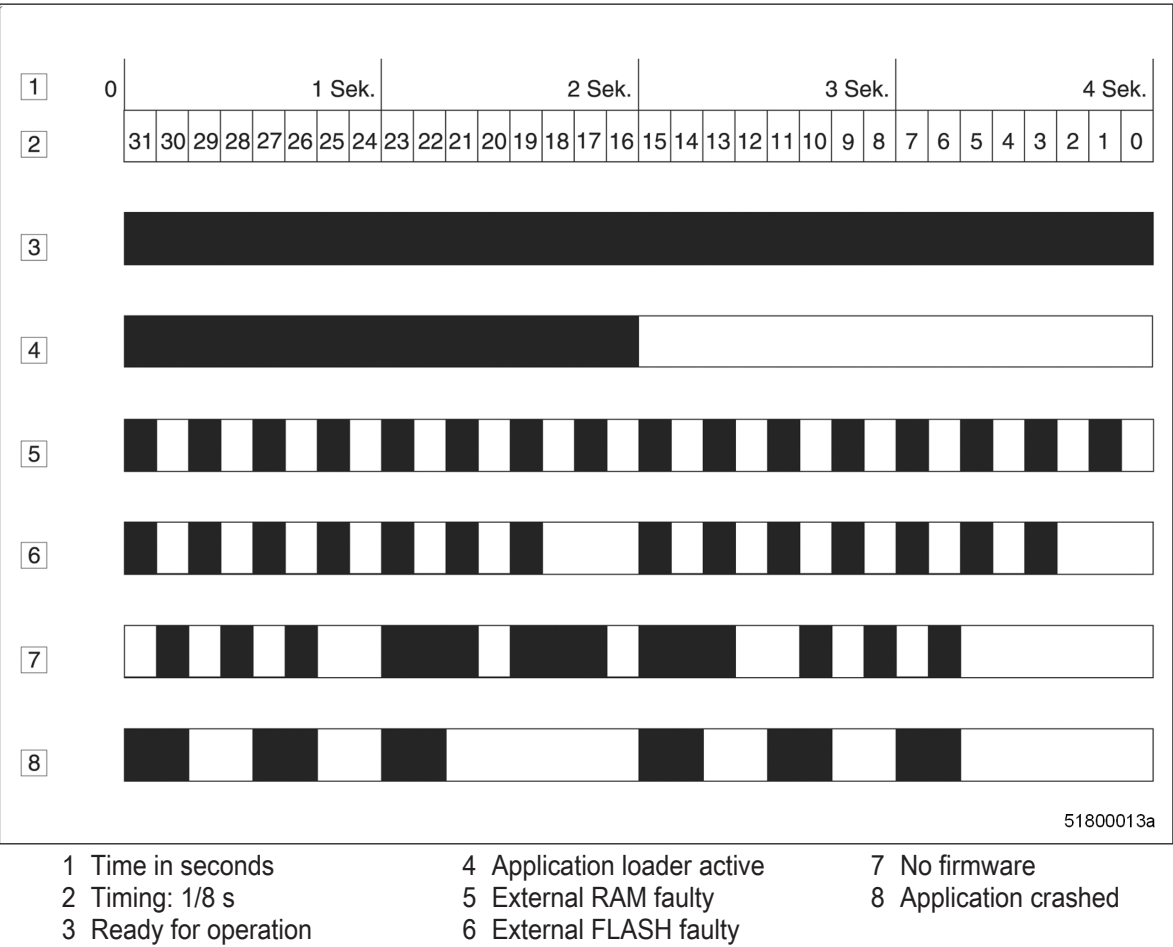
## Diagnostic lamp

A diagnostic lamp (LED DILA, green) is integrated in the housing of the Engine Interface Module. It indicates the operating status of the EIM.

The DILA has the following functions:

- Diagnostic lamp lit:  
Engine Interface Module is OK
- Diagnostic lamp dark:  
Engine Interface Module supply voltage missing or diagnostic lamp activation is faulty
- Diagnostic lamp flashes:  
Hardware or software fault in the Engine Interface Module

The diagnostic lamp (DILA) signals the following states:



## Fuse lamp

A second indicator is the fuse lamp SILA

This is also integrated in the housing of the Engine Interface Module. It indicates the status of the fuses.

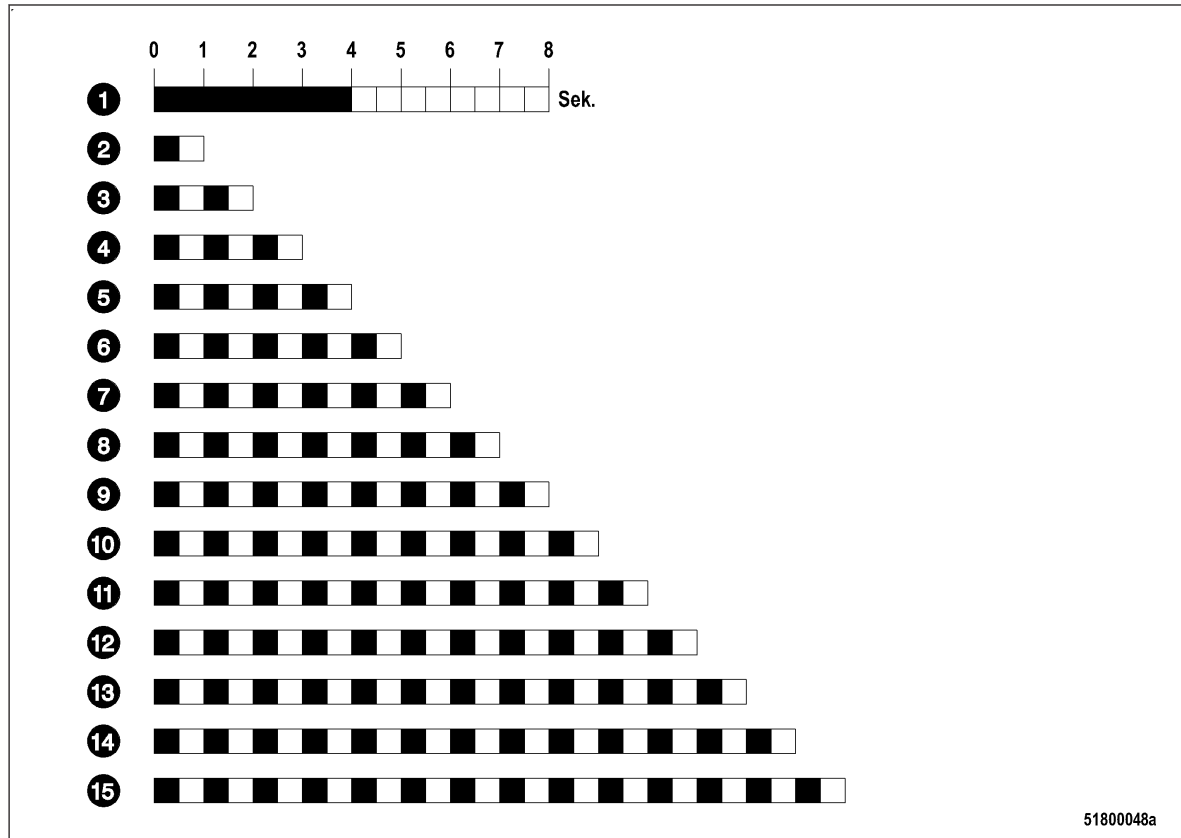
An orange LED is provided to allow diagnosis of a “tripped fuse” fault directly at the unit as it is often difficult to pinpoint a fault in the field without cabling diagrams.

This LED is activated by the controller.

Brief description of SILA:

- SILA dark  
Normal operating state
- SILA flashes orange  
One or more fuses have tripped

The fuse lamp (SILA) signals the following states:



- |                                    |                                                          |                                                          |
|------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| 1 Preamble                         | 6 VSP current path failed (S5)                           | 11 ES pushbutton current path failed –24V external (S10) |
| 2 ECU current path failed (S1)     | 7 SLD current path failed (S6)                           | 12 Key switch current path failed (S11)                  |
| 3 MCS current path failed (S2)     | 8 DDV current path failed (S7)                           | 13 SDAF 1+2 current path failed (S12)                    |
| 4 EMU current path failed (S3)     | 9 Gear monitoring current path failed (S8)               | 14 PIM current path failed (S13)                         |
| 5 Starter current path failed (S4) | 10 Emergency stop current path failed –24V internal (S9) | 15 Spare current path failed (S14)                       |

The failed current paths are signaled consecutively following the preamble (LED on for 4 seconds (1)). There is a pause lasting 4 seconds in between.

