Option SC06/SC07/SC08
Engine CAN Bus

Functional Description
GCP-30 from Software Version 4.3021

WARNING

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine, turbine, or other type of prime mover should be equipped with an overspeed (overtemperature, or overpressure, where applicable) shutdown unit(s), that operates totally independently of the prime mover control unit(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled unit(s) fail.

CAUTION

To prevent damage to a control system that uses an alternator or battery-charging unit, make sure the charging unit is turned off before disconnecting the battery from the system.

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive units.**

Important Definitions

WARNING

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. Appropriate precautions have to be taken.

CAUTION

Indicates a potentially hazardous situation that, if not avoided, could result in damage to equipment. This note should absolutely be observed when connecting the control.

NOTE

References to other notes and supplements as well as tables and lists are identified by means of the "i" symbol. Most of the referenced sections are included in the Annex.

Revision History

Rev.	Date	Editor	Changes
NEW	05-06-16	TP	Release
A	06-01-11	TP	Minor corrections

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Chapter 1.
General Information

CAUTION

This brief manual can only be used together with the complete manual. This manual 37313 replaces the following manuals: 37182, 37237, and 37236

This manual describes the following options:

- **Option SC06** (selectable during configuration, description starting at page 6)
  - **mtu MDEC** (details starting at page 26) or
  - **Deutz EMR 2** (visualization only) or
  - **Standard ECU** (engine control) via **SAE J1939**
  - and **Woodward IKD 1** (unit 1; details in manual 37135)
  - and **Woodward IKD 1** (unit 2; details in manual 37135)
  - and **Woodward ST 3** (unit 2; details in manual 37112)
  - to **Woodward GCP-30 Series** via CAN bus

- **Option SC07** (additionally to **SC06**)
  - Monitoring of measured values of the ECU
  - Scania S6 control

- **Option SC08** (like **SC07** but without ST3 coupling)

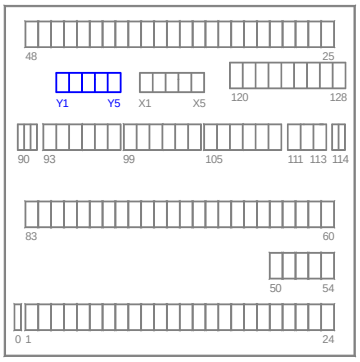
The **Options SC06**, **SC07**, and **SC08** allows to operate the above mentioned devices at the CAN engine bus. It is not possible to operate 2 engine controls at the same time.

The connected devices have to be enabled using the configuration.

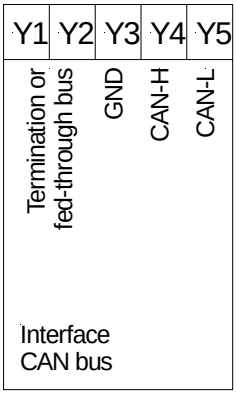
Chapter 2.
Option SC06/SC07/SC08

Connection

back view:



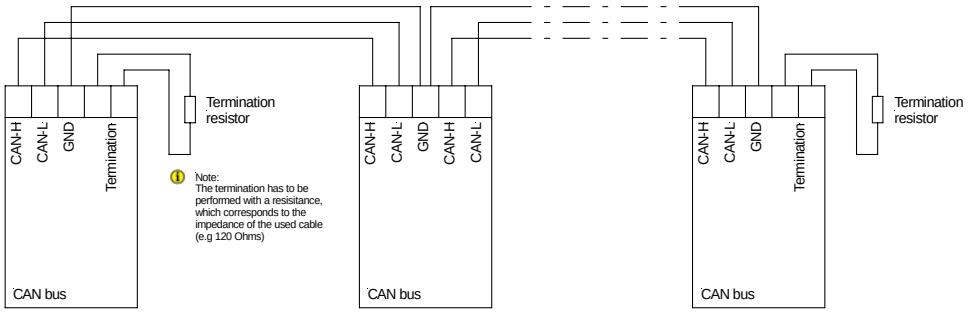
terminal assignment



Y1	Y2	Y3	Y4	Y5	CAN bus (engine bus)
[1] CAN-H	[1] CAN-L	GND	CAN-H	CAN-L	CAN bus
X1	X2	X3	X4	X5	CAN bus (guidance bus)

[1]..may be used for feeding through the CAN bus to other participants or for connecting the termination reisitor.

Please note that the CAN bus line has to be terminated with a termination resistor at both ends! The following figure illustrates the structure of a CAN bus.



Configuration

```
Configure
engin.bus     JA
```

Configuration of the engine bus **YES/NO**

To ensure a fast proceeding in the extensive configuration screens, different parameter groups are grouped in blocks. A setting to "YES" or "NO" has no influence on the fact whether a control, monitoring, etc. is performed or not. The entry has only the following effects:

YES .....The configuration screens of the following blocks are displayed and can either be enabled ("Select" button) or parameter changes can be performed ("Cursor→", "Digit↑" or "Select" buttons). A decision whether the parameters are processed will not be made.

NO .....The parameters of the following block are skipped, i.e. they are not displayed and cannot be changed.

```
CAN baud rate
          000kBd
```

Baud rate of the engine CAN bus **100/125/250/500 kBaud**

Baud rate of the engine CAN bus. Please note that **all** participants at the engine CAN bus have to be operated with the same baud rate.
The default value is 250 kBaud.
(If an MDEC unit is to be connected, 125 kBaud is to be configured here.)

IKD 1 - Digital Extension Card

NOTE

The discrete inputs of the IKD 1 can only be configured using the PC software LeoPC1.
Please take information about the IKD 1 functions from the Woodward manual 37135.

Parameter

IKDx on bus
NO
[x = 1/2]

IKD 1.x on bus **YES/NO**

YES..... The IKD 1 functions are activated. Moreover, it is monitored whether the IKD 1.{x} is connected to the engine bus. If this parameter is set to YES, but the IKD 1.{x} is not connected to the CAN bus, an interface error will be triggered in the GCP.
NO..... The functions of the IKD 1 are locked and no communication monitoring to IKD1.{x} is performed.

