Technical Documentation

Electronics
Training Documentation for
Electronic Engine Control Unit ECU-7
(ADEC)

Functional Description
T000001/01E

Printed in Germany

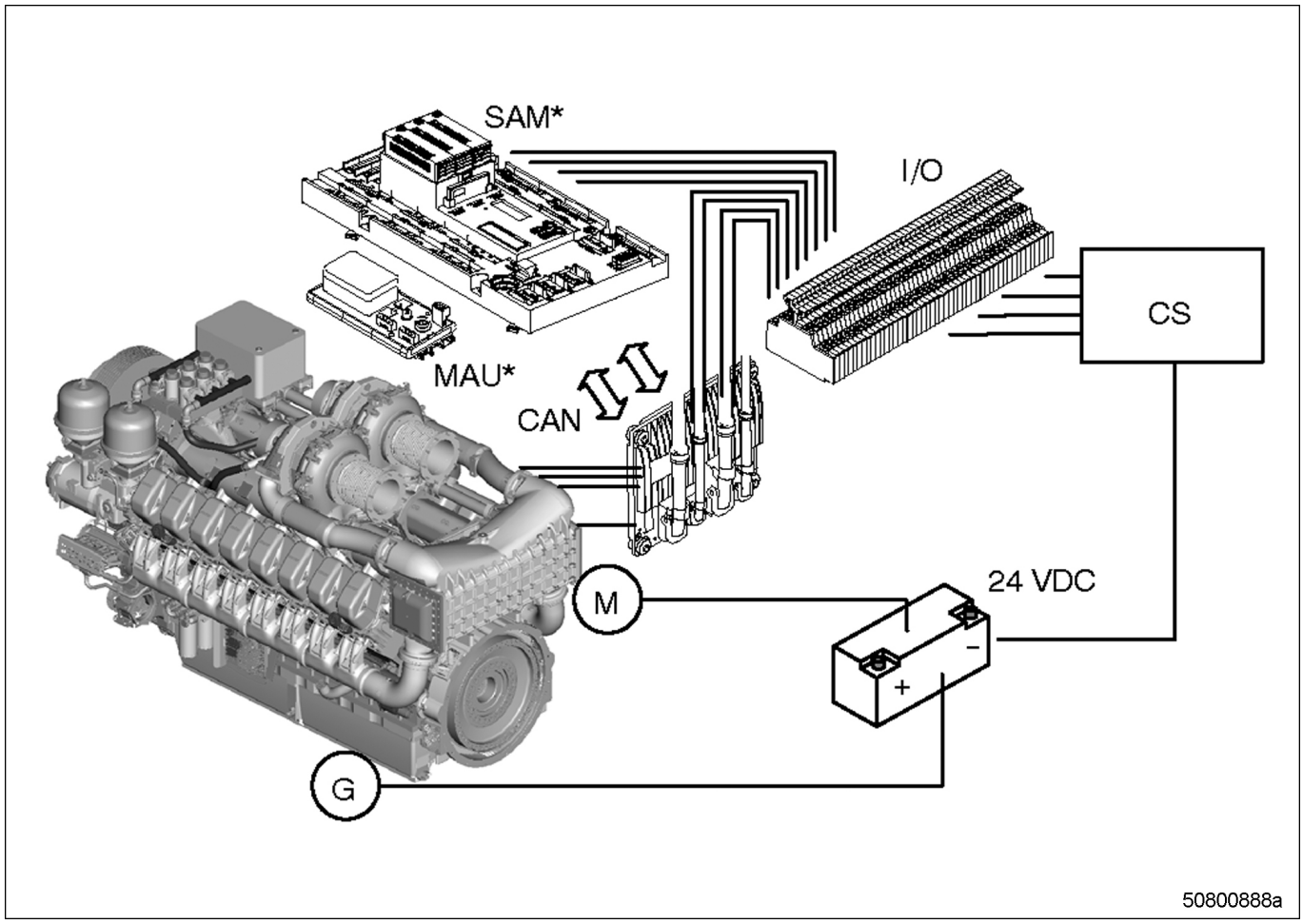
This handbook is provided for use by maintenance and operating personnel in order to avoid malfunctions or damage during operation.
Subject to alterations and amendments.

1 The engine governor

1.1 Engine governor ECU 7 – ADEC

General information

To control and regulate a diesel engine, a large number of measurement variables and control signals have to be recorded, evaluated and processed. This information can either be generated on the engine side (e.g. operating data such as pressure and temperatures) or on the system side, i.e. by devices of a higher-order system, which determine how the diesel engine behaves.



*	alternative	I/O	Terminal strip for distribution of input and output signals
SAM	Connection with its own processor assembly	M	Starter
MAU	Passive connection module	G	Battery-charging generator:
CAN	Redundant data bus (Controller Area Network)	24 VDC	On-board battery
		CS	Customer-provided control system (Customer System)

The ECU 7 engine governor was designed and developed to cover a large number of applications and engine types.

Application

The term "application" is used to describe the environment in which the engine (and thus the governor) is used. MTU engines are designed and adapted for the following applications:

- Marine

  These are drive motors for the ship’s main drive.
- Rail

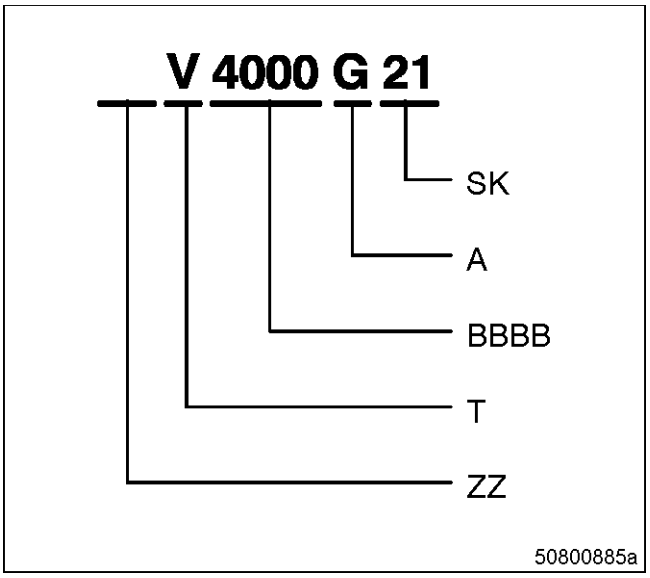
Engines for railroad vehicles are used for diesel-electric drives or diesel-hydraulic drives. Diesel-electric drives are basically engines that drive a generator to produce operating voltage. This generator package is geared to the special requirements of a locomotive drive. In the case of diesel-hydraulic drives, a hydraulic pump is driven.

- Genset

  Gensets for current generation are either stationary or mobile plants. Mobile plants are used, for example, in ships for on-board power generation (marine gensets") or in power containers for autonomous power generation. Stationary plants are used, for example, as emergency power units or in combined heat and power plants.
- C&I

  The term C&I covers industrial engines, which can be used in many areas, e.g. excavators or off-highway dump trucks. These engines generally drive generators or hydraulic pumps in a vehicle. These engines are normally delivered to the manufacturer of these vehicles, who then have to adapt the engine and its characteristics to their application.

Engine types



ZZ Number of cylinders
T Cylinder arrangement (type)
BBBB Series
A Application
SK Power class

The term "engine model" refers to the series and the main features of the engine (number of cylinders, characteristics, usage, etc.).

Series

The engine governor described in this documentation is presently used for:

- 2000CR series
- 4000 series

Main features

These engines have the following main features and are supplied for the following purposes:

- 8V, 10V, 12V, 16V and 20V
- Application:
  - Marine
  - Rail
  - Genset
  - C&I (industrial engines, mining trucks, excavators, etc.)
- Power class (16 ..... 93)

Adaptation of the engine governor

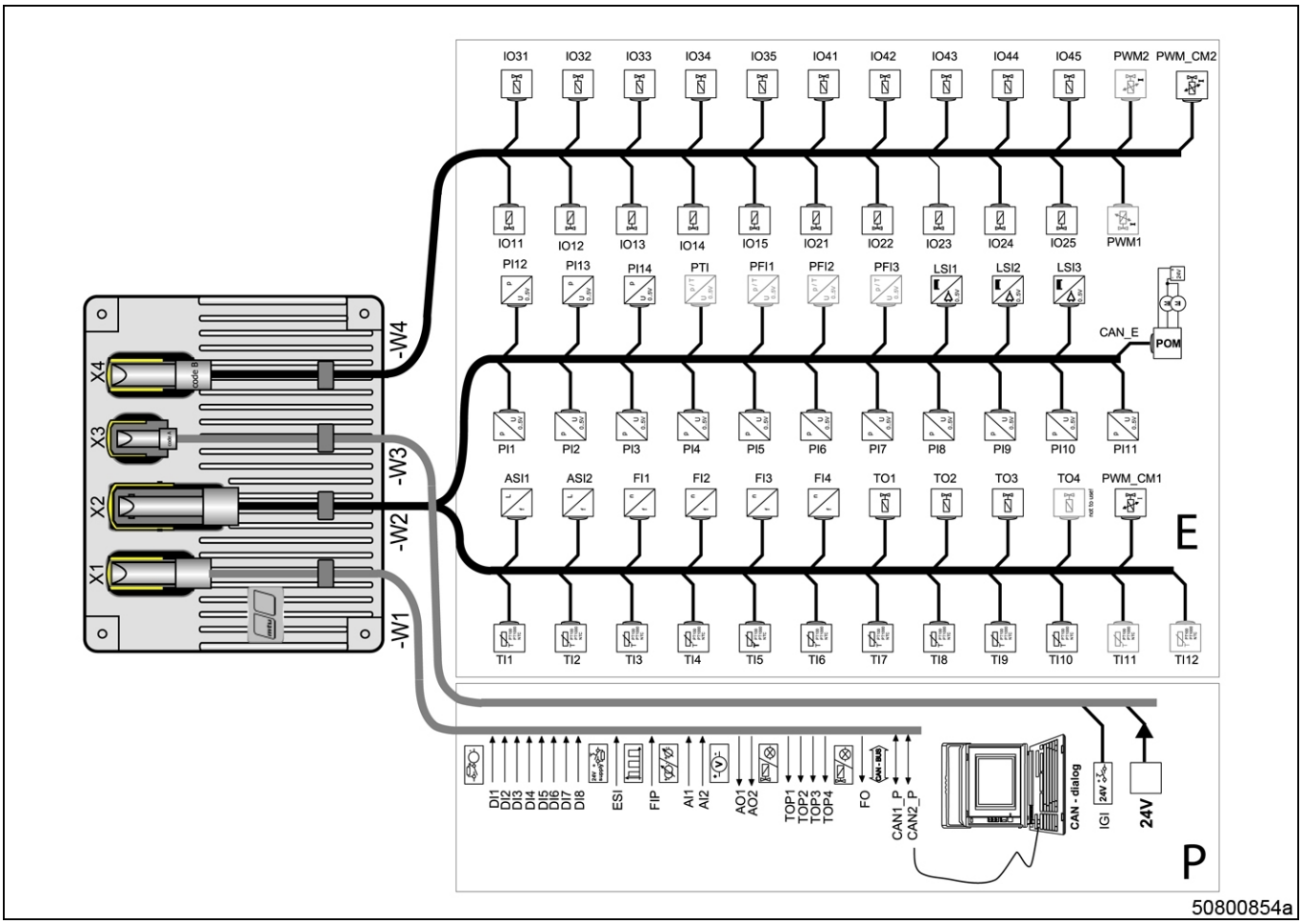
In order that the engine governor can be adapted to this wide variety of requirements, it has been developed so that all functions and interfaces to the engine and the plant can be modified.