# 3 Connections, Cabling

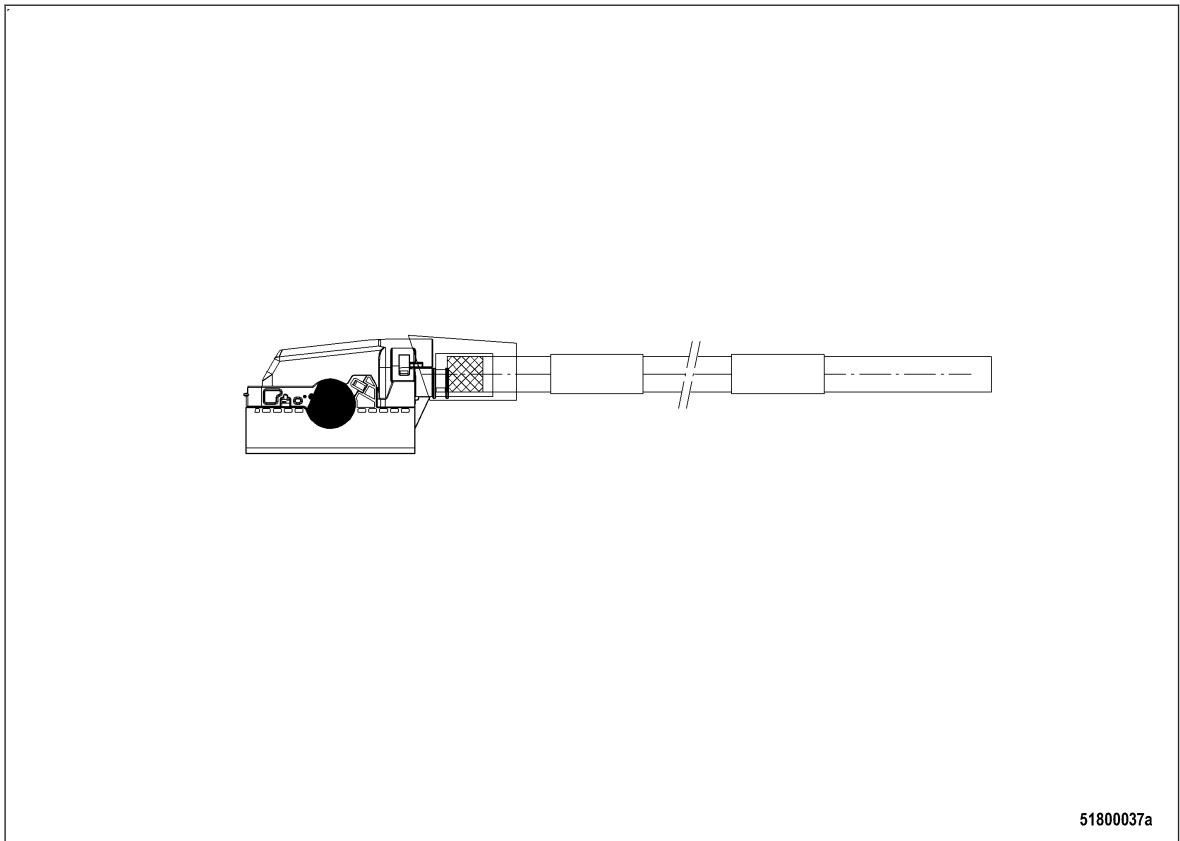
## 3.1 Plant connector X51

### Connection variants

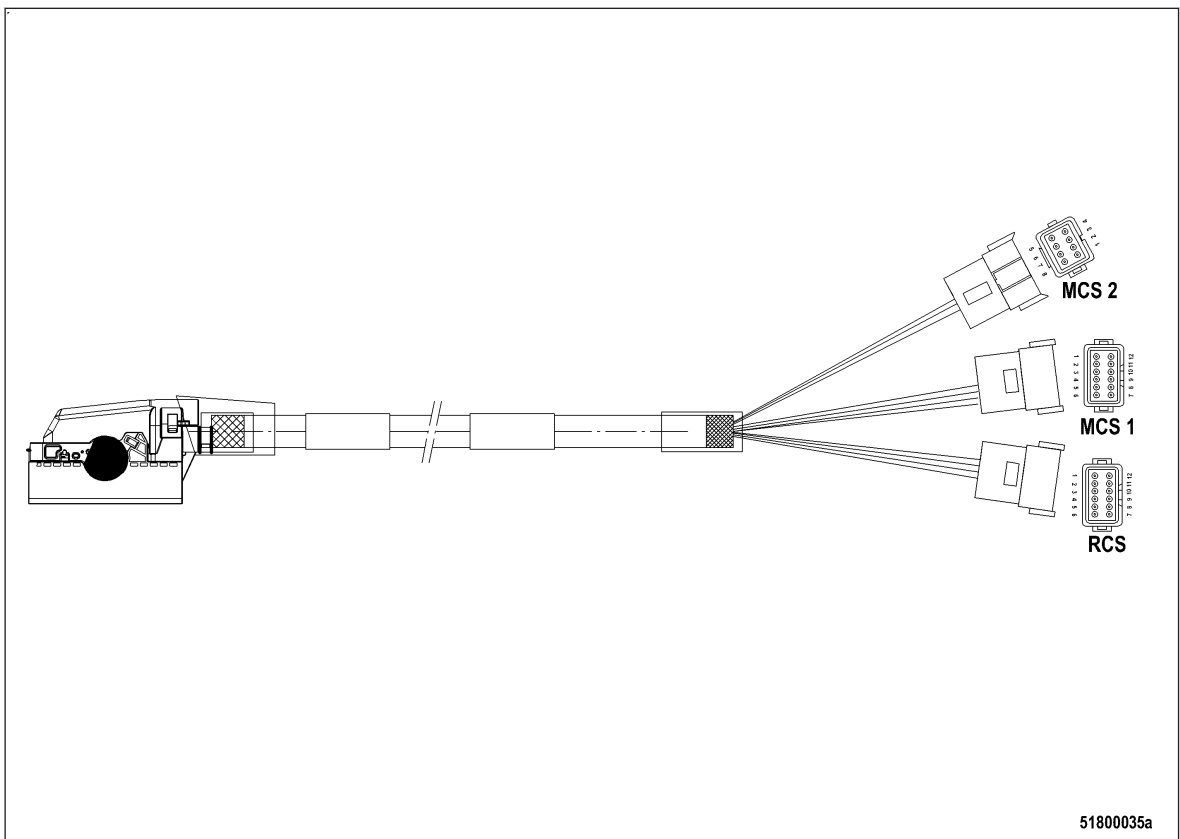
MTU offers 4 different connection options for various configuration levels and variants:

- **Standard:** Just one cable connector for connector X51 on EIM  
The Yard must connect a cable in the connector. Resistors provided in the connector must not be removed.  
Connection of the MTU Local Operating Station LOS and the MTU Priming Pump Controller PPC is not possible in the standard configuration but only in Option 3 (see below).
- **Option 1:** Connector with open cable end W51  
The cable can be cut to the appropriate length and fully connected to a terminal strip provided by the Yard. Cable connections can then be established from here.
- **Option 2:** Cable with 3 connected DEUTSCH connectors X51.3, X51.4 and X51.5  
The following third-party systems can be directly connected to appropriate DEUTSCH mating connectors here:
  - Remote control system to X51.5
  - Monitoring system to X51.4
  - J1939 bus to X51.3
- **Option 3:** Cable with 5 connected DEUTSCH connectors X51.1...5  
The following MTU and third-party systems can be directly connected to appropriate DEUTSCH mating connectors here:
  - MTU Local Operating Station LOS to X51.2
  - MTU Priming Pump Controller PPC to X51.1
  - Remote control system to X51.5
  - Monitoring system to X51.4
  - J1939 bus to X51.3
  - Oil priming pump VSP is detected automatically, reset via DiaSys® is possible

## Cable for option 1

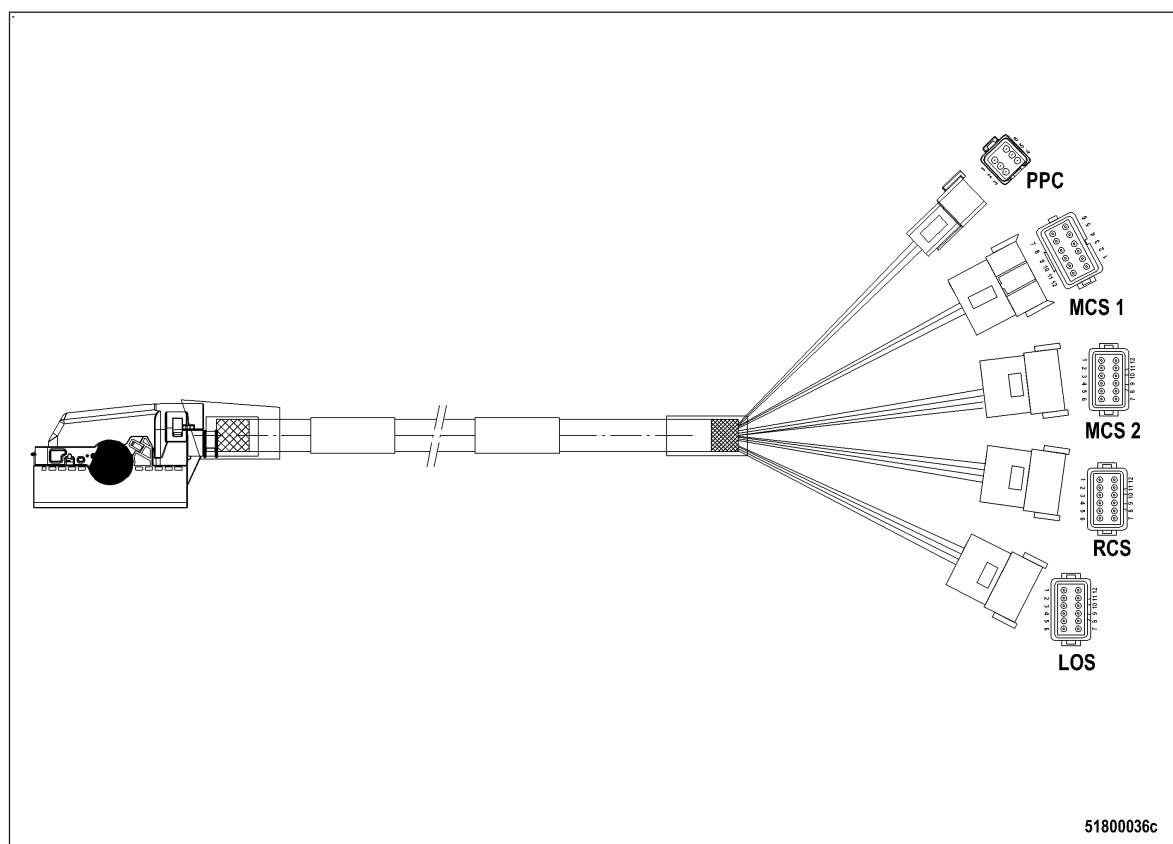


## Cable for option 2



TIM-ID: 0000017040 - 002

## Cable for option 3



## Signal overview

The table below list signal distribution at plant connector X51 and distribution to:

- the wires in cable W51
- the DEUTSCH connectors of options 2 and 3

The columns provide the following information:

- FR: Function range
- X51: Pin no. of connector X51
- CS: Required cross-section when cable is supplied by the Yard
- I/O: Input signal or output signal (from the MTU perspective)
- Signal function: What is controlled?
- W51: Wire number of MTU cable W51 (option 1)
- X: Connector number of DEUTSCH connector for options 2 and 3
- No.: Pin no. of DEUTSCH connectors for options 2 and 3
- Note: Additional information

| Cable with connectors fitted at both ends: X51 at one end and X51.1 to 3 (for third-party systems) or X51.1 to 5 (for MTU systems) |     |     |     |                                                         |                        |       | Note     |      |                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------------------------------------------------|------------------------|-------|----------|------|--------------------------------------------------------------------------------------|
| Connector with pigtail cable (open end)                                                                                            |     |     |     |                                                         |                        |       |          |      |                                                                                      |
| Connector only                                                                                                                     |     |     |     |                                                         |                        |       |          |      |                                                                                      |
| FB                                                                                                                                 | X51 | Q   | I/O | Signal function                                         | Signal name            | W 5 1 | X        | No . |                                                                                      |
| MCS 2                                                                                                                              | 57  | 0.5 | I   | Power supply for MCS functions and devices              | +Ub_MCS                | 1     | X 51 . 4 | 1    | Includes current monitoring allowing cabling damage to be detected. Max. current 6 A |
|                                                                                                                                    | 60  | 0.5 | O   |                                                         | +Ub_MCS                | 2     |          | 2    |                                                                                      |
|                                                                                                                                    | 59  | 0.5 | -   | Ground for supply voltage at wires 1 and 2              | GND_MCS                | 3     |          | 3    |                                                                                      |
|                                                                                                                                    | 62  | 0.5 | -   |                                                         | GND_MCS                | 4     |          | 4    |                                                                                      |
|                                                                                                                                    | 49  | 0.5 | I   | Engine start signal                                     | DI_START               | 5     |          | 5    | Signal stored                                                                        |
|                                                                                                                                    | 16  | 0.5 | O   | Supply voltage for key switch                           | +Ub_SS                 | 6     |          | 6    | Max. current: 1A                                                                     |
|                                                                                                                                    | 15  | 0.5 | I   | Input for key switch "ON"                               | SS_ON                  | 7     |          | 7    | Supply static signal                                                                 |
|                                                                                                                                    | 14  | 0.5 | I   | Input for key switch "OFF"                              | SS_OFF                 | 8     |          | 8    | Supply static signal                                                                 |
|                                                                                                                                    | 42  | 0.5 | I   | Engine stop signal                                      | ECU_DI1_STOP           | 9     |          | 9    | Stored                                                                               |
|                                                                                                                                    | 38  | 0.5 | I   | Deactivated cylinder cutout (also called "full engine") | ECU_DI2_CYLCUT-OUT OFF | 10    |          | 10   |                                                                                      |
|                                                                                                                                    | 43  | 0.5 | -   | Corresponding ground for both signals at wires 9 and 10 | GND_ECU_DI1_2          | 11    |          | 11   | Electrical isolation between the grounds at wires 11 and 30                          |
|                                                                                                                                    | 53  | 0.5 | O   | Set when LOS is in "LOCAL" mode                         | T_OUT_LOCAL            | 12    |          | 12   | Max. current 1 A, line disruption not detected                                       |

| Cable with connectors fitted at both ends: X51 at one end and X51.1 to 3 (for third-party systems) or X51.1 to 5 (for MTU systems) |     |     |     |                                                       |                     |       |        | Note |                                               |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-------------------------------------------------------|---------------------|-------|--------|------|-----------------------------------------------|
| Connector with pigtail cable (open end)                                                                                            |     |     |     |                                                       |                     |       |        |      |                                               |
| Connector only                                                                                                                     |     |     |     |                                                       |                     |       |        |      |                                               |
| FB                                                                                                                                 | X51 | Q   | I/O | Signal function                                       | Signal name         | W 5 1 | X      |      | N o .                                         |
| MCS 1                                                                                                                              | 55  | 0.5 | I/O | CAN-Low of J1939 interface                            | CAN_J1939_L         | 13    | X 51.3 | 1    |                                               |
|                                                                                                                                    | 56  | 0.5 | I/O | CAN-High of J1939 interface                           | CAN_J1939_H         | 14    |        | 2    |                                               |
|                                                                                                                                    | 54  | 0.5 | -   | Ground of CAN bus J1939                               | CAN_J1939_GND       | 15    |        | 3    |                                               |
|                                                                                                                                    | 54  | 0.5 | -   | Ground of CAN bus J1939                               | CAN_J1939_GND       | 16    |        | 4    |                                               |
|                                                                                                                                    | 45  | 0.5 | I/O | CAN-Low of J1939 interface                            | CAN_J1939_L         | 17    |        | 5    | Connection is intended for 120 ohm terminator |
|                                                                                                                                    | 41  | 0.5 | I/O | CAN-High of J1939 interface                           | CAN_J1939_H         | 18    |        | 6    | Connection is intended for 120 ohm terminator |
|                                                                                                                                    | 12  | 0.5 | O   | Power supply for emergency stop push-button           | +Ub_EMERG_STOP      | 19    |        | 7    | Max. current: 1A                              |
|                                                                                                                                    | 11  | 0.5 | I   | Emergency stop input                                  | DI_EMERG_STOP       | 20    |        | 8    | Input is monitored for wire break             |
|                                                                                                                                    | 23  | 0.5 | I   | A High signal on this input activates start interlock | DI_START_INTER-LOCK | 51    |        | 9    | Input is monitored for wire break             |
|                                                                                                                                    | 24  | 0.5 | O   | Power supply + 24 V DC                                | +Ub                 | 52    |        | 10   | Max. current: 1A                              |