Note to IKD 1 interface error - The "interface error Y1Y5" with alarm class 1 is triggered, if the GCP does not receive a message from the IKD 1 for about 5 s. Moreover, the relay with the parameter 134 (or 135) de-energizes (or energizes; depending on programming). The relay energizes again as soon as the GCP receives data from the IKD 1 again. The message "interface error Y1Y5" is only cleared with an acknowledgement.

IKD 1 Discrete Inputs

The parameters are at the end of the GCP configuration file. Please note that you may have to perform additional settings (e.g. normally open/closed, delay, alarm class, etc.) directly at the IKD 1 via direct configuration if necessary. Please observe the IKD 1 manual about this.

Error text DI{x} IKD{y} (term. {z})
[x = 1..8] / [y = 1/2] / [z = 5..12]

Configuration of the IKD 1.y alarm texts

The discrete input {x} (term. {y}) on the IKD 1.{z} displays the text configured here at the GCP display.

Example: Discrete input 5 on the IKD 1.1

Error text DI5 IKD1 (term. 9)

Configuration of the IKD 1.1 alarm texts

The discrete input 5 (term. 9) on the IKD 1.1 displays the text configured here at the GCP display.

IKD 1 Relay Outputs

The parameters are at the end of the GCP configuration file. Please note that you may have to perform additional settings directly at the IKD 1 via direct configuration if necessary. Please observe the IKD 1 manual about this.

Assignment {x}. relay on IKD{y}
[x = 1..8] / [y = 1/2]

Configuration of the relay outputs on the IKD 1.y

The relay {x} on the IKD 1.{y} energizes if the configured logical condition is fulfilled.

Example: Relay 2 on the IKD 1.2

Assignment 2. relay on IKD2

Configuration of the 2nd relay on the IKD 1.2

The relay 2 on the IKD 1.2 energizes if the configured logical condition is fulfilled.

Relay Manager

No.	Outputs	Comment
...	...	
98	IKD 1.[1] - discrete input [1]	
99	IKD 1.[1] - discrete input [2]	
100	IKD 1.[1] - discrete input [3]	
101	IKD 1.[1] - discrete input [4]	
102	IKD 1.[1] - discrete input [5]	
103	IKD 1.[1] - discrete input [6]	
104	IKD 1.[1] - discrete input [7]	
105	IKD 1.[1] - discrete input [8]	
106	IKD 1.[2] - discrete input [1]	
107	IKD 1.[2] - discrete input [2]	
108	IKD 1.[2] - discrete input [3]	
109	IKD 1.[2] - discrete input [4]	
110	IKD 1.[2] - discrete input [5]	
111	IKD 1.[2] - discrete input [6]	
112	IKD 1.[2] - discrete input [7]	
113	IKD 1.[2] - discrete input [8]	
...	...	
134	Communication with IKD1.[1] okay	
135	Communication with IKD1.[2] okay	
..	..	

Send Telegram 'Guidance Bus of the GCP-30'

MUX	No.	Content (words)	Unit	Comment	
...	...	...			
4/1	13	IKD 1 alarms		Bit 15 = 1	IKD 1.[1] - discrete input [8]
				Bit 14 = 1	IKD 1.[1] - discrete input [7]
				Bit 13 = 1	IKD 1.[1] - discrete input [6]
				Bit 12 = 1	IKD 1.[1] - discrete input [5]
				Bit 11 = 1	IKD 1.[1] - discrete input [4]
				Bit 10 = 1	IKD 1.[1] - discrete input [3]
				Bit 9 = 1	IKD 1.[1] - discrete input [2]
				Bit 8 = 1	IKD 1.[1] - discrete input [1]
				Bit 7 = 1	
				Bit 6 = 1	
				Bit 5 = 1	
				Bit 4 = 1	
				Bit 3 = 1	
				Bit 2 = 1	
				Bit 1 = 1	
				Bit 0 = 1	
...	...	...			
22/2	68	IKD 1.[2] alarms		Bit 15 = 1	IKD 1.[2] - discrete input [1]
				Bit 14 = 1	IKD 1.[2] - discrete input [2]
				Bit 13 = 1	IKD 1.[2] - discrete input [3]
				Bit 12 = 1	IKD 1.[2] - discrete input [4]
				Bit 11 = 1	IKD 1.[2] - discrete input [5]
				Bit 10 = 1	IKD 1.[2] - discrete input [6]
				Bit 9 = 1	IKD 1.[2] - discrete input [7]
				Bit 8 = 1	IKD 1.[2] - discrete input [8]
				Bit 7 = 1	
				Bit 6 = 1	
				Bit 5 = 1	
				Bit 4 = 1	
				Bit 3 = 1	
				Bit 2 = 1	
				Bit 1 = 1	
				Bit 0 = 1	
...	...	...			

ST 3 - Lambda Controller (not with Option SC08)

NOTE

The ST 3 functions can only be configured using the PC software LeoPC1.
Please take information about the ST 3 functions from the Woodward manual 37112.

Parameter

ST3 on bus NO

ST 3 on engine bus	YES/NO

YES .....The ST 3 functions are activated. Moreover, it is monitored whether the ST 3 is connected to the engine bus. If this parameter is set to YES, but the ST 3 is not connected to the CAN bus, an interface error will be triggered in the GCP.
NO .....The ST 3 functions are locked and the communication to the ST 3 is not monitored.

Note: Ensure that the ST 3 controller is configured correctly. Enter 6 as **Node-ID** there.

Note to ST 3 interface error - The "interface error Y1Y5" with alarm class 1 is triggered, if the GCP does not receive a message from the ST 3 for about 5 s. The ST 3 display values are overwritten with "0". Moreover, the relay with the parameter 136 de-energizes (or energizes; depending on programming). If the GCP receives data from the ST 3 again, the relay energizes again, and the ST 3 values are displayed again. The message "interface error Y1Y5" is only cleared with an acknowledgement.
(If an interface error Y1Y5 is triggered, which has been caused by e.g. a faulty IKD communication, the ST 3 values will still be displayed correctly.)