Furthermore, approx. 4000 different parameters can be set in the ECU. Some of these parameters must be adapted directly to the engine, or match a specific engine exactly. These parameters can only be accessed or changed by MTU. However, a large number of settings can be made by Customer Service, the OEM or the final customer.

This documentation is designed to help this person subgroup, following appropriate training, to adjust the parameters that have been activated for them in accordance with their requirements.

1.2 Inputs and outputs of the ECU 7 engine governor

Block diagram



X1 Connection for plant inputs/outputs, CAN
X2 Connection for engine wiring harness, sensors
X3 Connection for plant, ignition and supply
X4 Connection for engine wiring harness, injectors
W1 Plant cables inputs/outputs, CAN
W2 Engine wiring harness, sensors
W3 Plant cables, ignition and supply
W4 Engine wiring harness, injectors
IO21...45 Outputs for injectors
PWM1..2 Pulse width modulated outputs
PWM_CM1...2 Pulse width modulated outputs with current monitoring
PI1...14 Pressure measurement inputs
CAN_E CAN bus connection, engine side*
PTI Pressure or torque input (programmable)
PFI1...3 Pressure or frequency input (programmable)
LSI1...3 Inputs for level sensors
ASI1...2 Analog frequency inputs for speed measurement
FI1...4 Frequency measurement inputs
TO1...4 Transistor outputs
TI1...12 Temperature measurement inputs
DI1...8 Binary inputs
ESI Emergency stop input
FIP Frequency input
AI1..2 Analog inputs
AO1...2 Analog outputs
TOP1...4 Transistor outputs
FO Frequency outputs
CAN1_P, CAN2_P CAN bus connection, plant side
IGI Ignition input
24V Input for voltage supply

* In future, a bus-compatible module for distributing the high-power supply in the 24 V area (starter, battery-charging generator) will be connected (POM).

The illustration shows the main wiring for the engine governor. The sensors and actuators/solenoid valves shown in block E ("Engine") are installed on the engine or on units belonging to the engine. They are connected via the two wiring harnesses W2 and W4 to the two plug-in connectors X2 and X4 of the engine governor ECU 7. Customer alteration is not possible.

The inputs and outputs shown in block P ("Plant") can be connected by the customer. Sensors and actuators from the plant are connected here. If the target system has a CAN interface, it can also be adapted here.

To arrange the connection as simply as possible, MTU generally supplies two cables (W1 and W3), which are provided on one side with the matching connector (X1 and X3). The other end of each cable is open, i.e. the customer can connect a terminal strip here. Signals that are to be interconnected on the plant side can then be connected to the governor via this terminal strip.

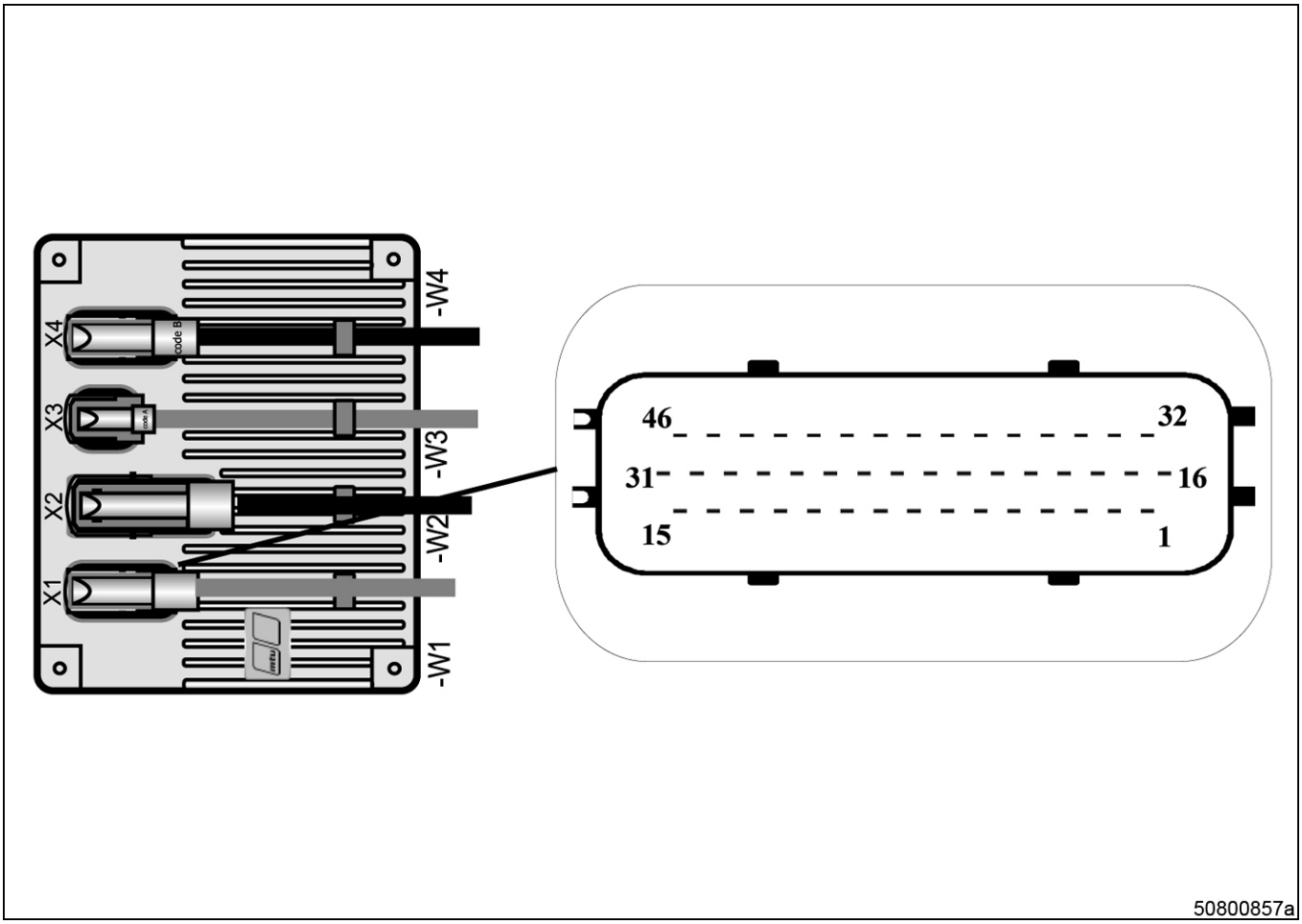
Number of inputs and outputs

Plant side		
Designation	**Number**	**Brief description (basis of abbreviation)**
DI	8	Digital Input (±50 isolated)
ESI	1	Emergency Stop Input
FIP	1	Frequency Input Plant side
FO	1	Frequency Output (PWM) (low switch)
TOP	4	Transistor Output Plant side (high or low switch)
AO	2	Analog Output
AI	2	Analog Input
CAN_P	2	Controller Area Network Plant side
U_Batt	1	24 V power supply
IGI	1	Ignition Input (terminal 15)

Engine side		
Designation	**Number**	**Brief description (basis of abbreviation)**
LSI	3	Level Sensor Input
TI	12	Temperature Input
PI	14	Pressure Input
PTI	1	Pressure Input or Torque Input
PFI	3	Pressure Frequency Input (hall/oil quality)
ASI	2	Angle Speed Input (frequency)
FI	4	Frequency Input
TO	4	Transistor Output engine side (high switch)
PWM_CM	2	Pulse Width Modulated output with Current Measurement
PWM	2	Pulse Width Modulated output
IO	20	Injector Output (4 banks)
CAN_E	1	Controller Area Network (Engine side)

Connector Assignment

Pin assignment X1



This connector is the interface to the plant:

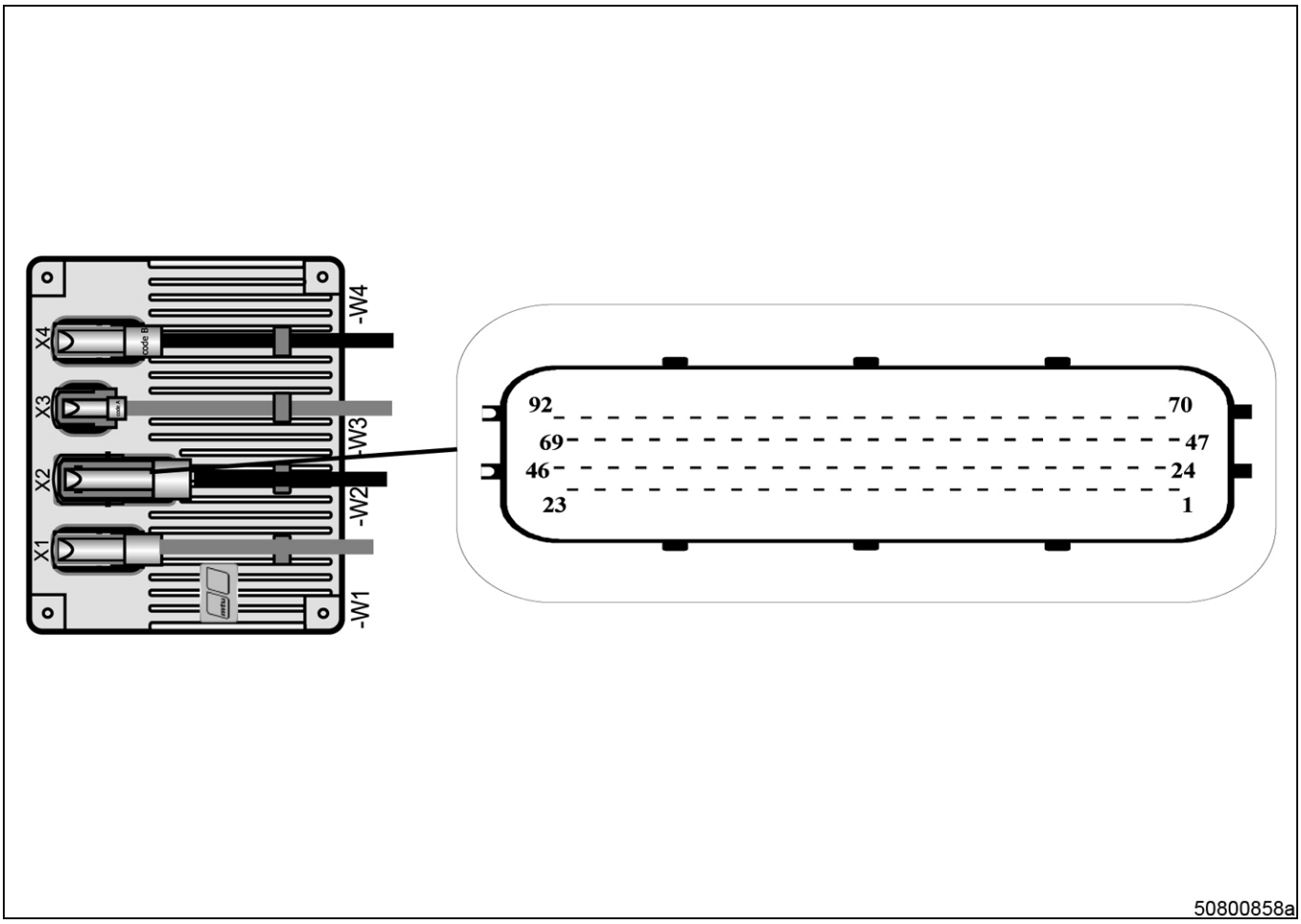
The following table illustrates the connector assignment for connector X1. It also specifies on which core of cable W1 the corresponding signal is applied. The brief specifications contain definitions of the most important characteristics of a channel.