| Cable with connectors fitted at both ends: X51 at one end and X51.1 to 3 (for third-party systems) or X51.1 to 5 (for MTU systems) |     |     |     |                                                         |                    |       |          | Note |                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------------------------------------------------|--------------------|-------|----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connector with pigtail cable (open end)                                                                                            |     |     |     |                                                         |                    |       |          |      |                                                                                                                                                                    |
| Connector only                                                                                                                     |     |     |     |                                                         |                    |       |          |      |                                                                                                                                                                    |
| FB                                                                                                                                 | X51 | Q   | I/O | Signal function                                         | Signal name        | W 5 1 | X        |      | N o .                                                                                                                                                              |
| RCS                                                                                                                                | 36  | 0.5 | A   | Reference voltage for the analog input at wire 22       | ECU_UREF_AI        | 2 1   | X 51 . 5 | 1    | Output with 5V: Do not use                                                                                                                                         |
|                                                                                                                                    | 40  | 0.5 | I   | Speed demand signal 4 ... 20 mA                         | ECU_AI1_SPEED_DEM  | 2 2   |          | 2    | Current supply                                                                                                                                                     |
|                                                                                                                                    | 32  | 0.5 | -   | Ground for speed demand signal                          | ECU_GND_AI1        | 2 3   |          | 3    | Ground is electrically isolated                                                                                                                                    |
|                                                                                                                                    | 28  | 0.5 | -   | Ground for the analog outputs at wires 25 and 26        | ECU_GND_AO         | 2 4   |          | 4    | Ground is electrically isolated                                                                                                                                    |
|                                                                                                                                    | 31  | 0.5 | A   | Engine load signal 0...10V                              | ECU_AO2_ENGLOAD    | 2 5   |          | 5    | Engine load signal at 0.5V: Load is on DBR                                                                                                                         |
|                                                                                                                                    | 27  | 0.5 | A   | Engine speed signal 0...10V                             | ECU_AO1_ENG-SPEED  | 2 6   |          | 6    |                                                                                                                                                                    |
|                                                                                                                                    | 34  | 0.5 | I   | Speed increase input                                    | ECU_DI5_SPEEDUP    | 2 7   |          | 7    |                                                                                                                                                                    |
|                                                                                                                                    | 30  | 0.5 | I   | Speed decrease input                                    | ECU_DI6_SPEEDDOWN  | 2 8   |          | 8    |                                                                                                                                                                    |
|                                                                                                                                    | 26  | 0.5 | I   | Speed demand selection                                  | ECU_DI8_SW_SPD_DEM | 2 9   |          | 9    | Select between speed demand via pushbutton (speed change by signals at wires 27 and 28) or analog speed demand (current at wire 22)                                |
|                                                                                                                                    | 35  | 0.5 | -   | Corresponding ground for signals at wires 27, 28 and 29 | ECU_GND_DI5_6_8    | 3 0   |          | 10   | Combined ground for speed demand via pushbutton signals (routed out separately for reasons of safety)                                                              |
|                                                                                                                                    | 29  | 0.5 | A   | Disengagement request                                   | T_OUT_DISENG       | 3 1   |          | 11   | Max. load: 1A, monitored for open-load, minimum load is therefore necessary (resistance must be less than 2 kohm). Rin(mating point) < U(swimming threshold) / 1mA |
|                                                                                                                                    | 33  | 0.5 | -   | Corresponding ground for wire 31                        | GND_T_OUT          | 3 2   |          | 12   | Mating point input must be electrically isolated to preclude circulating currents.                                                                                 |

| Cable with connectors fitted at both ends: X51 at one end and X51.1 to 3 (for third-party systems) or X51.1 to 5 (for MTU systems) |     |     |     |                                                  |             |       | Note   |   |                                                                |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|--------------------------------------------------|-------------|-------|--------|---|----------------------------------------------------------------|
| Connector with pigtail cable (open end)                                                                                            |     |     |     |                                                  |             |       |        |   |                                                                |
| Connector only                                                                                                                     |     |     |     |                                                  |             |       |        |   |                                                                |
| FB                                                                                                                                 | X51 | Q   | I/O | Signal function                                  | Signal name | W 5 1 |        | X | N o .                                                          |
| PPC                                                                                                                                | 20  | 0.5 | -   | Only when an MTU Priming Pump Controller is used |             | 33    | X 51.1 | 1 | No function when a third-party priming pump controller is used |
|                                                                                                                                    | 19  | 0.5 |     |                                                  |             | 34    |        | 2 |                                                                |
|                                                                                                                                    | 13  | 0.5 |     |                                                  |             | 35    |        | 3 |                                                                |
|                                                                                                                                    | 18  | 0.5 |     |                                                  |             | 36    |        | 4 |                                                                |
|                                                                                                                                    | 17  | 0.5 |     |                                                  |             | 37    |        | 5 |                                                                |
|                                                                                                                                    |     |     |     |                                                  |             | 38    |        | 6 |                                                                |

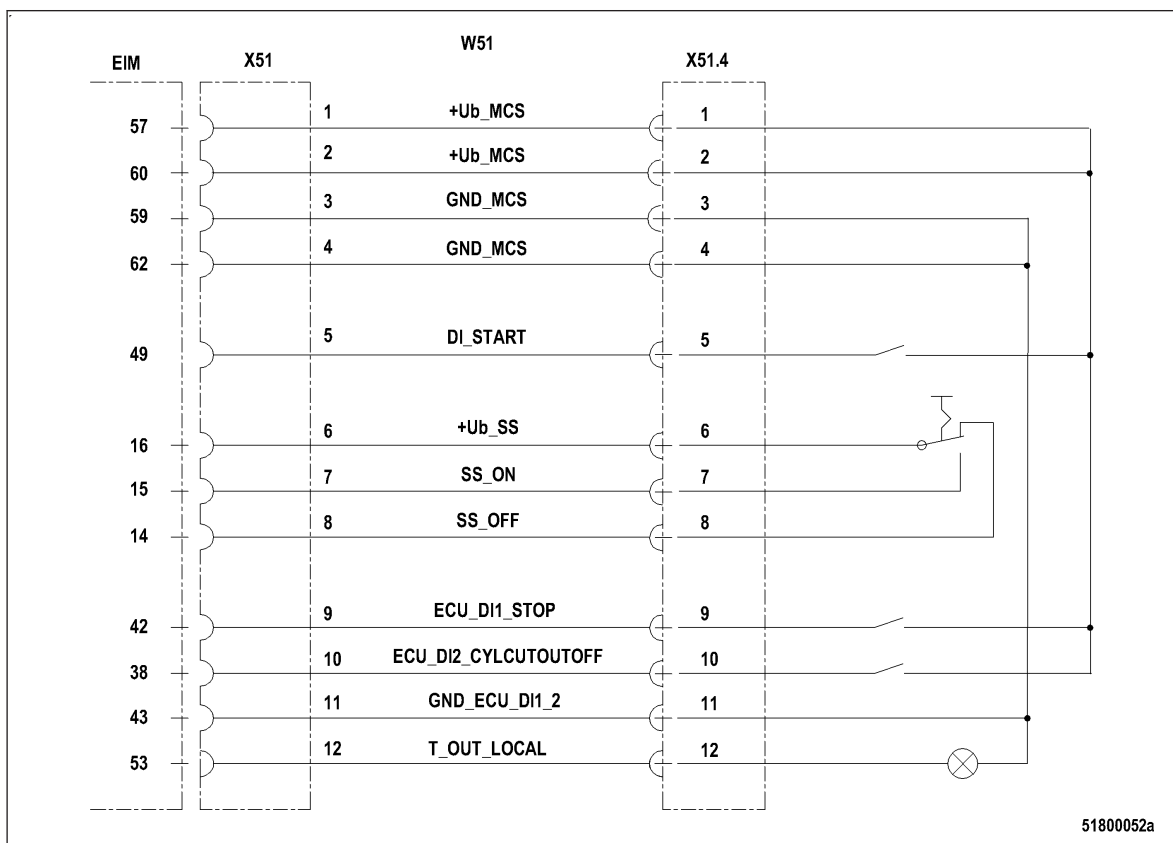
| Cable with connectors fitted at both ends: X51 at one end and X51.1 to 3 (for third-party systems) or X51.1 to 5 (for MTU systems)<br>Connector with pigtail cable (open end)<br>Connector only |     |     |     |                                                      |             |       |        | Note |                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------------------------------------------------------|-------------|-------|--------|------|-------------------------------------------------------------|
| FB                                                                                                                                                                                              | X51 | Q   | I/O | Signal function                                      | Signal name | W 5 1 | X      |      | N o .                                                       |
| LOS                                                                                                                                                                                             | 52  | 0.5 | -   | Only when an MTU Local Operating Station LOS is used |             | 39    | X 51.2 | 1    | No function when a third-party local control system is used |
|                                                                                                                                                                                                 | 51  | 0.5 |     |                                                      |             | 40    |        | 2    |                                                             |
|                                                                                                                                                                                                 | 48  | 0.5 |     |                                                      |             | 41    |        | 3    |                                                             |
|                                                                                                                                                                                                 | 47  | 0.5 |     |                                                      |             | 42    |        | 4    |                                                             |
|                                                                                                                                                                                                 | 50  | 0.5 |     |                                                      |             | 43    |        | 5    |                                                             |
|                                                                                                                                                                                                 | 46  | 0.5 |     |                                                      |             | 44    |        | 6    |                                                             |
|                                                                                                                                                                                                 | 21  | 0.5 |     |                                                      |             | 45    |        | 7    |                                                             |
|                                                                                                                                                                                                 | 25  | 0.5 |     |                                                      |             | 46    |        | 8    |                                                             |
|                                                                                                                                                                                                 | 12  | 0.5 |     |                                                      |             | 47    |        | 9    |                                                             |
|                                                                                                                                                                                                 | 11  | 0.5 |     |                                                      |             | 48    |        | 10   |                                                             |
|                                                                                                                                                                                                 |     | 0.5 |     |                                                      |             | 49    |        | 11   |                                                             |
|                                                                                                                                                                                                 |     | 0.5 |     |                                                      |             | 50    |        | 12   |                                                             |
|                                                                                                                                                                                                 | 7   | 0.5 |     | Not assigned                                         |             |       |        |      |                                                             |
|                                                                                                                                                                                                 | 9   | 0.5 |     | Not assigned                                         |             |       |        |      |                                                             |
|                                                                                                                                                                                                 | 10  | 0.5 |     | Not assigned                                         |             |       |        |      |                                                             |
|                                                                                                                                                                                                 | 58  | 0.5 |     | Not assigned                                         |             |       |        |      |                                                             |
|                                                                                                                                                                                                 | 4   | 0.5 |     | Only when an MTU MCS/RCS is used                     |             |       |        |      |                                                             |