Functional Description GCP-30 with ST 3 Coupling

Displays

Three ST 3 values are transferred to the GCP and displayed in the GCP online display as follows:
Lambda set value and actual values in screen: "L: Se0,00 Ac0,00"
Actuator position in % in screen: "P.actu: 000,00%"

Error message lambda probe

If the ST 3 detects a malfunction of the lambda probe, the error message 'Lambda probe' appears with alarm class 1 in the display.

GCP commands to the ST 3 controller

The GCP sends the following commands to the ST 3 controller depending on the respective operation state:

- Leave stop position
  This command is sent to the ST 3 controller as long as the GCP controls the auxiliary drives (pre-run and post-run auxiliary drives).
  (In operation mode manual, the auxiliary drives are always controlled and therefore, the message "Leave stop position" is always sent.)

- Release lambda control
  This command is sent to the ST 3 controller as long as the reply "GLS closed"
  is present at the GCP.

- Initialization of the stepper motor
  This command is sent to the ST 3 controller for approx. 200ms as soon as the auxiliary drives pre-run is started.

Additionally, the GCP sends the actual value of the generator real power for the control to the ST 3 controller.

Manual adjustment of the actuator position:

The actuator position can be adjusted manually using the higher/lower buttons of the GCP. To do this, the GCP has to be in manual operation mode and the actuator position display has to be visible.

Relay Manager

No.	Outputs	Comment
...	...	
129	Error lambda probe (via CAN bus)	
130	Activate lambda probe	
...	...	
136	Communication with ST 3 okay	
..	..	

Send Telegram 'Guidance Bus of the GCP-30'

MUX	No.	Content (words)	Unit	Comment	
...	...	...			
19/3	**60**	Internal alarms 7		Bit 15 = 1	
				Bit 14 = 1	
				Bit 13 = 1	Alarm ST3: lambda probe
				Bit 12 = 1	
				Bit 11 = 1	
				Bit 10 = 1	
				Bit 9 = 1	
				Bit 8 = 1	
				Bit 7 = 1	
				Bit 6 = 1	
				Bit 5 = 1	
				Bit 4 = 1	
				Bit 3 = 1	
				Bit 2 = 1	
				Bit 1 = 1	
				Bit 0 = 1	
...	...				
23/1	**70**	Lambda set value	× 100		
23/2	**71**	Lambda actual value	× 100		
23/3	**72**	Actuator position	× 0,01 %		
...	...	...			

Engine Controls Overview Table

NOTE

A simultaneous CAN bus coupling of the MDEC and J1939 components is not possible.

Description	Displays / Messages		J1939				mtu
	German	English	SPN /#6	Std. *	Deutz EMR2	Scania S6	MDEC
Display: engine speed [1/min]	Mot.Drehz. 0000	Eng.speed 0000	190	✓	✓	✓	✓
Display: oil pressure /#4	Öldruck 00,00b	Oil pres. 00.00b	100	✓	✓	✓	✓
Display: Alarm codes #7	Fehlercodes 0000	Fail.codes 0000		✓ /#5	✓ /#5		✓
Display: ECU operating hours	Betrieb: 00000h	running 00000h	247	✓	✓	✓	✓
Display: coolant temperature /#4	Kühlmit. 000,0C	Coolant 000.0C	110	✓ /#1	✓	✓	✓
Display: oil temperature /#4	Öl 000,0C	Oil 000.0C	175	✓		✓	✓
Display: fuel temperature /#4	Kraftst. 000,0C	Fuel ü000.0C	174	✓ /#1	✓	✓	✓
Display: speed reply	Feedb.Drz. 0000	Feedb.speed 0000					✓
Display: coolant level	Kühlm.Stand 000%	Cool. level 000%	111	✓	✓	✓	
Alarm: ECU defective	AL ECU defekt	AL ECU defect					✓
Alarm: coolant temperature	Kühlmitteltemp.	Coolant temp.				✓	✓
Alarm: ST coolant temperature	ST Kühlmitt.temp	ST Coolant temp.			✓		✓
Alarm: oil temperature exceeded	Öltemp. zu hoch	HI Oil temp.					✓
Alarm: SD coolant level	SD Kühlm.stand	SD Coolant level		✓	✓	✓	✓
Alarm: SD coolant charging air	SDKühlm.Ladeluft	SD Cool.chrg.air					✓
Alarm: ST oil level	ST Ölstand	ST oil level			✓	✓ /#2	
Alarm: ST engine protection	ST Motorschutz	ST Eng. protect.			✓		
Alarm: ST overspeed	ST Überdrehzahl	ST overspeed					✓
Alarm: ECU red alarm #7	ECU Rot-Alarm	ECU red alarm		SC07/08	SC07/08	SC07/08	✓
Alarm: oil pressure too low	Öldruck niedrig	Low oil pressure				✓	✓
Alarm: ST oil pressure	ST Öldruck	ST oil pressure			✓		✓
Alarm: ECU yellow alarm #7	ECU Gelb-Alarm	ECU yell. alarm		SC07/08	SC07/08	SC07/08	✓
Alarm: coolant level	Kühlmittelstand	Coolant level			✓ /#3		✓ /#3
Alarm: coolant temperature	Kühlmittelvorh.	Preheat Temp low					✓
Alarm: ST coolant charging air	STKühlm.Ladeluft	ST Cool.chrg.air			✓		✓
Alarm: SD set speed	SD Solldrehzahl	SD Speed demand					✓
Alarm: SD engine speed	SD Agg.Drehzahl	SD Engine speed		✓	✓	✓	✓
Alarm: SD oil pressure	SD Öldruck	SD Oil pressure		✓	✓	✓	✓
Alarm: SD error codes	SD Fehler Codes	SD failure codes					✓
Alarm: SD operating hours	SD Betr.Std.	SD oper. hours					✓
Alarm: SD coolant temperature	SD Kühlmitteltmp	SD Coolant temp.		✓	✓	✓	✓
Alarm: SD oil temperature	SD Öltemperatur	SD Oil temp.				✓	✓
Alarm: SD fuel temperature	SD Kraftst.Tmp.	SD Fuel temp.		✓	✓	✓	✓
Remote control							
Speed set point via CAN						SC07/08	✓
Start engine via CAN						SC07/08	
Stop engine via CAN						SC07/08	
Monitoring (If these watchdogs are enabled, the values measured by the ECU are monitored instead of the repsetive analog inputs.)							
Oil pressure				SC07/08	SC07/08	SC07/08	SC07/08
Coolant temperature				SC07/08	SC07/08	SC07/08	SC07/08
Speed				SC07/08	SC07/08	SC07/08	SC07/08