Designation	Pin X1	Type of signal	Core W1	Brief specifications
CAN1_P	19	CAN1_P_H	39	50 V isolated
CAN1_P	35	CAN1_P_L	40	
CAN1_P	20	CAN1_P_GND	43	
CAN2_P	33	CAN2_P_H	41	50 V isolated
CAN2_P	8	CAN2_P_L	42	
CAN2_P	34	CAN2_P_GND	44	
DI1	43	DI1_H	7	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI1	28	DI1_L	8	50 V isolated

Designa-tion	Pin X1	Type of signal	Core W1	Brief specifications
DI2	42	DI2_H	9	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI2	27	DI2_L	10	50 V isolated
DI3	41	DI3_H	19	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI3	26	DI3_L	20	50 V isolated
DI4	40	DI4_H	21	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI4	25	DI4_L	22	50 V isolated
DI5	39	DI5_H	23	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI5	24	DI5_L	24	50 V isolated
DI6	38	DI6_H	25	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI6	23	DI6_L	26	50 V isolated
DI7	37	DI7_H	27	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI7	22	DI7_L	28	50 V isolated
DI8	36	DI8_H	29	< 4 V (< 1.1 mA) = low > 8 V (> 1.5 mA) = high
DI8	21	DI8_L	30	50 V isolated
ESI	4	ESI_IN	34	<4V (2mA) = low/>8V (4mA) = high
AI1_2	44	AI1_2_5V	5	5V/25mA ±50 V isolated to other potential
AI1	31	AI1_U	1	0...10 V (not isolated to AI2)
AI1	46	AI1_I	2	0...23.7 mA (not isolated to AI2)
AI2	30	AI2_U	3	0...10 V (not isolated to AI1)
AI2	45	AI2_I	4	0...23.7 mA (not isolated to AI1)
AI1_2	29	AI1_2_GND	6	AI_GND ±50 V isolated to other potential
AO1	7	AO1_OUT	35	0..10 V/8 mA
AO2	6	AO2_OUT	36	0..10 V/8 mA
AO1_2_FIP	5	AO1_2_FIP_GND	37	GND
FIP	8	FIP_IN	38	0..5 V or frequency input
TOP1	14	TOP1_OUT	12	24 V/TOP1+..+TOP4 = 3 A; max. 1.5 A source/sink

Designa-tion	Pin X1	Type of signal	Core W1	Brief specifications
TOP2	13	TOP2_OUT	13	24 V/TOP1+..+TOP4 = 3 A; max. 1.5 A source/sink
TOP1_2	12	TOP1_2_GND	14	LGND (3 A)
TOP3	11	TOP3_OUT	15	24 V/TOP1+..+TOP4 = 3 A; max. 1.5 A source/sink
TOP4	10	TOP4_OUT	16	24 V/TOP1+..+TOP4 = 3 A; max. 1.5 A source/sink
TOP3_4	9	TOP3_4_GND		LGND (3 A) 17
FO	15	FO_OUT	11	24 V/1.5 A sink to LGND/<500 Hz
ITS_O	3	TxD_1	31	ITS OFF -> ITS_O (3) Jumper to ITS_I (2)
ITS_I	2	RxD_1	32	ITS OFF -> ITS_O (3) Jumper to ITS_I (2)
FGND	1		33	NC
	32		45	NC
	16		18	NC
	17		46	NC

Pin assignment X2



The engine sensor system is connected to this connector.

The following table illustrates the connector assignment for connector X2. It also specifies on which core of cable W2 the corresponding signal is applied. The brief specifications contain definitions of the most important characteristics of a channel.

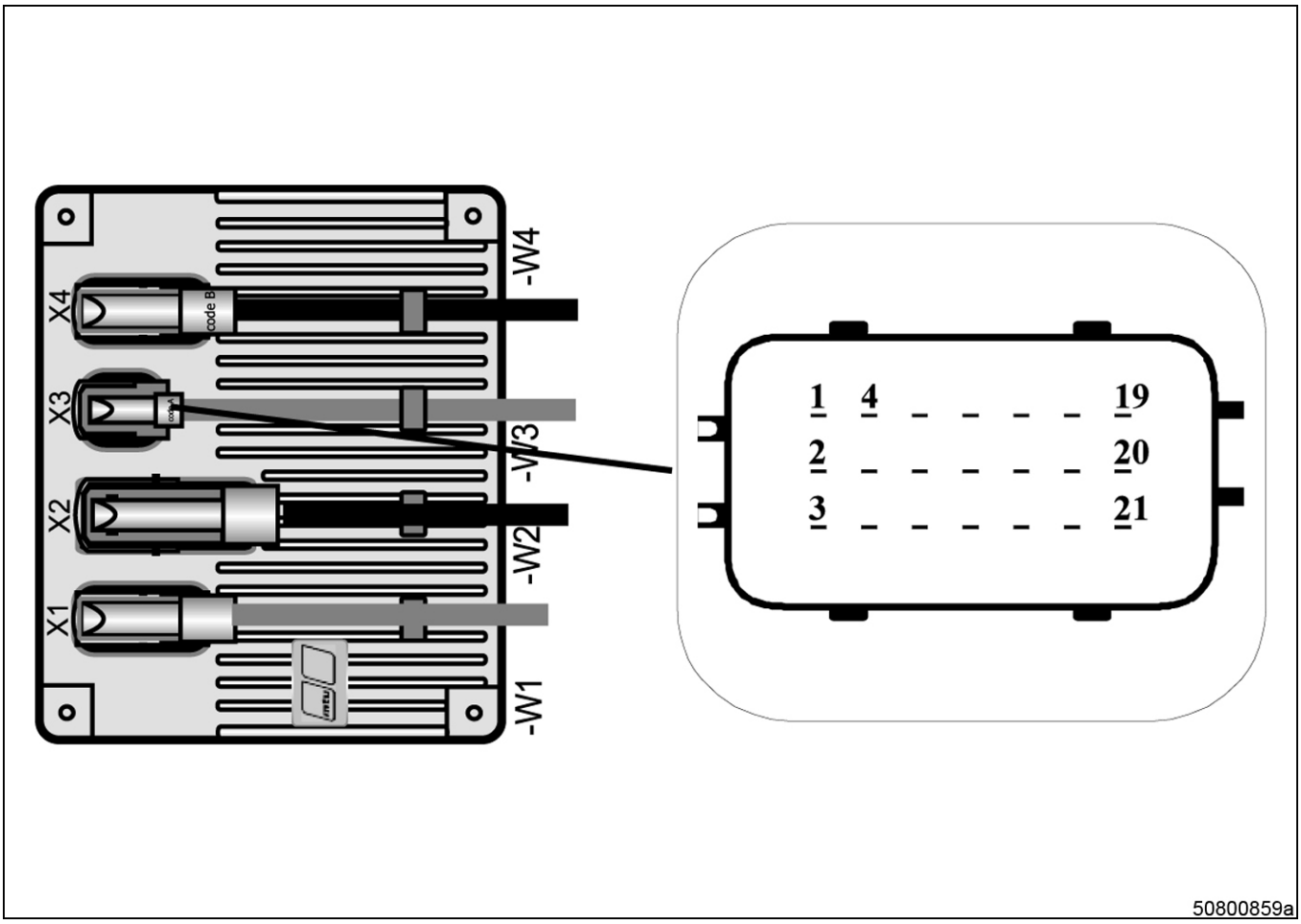
Designation	Pin X1	Type of signal	Core W1	Brief specifications
TI1	1	TI1_IN	92	0...5 V/internal 1k91 pull up to TI_BUF
TI1	2	TI1_GND	46	GND
TI2	3	TI2_IN	91	0...5 V/internal 1k91 pull up to TI_BUF
TI2	4	TI2_GND	69	GND
TI3	5	TI3_IN	90	0...5 V/internal 1k91 pull up to TI_BUF
TI3	6	TI3_GND	68	GND
TI4	7	TI4_IN	89	0...5 V/internal 1k91 pull up to TI_BUF
TI4	8	TI4_GND	67	GND
TI5	9	TI5_IN	88	0...5 V/internal 1k91 pull up to TI_BUF
TI5	10	TI5_GND	66	GND

Designa-tion	Pin X1	Type of signal	Core W1	Brief specifications
TI6	11	TI6_IN	87	0...5 V/internal 1k91 pull up to TI_BUF
TI6	12	TI6_GND	65	GND
TI7	13	TI7_IN	86	0...5 V/internal 1k91 pull up to TI_BUF
TI7	14	TI7_GND	64	GND
TI8	15	TI8_IN	85	0...5 V/internal 1k91 pull up to TI_BUF
TI8	16	TI8_GND	63	GND
TI9	17	TI9_IN	84	0...5 V/internal 1k91 pull up to TI_BUF
TI9	18	TI9_GND	62	GND
TI10	19	TI10_IN	83	0...5 V/internal 1k91 pull up to TI_BUF
TI10	20	TI10_GND	61	GND
TI11	21	TI11_IN	11	0...5 V/internal 1k91 pull up to TI_BUF
TI12	22	TI12_IN	33	0...5 V/internal 1k91 pull up to TI_BUF
PI1	23	PI1_5V_T1	59	5 V/12 mA/tracker T1
PI1	24	PI1_IN	82	0...5 V/internal 47k5 pull down
PI1	25	PI1_GND	60	GND
PI2	26	PI2_5V_T2	80	5 V/12 mA/tracker T2
PI2	27	PI2_IN	58	0...5 V/internal 47k5 pull down
PI2	28	PI2_GND	81	GND
PI3	29	PI3_5V_T3	56	5 V/12 mA/tracker T3
PI3	30	PI3_IN	79	0...5 V/internal 47k5 pull down
PI3	31	PI3_GND	57	GND
PI4	32	PI4_5V_T4	77	5 V/12 mA/tracker T4
PI4	33	PI4_IN	55	0...5 V/internal 47k5 pull down
PI4	34	PI4_GND	78	GND
PI5	35	PI5_5V_T5	53	5 V/12 mA/tracker T5
PI5	36	PI5_IN	76	0...5 V/internal 47k5 pull down
PI5	37	PI5_GND	54	GND
PI6	38	PI6_5V_T6	74	5 V/12 mA/tracker T6
PI6	39	PI6_IN	52	0...5 V/internal 47k5 pull down
PI6	40	PI6_GND	75	GND
PI7	41	PI7_5V_T7	50	Supply 5 V/tracker T7 for PI7.. 48 mA
PI7	42	PI7_IN	73	0...5 V/internal 47k5 pull down