TIM-ID: 0000017040 - 002

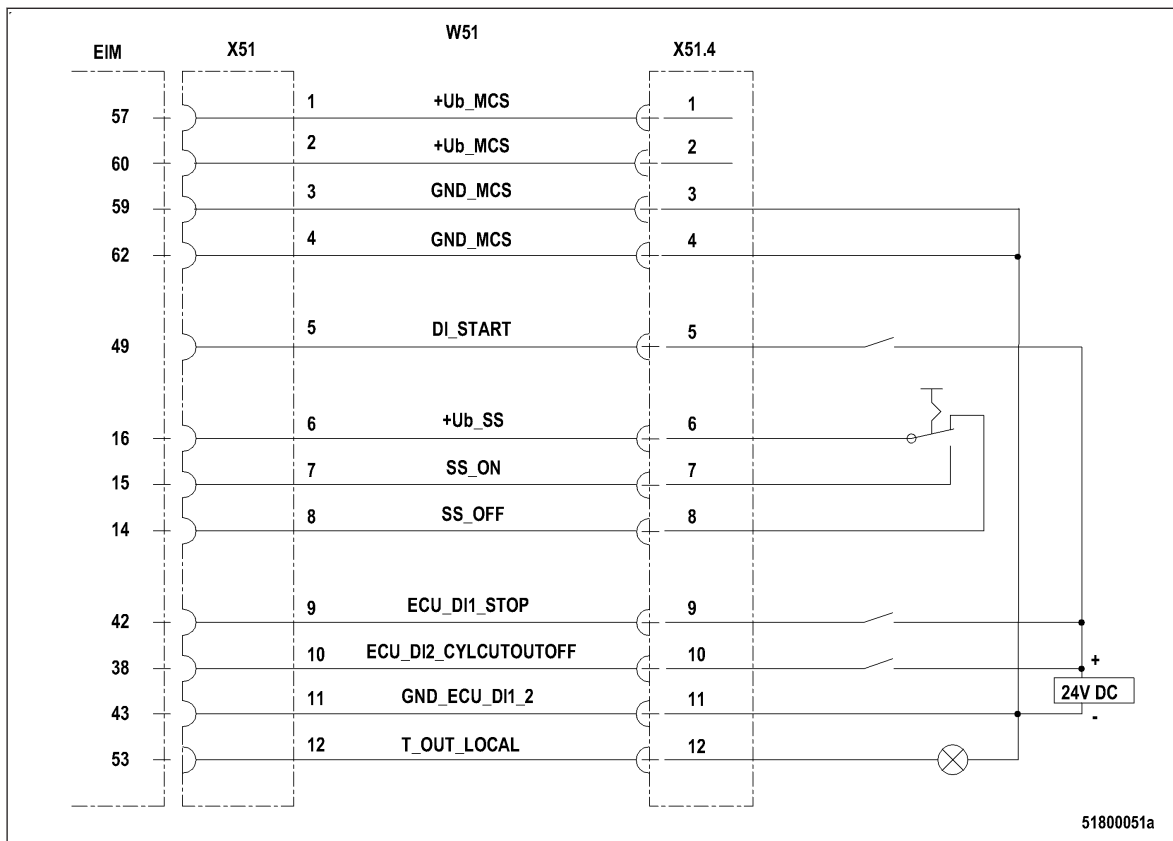
| Cable with connectors fitted at both ends: X51 at one end and X51.1 to 3 (for third-party systems) or X51.1 to 5 (for MTU systems) |     |     |     |                                  |             |              | Note |  |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|----------------------------------|-------------|--------------|------|--|
| Connector with pigtail cable (open end)                                                                                            |     |     |     |                                  |             |              |      |  |
| Connector only                                                                                                                     |     |     |     |                                  |             |              |      |  |
| FB                                                                                                                                 | X51 | Q   | I/O | Signal function                  | Signal name | W 5 1 X No . |      |  |
|                                                                                                                                    | 8   | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 22  | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 37  | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 44  | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 1   | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 2   | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 3   | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 5   | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 6   | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 39  | 0.5 |     | Only when an MTU MCS/RCS is used |             |              |      |  |
|                                                                                                                                    | 61  |     |     | Shielding                        |             | Shield       |      |  |

## MCS 2 function range

The figure below illustrates connection performed by the Yard. Note that connections must be established either directly at connector X51, at cable W51 or at the DEUTSCH connectors depending on which of the variants (standard or one of the options 1 to 3) is being realized. In this example the internal operating voltage is used to activate the inputs.



In contrast to the figure above, the following figure illustrates supply of the inputs by an external (Yard) power source. Note that the ground of this external power source must be connected to the ground GND\_ECU\_DI1\_2.



## Output for higher-level automation system, supply voltage +Ub\_MCS, GND\_MCS

### Purpose

For smaller, straightforward plants the Engine Interface Module incorporates a basic supply for higher level plant components. 4 supply voltage pins (2x +24V, 2x GND) are routed out at the plant connector. The current is limited to 6A. Higher-level plant components must be supplied separately if they require more current.

### Output specification

- Output voltage: 0 ... +U<sub>BATT</sub> minus max. 0.35V @ 1A
- Short-circuit current: Overcurrent cutout (temperature-dependent)
- Max. rated current: Min. 6A
- Settling time: —
- Electrical isolation: None
- Wire break monitoring: No
- Switched by key switch

## Engine start signal input – DI\_START

### Operation

A signal applied to this input trips an automatic engine start. The status “Local/Remote mode” is disregarded in this case.

### Input specification D\_IN

- Switches: +U<sub>BATT</sub>
- Input voltage range: 0..32V
- LOW detection: U<sub>IN</sub> < 4 V
- HIGH detection: U<sub>IN</sub> > 8 V
- Input impedance: 3.5 ... 4.6 kΩ
- Electrical isolation: None
- Input filter: f < 144 Hz
- Reverse-polarity protection: -U<sub>BATT</sub>

## Stop signal input – ECU\_DI1\_STOP

### Operation

A normal engine stop is tripped when a signal is applied to this input. The status “Local/Remote mode” is disregarded in this case.

### Input specification (signal looped through to ECU 7 – DI1)

- Switches: External voltage or +U<sub>BATT</sub>
- Input voltage 0 ... 32 VDC
- LOW detection: U<sub>IN</sub> < 4 V
- HIGH detection: U<sub>IN</sub> > 8 V
- Input impedance: 12.1 kΩ
- Input filter: f < 19 Hz
- Electrical isolation: Up to 50 VDC

## Key switch signal input – +Ub\_SS, SS\_ON, SS\_OFF

### Operation

The EIM and all devices supplied by it can be switched on and off by means of a key switch. Evaluation of the key switch is realized by hardware as the microcontroller is also switched off when the supply is discontinued.

Only the key switch logic is still supplied when the device is switched off. A transistor circuit realizes the evaluation.

- A broken wire does not lead to switching off.
- The ON signal has priority over the OFF signal.
- The ON signal can be used to switch on and off if the OFF signal is constantly high (however, a broken SS\_ON wire then leads to switch off).
- The engine is stopped in accordance with the normal stop routine if the key switch is switched to the off position when the engine is running. Only then is the supply disconnected.

The diode in the input circuit ensures that the supply voltage output for the key switch is protected from reverse voltage. The key switch switches this voltage between the ON pin (SS\_ON) and the OFF pin (SS\_OFF) alternately.

#### Note:

The following causes may prevent the plant being switched on via the key switch:

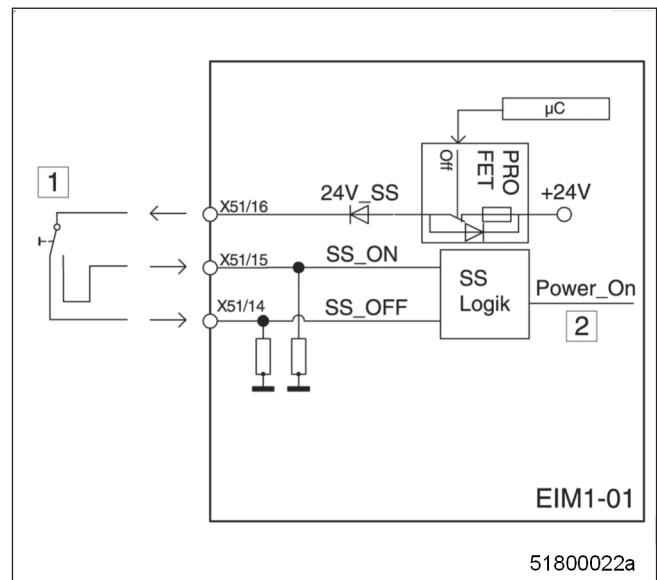
- Wire break SS\_ON
- Wire break +Ub\_SS
- Fuse failure (e.g. due to short circuit to ground); monitored via SILA

The following causes may prevent the plant being switched off via the key switch:

- Short circuit of key switch fuse:
  - Stop engine
  - Switch off plant (by disconnecting the battery)
  - Rectify fault; the fuse is automatically reset the next time the plant is switched on
  - IMPORTANT: The plant cannot be switched back on after disconnecting the battery if the fault is not rectified.

#### Schematic circuit diagram

- 1 Key switch
- 2 Output signal "ON"



#### Deactivate cylinder cutout signal input – ECU\_DI2\_CYLCUTOUTOFF

##### Operation

The Engine Control Unit prevents cylinder cutout when a signal is applied to this input (also referred to as "full engine").

### Input specification (signal looped through to ECU 7 – DI2)

- Switches: External voltage or +U<sub>BATT</sub>
- Input voltage 0 ... 32 VDC
- LOW detection: U<sub>IN</sub> < 4 V
- HIGH detection: U<sub>IN</sub> > 8 V
- Input impedance: 12.1 kΩ
- Input filter: f < 19 Hz
- Electrical isolation: Up to 50 VDC

### Signal output Local — T\_OUT\_LOCAL

#### Operation

This output is activated by the following events:

- LOS in local control mode

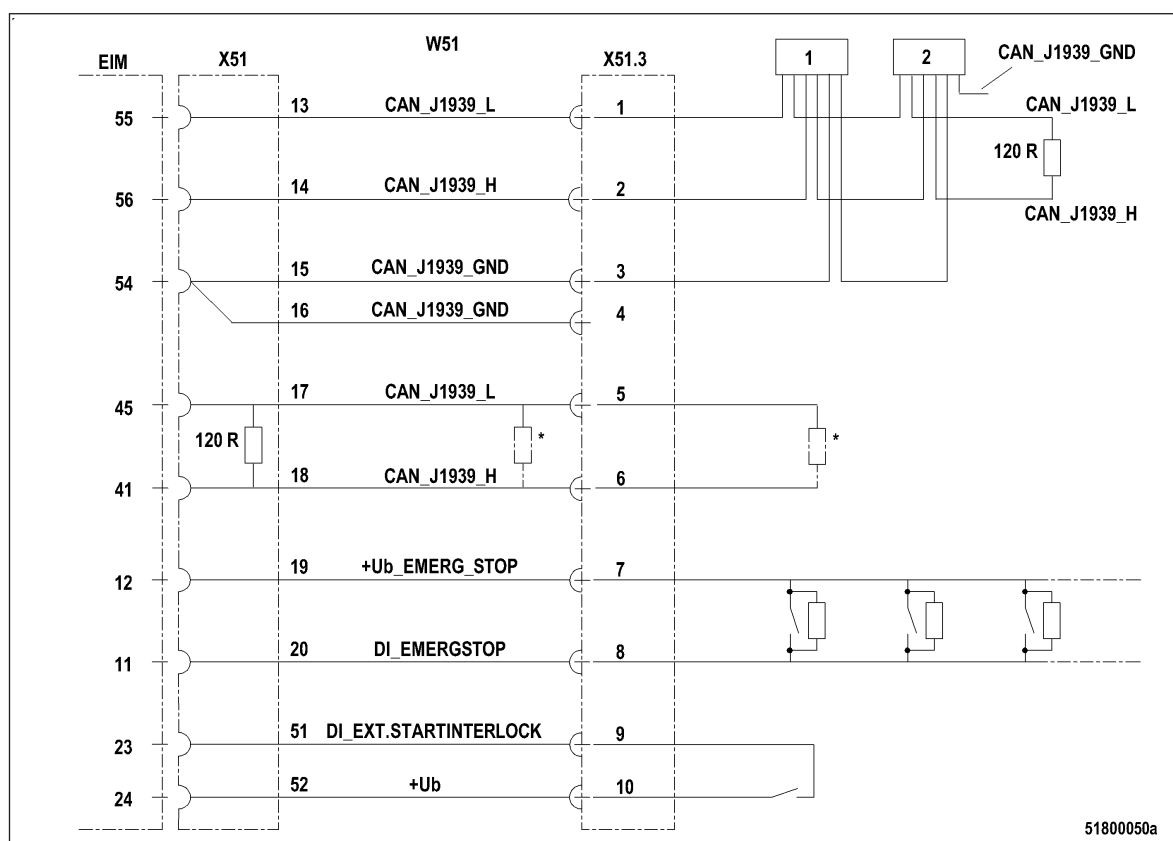
When the plant is operated in local control mode, the plant is controlled exclusively via the LOS. Control signals from RCS, regardless of whether they are hardwired or CAN signal, are disregarded.

#### Output specification T\_OUT

- Output voltage: 0 ... +U<sub>BATT</sub> minus max. 0.35V @ 1A
- Short-circuit current: Overcurrent cutout, temperature-dependent
- Max. rated current: minimum 1 A
- Settling time: —
- Electrical isolation: None
- Wire break monitoring: No

### MCS 1 function range

The figure below illustrates connection performed by the Yard. Note that connections must be established either directly at connector X51, at cable W51 or at the DEUTSCH connectors depending on which of the variants (standard or one of the options 1 to 3) is being realized.



## CAN 3 bus – SAE J1939

### Operation

The Engine Interface Module has an interface for an open CAN protocol (SAE J1939 or CANopen). SAEJ1939 is generally envisaged as the open protocol. CANopen is also to be implemented in future for other cases.