* for example Volvo, Iveco, Perkins, John Deere, CAT and other ECU manufacturers
SD..Sensor defective, ST..Stop/shutdown, AL..Alarm; **#1** the resolution is 1 °C; **#2** can either mean "oil pressure too high" as well as "oil pressure too low"; **#3** For the EMR2, this display means **shutdown** because of too low coolant level; for MDEC only **Warning** because of too low coolant level; **#4** Switchable: bar ↔ psi, or °C ↔ °F; #**5** displayed are SPN and FMI of the active errors DM1; #6 (=Suspect Parameter Name) indicates the measurement values, to which the error code refers, according to J1939 protocol; #7 Please note that this type of fault display is standard, but is not supported by all ECUs

NOTE

This overview has only an informative character and is not binding because of the many ECU models and their configuration possibilities.

Please note that the functions may require to be enabled for some ECUs when coupling ECUs. It may happen that this is only possible by the manufacturer and should be observed when ordering the ECU!

NOTE

The previous table (J1939 'Standard' = 'Std.') lists the displays, which can be displayed by the GCP in principal. If a value is not sent by the used ECU, this sends a corresponding indicator value according to the SAE J1939 standard. This is detected by the GCP and the respective value will not be displayed. A priority is defined in the CAN ID of an SAE J1939 message according to SAE J1939 standard. This is not taken into account by the GCP. Basically. the GCP receives messages of all priorities.

NOTE

Some ECUs show the behavior that the CAN bus is only active if the ignition is energized, i.e: disabling the ignition results a faulty display (some screens are overwritten with question marks) for these ECUs and it also results an interface error if interface monitoring is enabled.

```
max speed offset
       000 1/min
```

MDEC speed offset **0 to 999 min^{-1}**

This parameter is only important if the set value pre-setting to the MDEC has to be performed via the CAN bus. The nominal power is controlled via a nominal speed for a power control. The speed offset to be configured here depends on the droop characteristics of the engine. To simplify the adjustment, the speed offset can be determined as follows:

Note:
This screen is under J1939 with **Option SC07**.

A speed control is only possible if the frequency controller is set to **ANALOG**. If the control is not active yet, the set rated speed is sent to the MDEC via CAN bus for versions < 4.2008. From versions > 4.2008, the output is calculated as follows if the controller is not yet active:

$$n_{output} = n_{rated} + \frac{\left(\left(IP - 50\%\right) \times n_{\max Offset}\right) \times 2}{100\%}$$

$n_{maxOffset}$ ..... **maximum speed offset** [min^{-1}]
n_{output} ..... output value [min^{-1}]
n_{rated} ..... rated speed [min^{-1}]
IP ..... initial position [%]

Examples:
Initial position = 50% -> output value = rated speed
Initial position = 0% -> output value = rated speed - maximum speed offset
Initial position = 100% -> output value = rated speed + maximum speed offset

MDEC:
The speed offset indicates the maximum speed deviation from the rated speed here. The speed offset may be determined as follows to ease setting:
Without set point pre-setting at the MDEC, the engine will be loaded half or full. The speed drop occurring with this can be entered directly as speed offset with full load. When determining under half load, the double value is to be entered. Please refer to the MDEC manual for more information.

Scania:
The speed offset is an additional "controller gain" here. This should be 1. Therefore, the same value, which is configured in the Scania ECU, must be configured here. It is required for this function to work that the max. deviation from the rated value is configured symmetrically in the ECU, i.e. the positive and the negative speed deviation has the same value.
(The value configured in the ECU may be read out using the Scania configuration tool.)

Note:
In order to utilize the speed output for MDEC via CAN, the analog controller for frequencies has to be configured with maximum output range. Otherwise the maximum speed offset may not be reached.

NOTE

This parameter can only be configured using LeoPC1 and is only valid from GCP-30 software version 4.3010. Units with an older software revision act as if this parameter is set to YES.

ECU interface monitoring **YES/NO**

YES .....If the connection MDEC-GCP or J1939-GCP or the power supply is interrupted for approx. 6 s, the message "interf.err. Y1Y5" is displayed with alarm class 1. Additionally, the display values will be overwritten with question marks.
Some ECUs show the behavior that the CAN bus is only active if the ignition is energized, i.e: **disabling the ignition results a faulty display**.

No .....If the connection MDEC-GCP or J1939-GCP is interrupted, this message is not displayed.

Note: This setting has no effect on the interface error triggering for IKD and ST3. It has also no influence on the relays with the parameters 134 to 138.

Monitoring Function (Options SC07/SC08 J1939 and MDEC)

```
Monitoring ECU
Values      ON
```

!

Monitoring ECU values (oil pressure, coolant temp., speed) **ON/OFF**

ON .....The values for oil pressure, coolant temperature, and speed, sent by the ECU via CAN, may be monitored for exceeding configurable limits by the GCP. The watchdogs and the display screens of the analog inputs T6, T7 and the pickup input evaluate the ECU values with this setting. **Therefore, the input signals of the analog inputs T6, T7 and the pickup input are not displayed and not monitored**.

The ECU oil pressure value is displayed for "analog input" T6, coolant temperature for "analog input" 7, and speed instead of the standard speed display. For this, these "inputs" must be **enabled** under analog inputs or engine.
The monitoring will be performed with the monitoring parameters configured for these "inputs".

The analog inputs 6 and 7 should be configured with the respective name and the respective unit (pressure: 00,0bar or 000,0psi.; temp.: 000°C or 000°F).

OFF No monitoring of the ECU values will be performed. The analog inputs T6, T7 and the pickup input of the GCP may be used as usual.

NOTE

The monitoring will be suppressed in case of a CAN bus fault. Since a reliable monitoring cannot be guaranteed anymore, it must be ensured that the engine shuts down automatically when reaching critical values!