Designa-tion	Pin X1	Type of signal	Core W1	Brief specifications
PI7	43	PI7_GND	51	GND
PI8	44	PI8_5V_T8	71	Supply 5 V/tracker T8 for PI8.. 48 mA
PI8	45	PI8_IN	49	0...5 V/internal 47k5 pull down
PI8	46	PI8_GND	72	GND
PI9	47	PI9_5V_T9	47	Supply 5 V/tracker T9 for PI9.. 48 mA
PI9	48	PI9_IN	70	0...5 V/internal 47k5 pull down
PI9	49	PI9_GND	48	GND
PI10	50	PI10_IN	10	0...5 V/internal 47k5 pull down (supply 5 V: T7 or T8 or T9)
PI11	51	PI11_IN	32	0...5 V/internal 47k5 pull down (supply 5 V: T7 or T8 or T9)
PI12	52	PI12_IN	9	0...5 V/internal 47k5 pull down (supply 5 V: T7 or T8 or T9)
PI13	53	PI13_IN	31	0...5 V/internal 47k5 pull down (supply 5 V: T7 or T8 or T9)
PI14	54	PI14_IN	8	0...5 V/internal 47k5 pull down (supply 5 V: T7 or T8 or T9)
PTI	55	PTI_IN	30	0...5 V/internal 47k5 pull down (supply 5 V: T7 or T8 or T9)
PFI1	56	PFI1_IN	7	PxI 0...5 V/internal 47k5 pull down/xFI CMOS 3k32 pull up
PFI2	57	PFI2_IN	29	PxI 0...5 V/internal 47k5 pull down/xFI CMOS 3k32 pull up
PFI3	58	PFI3_IN	6	PxI 0...5 V/internal 47k5 pull down/xFI CMOS 3k32 pull up
LSI1	59	LSI1_13V_5V_T10	22	supply 13 V/5 V for LSI1 max. 12 mA/channel Tracker 10
LSI1	60	LSI1_IN	45	0...5 V/internal 47k5 pull down PI/pull up LSI
LSI1	61	LSI1_GND	23	GND
LSI2	62	LSI2_13V_5V_T11	43	supply 13 V/5 V for LSI2 max. 12 mA/channel Tracker 11
LSI2	63	LSI2_IN	21	0...5 V/internal 47k5 pull down PI/pull up LSI
LSI2	64	LSI2_GND	44	GND
LSI3	65	LSI3_13V_5V_T12	27	supply 13 V/5 V for LSI3 max. 12 mA/channel Tracker 12
LSI3	66	LSI3_IN	5	0...5 V/internal 47k5 pull down PI/pull up LSI
LSI3	67	LSI3_GND	28	GND

Designa-tion	Pin X1	Type of signal	Core W1	Brief specifications
ASI1	68	ASI1_L	20	<-130 mV = low <0 mV = high
ASI1	69	ASI1_H	42	
ASI2	70	ASI2_L	19	<-130 mV = low <0 mV = high
ASI2	71	ASI2_H	41	
FI1	72	FI1_H	18	<-630 mV = low >540 mV = high
FI1	73	FI1_L	40	
FI2	74	FI2_H	17	<-630 mV = low >540 mV = high
FI2	75	FI2_L	39	
FI3	76	FI3_H	4	<-630 mV = low >540 mV = high
FI3	77	FI3_L	26	
FI4	78	FI4_H	3	<-630 mV = low >540 mV = high
FI4	79	FI4_L	25	
TO1	80	TO1_OUT	15	24 V/1.5 A
TO1	81	TO1_GND	37	LGND
TO2	82	TO2_OUT	14	24 V/1.5 A
TO2	83	TO2_GND	36	LGND
TO3	84	TO3_OUT	13	24 V/1.5 A
TO3	85	TO3_GND	35	LGND
TO4	86	TO4_OUT	12	24 V/1.5 A
TO4	87	TO4_GND	34	LGND
PWM_CM1	88	PWM_CM1_OUT	16	24 V/3 A with current measurement (CM)
PWM_CM1	89	PWM_CM1_GND	38	LGND
CAN3_E	90	CAN3_E_H	1	50 V isolated
CAN3_E	91	CAN3_E_L	24	
CAN3_E	92	CAN3_E_GND	2	

Pin assignment X3



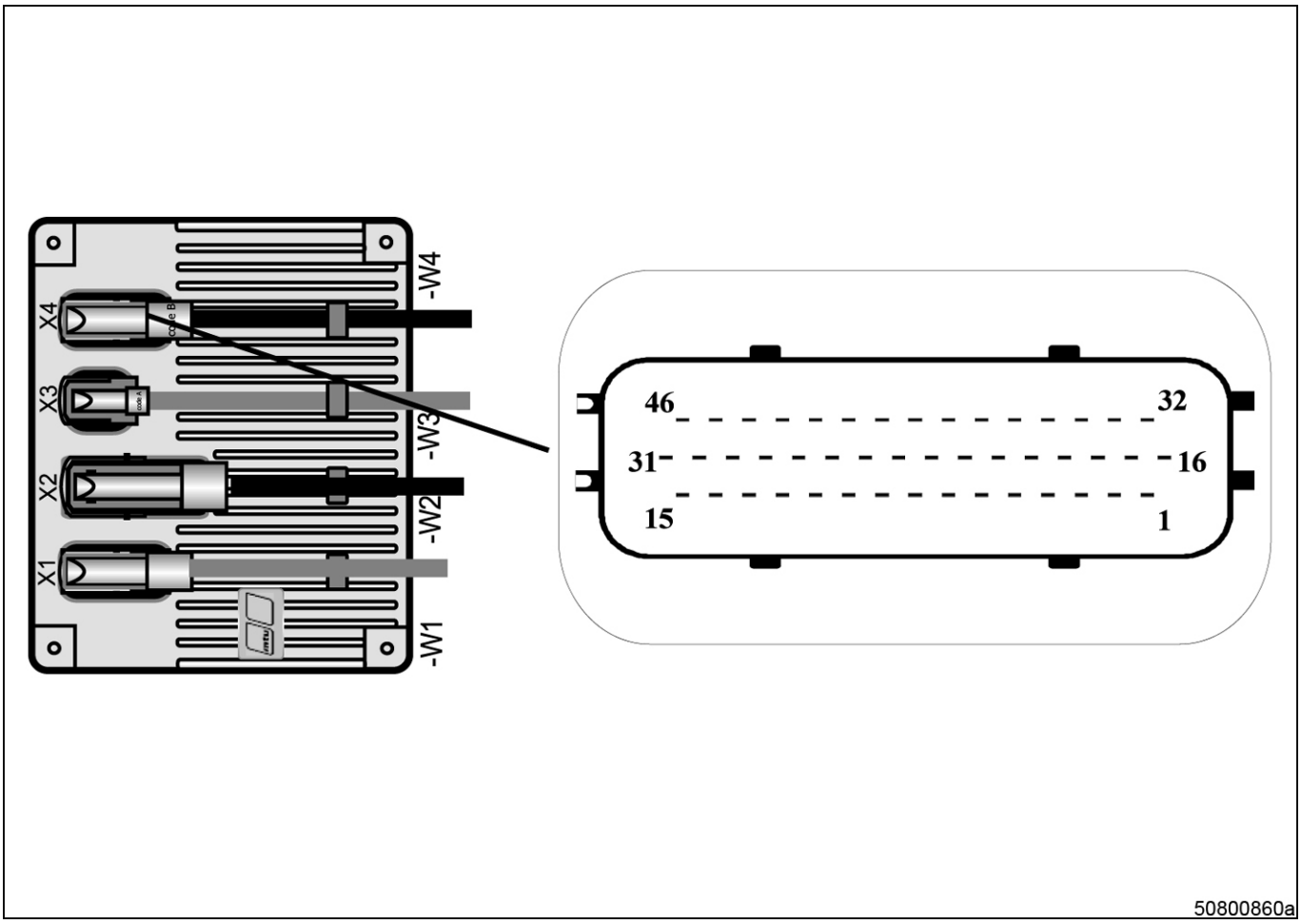
The supply voltage as well as the "Ignition" signal is supplied via this connector.

The following table illustrates the connector assignment for connector X3. It also specifies on which core of cable W3 the corresponding signal is applied. The brief specifications contain definitions of the most important characteristics of a channel.

Designation	Pin X1	Type of signal	Core W3	Brief specifications
POWER	3	+24V	*	24 V/30 A
POWER	6	+24V	*	
POWER	9	+24V	*	
POWER	12	+24V	*	
POWER	1	GND	*	GND/30 A
POWER	4	GND	*	
POWER	7	GND	*	
POWER	10	GND	*	
IGI	16	IGI_24V	*	24 V/10 mA (bridge to IGI_IN to disable IGI function)
IGI	13	IGI_IN	*	<4 V (2 mA) = low >8 V (4 mA) = high
	2	NC	*	
	5	NC	*	
	8	NC	*	
	11	NC	*	
	14	NC	*	
	15	NC	*	
	17	NC	*	
	18	NC	*	
	19	NC	*	
	20	NC	*	
	21	NC	*	

* The core numbers can be obtained from the corresponding SM wiring of the respective order.

Pin assignment X4



All injectors of the engine are connected to this connector.

The following table illustrates the connector assignment for connector X4. It also specifies on which core of cable W3 the corresponding signal is applied. The brief specifications contain definitions of the most important characteristics of a channel.

Designation	Pin X1	Type of signal	Core W4	Brief specifications
IO11	39	IO11_H	23	24 V/17 A; 42 V/10 A
IO11	23	IO11_L	24	Bank 1
IO12	38	IO12_H	27	24 V/17 A; 42 V/10 A
IO12	22	IO12_L	28	Bank 1
IO13	37	IO13_H	29	24 V/17 A; 42 V/10 A
IO13	21	IO13_L	30	Bank 1
IO14	36	IO14_H	33	24 V/17 A; 42 V/10 A
IO14	20	IO14_L	34	Bank 1
IO15	35	IO15_H	37	24 V/17 A; 42 V/10 A
IO15	19	IO15_L	38	Bank 1

Designa-tion	Pin X1	Type of signal	Core W4	Brief specifications
IO21	46	IO21_H	1	24 V/17 A; 42 V/10 A
IO21	45	IO21_L	2	Bank 2
IO22	44	IO22_H	9	24 V/17 A; 42 V/10 A
IO22	43	IO22_L	10	Bank 2
IO23	42	IO23_H	15	24 V/17 A; 42 V/10 A
IO23	26	IO23_L	16	Bank 2
IO24	41	IO24_H	19	24 V/17 A; 42 V/10 A
IO24	25	IO24_L	20	Bank 2
IO25	40	IO25_H	21	24 V/17 A; 42 V/10 A
IO25	24	IO25_L	22	Bank 2
IO31	11	IO31_H	14	24 V/17 A; 42 V/10 A
IO31	27	IO31_L	13	Bank 3
IO32	12	IO32_H	12	24 V/17 A; 42 V/10 A
IO32	28	IO32_L	11	Bank 3
IO33	14	IO33_H	6	24 V/17 A; 42 V/10 A
IO33	30	IO33_L	5	Bank 3
IO34	13	IO34_H	8	24 V/17 A; 42 V/10 A
IO34	29	IO34_L	7	Bank 3
IO35	15	IO35_H	4	24 V/17 A; 42 V/10 A
IO35	31	IO35_L	3	Bank 3
IO41	2	IO41_H	39	24 V/17 A; 42 V/10 A
IO41	1	IO41_L	40	Bank 4
IO42	4	IO42_H	35	24 V/17 A; 42 V/10 A
IO42	3	IO42_L	36	Bank 4
IO43	8	IO43_H	25	24 V/17 A; 42 V/10 A
IO43	7	IO43_L	26	Bank 4
IO44	6	IO44_H	31	24 V/17 A; 42 V/10 A
IO44	5	IO44_L	32	Bank 4
IO45	10	IO45_H	17	24 V/17 A; 42 V/10 A
IO45	9	IO45_L	18	Bank 4
PWM1	33	PWM1_OUT	43	24V/3A/< 500Hz
PWM1	17	PWM1_GND	44	LGND