- Standard: ISO 11898 (High Speed CAN)
- Specification: Version 2.0A/B (simple format with 11 bit identifier and extended format with 29 bit identifier)
- Data rate: Up to 1Mbit/s
- Short-circuit rating in voltage range between –3 and +32V
- Transmitter output current > 25mA
- Max. bus length (as per CAN in automation CIA DS-102):
  - 500m at 125kbit/s
  - 250m at 250kbit/s
- El. isolation: 50V DC electrical isolation
- Bus line: Sym. signal transmission via 2-wire line with common return line, alternatively twisted or shielded
- Line impedance: Typ. 120Ohm
- Bus termination: Termination resistor 120 Ohm at the end of the bus line (see figure\*: ONLY ONE RESISTOR MAY BE CONNECTED, it must be at the end of the bus).

## Emergency stop signal input – DI\_EMERG\_STOP

### Operation

The emergency stop feature is a class-relevant safety facility. Special directives apply to such facilities. The following functions are implemented to this end:

- Safety facilities are designed as simply as possible and take unavoidable effect
- Designed with conventional technology (hard-wired)
- Monitored load current principle
- Power supply is monitored, failure leads to alarm signaling
- Possible faults (e.g. voltage failure or wire break) will not lead to a hazardous condition; Their occurrence leads to alarm signaling
- Tripping the safety feature leads to alarm signaling

The principle element of the emergency stop circuit is the emergency stop root which couples all inputs and outputs together. The emergency stop root is activated and maintains itself (self-holding) when an emergency stop signal is applied to one of the emergency stop inputs, .

The source of an emergency stop may be either one of the devices (ECU and EMU), or one of the emergency stop pushbuttons.

The emergency stop pushbuttons are monitored for wire break by parallel-connected resistors. As a current always flows in the emergency stop pushbutton circuit, wire break is detected by the change in current flow or the change in voltage at the measuring resistor. The objective of an emergency stop is to shut down the engine. The ECU (engine governor) must receive an active ECU\_ESI (Emergency Stop Input) signal for this, or, if a cable is disrupted, the supply voltage of the ECU must be switched off.

As ECU4 has neither an ESI input nor an FB\_OL output, the supply voltage is always switched off in this case.

The emergency stop root is monitored and a “Disengage for RCS” signal is output in the event of an emergency stop in order to disengage the gear to prevent the engine being turned by a dragging propeller.

If the engine is equipped with emergency air-shutoff flaps (SDAFs) these are tripped by a PROFET connected to the emergency stop root. The SDAFs have a limited activation period and must therefore be shut down after a timeout. When the SDAFs close as intended a limit switch outputs a feedback signal ensuring that activation is switched off. The feedback signal is evaluated and an engine stop message is transmitted to the ECU via the CAN. This is necessary in case one or both SDAF(s) was (were) tripped by a mechanical fault. The SDAFs remain closed until they are returned to their original position manually.

#### Input specification NS\_IN

- Input voltage range: 0..32V
- LOW detection:  $U_{IN} < 10\text{ V}$
- HIGH detection:  $U_{IN} > 12\text{ V}$
- Max. number of emergency stop pushbuttons: 8 pcs.
- Input impedance: 1.1 k $\Omega$
- Electrical isolation: None
- Input filter:  $f < 123\text{ Hz}$
- Reverse-polarity protection:  $-U_{BATT}$
- Wire break monitoring:
  - One resistor respectively connected in parallel to the switching contact: 33.2 k $\Omega \pm 1\%$
  - Pushbutton detection switching thresholds:
    - 0 pushbutton:  $> 68.9\text{ k}\Omega$
    - 1 pushbutton: 68.9 ... 22.66 k $\Omega$
    - 2 pushbuttons: 22.66 ... 13.57 k $\Omega$
    - 3 pushbuttons: 13.57 ... 9.68 k $\Omega$
    - 4 pushbuttons: 9.68 ... 7.53 k $\Omega$
    - 5 pushbuttons: 7.53 ... 6.16 k $\Omega$
    - 6 pushbuttons: 6.16 ... 5.21 k $\Omega$
    - 7 pushbuttons: 5.21 ... 4.52 k $\Omega$
    - 8 pushbuttons: 4.52 ... 3.99 k $\Omega$

The emergency stop interface incorporates the following signals both to the plant and the engine (parallel):

- Signal input of external start interlock DI\_EXT.STARTINTERLOC**

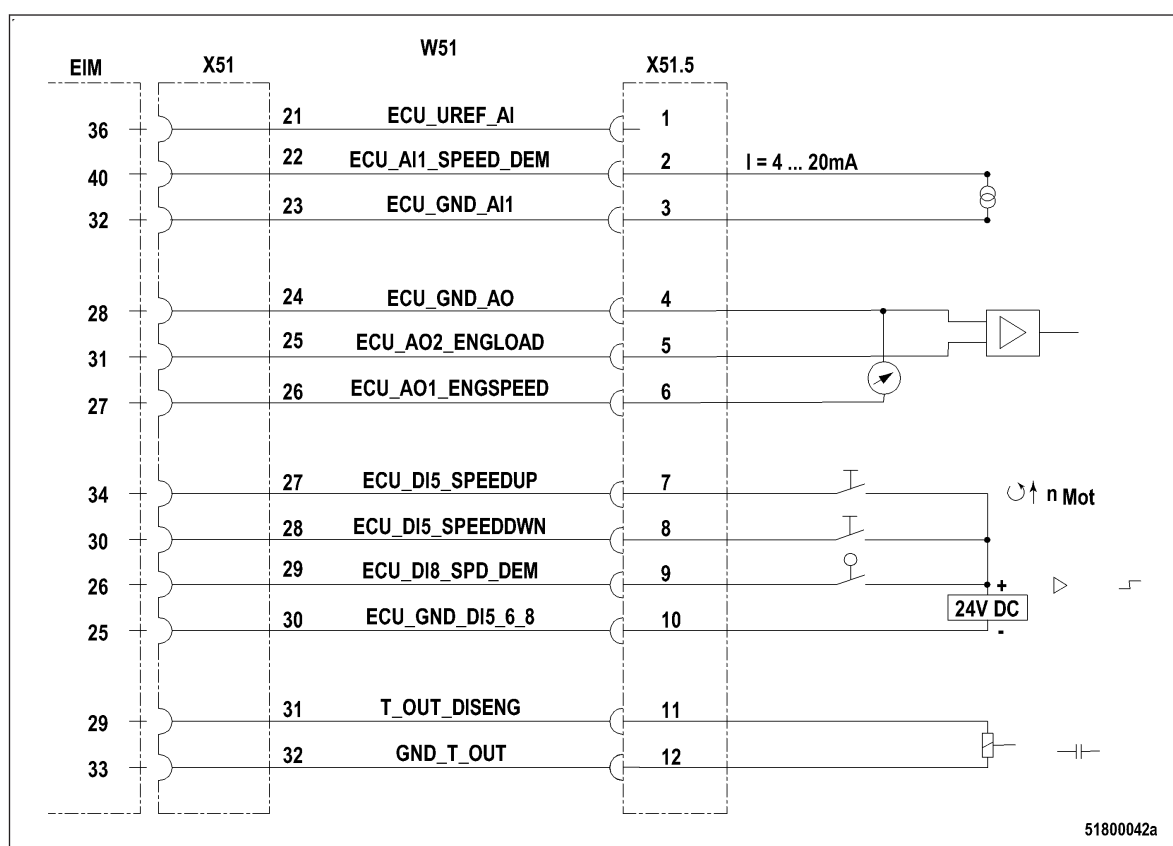
A signal applied to this input will inhibit an engine start (provided that parameter ZKP 10.2000.005 is deactivated).

### Input specification D\_IN

- Switches +U<sub>BATT</sub>
- Input voltage range: 0...32 V
- LOW detection: U<sub>IN</sub> < 4 V
- HIGH detection: U<sub>IN</sub> > 8 V
- Input impedance: 3.5 ... 4.6 kΩ
- Electrical isolation: None
- Input filter: f < 144 Hz
- Reverse-polarity protection: -U<sub>BATT</sub>

### RCS function range

The figure below illustrates connection performed by the Yard. Note that connections must be established either directly at connector X51, at cable W51 or at the DEUTSCH connectors depending on which of the variants (standard or one of the options 1 to 3) is being realized.



### Speed demand signal input – ECU\_AI1\_SPPED\_DEM

#### Operation

An analog signal (current) applied at this input is evaluated as a speed demand. Scaling (i.e. the correlation between electrical value and speed value) must be set with the dialog system DiaSys.

#### Input specification (signal looped through to ECU 7 – AI1)

- Current sources
- Sensor supply: 5 VDC  $\pm$  3%, max. 25mA (ECU\_UREF\_AI)
- Current: 0 ... 20 mA nom., 0 ... 25 mA max.; compliance voltage 4.5 V at 20 mA
- Electrical isolation: 50 VDC
- Fault detection current input:  $I < 4 \text{ mA}$ ,  $I > 20 \text{ mA}$
- Power supply protection: Short circuit to GND, overvoltage 36 VDC

## Engine load signal output – ECU\_AO2\_ENGLOAD

### Operation

The engine load signal is an analog output signal (between 0 VDC and 10 VDC) which is defined as follows:

- 0 V DC: No engine load
- U = 10 VDC: Engine load at 120%

### Output specification (signal looped through from ECU 7 – AO2)

- Control of:
  - Display instruments
  - Analog inputs
- Channel specification
  - Output voltage: 0 ... 10 V
  - Output voltage without load: Approx. 0V
  - Short-circuit current: 17 mA
  - $I_{max}$ : 0 ... 8 mA at 10 V
  - Settling time: 45 ms
  - Electrical isolation: None
  - Wire break monitoring: No
  - Overvoltage protection: 36 VDC

## Engine speed signal output – ECU\_AO1\_ENGSPEED

### Operation

A DC voltage signal the value of which is proportional to the engine speed is applied to this output. The following applies:

- 0V: 0 rpm
- 10V: Max. speed

### Output specification (signal looped through from ECU 7 – AO1)

- Control of:
  - Display instruments
  - Analog inputs
- Channel specification
  - Output voltage: 0 ... 10 V
  - Output voltage without load: Approx. 0V
  - Short-circuit current: 17 mA
  - $I_{max}$ : 0 ... 8 mA at 10 V
  - Settling time: 45 ms
  - Electrical isolation: None
  - Wire break monitoring: No
  - Overvoltage protection: 36 VDC

## Speed UP and Speed DOWN signal inputs – ECU\_DI5\_SPPEDUP, ECU\_DI6\_SPEEDDWN

### Operation

The "Speed demand switching" signal must be active at DI8 to allow these two inputs to be evaluated.

A signal briefly applied to these inputs increases (DI5) or decreases (DI6) the present engine speed by a certain value. The speed increases or decreases along a defined ramp if the signal is applied for a longer period.

### Input specification (signals looped through to ECU 7 – DI5 -“Speed UP” and DI6-“Speed DOWN”)

- Switches: External voltage or  $+U_{BATT}$
- Input voltage 0 ... 32 VDC
- LOW detection:  $U_{IN} < 4 \text{ V}$
- HIGH detection:  $U_{IN} > 8 \text{ V}$
- Input impedance: 12.1 k $\Omega$
- Input filter:  $f < 19 \text{ Hz}$
- Electrical isolation: Up to 50 VDC
- Wire break monitoring: Current monitoring with  $R_{OL} = 33 \text{ k}\Omega \pm 10\%$ , see figure

### Speed demand switching signal input – ECU\_DI8\_SW\_SPD\_DEM

#### Operation

A signal at this input makes the two inputs DI5 and DI6 “live”.

#### Input specification (signal looped through to ECU 7 – DI8)

- Switches: External voltage or  $+U_{BATT}$
- Input voltage 0 ... 32 VDC
- LOW detection:  $U_{IN} < 4 \text{ V}$
- HIGH detection:  $U_{IN} > 8 \text{ V}$
- Input impedance: 12.1 k $\Omega$
- Input filter:  $f < 19 \text{ Hz}$
- Electrical isolation: Up to 50 VDC
- Wire break monitoring: Current monitoring with  $R_{OL} = 33 \text{ k}\Omega \pm 10\%$ , see figure

The switching function must be checked manually at regular intervals.

### Disengage signal output – T\_OUT\_DISENG

#### Operation

This output is activated by the following events:

- Engine start is activated
- Emergency stop is activated
- Engine stop is activated
- Emergency shutdown due to low speed is activated

Any connected remote control system MUST evaluate this signal and disengage when the T\_OUT\_DISENG signal is active.