Engine Control 'MDEC'

NOTE

Please take information about the MDEC functions from the manufacturer's manual.

```
MDEC
----------------
```

Note
MDEC cannot be operated simultaneously with J1939 coupling!

MDEC **OFF / Visual/Control / Visualization / Control**

OFF..... The mtu MDEC coupling is disabled and no MDEC data is processed. A faulty MDEC connection cannot trigger an interface error Y1Y5.

Visual/Control - The mtu MDEC coupling is enabled, MDEC values and the following parameters are displayed, and values are sent to the MDEC.

Visualization - The mtu MDEC coupling is enabled and MDEC values and the following parameters are displayed.

Control ..... The mtu MDEC coupling is enabled, the following parameters are displayed, and values are sent to the MDEC.

Note: This parameter should be set to "Visual/Control" in MDEC operation, since MDEC expects the speed setting even if the control is performed via analog or three-step controllers.
If the parameter is **not** set to "OFF", a faulty MDEC connection can trigger an interface error Y1Y5 depending on the setting of the parameter interface monitoring.

(If an interface error is triggered by the MDEC, the display values are overwritten with question marks.)

```
MDEC protocol
          ---
```

MDEC protocol **V302 / V303 / V304**

Firmware version of the MDEC.
Configure the protocol implemented in the MDEC here.

Note to MDEC interface error - If the GCP does not receive an "Alive" message from the MDEC for approx. 6 s, the MDEC measurement values are overwritten with question marks and the MDEC alarm messages are suppressed. Moreover, the relay with the parameter 137 de-energizes (or energizes; depending on programming). If the GCP receives the "Alive" message again, the relay energizes again, and the measurement values as well as the alarm messages of the MDEC are displayed again.
If the parameter ECU interface monitoring is set to YES, the interface error Y1Y5 message is displayed with alarm class 1.
This message is only cleared with an acknowledgement.
(If an interface error Y1Y5 is triggered, which has been caused by e.g. a faulty IKD communication, the MDEC values will still be displayed correctly.)

Display of the MDEC Operating Hours

If MDEC is enabled, the operating hours of the ECU (max. 65535 hours) are used for the operating hour display. The maintenance is also evaluated from this.

NOTE

The operating hour update takes place every minute with detected speed.

(The operating hour output on word 76 of the guidance bus takes place independently of the speed).

The Output Relay Manager

No.	Outputs	Note
...	...	
137	Communication with MDEC okay	
..	..	

If the red or yellow alarm is intended to trigger an alarm class, the respective relay output may be connected with a discrete input.

Send Telegram 'Guidance Bus of the GCP-30'

NOTE

The following data is transferred in the 'extended blocks' of the GCP. The data volume, which is added by the 'extended blocks', results that a gateway GW 4 can only transfer the data of the first four GCPs anymore. If it is necessary that all data of all GCPs is to be transferred, a second Gateway GW 4 has to be used.

MUX	No.	Content (words)	Unit	Comment	
24/1	**73**	Engine speed	rpm	From software version 4.3010	
24/1	**73**	Engine speed	rpm × 0,1	Until software version 4.3009	
24/2	**74**	Oil pressure	bar × 0,01	Switchable: bar ↔ psi	
24/3	**75**	Alarm codes			
25/1	**76**	Operating hours of the ECU	h		
25/2	**77**	Coolant temperature	°C × 0,1 (+/-)	Switchable: °C ↔ °F	
25/3	**78**	Oil temperature	°C × 0,1 (+/-)	Switchable: °C ↔ °F	
26/1	**79**	Fuel temperature	°C × 0,1 (+/-)	Switchable: °C ↔ °F	
26/2	**80**	Speed reply	rpm	From software version 4.3010	
26/2	**80**	Speed reply	rpm × 0,1	Until software version 4.3009	
26/3	**81**	ECU alarms 1		Bit 15 = 1	ST coolant charging air
				Bit 14 = 1	Coolant preheating
				Bit 13 = 1	Coolant level
				Bit 12 = 1	ECU yellow alarm
				Bit 11 = 1	ST oil pressure
				Bit 10 = 1	Oil pressure low
				Bit 9 = 1	ECU red alarm
				Bit 8 = 1	ST overspeed
				Bit 7 = 1	Internal
				Bit 6 = 1	Internal
				Bit 5 = 1	SD coolant charging air
				Bit 4 = 1	SD coolant level
				Bit 3 = 1	Oil temperature exceeded
				Bit 2 = 1	ST coolant temperature
				Bit 1 = 1	Coolant temperature
				Bit 0 = 1	AL ECU defective
27/1	**82**	ECU alarms 2		Bit 15 = 1	SD fuel temperature
				Bit 14 = 1	SD oil temperature
				Bit 13 = 1	SD coolant temperature
				Bit 12 = 1	SD operating hours
				Bit 11 = 1	SD alarm codes
				Bit 10 = 1	SD oil pressure
				Bit 9 = 1	SD engine speed
				Bit 8 = 1	Reserve (MDEC bit 8)
				Bit 7 = 1	Reserve (MDEC bit 7)
				Bit 6 = 1	Reserve (MDEC bit 6)
				Bit 5 = 1	Reserve (MDEC bit 5)
				Bit 4 = 1	Reserve (MDEC bit 4)
				Bit 3 = 1	Reserve (MDEC bit 3)
				Bit 2 = 1	Reserve (MDEC bit 2)
				Bit 1 = 1	Reserve (MDEC bit 1)
				Bit 0 = 1	SD speed request
27/2	**83**	Reserve (MDEC bit 11)			
27/3	**84**	Reserve (MDEC bit 12)			
28/1	**85**	Reserve (MDEC bit 13)			
28/2	**86**	Reserve (MDEC bit 14)			
28/3	**87**	Reserve (MDEC bit 15)		Bit 15 = 1	Internal
				...	...
				Bit 9 = 1	Internal
				Bit 8 = 1	Interface error Y1Y5 by MDEC
				Bit 7 = 1	Internal
				...	...
				Bit 0 = 1	Internal
29/1	**88**	Reserve (MDEC bit 16)			
29/2	**89**	Reserve (MDEC bit 17)			
29/3	**90**	Reserve (MDEC bit 18)			

NOTE

The analog values are overwritten with "0" in case of an interface error.