Designa-tion	Pin X1	Type of signal	Core W4	Brief specifications
PWM2	32	PWM2_OUT	45	24V/3A/< 500Hz
PWM2	16	PWM2_GND	46	LGND
PWM_CM2	34	PWM_CM2_OUT	41	24V/3A/< 500Hz
PWM_CM2	18	PWM_CM2_GND	42	LGND (10 mΩ)

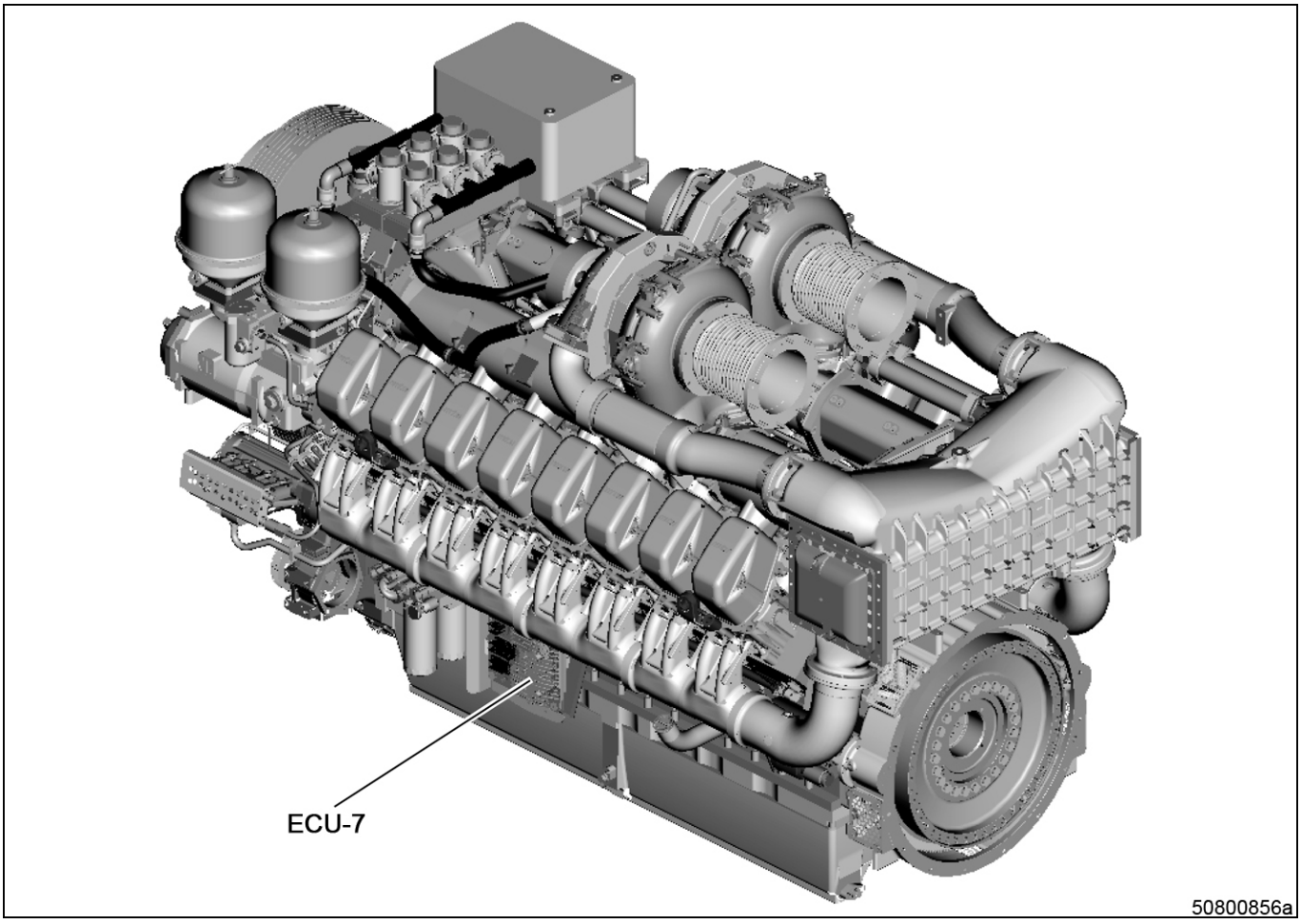
1.3 Installation on engine

Specifications

The engine governor has been designed, with regard to the mechanical structure and thermal stability, so that it can be installed directly on the engine:

- Housing temperature range during operation from –40 °C to +75 °C
- Ambient temperature during operation up to 110 °C
- Relative humidity 95 % at 55 °C
- Shock resistance 15 g in all axes
- Protection IP69K, i.e. dustproof and waterproof when subject to direct water jet at up to 100 bar
- Salt-fog resistant
- Resistant to chemicals (incl. biodiesel)

Mechanical installation



Depending on the engine type, the ECU can be mounted on different points on the engine:

- At the top between the banks of cylinder head covers (e.g. with the 10 V 2000 M91 CR, marine application)
- On an inspection port cover below the exhaust elbow, beside the oil filters (e.g. with the 4000 S60 C&I application, the example in the illustration)
- On the front face of the engine on the free end, above the auxiliary PTOs

Installation separated from the engine is not possible.

2 The dialog system

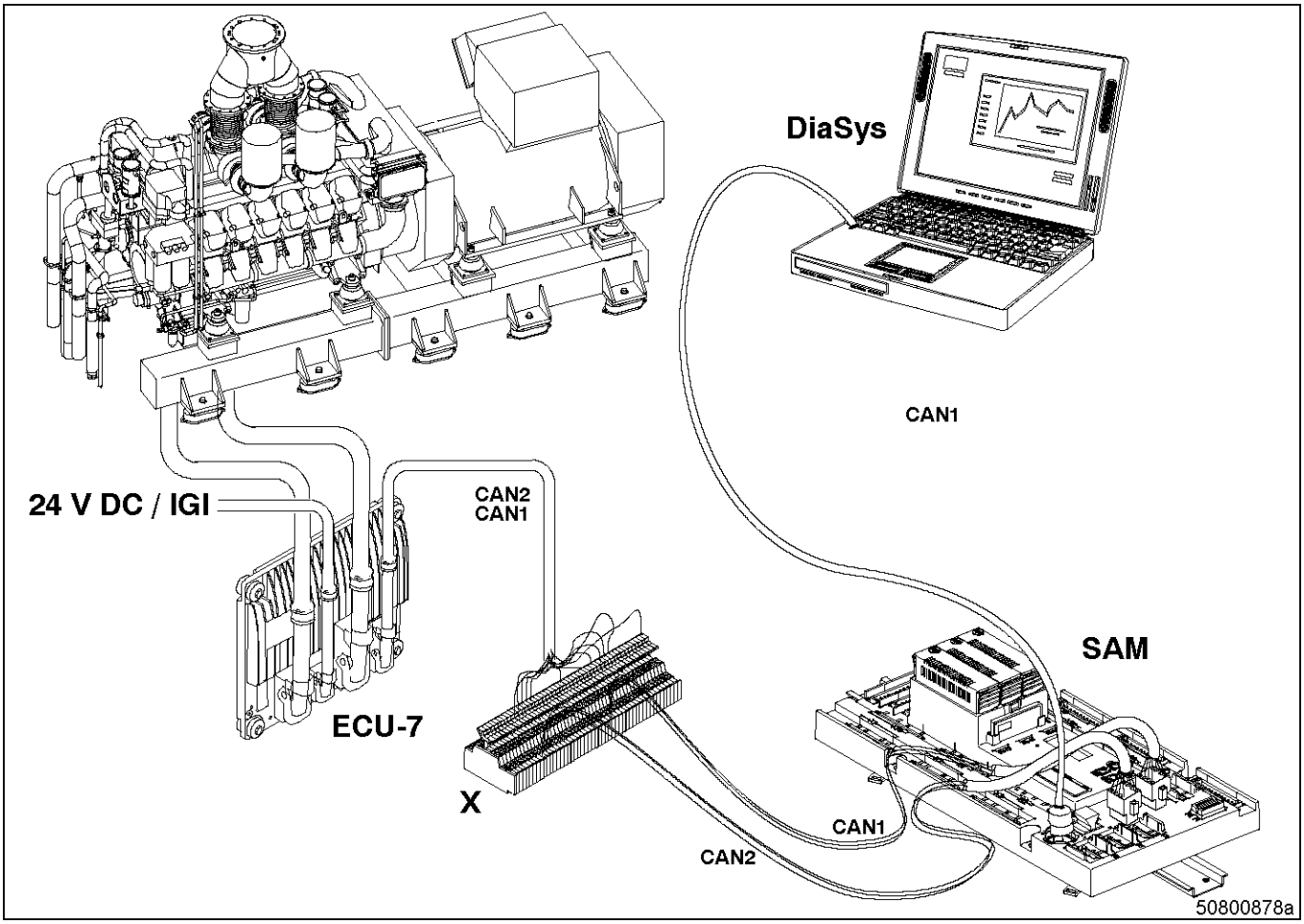
2.1 The dialog system DiaSys®

General information

In order to set the electronic engine governor, or to read out data, the MTU dialog system DiaSys® is necessary. The dialog system has the following components:

- A laptop with operating system Windows™ and a CAN controller
- The installed software DiaSys® (handling of the dialog system described in this documentation is based on the version DiaSys® Version 2.40 SP 1)
- A connecting cable for connecting to the system in which the engine governor is integrated (e.g. to SAM dialog connector)

Design



DiaSys	Dialog unit (laptop with software)	ECU 7	Engine governor (Engine Control Unit), also designated ADEC (Advanced Diesel Engine Controller)	X	Terminal strip
24 V DC / IGI	Supply voltage and ignition input			SAM	I/O assembly with a connection for the dialog unit (CAN1)
CAN	Controller Area Network, serial data connection				

Connection options

The devices of an MTU system are connected with one another via a redundant CAN bus (CAN1 and CAN2, whereby CAN1 is the so-called "Default bus" and CAN2 is the so-called "Redundant bus"). In order to access the engine governor, the dialog unit requires a connection to the CAN1 of this redundant bus.

Each MTU system is arranged so that at least one unit on the CAN bus is equipped with a dialog socket. In systems in which the engine governor is integrated, usually one of the following units with sockets is currently available:

- MAU – an autonomous (passive) adaptation module
- SAM – an intelligent I/O unit with its own processor and memory
- LOP BlueLine or LOS BlueLine – units with operating elements for operation of drive plants in the engine room of a ship
- CCS SmartLine connecting box – central control unit for simple ship drive systems (it is equipped internally with a SAM)
- Further devices may also be included – this list does not claim to be complete

Access to the CAN bus (at both ends terminated with 121 Ω in each case) is carried out with the supplied cable. This is then connected as a "stub cable" to the bus. This is why the cable must not be extended. Otherwise reflections on the bus could lead to malfunctions (including a total failure of the CAN bus).