#### Output specification T\_OUT

- Output voltage: 0 ...  $+U_{BATT}$  minus max. 0.35V @ 1A
- Short-circuit current: Overcurrent cutout (temperature-dependent)
- Max. rated current: Min. 1A
- Settling time: —
- Electrical isolation: None
- Wire break monitoring: Configurable (monitoring current flows when configured)

This signal must be electrically isolated on the plant side to prevent circulating currents via signal ground if an RCS is connected here which is not supplied by the same battery and thus does not have the same reference ground.

The function must be monitored by the customer if wire break monitoring is not configured.

### MTU devices LOS and PPC

Suitable cables are delivered for connection of the two MTU devices LOS and PPC. The cables cannot be interchanged and are connected to the two DEUTSCH connectors X51.1 and X51.2 and the two devices.

Manual wiring is not necessary.

A connected oil priming pump is detected automatically and detection is stored internally. Automatic priming takes place in accordance with the configuration when a lube-oil priming pump has been detected.

To deactivate a lube-oil priming pump which has been detected the lube-oil priming pump must be reset with the aid of DiaSys®.

## Plant control with LOS

Plant control with the Local Operating Station LOS is described in a separate Quick Reference.

## Oil priming features

### Starting prelubrication

If starting prelubrication is part of the project design, the VSP is activated prior to each engine start. In local control mode, the start signal is not stored, which means that the start signal must be applied until the engine has reached the starter disengagement speed ( $n > 300$  rpm).

Starting prelubrication is activated for a configurable period of time before the starter is activated. Detection of a prelubrication fault leads to termination of the starting prelubrication process. Faults might be a missing feedback signal to VSP or a VSP fault. When message „Ext. Stop Priming“ is received via J1939, the prepublication process is terminated. A re-start within a time frame  $t_{max}$ , which can be configured with parameter “Restart Time“, will be conducted without prelubrication.

### Intermittent oil priming

Intermittent oil priming involves cyclical lubrication of the engine when at standstill by repeatedly activating the electrical lube-oil priming pump (prelube pump) for a certain period.

The lube-oil priming pump is activated with the engine at a standstill on expiry of the configurable interval ( $t_{interval}$ ). The lube-oil priming pump is switched off when the oil pressure reaches the priming target value  $p_{priming}$  or the maximum priming time  $t_{max}$  expires. When the oil pressure limit value  $p_{priming}$  for oil priming is reached, the priming process is terminated. Parameter  $t_{priming}$  can be used to set the period of time the priming pump continues running after reaching the desired oil pressure. This prevents excessive lubrication of the engine. If  $t_{priming}$  is zero, oil priming is stopped immediately. Oil priming is stopped when the maximum oil priming time  $t_{max}$  expired irrespective whether the desired oil pressure  $p_{priming}$  has been reached or not. For alarm signaling, see below. When the oil priming time  $t_{priming}$  or the maximum oil priming time  $t_{max}$  (also possible in continuous mode) expire, the oil priming pump is switched off and the interval time ( $t_{interval}$ ) starts again. The priming sequence recommences when the interval is over. If the engine is re-started within a configurable period of time  $t_{pause}$  following a successful oil priming sequence, the start is conducted without repeated oil priming. If the time interval is set to zero in the data record, oil priming is carried out at each engine start.

### Pressure monitoring and alarm signaling

The lube-oil priming pump is monitored to ensure that the required oil pressure is reached within a certain time regardless of the priming sequence itself.

Alarm "AL P-Priming Pump Low" is output if the measured oil pressure value fails to reach the configurable limit value  $p_{Alarm}$  within a configurable period  $t_{Alarm}$  (reason: pump fault, low oil level, oil leak, excessive temperature...). If the oil pressure value is between  $p_{Alarm}$  and  $p_{priming}$  ( $p_{Alarm} < p_{lube\ oil} < p_{priming}$ ), no alarm signal is output. Alarm "AL P-Priming Pump Low" is not set if lube oil temperature  $T_{lube\ oil} > T_{Alarm}$ . Parameter  $T_{Alarm}$  is set to a value ensuring that an alarm is always output – regardless of the lube oil temperature.

The pump continues running until the maximum oil priming time is reached.

### Control with Priming Pump Control PPC

Oil priming pump control with the Priming Pump Control PPC is described in a separate Quick Reference.

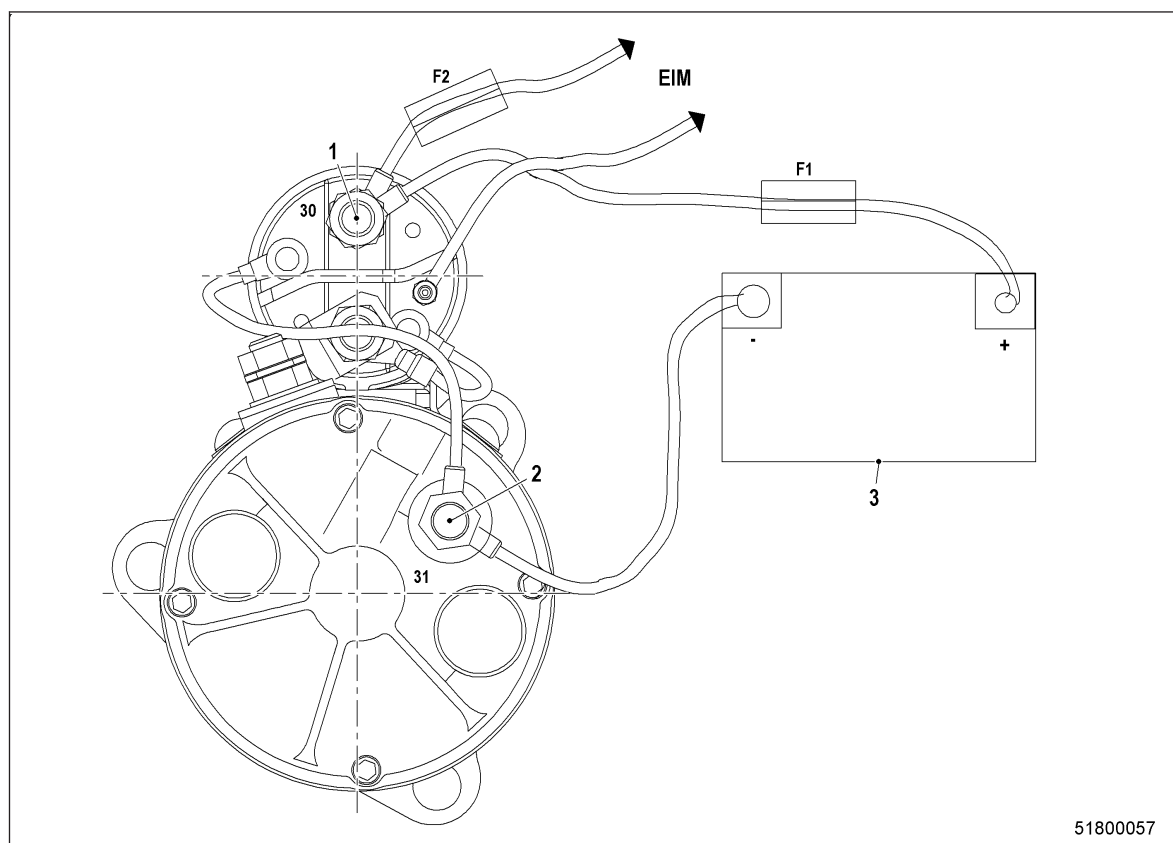
## 3.2 High current connections – EIM and starter

### Starter battery to starter

The starter battery must be connected to the starter by the Yard.

Minimum cable cross-sections apply depending on the distance between starter battery and starter.

The figure below illustrates connection for engines with one starter.

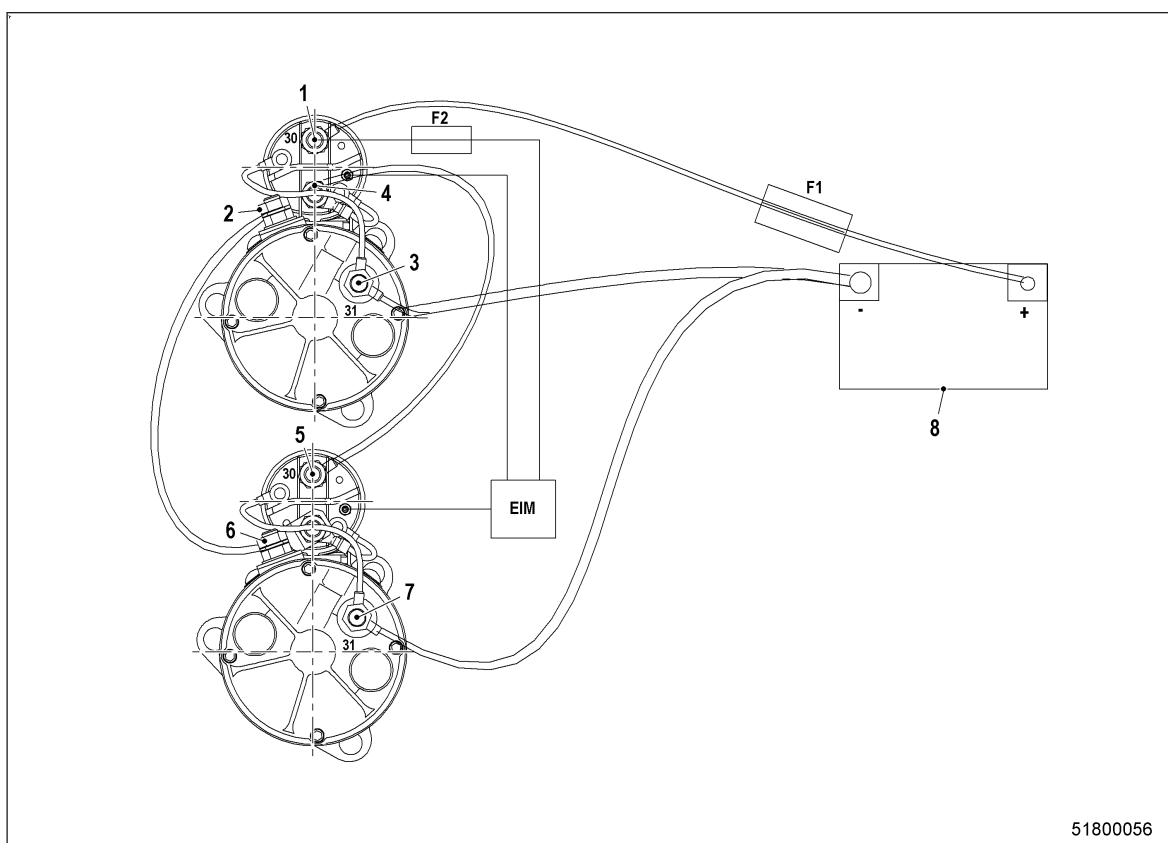


- |                           |                   |
|---------------------------|-------------------|
| 1 Terminal 30 – Starter + | 3 Starter battery |
| 2 Terminal 31 – Starter – | F1 Fuse           |

Establish the connection as follows:

1. Undo nuts at terminals 31 (ground) and 30 (supply) and remove together with the washers.
2. Route cable between battery and starter.
3. Fit M12 cable rings for the ground cable and M12 for the supply cables on the EIM side.
4. Connect cables to the appropriate stud bolts and fit one washer and nut respectively:
  - (1): Starter battery + terminal
  - (2): Starter battery – terminal
5. Tighten nuts to 29.8 Nm countering the stud bolt (starter side) in so doing.

Both starters are connected in series on engines with 2 starters. Both starters must be connected directly to the starter battery. The figure below is a schematic representation illustrating connection. Note that no metal jumper may be installed between starter and starter relay at the starter connected to the + terminal of the battery (starter 1 in the figure).



- |                                                            |                                                                             |                                                      |
|------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------|
| 1 to 4 Starter WITHOUT jumper between terminals 45 and 30b | 3 Starter 1 – Terminal 31: Apply to battery negative (connection not shown) | 7 Starter 2 – Terminal 31: Apply to battery negative |
| 5 to 7 Starter WITH jumper between terminals 45 and 30b    | 4 Starter 1– Starter relay output                                           | 8 Starter battery                                    |
| 1 Starter 1 – Terminal 30 +                                | 5 Starter 2 – Terminal 30 +                                                 | F1 Fuse                                              |
| 2 Starter 1 – Motor supply +                               | 6 Starter 2 – Motor supply +/starter relay output                           |                                                      |

## Battery to EIM

### General information about battery cabling

Various battery cabling applications are possible.

One system battery and one starter battery are always provided for each engine. The starter battery is generally used as a redundant supply. The other starter battery is generally used as a redundant system battery in order to prevent significant voltage dips during starting:

- Starter battery Motor 1 is the redundant system battery for Motor 2
- Starter battery Motor 2 is the redundant system battery for Motor 1

A second redundant system battery may also be provided in some cases.