Engine Control 'SAE J1939'

NOTE

The J1939 data coupling, parameter setting 'Standard', is performed according to the SAE J1939 standard.

NOTE

Refer to the manufacturer's manuals for information about the functionality of the devices connected to the SAE J1939 engine CAN bus.

Parameter

```
J1939
----------------
```

Note
J1939 coupling cannot be operated simultaneously with MDEC!

J1939 **AUS / Standard / EMR2 / S6**

OFF .....The J1939 coupling is disabled and no J1939 data is processed. A faulty J1939 connection cannot trigger an interface error Y1Y5.

Standard .....The J1939 coupling is enabled, J1939 data is displayed according to the SAE J1939 standard and the following parameters are displayed. A faulty J1939 connection can trigger an interface error Y1Y5. (If an interface error is triggered by the J1939 component, the display values are overwritten with question marks.)

EMR2.....The Deutz EMR2 coupling is enabled and EMR2 specific data and the following parameters are displayed. A faulty J1939 connection can trigger an interface error Y1Y5.

S6.....The Scania EMS/S6 coupling is enabled and EMS/S6 specific data and the following parameters are displayed. A faulty J1939 connection can trigger an interface error Y1Y5.

```
J1939 unit numb.
             000
```

J1939 unit number **0..255**

The GCP processes only data from a J1939 device, which sends using this CAN device number. *Standard value = 0*

Note to J1939 interface error - If the GCP does not receive J1939 data for approx. 5 s, the measurement values of the J1939 participants are overwritten with question marks and the J1939 alarm messages are suppressed. Moreover, the relay with the parameter 138 de-energizes (or energizes; depending on programming). If the GCP receives J1939 data again, the relay energizes again, and the measurement values as well as the alarm messages of the J1939 participants are displayed again.
If the parameter ECU interface monitoring is set to YES, the interface error Y1Y5 message is displayed with alarm class 1 additionally.
This message is only cleared with an acknowledgement.

J1939 Data Display

The values listed in the above table can be displayed in online mode. It has to be observed that data can only be displayed, if it is sent by the ECU. Please refer to the documentation of the used ECU for this! Please note that the functions may require to be enabled for some ECUs.

Display of the Active Alarm Codes SPN FMI

The GCP can display the active alarm codes, which are sent with the "Conversion Method" version 1 or version 4 (refer to the information from the ECU manufacturer).
The GCP displays the active alarm codes in a screen as follows, if supported by the ECU:

"A SPN00000 FMI00"

This screen displays the **active** (**A**) alarm codes according to **SAE J1939** (DM1):

SPN (= Suspect Parameter Number) indicates e.g. the measurement value, to which the alarm code refers, (e.g. SPN = 100 corresponds to oil pressure).

FMI (= Failure Mode Indicator) specifies the alarm more detailed (e.g. FMI = 3 means: value is valid but over the standard value.)

If more alarms are present, up to 10 alarms can be taken up. The displayed alarm code changes approx. every 3 s then.

"SPN = FMI = 0" means: No alarm is present or alarm codes are not available (see documentation of the used ECU).
SPNs > 32767 are not defined according to the J1939 standard and cannot be displayed.

Display of the J1939 Operating Hours

If J1939 is enabled and the operating hours are sent by the J1939 ECU, the operating hours of the ECU (max. 65535 hours) are used for the operating hour display.
The maintenance is also evaluated from this.

NOTE

The operating hour update takes place every minute with detected speed.

The operating hour output on word 76 of the guidance bus takes place independently of the speed.

Remote Control (Option SC07 Scania only)

CAUTION

It must absolutely be observed that the engine may also be stopped safely without CAN connection in emergency cases! (For example by disconnecting the ignition at the ECU.)

We recommend to enable the ignition of the ECU via the operating solenoid of the GCP and to configure the start/stop logic to Diesel.

```
Remote con.J1939
             ON
```

Note
The setting is only effective with **Scania S6**!

Remote control	ON/OFF

OFF..... Remote control is disabled. The GCP sends **no** control commands to the ECU.

ON..... The GCP sends a rated speed, a speed offset, as well as a start or stop command to the Scania ECU (refer to the following text for details). In addition, the GCP may also command an idle and override mode.

Rated speed:

The GCP selects the rated speed 1 or 2 to be sent to the Scania ECU using the rated speed configured under Engine / Pickup. If the configured rated speed is 1800 rpm, rated speed 2 (standard 1800 rpm) will be sent, for every other value, rated speed 1 (standard 1500 rpm) will be sent.
(ID: DLN1-Proprietary)

Speed offset:

The GCP sends a speed offset to the Scania ECU for speed control. This speed offset is a percentage value. It depends on the set point speed, the configured rated frequency, and the configured speed offset.
Therefore, it is **important** that the **speed offset** configured at the GCP **matches** with the Scania ECU.
(Usually, +/-120 rpm are configured with Scania.)
(ID: DLN1-Proprietary)

NOTE

In order to utilize the speed output for MDEC via CAN, the analog controller for frequencies has to be configured with maximum output range. Otherwise the maximum speed offset may not be reached.

Start command:

The GCP sends the enable starter command to the Scania ECU for starting. This command will be disabled as soon as ignition speed is detected.
(ID: DLN1-Proprietary)

Stop command:

The GCP sends a shutdown command to the Scania ECU for stopping (disabling the engine).
(ID: DLN1-Proprietary)

CAUTION

It must absolutely be observed that the engine may also be stopped safely without CAN connection in emergency cases! (For example by disconnecting the ignition at the ECU.)

Idle mode:

If idle mode is enabled via terminal 70, the GCP issues a respective command to the Scania ECU.
(Rated speed 1 and rated speed 2 are enabled simultaneously.)
(ID: DLN1-Proprietary)

Critical mode:

If critical mode is selected via terminal 6, the GCP issues an "Override" command to the Scania ECU.
(ID: Cruise Control/ Vehicle Speed)

Relay Manager

No.	Outputs	Note
...	...	
138	Communication with J1939 okay	
..	..	