Software

After program start, a window appears showing the version number of the release. In conjunction with this documentation, the version 2.40 SP 1 (Service Pack 1) or higher should appear.

NOTE THAT INCORRECT HANDLING OF THE DIALOG SYSTEM CAN RESULT IN SERIOUS DAMAGE TO HEALTH OR PROPERTY DAMAGE .

The user’s attention is drawn to this situation again by means of a corresponding display window.

Further details on basic use of the program are available in the documentation (E531920/XX, Version XX must be higher or equal to 03) provided separately for every training course.

3 Parameter

3.1 Purpose and structure

What is a parameter?

A "parameter" is the designation for all setting options available to the engine governor. These parameters can be altered via the dialog system DiaSys® This allows the adaptation to an engine, the entire governor behavior and the adaptation to a plant to be changed. Alterable data generated or calculated program-internally is referred to by the term "Process variable (PV)". Process variables also have designations like a parameter (i.e. a name and a number, (→ Page 26)). However, it is not possible to influence process variables externally. They serve as transfer variables between the individual program parts.

There are various forms of alterable parameters:

- A parameter can only assume values, e.g. On or Off. Such parameters are designated as binary single parameters or binary 1D parameters (1D: unidimensional).

  Example: 2.1050.014 TOP1 Select for test "X".

  Address the transistor output channel TOP1 during a binary output test? Yes or No ("X" or no "X")
- A parameter can assume an analog value. These parameters are designated analog single parameters or analog 1D parameters (1D: unidimensional).

  Example: 2.1060.042 Engine Speed demand max.

  How high can the maximum speed request be? for example, "1900" rpm (a value must be entered here). Associated units of these parameters are displayed in the DiaSys®
- The value of a parameter depends on another value (e.g. a speed). Such parameters are specified as function P_{Wert} (value) = $f_{(Variable)}$ Such a parameter is designated as a 2D parameter (2D: two-dimensional).

  This function (curve) is set via predefined support points.

  Example: 2.0400.001 P-Lube Oil Limit 1

  What is the minimum permissible lube oil pressure as a function of the engine speed? $p_{lube} = f(n_{MOT})$ Support points are specified in an X-Y matrix as a function of speed.
- The value of a parameter depends on two other values (e.g. a speed and the torque). Such parameters are specified as function P_{Wert} (value) = $f_{(Variable1, Variable2)}$ Such a parameter is designated as a 3D parameter (3D: three-dimensional).

  This function (area) is set via predefined support points.

  Example: 1.1300.140 Rail fuel pressure

  How high must pressure be on the H.P. fuel line? $p_{rail} = f(n_{MOT}; M)$

  Support points are specified in an X-Y-Z matrix as a function of speed and torque.

Dongle and access options

Access protection (dongle) is required to allow you to work with the dialog system DiaSys®
Different dongles permit different access authorization:

- Level 0

  This dongle allows you to set some simple basic functions. The setting of certain parameters can be viewed but not changed. Level 0 is provided for final customers.
- Level 1a

  Dongle 1a can be used to make more extensive changes in the operating behavior of the engine and the adaptation of an engine (with its governor) to a plant. Level 1a is designed for OEMs who have to install the engine in their own machines/plants.
- Level 1b

  This dongle can be used to change the entire operating behavior of an engine. Furthermore, all parameters required to adapt an engine (with its governor) to a plant are accessible. Level 1b is used by Customer Service and distributors.
- Level 1c

  This dongle can only be used to influence the management/circuitry of some outputs/inputs in the ECU. Level 1c is required for operation on a test stand.
- Level 2

This dongle ("Super-User Dongle") allows you to change ALL parameters. This includes, in particular, parameters that have been determined for an engine specifically on the test stand. Furthermore, parameters related to engine safety can be changed. This dongle can therefore only be used by MTU personnel with extensive knowledge of electronics and engines (engine designers, test stand specialists, electronic developers). Transfer of this level from the MTU development departments to other MTU departments or MTU-external offices (neither customers, nor OEMs) is not possible due to the associated potential dangers.

Depending on the definition assigned by MTU, it may be possible to display parameters via DiaSys® that CAN NOT be changed. The display fields of these parameters are shaded gray. Values that the user can change with the help of a dongle are always shaded white.

Structure of a "ZKP number"

Each parameter has a number, the so-called "ZKP number". A ZKP number is always structured according to the following pattern:

- ZZ.KKKK.PPP

  Two positions for Z, followed by a period (.)

  Four positions for K, followed by a period (.)

  Three positions for P

These numbers all have a meaning, i.e. the numbers or number ranges stand for certain functions/assignments.

Number ranges

- ZZ*

  Z stands for "Zuordnung" = Assignment. This digit indicates whether the parameter is responsible for the plant area or for the engine:
  - Z = 01*: Parameter belongs to the engine
  - Z = 02*: Parameter belongs to the plant area

  * the leading 0 (zero) is generally suppressed and therefore not displayed.
- KKKK

  K stands for "Kategorie" = Category. Categories are used for a more comprehensive presentation of parameters and PVs. Categories are used to combine variables that are closely related to one another, e.g. which all belong to the same function.

  There are also categories that form a group, e.g. all measuring points. All parameters are functionally assigned to certain areas, e.g. to the category "Measuring points" or the category "Monitoring/Protection". The K number indicates to which category a parameter belongs:
  - Measuring points occupy the number range from 0100 to 0299
  - Monitoring modules occupy the number range from 0300 to 0309
  - Protection modules occupy the number range from 0310 to 0399

  No further groups are defined above 0400.

  A category can be used both in the engine area as well as in the plant. There are no categories, however, that exist on the engine side and the plant side and which have the same number.

Note that - depending on the authorization level of the dongle used - certain parameters or categories can be faded out and are therefore not visible.

K No.	Category	Comment
0010	System configuration	Variables for configuration of the system: Engine/plant
Category group Measuring points: 0100 to 0299		
0100	Meas. pt. P-lube oil after filter	
0101	Meas. pt. P-coolant	
0102	Meas. pt. P-fuel	
0103	Meas. pt. P-charge air	

K No.	Category	Comment
0104	Meas. pt. P-HP	
0105	Meas. pt. P-HP unfiltered	
0106	Meas. pt. P-crankcase	
0107	Meas. pt. Intercooler coolant	
0108	Meas. pt. P-ambient Air	
0109	Meas. pt. P-lube oil before filter	
0110	P-aux1	Freely configurable pressure channel
0111	P-aux2	Freely configurable pressure channel
0112	Meas. pt. P-lube oil redundant	
0113	Meas. pt. P-fuel before filter	
0114	Meas. pt. P-fuel diff.	
0115	Meas. pt. P-HP unfiltered 2nd pump	
0116	Meas. pt. P-HP 2nd pump	
0120	Meas. pt. T-coolant	
0121	Meas. pt. T-charge air	
0122	Meas. pt. T-fuel	
0123	Meas. pt. T-intake air	
0124	Meas. pt. T-intercooler coolant	
0125	Meas. pt. T-lube oil	
0126	Meas. pt. T-exhaust A	
0127	Meas. pt. T-exhaust B	
0128	Meas. pt. T-Charge Air SeqCtr Valve	Air transfer temperature
0129	Meas. pt. T-coolant redundant	
0130	T-aux1	Freely configurable temperature channel
0131	T-aux2	Freely configurable temperature channel
0132	T-ECU	Electronics temperature
0133	Meas. pt. T-exhaust C	
0134	Meas. pt. T-exhaust D	
0138	PWM 2 current	
0140	Meas. pt. operating voltage	
0141	Injector voltage	
0150	Meas. pt. coolant level, binary	

K No.	Category	Comment
0151	Meas. pt. leak-off fuel level	
0152	Meas. pt. coolant level	
0153	Intercooler coolant level	
0154	Meas. pt. P-diff. lube oil	
0155	Meas. pt. P-diff. lube oil, binary	
0156	Meas. pt. prefilter water level	
0160	Aux1	
0161	Aux2	
0279	Meas. pt. specified speed ECU, relative	
0280	Meas. pt. specified speed ECU, analog	Analog speed setpoint
0281	Meas. pt. specified speed ECU, test stand	Analog speed setpoint
0282	Meas. pt. brakes, analog	
0283	Load pulse	
0284	Meas. pt. frequency input	
0285	Meas. pt. wheel spin, analog	
0286	Meas. pt. frequency RPM input	Speed setpoint via frequency input
0287	Meas. pt. filling signal	
0290	AUX 1 Plant	
0291	Ext. plant-side engine protection	
Category group Monitoring: 0300 to 0309		
0300	Monitoring module Engine	
0301	Monitoring module Engine	
0302	Monitoring module Engine	
0303	Monitoring module Engine	
0304	Monitoring module Engine	
0305	Monitoring module Plant	
0306	Monitoring module Plant	
0307	Monitoring module Plant	
0308	Monitoring module Plant	
0309	Monitoring module Plant	
Category group Protection 0310 to 0399		
0310	Protection module Engine	Not used

K No.	Category	Comment
0311	Protection module Plant	Module for engine FSW
0312	Protection module Plant	Module for engine FSW
0313	Protection module Plant	Module for engine FSW
0314	Protection module Plant	Modules for plant FSW
0315	Protection module Plant	Modules for plant FSW
0316	Protection module Plant	Modules for plant FSW
0320	Protection module Plant	Module for engine FSW
0321	Protection module Plant	Module for engine FSW
0399	ProtMonTexts	The standardized texts for Protection and Monitoring modules are defined here.
No further groups are defined above 0400.		
0400	Limit value curves	Limit value curves for monitoring physical variables; the curves are usually speed-dependent
0401	Correction curves	The curves are used for the internal conversion of an input variable, e.g. current, voltage resistance, into a physical value such as pressure, speed, etc.
0450	Binary measurement points	Binary measuring point for level sensors for hull-mounted cooling system
0500	CAN	Configuration parameters and status displays for the current setting of the CAN connection
0555	Service	Used for service parameters or PVs; for the first time with the maintenance concept.
0600	EMU	Parameters and PVs for processing values from and into the EMU
1000	Speed governor, general	
1005	General engine values	Delay after Power ON, start, engine power, rated power, etc.
1010	Idle speed governor	
1020	Injection	
1021	Injector check	
1022	Cylinder-based settings (individually for each cylinder)	Parameters for individual settings at each cylinder, e.g.: • Start of injection • Injection duration of pre-injection, main injection and post injection
1030	Virtual measured values	Values that are calculated from at least two other phys. variables

K No.	Category	Comment
1040	Binary outputs, engine	Configuration of the engine-side transistor outputs
1045	PWM out	Engine-side PWM output (PWMCM2)
1050	Binout, plant	Configuration of the plant-side transistor outputs
1051	Speed window	e.g. engagement window
1052	Analog outputs, plant	e.g. for activating display instruments
1055	Frequency output (FO), plant	Plant-side frequency output
1060	Specified speed	
1061	Engine load signal	
1070	Performance data	
1075	Torque limitation	
1080	DBR	
1085	MCR	
1090	Engine starting procedure	Starting sequence controlled by the engine governor
1100	BOI	Begin of injection
1200	Efficiency	
1300	High-pressure controller	
2000	CAN	Is no longer used
2010	MCS system	Conversion variables
2500	Speed recording	
2510	Overspeed processing	
2700	Cooler fan control	
3000	Cylinder cutout	Parameters for configuration of cylinder cutout
3010	Turbocharger (PVs)	PVs for sequential turbocharging control and monitoring
3011	Turbocharger (PRs)	PRs for sequential turbocharging control and monitoring
3012	Turbocharger speed 1 alarms	
3013	Turbocharger speed 2 alarms	
3014	Turbocharger speed 3 alarms	
3015	Turbocharger speed 4 alarms	
4000	LifeData	LifeData
4500	POM	