The negative terminals of the two batteries must be connected to the protect internal circuitry against circulating currents and grounding.

Notes regarding the EIM connection to the system battery (default and redundant): The nominal current of the EIM is typically 40A (depending on the consumers connected, without starter). Standard design fuses are used (see F3 and F4). The total nominal current is the sum off all currents mentioned in section "Supplied devices and protection" (→ Functional Description).

The cable from the starter battery to the starter (TI. 30, TI. 31) is solid (short-circuit resistant) and is not necessarily fuse-protected. Fuse protection, should, however be provided by the yard. This fuse protection must be dimensioned by the Yard, considering the following factors:

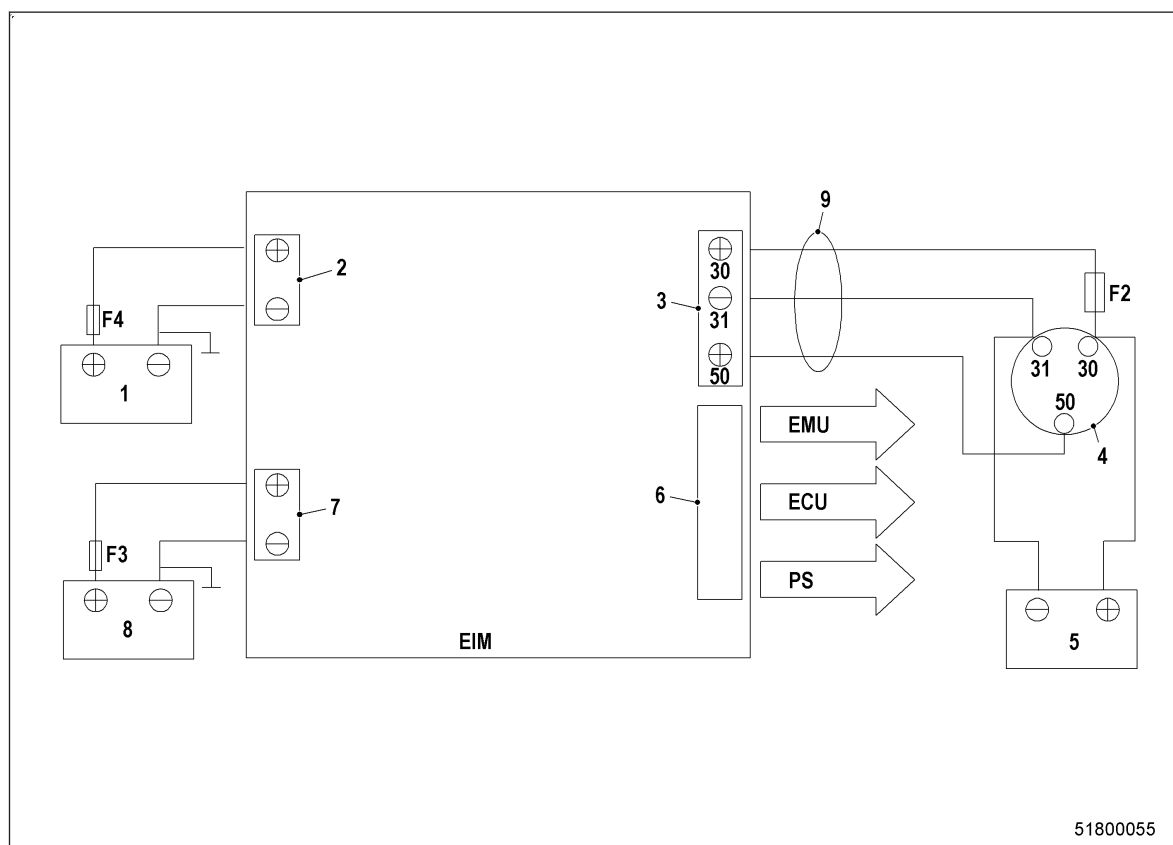
- Starter (power/current)
- Battery (internal resistance)
- Cable length (cross-section and line resistance)

A fuse is provided directly at the starter owing to the tapering cross-section as an engine cable with a smaller cross-section runs from the starter to the Engine Interface Module (integrated in the wiring harness).

When isolating one of the batteries disconnect either the positive line at one terminal or both terminals. In this arrangement, disconnecting at just one negative terminal would have no direct effect as there is an alternative current path via the internal connection of default and redundant, the two grounds of the negative terminals and via the jumpers. The alternative current path is not designed to withstand loading by the starter.

## Version with default system battery with redundant system battery and starter battery

### Schematic circuit diagram

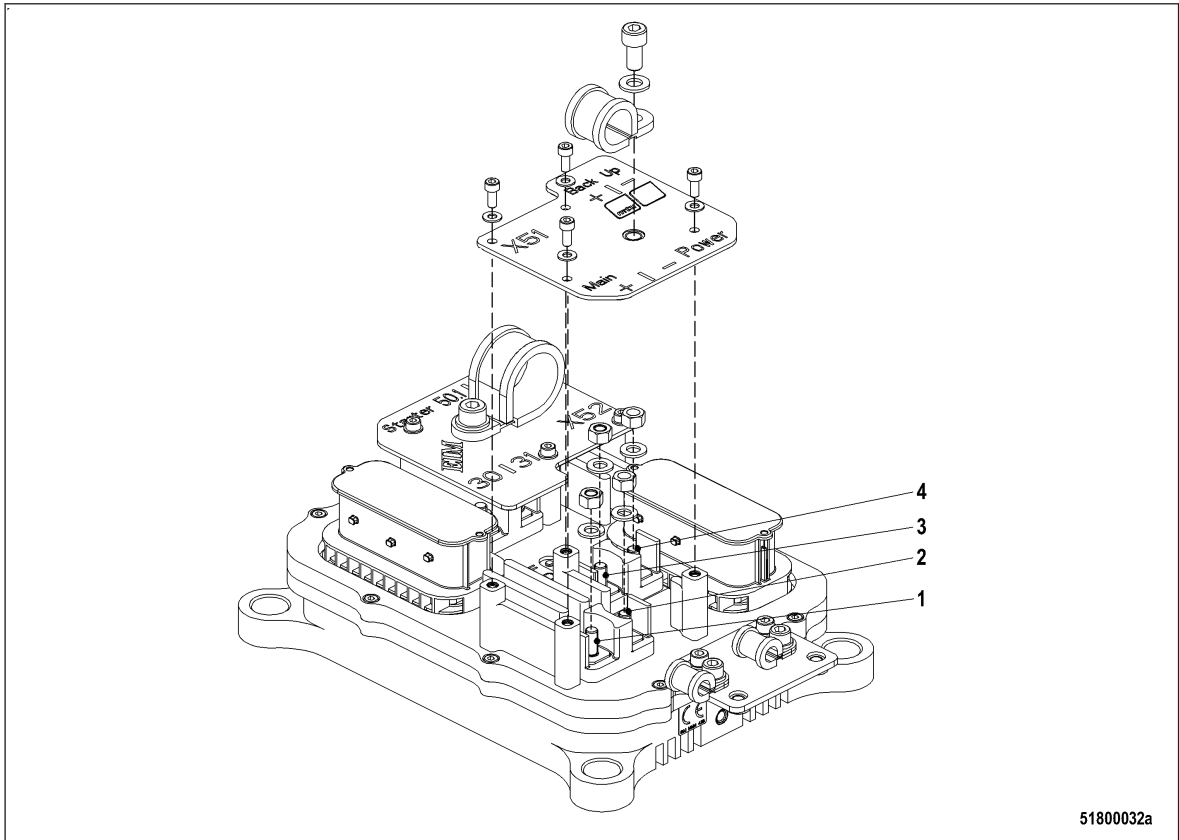


- 1 Redundant system battery
- 2 Redundant supply
- 3 Terminals to starter
- 4 Starter

- 5 Starter battery (system battery)
- 6 Connector for EMU, ECU, PS
- 7 Default supply
- 8 Default system battery

- 9 Engine wiring harness
- EMU EMU supply
- ECU ECU supply
- PS Pneumatic starter

## Connection to EIM

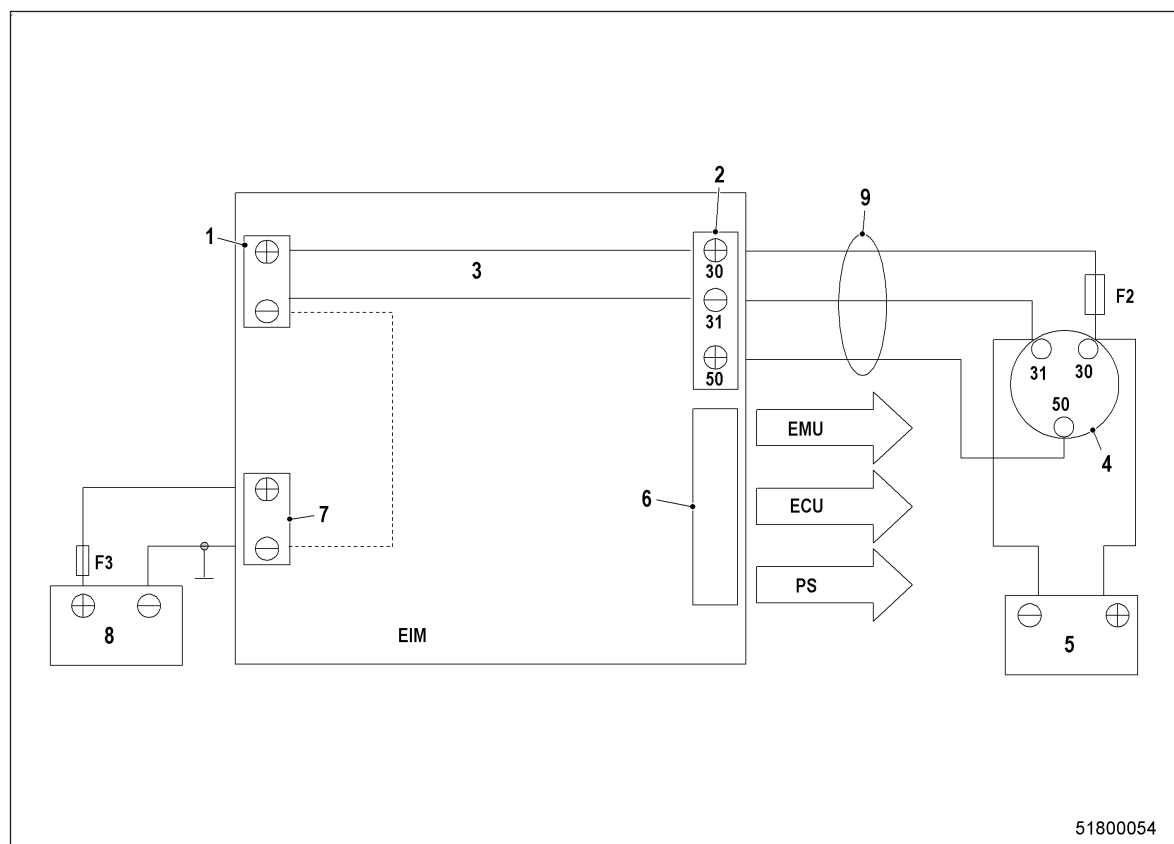


Four M6 stud bolts are provided for connection at the EIM. The batteries are connected here in accordance with the diagrams above. Proceed as follows:

1. Undo nuts and remove together with the washers.
2. Remove covers.
3. Route cable between batteries and EIM.
4. Fit M6 cable rings to the cables on the EIM side.
5. Connect cables to the appropriate stud bolts and fit one washer and nut respectively:
  - (1): Main battery + terminal
  - (2): Main battery: – terminal
  - (3): Backup battery: + terminal
  - (4): Backup battery: – terminal
6. Tighten nuts to 4 Nm.