Send Telegram 'Guidance Bus of the GCP-30'

NOTE

The following data is transferred in the 'extended blocks' of the GCP. The data volume, which is added by the 'extended blocks', results that a gateway GW 4 can only transfer the data of the first four GCPs anymore. If it is necessary that all data of all GCPs is to be transferred, a second GW 4 must be used.

MUX	No.	Content (words)	Unit	Comment
24/1	**73**	Engine speed	rpm	From software version 4.3010
24/1	**73**	Engine speed	rpm × 0,1	Until software version 4.3009
24/2	**74**	Oil pressure	bar × 0,01	Switchable: bar ↔ psi
24/3	**75**	Alarm code SPN (active alarms DM1)	-	together with No. 80 /#3
25/1	**76**	Operating hours	h	
25/2	**77**	Coolant temperature	°C × 0,1 (+/-)	Switchable: °C ↔ °F
25/3	**78**	Oil temperature	°C × 0,1 (+/-)	Switchable: °C ↔ °F
26/1	**79**	Fuel temperature	°C × 0,1 (+/-)	Switchable: °C ↔ °F
26/2	**80**	Alarm code FMI (active alarms DM1)	-	together with No. 75 /#3
26/3	**81**	ECU alarms 1		Bit 15 = 1 ST coolant charging air /#1
				Bit 14 = 1 Internal
				Bit 13 = 1 Coolant level /#1
				Bit 12 = 1 Internal
				Bit 11 = 1 ST oil pressure /#1
				Bit 10 = 1 Oil pressure low /#2
				Bit 9 = 1 Internal
				Bit 8 = 1 Internal
				Bit 7 = 1 ST engine protection /#1
				Bit 6 = 1 ST oil level /#1 /#2
				Bit 5 = 1 Internal
				Bit 4 = 1 SD coolant level
				Bit 3 = 1 Internal
				Bit 2 = 1 ST coolant temperature /#1
				Bit 1 = 1 Coolant temperature /#2
				Bit 0 = 1 Internal
27/1	**82**	ECU alarms 2		Bit 15 = 1 SD fuel temperature
				Bit 14 = 1 SD oil temperature
				Bit 13 = 1 SD coolant temperature
				Bit 12 = 1 Internal
				Bit 11 = 1 Internal
				Bit 10 = 1 SD oil pressure
				Bit 9 = 1 SD engine speed
				Bit 8 = 1 Internal
				Bit 7 = 1 Internal
				Bit 6 = 1 Internal
				Bit 5 = 1 Internal
				Bit 4 = 1 Internal
				Bit 3 = 1 Internal
				Bit 2 = 1 Internal
				Bit 1 = 1 Internal
				Bit 0 = 1 Internal
27/2	**83**	Reserve		
27/3	**84**	Reserve		
28/1	**85**	Coolant level	%	FFxx'h = no ECU value present FExx'h = probe error
28/2	**86**	Reserve		
28/3	**87**	Reserve		Bit 15 = 1 Internal
				... ...
				Bit 9 = 1 Internal
				Bit 8 = 1 Interface error Y1Y5 by J1939
				Bit 7 = 1 Internal
				... ...
				Bit 0 = 1 Internal

#1 only Deutz EMR 2, **#2** only Scania EMS/S6, #**3** the DM1 errors are displayed for Standard and EMR. If more alarms are present, up to 10 alarms can be taken up at the same time. The forwarded alarm code changes approx. every 3 s then.

NOTE

The analog values are overwritten with "0" for an interface error. If a measurand does not exist, it is also overwritten with "0".

Engine Bus Visualization Via LeoPC1

NOTE

This function is only implemented from Software version 4.3010.

The following MDEC or J1939 data can be displayed via LeoPC1 in the Sensors/actors level:

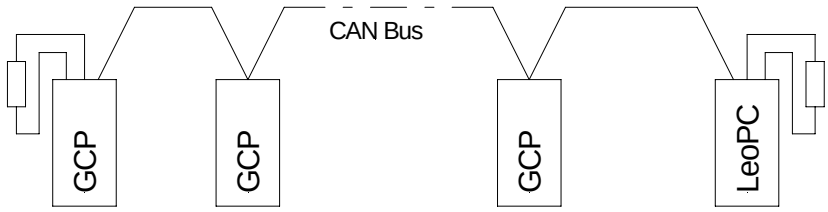
Engine speed	[rpm]
Oil pressure	[bar or psi]
Oil temp.	[°C or °F]
Coolant temp.	[°C or °F]
Fuel temp.	[°C or °F]
Alarm codes	

NOTE

The display "0" appears for an interface error MDEC/J1939. If a measurand does not exist for J1939, "0" is displayed here as well.

The displayed unit depends on the settings in parameter block Measuring. Further information about this can be found in the LeoPC1 manual (37146).

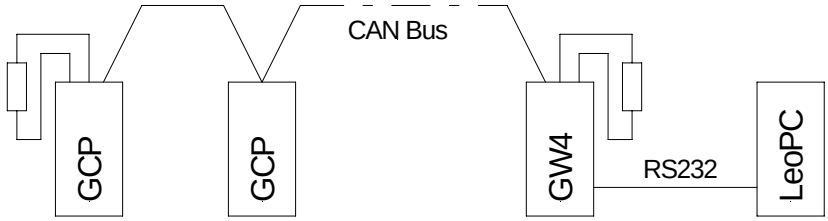
CAN Bus Connection Via A CAN Card or an USB to CAN Adapter to the LeoPC1 computer



Observe the notes about termination (termination resistor) of the CAN bus under Connection on page 5. Ensure that the CAN card or the CAN to USB adapter at the LeoPC1 computer is terminated properly.

Up to 14 GCPs can be connected as participants.

CAN Bus Connection Via A GW 4 and the RS-232 Interface to the LeoPC1 computer



Observe the notes about termination (termination resistor) of the CAN bus under Connection on page 5.

Up to 4 GCPs can be connected to a GW 4.