K No.	Category	Comment
7000	Plant signals	
7001	STOP	For all stop parameters and PVs, e.g. also run-on stop
7002	Override	
7003	ModeSwitch	
7010	Cold engine operation	
8000	Alarm PVs, engine side	
8001	Res. alarm PVs, engine side	
8002	Alarm PVs, plant side	
8003	Res. alarm PVs, plant side	
8004	Alarm PRs, engine side	
8005	Res. alarm PRs, engine side	
8006	Alarm PRs, plant side	
8007	Res. alarm PRs, plant side	
8008	Unmovable PRs/ PVs	
8009	AlarmFct_BSZ_FLASH	
8010	CrashRec	Crash recorder
9900	Engine governor AI channel, characteristics	Operating mode setting for AI1, AI2 and FIP
9901	Analog sensor type input, engine governor	Configuration of inputs AI1, Ai2, U 24V and FIP
9902	Binary input config., engine governor	Monitoring open load DU - DI8
9905	Test values, input	Test option for engine-side analog inputs up to measuring point
9906	Level sensor test	Configuration of self-test for level sensors
9910	Binary channel config.	Configuration of the plant-side binary channels DU - D18

- PPP — measuring points
  "P" stands for "parameter". Within each category, this 3-digit number designates the individual parameters.

With the category group "Measuring points" (the measurement variable itself has the number 001; it denotes the measurement value), parameters with the same number always describe the same function:

P-No.	Parameter	Comment
002	Hardware input of the ECU	
003	Filter time constant	
004	Scanning rate in ms	(currently not used)
005	Replacement value	Is used for SD detection
921	Limit value for low detection	For limit value undershot
922	2nd limit value for low detection	
931	Limit value for high detection	For limit value exceeded
932	2nd limit value for high detection	

- PPP — Monitoring/Protection

  With the category groups "Monitoring/Protection", parameters at intervals of 40 always describe the same function because a range of 40 numbers is reserved for one module in each case:

P-No.	Designation
001, 041, 081, 121, 161 etc. (in each case +40)	Switching on Protection modules
002, 042. 082, 122, 162 etc. (in each case +40)	Limitation with delayed alarm
003, 043, 083, 123, 163 etc. (in each case +40)	Override possible
004, 044, 084, 124, 164 etc. (in each case +40)	Delayed stop
005, 045, 085, 125, 165 etc. (in each case +40)	Alarm suppression with active stop signal
006, 046, 086, 126, 166 etc. (in each case +40)	Alarm suppression with active self-test
007, 047, 087, 127, 167 etc. (in each case +40)	Alarm suppression via function
008, 048, 088, 128, 168 etc. (in each case +40)	Alarm delay after start
011, 051, 091, 131, 171 etc. (in each case +40)	Limitation of torque or speed
012, 052, 092, 132, 172 etc. (in each case +40)	Absolute or relative limitation
017, 057, 097, 137, 177 etc. (in each case +40)	Limit value as % of DBR/MCR value
020, 060, 100, 140, 180 etc. (in each case +40)	P-parameter reduction

P-No.	Designation
021, 061, 101, 141, 181 etc. (in each case +40)	I-parameter reduction
022, 062, 102, 142, 182 etc. (in each case +40)	Speed limitation ramp
023, 063, 103, 143, 183 etc. (in each case +40)	Minimum speed limit value with a limitation
024, 064, 104, 144, 184 etc. (in each case +40)	Speed enable ramp
025, 065, 105, 145, 185 etc. (in each case +40)	Torque limitation ramp
026, 066, 106, 146, 186 etc. (in each case +40)	Minimum torque limit value with a limitation
027, 067, 107, 147, 187 etc. (in each case +40)	Torque enable ramp
028, 068, 108, 148, 188 etc. (in each case +40)	Emergency stop delay
029, 069, 109, 149, 189 etc. (in each case +40)	Speed limit alarm
030, 070, 110, 150, 190 etc. (in each case +40)	Torque limit alarm
031, 071, 111, 151, 191 etc. (in each case +40)	Alarm ON delay
032, 072, 112, 152, 192 etc. (in each case +40)	Alarm OFF delay
033, 073, 113, 153, 193 etc. (in each case +40)	P-parameter scaling
034, 074, 114, 154, 194 etc. (in each case +40)	I-parameter scaling

4 Functions of the engine governor

4.1 Start sequence

Engine governor-internal starting sequence

The starting sequence internally controlled by the engine governor is normally used for the applications Genset and C&I.

To activate the starting sequence for these applications, parameter No. 2.1090.100 "Enable Starting Procedure", which activates an external starting sequence (see also 1D parameters) must not be set (do not set "X").

In the application Marine and Rail, the starting sequence is also stored in a device connected to the MTU CAN bus, e.g. in the control stand LOP. Here, the external starting sequence is activated via parameter No. 2.1090.100 "Enable Starting Procedure" (set "X").

General information

The starting sequence for the various applications

- Marine
- Rail
- Genset
- C&I

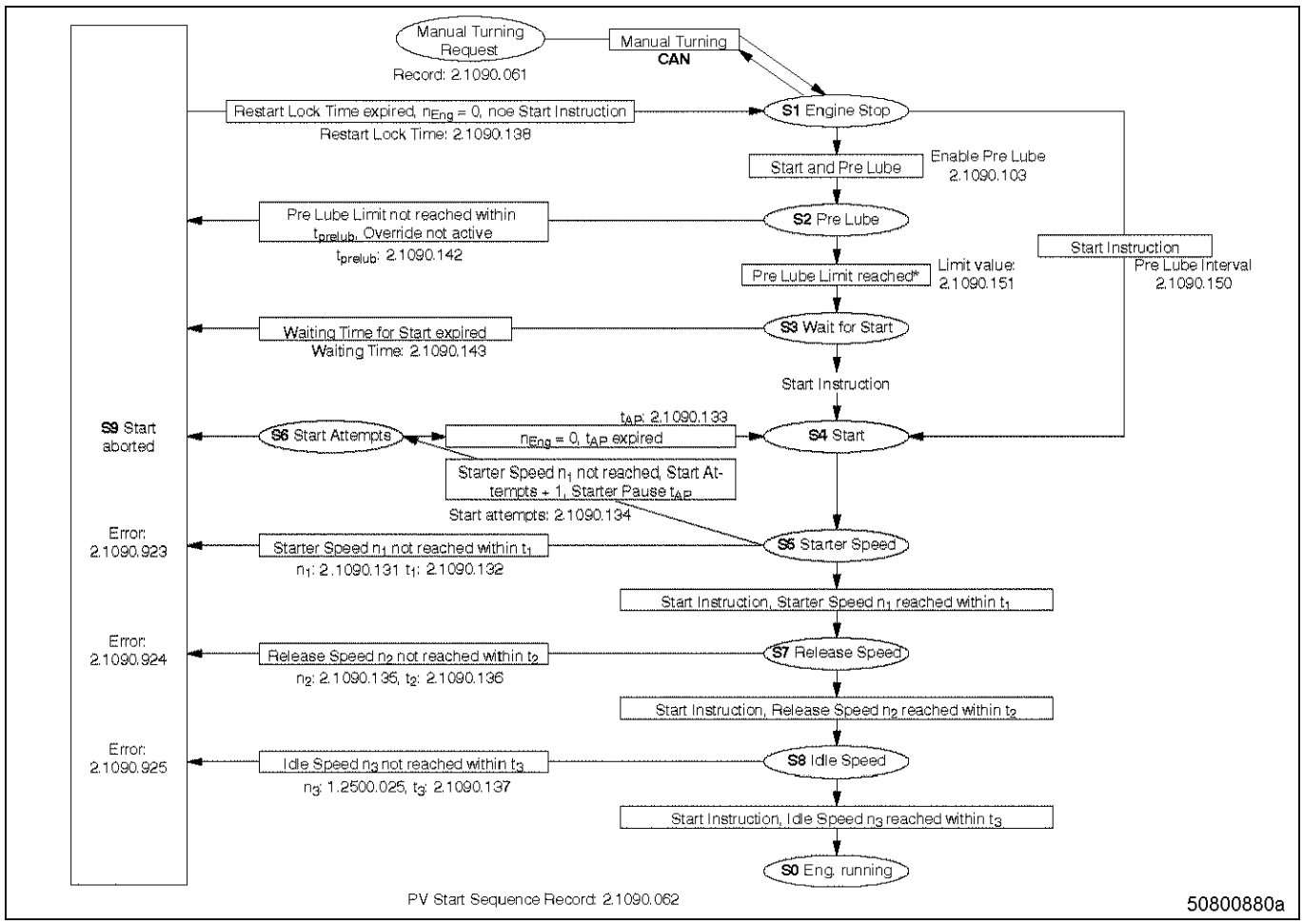
is worked through very differently. For this reason, the engine governor provides a basic program that has to be adapted to the respective application. If even more advanced functions are required, the ECU-internal program part can be switched off for the starting sequence. In its place, a starting sequence must then be implemented in an external, intelligent assembly (e.g. in the SAM or an LOP control stand, see above).

Settings

To program a starting sequence, the following functions must be set:

- Saved or non-stored start
- Type of stop
- Monitoring of coolant temperature
- Prelubrication
- Binary output for starter
- Permissible time until starter speed is reached
- Permissible time until release speed is reached
- Permissible time until idle speed is reached
- Start locking time
- Manual turning

Functions of the starting sequence



Manual Turning Request	Manual turning request
Restart Lock Time expired	Restart lock time expired
No Start Instruction	No start request
Pre Lube Limit not reached within t_{prelub}	Pre Lube Limit not reached within t_{prelub}
Override not active	Override not active
Waiting Time for Start expired	Waiting Time for Start expired
Start Attempts	Start Attempts
n_1	Starter speed to be reached
n_2	Starter release speed
n_3	Idle speed
t_1	Time up to starter speed
t_2	Time up to release speed
t_3	Time up to idle speed
t_{AP}	Starter pause

Start aborted	Start termination
Start Instruction	Start instruction
Start and Pre Lube	Start with prelubrication
Pre Lube Limit reached	Minimum prelubrication pressure reached
Wait for Start	Wait for start (start waiting time running)
Starter Speed	Starter speed
Release Speed	Starter release speed
Idle Speed	Idle speed
Engine Running	Engine running

This diagram (status diagram) shows the conditions under which the governor assumes statuses S1 to S9:

S0 Status engine running
S1 Status engine stationary
S2 Status prelubrication
S3 Status waiting for start
S4 Status starting
S5 Status starter speed
S6 Status starting attempts
S7 Status starter release speed
S8 Status idle speed
S9 Status start termination

These conditions and their setting options are explained briefly in the following section.