## Version with default system battery with starter battery as redundant system battery

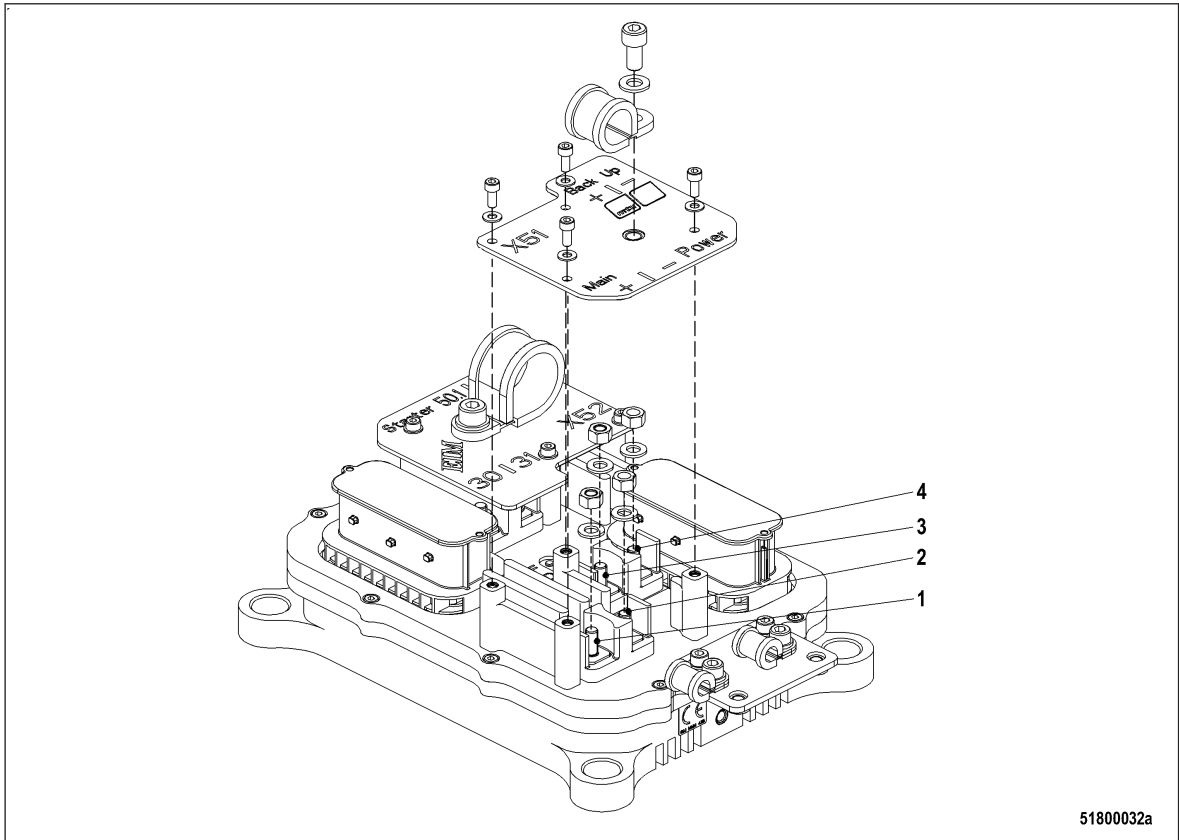
### Schematic circuit diagram



51800054

- |                        |                                    |                         |
|------------------------|------------------------------------|-------------------------|
| 1 Redundant supply     | 5 Starter battery (system battery) | 9 Engine wiring harness |
| 2 Terminals to starter | 6 Connector for EMU, ECU, PS       | EMU EMU supply          |
| 3 Jumpers              | 7 Default supply                   | ECU ECU supply          |
| 4 Starter              | 8 Default system battery           | PS Pneumatic starter    |

Connection at EIM when starter battery is used as a redundant system battery.



Four M6 stud bolts are provided for connection at the EIM. The batteries are connected here in accordance with the diagrams above. Proceed as follows:

1. Undo nuts and remove together with the washers.
2. Remove covers.
3. Route cable between battery and EIM.
4. Fit M6 cable rings to the cables on the EIM side.
5. Connect cables to the appropriate stud bolts and fit one washer and nut respectively:
  - (1): Main battery: + terminal to (1)
  - (2): Main battery: – terminal to (2)
  - (3): Jumper terminal 30 to (1)
  - (4) Jumper terminal 31 to (2)
6. Tighten nuts to 4 Nm.

### Exception when using one starter battery as a redundant battery

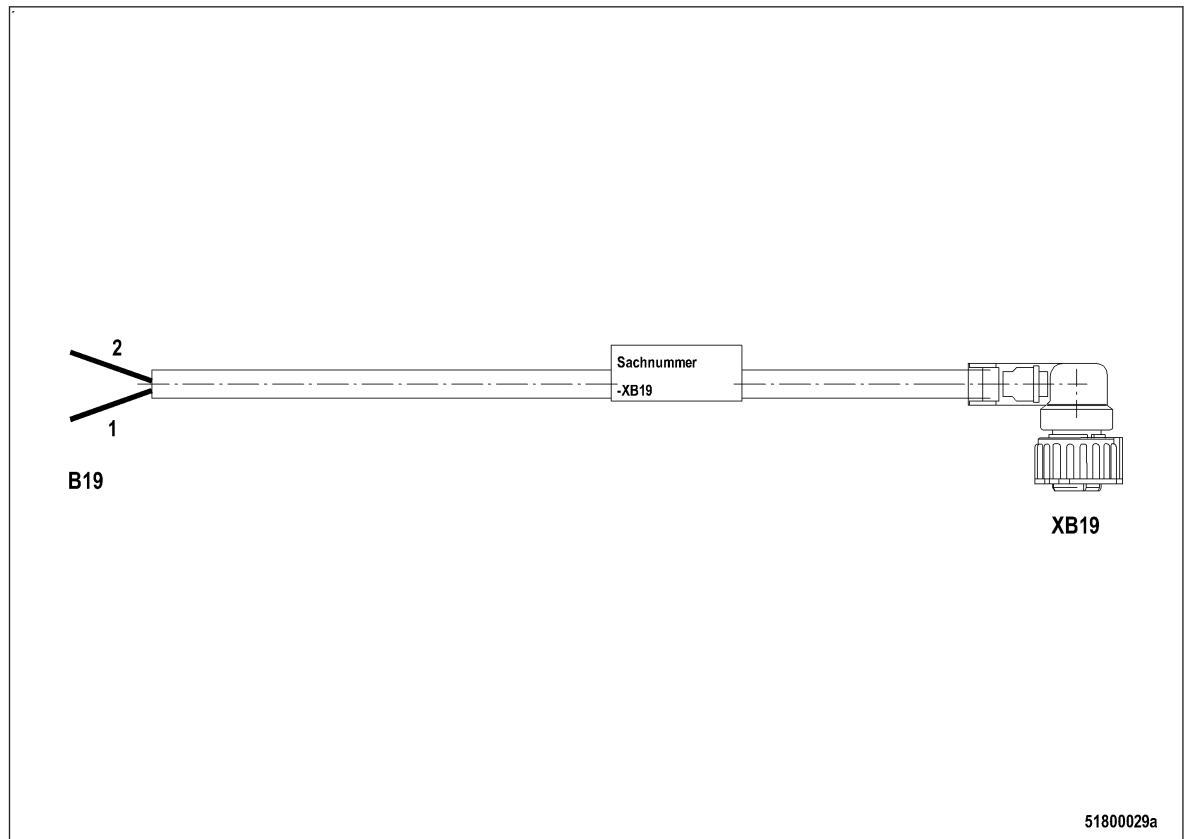
The jumpers on the EIM must have a minimum cross-section of 6 mm<sup>2</sup>.

## 3.3 External sensors

### Starting air pressure sensor B19

The connector XB19 for the starting air pressure sensor is located on engine wiring harness W2 directly next to Engine Control Unit ECU 7.

Plug in the cable with the appropriate mating connector and open end here. The sensor is connected to the open end as follows:



The sensor must meet the following electrical specifications:

- Signal 4 ... 20 mA
- Range 0 .... 50 bar (standard, may be changed on an optional basis)

Establish the connection as follows:

1. Route the cable along the engine to starting air pressure sensor B19 and secure at suitable points using cable ties.
2. Wire number 1: Signal +U\_STAIR at sensor B10 pin +
3. Wire number 2: Signal P\_IN\_STAIR at sensor B10 pin -

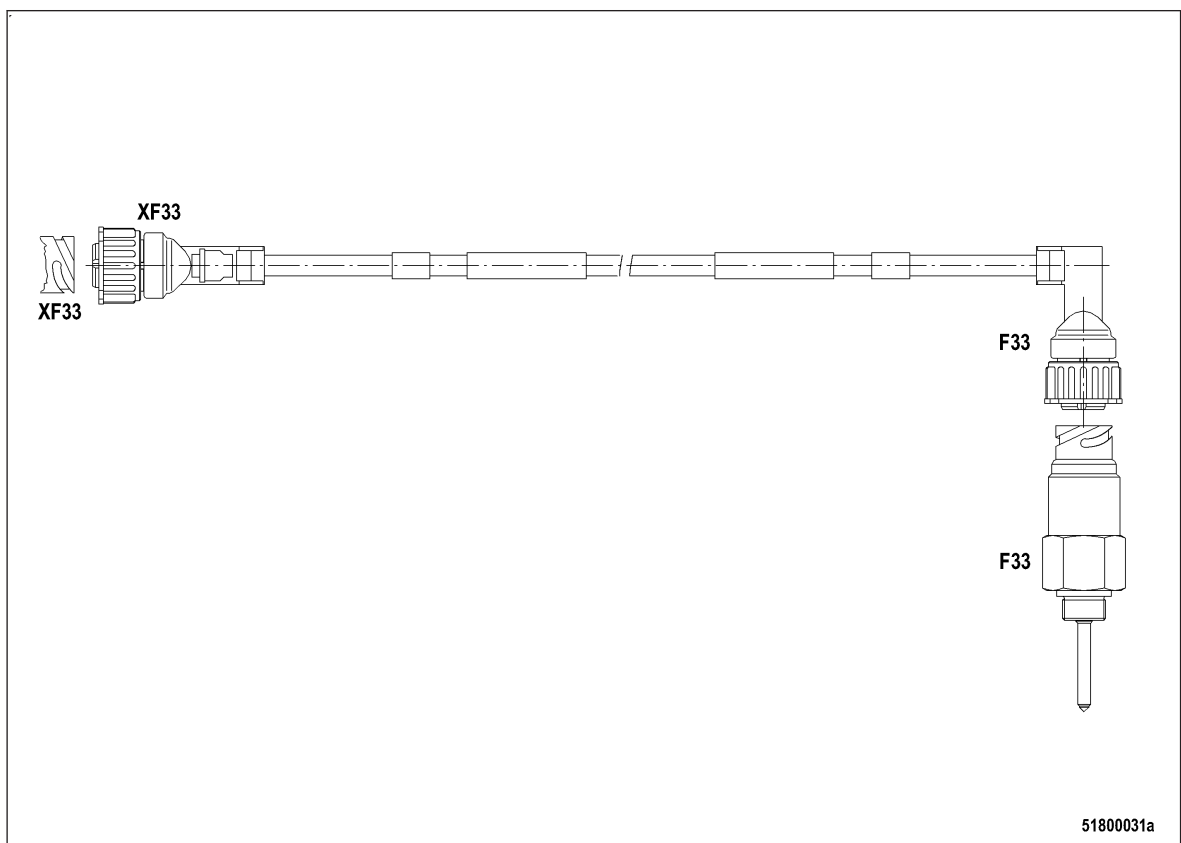
The channel is switched off for safety reasons (protection) if a sensor current exceeding 24 mA is measured. The sensor value is then displayed as "SD".

A functional sensor is not detected automatically after repair or replacement. The system must be RE-SET for this reason (switched off and back on).

### Coolant level sensor F33

The coolant level sensor F33 must only be connected by the Yard when an external expansion tank is installed. The sensor is already wired up by MTU in all other cases.

Cable connector XF33 for the coolant level sensor is located on engine wiring harness W2 in the immediate vicinity of the ECU.



The cable with the appropriate mating connector and suitable connector for the coolant level sensor is connected here when an external expansion tank is installed:

1. Plug in connector XF33 on engine wiring harness XF33 and secure it.
2. Route cable to sensor F33.
3. Plug in connector F33 at the sensor and secure it.

If a current exceeding 24 mA is measured at this input the load resistor in the EIM is switched off and “voltage measuring” mode is activated. This results in detection of a sensor failure. The system must be reset (switch off and back on) following repair of the sensor so that the functioning sensor is detected as such.

# 4 Dialog System

## 4.1 Parameter setting

Check and/or set the following parameters when an EIM is intended to be used:

- 10.2100.001 Number of emergency stop buttons
- 10.2100.004 J1939 Alarms not stored
- 10.2100.006 Speed Demand Config
- 10.2600.001 Limit L1L P-Start Air
- 10.2600.001 Limit L1L P-Start Air
- 10.2600.003 Delay LO P-Start Air
- 10.2600.004 Hysteresis LO-P-Start Air
- 10.2600.005 Measuring range P-Start Air
- 10.2600.006 T\_max\_Start\_Air

The DiaSys dialog system is required to set these parameters. If this equipment should not be available, contact the MTU Product Support.

# 5 Appendix

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