Configuration of the GW 4:

Since the GCP uses the extended block to visualize the engine control data , the GW 4 has to be configured to extended blocks as well. See manual GW 4 (37133).

Configuration of the GCP:

Only odd generator numbers may be configured at the GCPs!

Adaptation of the LeoPC1 file

(only necessary if the engine control data of engines with a generator number different from 1 are to be visualized.)

The modification can be made using a text editor. It is strongly recommended to store a copy of the original file in a different directory or under a different name for security reasons.

In order to only display the odd machine numbers with visualization, the LeoPc1 file xxxx-xxxx_x_pyzz.cfg (xxxx-xxxx_x = part number, y = number of machines, zz = language) has to be modified as described in the following:

Example for 2 machines:

The file for 3 machines has to be used and the 2nd machine (or the machines with even numbers for more machines) has to be commented out with " ;* ".

Original location in the .cfg file:

```
;* Definition: levels, used devices, options - Ansichten, verwendete Geräte,
Optionen
[PLANT]
NAME=Demo
DEF_VIEW=1
ENGINE1="Generator 01"
ENGINE2="Generator 02"
ENGINE3="Generator 03"
```

Modified .cfg file:

```
;* Definition: levels, used devices, options - Ansichten, verwendete Geräte,
Optionen
[PLANT]
NAME=Demo
DEF_VIEW=1
ENGINE1="Generator 01"
;*ENGINE2="Generator 02"
ENGINE3="Generator 03"
```

Chapter 3.
mtu MDEC

Introduction

Coupling for set point value transfer of the unit GCP-30 Series, GCP-20 Series (in the following called GCP; manufacturer: Woodward), and the mtu Diesel Engine Control (in the following called MDEC; manufacturer: mtu) can be realized alternatively using a connection ...

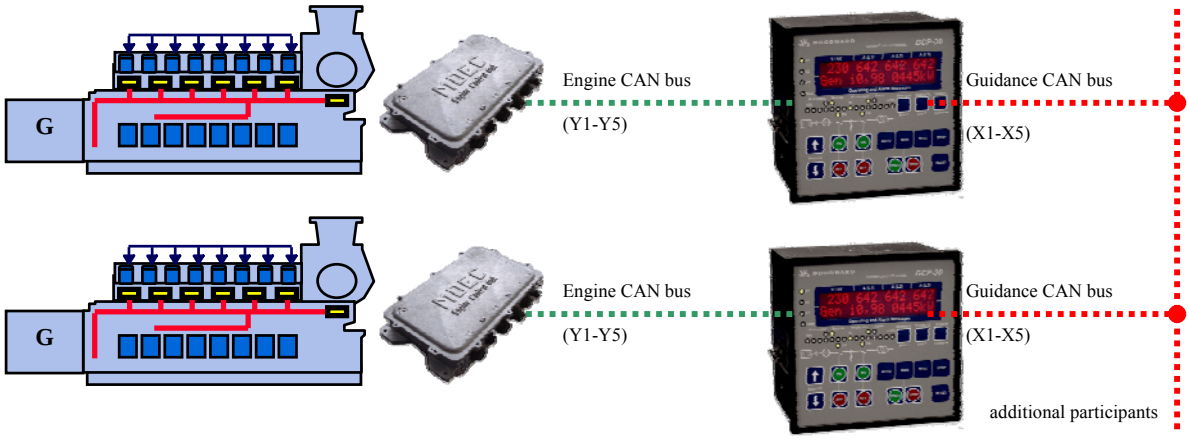
... via **three-position controllers**
(possible in every standard unit with three-position controller),

... via **analog controller outputs**
(possible in every standard unit with analog controller outputs with 20 mA signal), or

... via **CAN bus**
(option Scm has to be implemented).

NOTE

If you order an MDEC at mtu please note this on your order to mtu. Different versions are available and mtu has to implement another remote set point value module in the MDEC. The MDEC would alternatively be delivered with remote set point value via three-position controller, analog controller or CAN bus connection.



Following functions are additionally available using a CAN bus coupling:

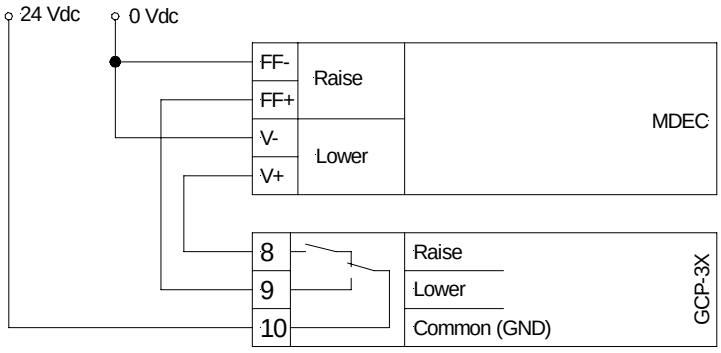
- remote set point value of speed..... GCP → MDEC
- display of selected values ..... GCP ← MDEC
- display of selected sensors..... GCP ← MDEC
- display of selected alarms ..... GCP ← MDEC

Connection to GCP

NOTE

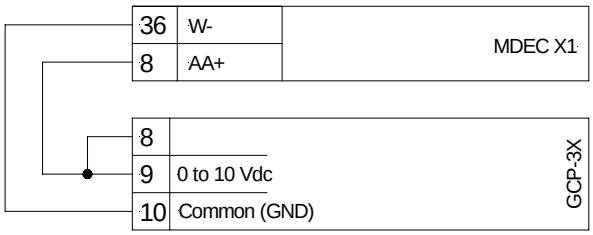
For function and configuration of the MDEC please see the manual of the manufacturer.

Set point Specification Via Three-Step Controller



Set point Specification Via Analog Controller

The controller output at the GCP has to be set to 0 to 10 V for this.



Set point Specification Via CAN

Except of the CAN connection described earlier, no further connection between MDEC and GCP has to be established.

Parameter of the MDEC

Ensure that the parameters specified in the MDEC by **mtu** are set for connecting MDEC and GCP.

We appreciate your comments about the content of our publications.

Please send comments to: stgt-documentation@woodward.com

Please include the manual number from the front cover of this publication.

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