Start request (initialization from S1)

There are two different ways of requesting an engine start:

- as a non-stored start
- as a stored start

The start request can be made by pushing a button connected to a binary input of the governor (the PV 2.1090.051 must be routed on the corresponding input of the ECU, see the section "Editing the settings of the inputs and outputs", e.g. on DI7). A start request is also possible by means of a corresponding CAN telegram (in this case, there are different process variables for start request for genset, control stand or monitoring and control system).

Non-stored start

In the case of a "non-stored start", the start signal (e.g. a signal from a pushbutton) must be pending until the engine has reached release speed. The release speed is the engine speed at which the starter is disengaged and from which the engine runs up to idle speed autonomously.

Stored start

In the case of a "stored start", the start signal (e.g. a signal from a pushbutton) only has to be applied for a short while. Following this, the engine runs up autonomously until it reaches idle speed.

Prelubrication

If the "Prelubrication" option is switched on, the prelubrication is initiated in both cases by a brief button signal. Upon completion of prelubrication, the engine starting sequence is implemented via a second button signal as described above.

Stop request

If an external or internal stop request is pending, the starting sequence is terminated.

In the event of a start termination, restart is only possible after the start lock time (adjustable using parameter 2.1090.138) has elapsed. The start lock time can be reset by applying an external stop signal. A prerequisite for this is that parameter 2.1090.102 is set.

Coolant temperature

An engine start when temperature is too low can result in engine damage. In any case, it will cause disproportionately high wear.

To prevent the engine being started when the coolant temperature is too low, the coolant temperature is monitored. If one of the two limit values is undershot (LO T-preheating for the first limit value and SS T-preheating for the 2nd limit value), a corresponding alarm is issued.

If the second limit value is undershot, a stop request is generated and the starting sequence is thus terminated. Precondition:

- Parameter Preheat L2 Aborts Start 2.1090.307 is set
  - and no override is pending or
  - parameter T-Preheat L2 Override Possible 2.1090.308 is not set

This query is also made even if no internal starting sequence is programmed (parameter 2.1090.100 is not set). This prevents an engine start in all cases when the coolant temperature is too low (exception: Override).

In most cases, an alarm is not desired during engine shutdown. The parameter coolant alarm suppression/engine stationary 2.1090.106 can be set for this purpose. This means that coolant temperature monitoring is not started until after a start request. The subsequent reaction of the governor then corresponds once again to the case described above.

When the respective limit values (plus hysteresis value) are reached, the corresponding alarms are reset and their displays are deleted. Limits and hysteresis values are specified via the four parameters 2.1090.303, 2.1090.304, 2.1090.305 and 2.1090.306 (refer also to the table below).

Prelubrication (S2, S3)

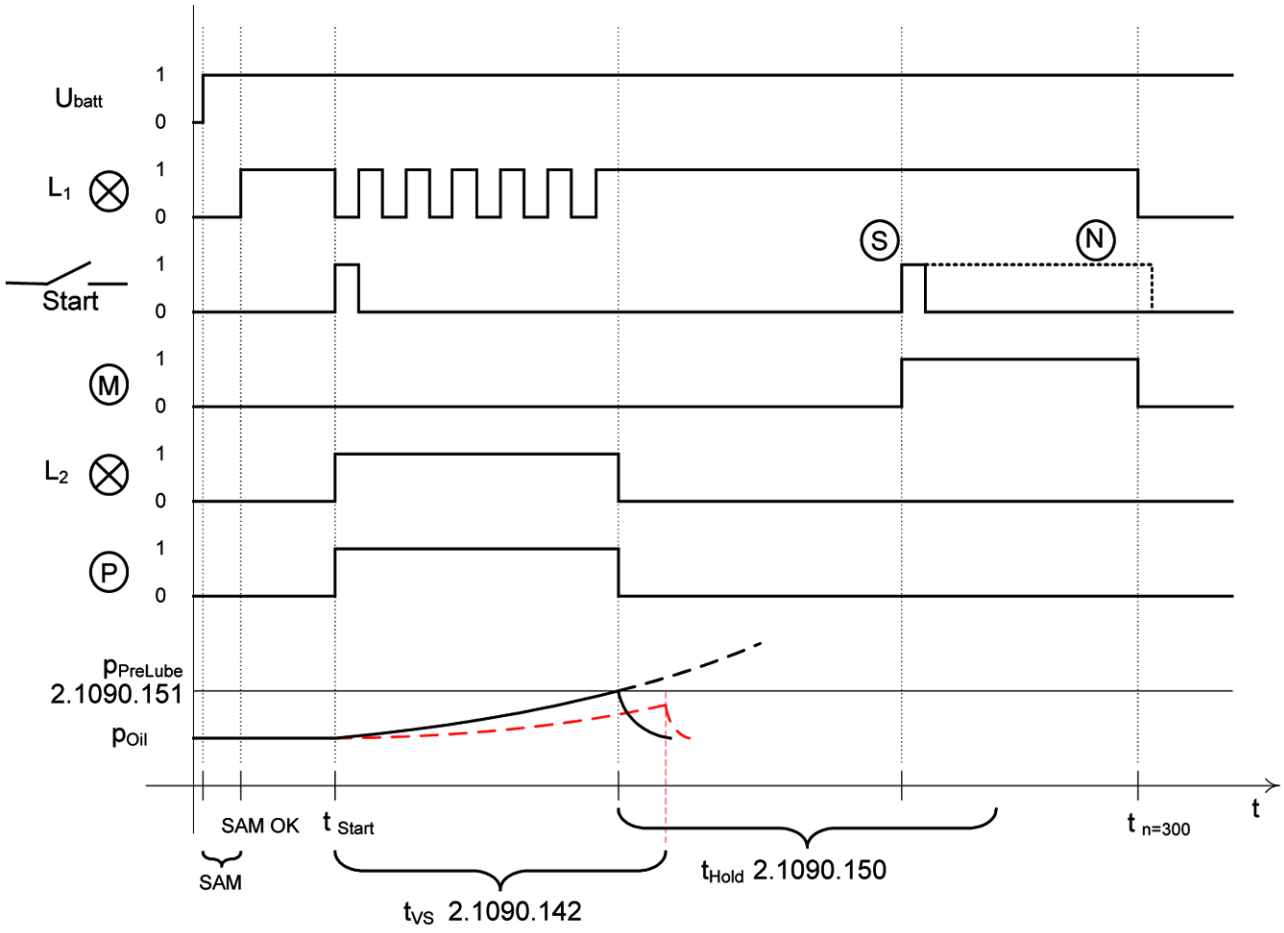
Parameter 2.1090.103 is used to specify that prelubrication is to be carried out (prerequisite: Oil priming pump available). This prelubrication can either be carried out automatically or manually (by setting parameter 2.1090.104). In this case, a binary input can be assigned the function "Manual prelubrication". The oil priming pump can be activated in two different ways:

- via the plant by sending a corresponding CAN telegram
- via a governor output, whereby one of the governor outputs must be assigned accordingly; see. "Editing settings of the inputs and outputs", TOP1...4; in this case, an output would have to be assigned with 2.1090.014 (the corresponding CAN telegram is also sent in this case, although it does not need to be evaluated by the plant)

If the (adjustable) limit value (parameter 2.1090.151) is exceeded, the oil priming pump is switched off and, for actual engine start, the governor waits for a new start signal via the start button (or a CAN telegram). The length of time the governor waits for this signal is set in parameter 2.1090.143. If there is no start request within this time, the governor switches to status "Start termination".

Parameter 2.1090.150 is used to specify how long the engine can wait after successful prelubrication until it has to be prelubricated again. If this time is set to 0 s, prelubrication takes place during every engine start. If the oil pressure does not reach the (adjustable) limit value (parameter 2.1090.151) within the specified time (parameter 2.1090.142), the starting procedure will be terminated.

The following diagram shows the course of the individual signals during a starting sequence:



50800877a

U_{bat}	Battery voltage	p_{Oil}	Oil pressure	N	Signal course with non-stored start
L_1	Start button indicator lamp	SAM OK	Signal "SAM is ready for operation"		
Start	Start button (start request)	t_{Start}	Start time begin		
M	Starter	t_{VS}	Prelubrication period		
P	Oil priming pump	t_{Hold}	Prelubrication interval		
L_2	Indicator lamp for prelubrication active	$t_{n=300}$	Time until an engine speed of 300 rpm is reached		
p_{PreLub}	Prelubrication limit value	S	Signal course with stored start		

Starting (S4)

The starter is either activated via an output TOP of the engine governor (PV 2.1090.013 must be routed to an output of the ECU, see the section "Editing settings of the inputs and outputs", e.g. TOP4), or via the plant (for this purpose, the corresponding bit "Starter ON" is sent via a CAN telegram). When this instruction has been issued, the governor waits for feedback confirming that the starter speed has been reached.

Starter speed (S5, S6)

Parameter 2.1090.132 is used to specify the time within which the engine has to reach starter speed. If this speed is not reached, a corresponding fault message is issued. A new starting attempt can only be carried after a pause, the length of which is determined by parameter 2.1090.133 (this time is necessary to allow the starter to cool down). At the same time, the number of starting attempts until idle speed is reached is counted. The maximum number of starting attempts is specified in parameter 2.1090.134.

IMPORTANT: The number must be set to at least 1. Otherwise, the engine can not be started.

If the number of possible starting attempts has been made and the engine is not running, the engine start is aborted.

If the engine reaches starter speed, the governor waits for feedback confirming that the starter release speed has been reached.

Starter release speed (S7)

Parameter 2.1090.136 is used to specify the time within which the engine has to reach starter release speed. If this speed is not reached, engine start is canceled and a corresponding fault message is issued. In the case of a non-stored start, the start signal can now be canceled (release button). The start button now has no effect and the corresponding indicator lamp goes out.

At this time, the starter is released and the governor waits for feedback confirming that idle speed has been reached.

Idle speed (S8)

Parameter 2.1090.137 is used to specify the time within which the engine has to reach idle speed. If this speed is not reached, engine start is canceled and a corresponding fault message is issued.

The memory for the number of starting attempts is now deleted.

Start termination (S9)

The starting procedure is terminated under the following conditions:

- Prelubrication limit value not reached within the specified time and no override active
- Start request is not issued within the maximum waiting time after prelubrication
- Number of possible starting attempts is exceeded
- Starter speed not reached within specified time
- Release speed not reached within specified time
- Idle speed not reached within specified time

In the event of a start termination, restart is only possible after the start lock time (adjustable using parameter 2.1090.138) has elapsed. The start lock time can be reset by applying an external stop signal. A prerequisite for this is that parameter 2.1090.102 is set.

In order that the engine can switch to the status "Engine stationary", the following conditions must be fulfilled:

- Engine is at standstill
- No start request
- No request for manual turning
- No buttons pressed

If all conditions are fulfilled, the alarms will be deleted. Only the memory for the number of starting attempts remains unchanged. It is not deleted until start is successful.

Manual turning

"Manual turning" (or barring) means that the engine is being turned with the help of the starter, although it does not start. The fuel injection is suppressed when doing this.

Parameter 2.1090.105 must be set. If this parameter is set, the turning procedure can be tripped by a corresponding CAN telegram. Prerequisites are:

- Engine stationary
- Start lock time has expired

A check is carried out during the turning procedure to determine whether the starter speed is reached within the specified time (parameter 2.1090.132). Turning is interrupted if starter speed is not reached. The maximum duration of the procedure is defined by parameter 2.1090.144 (this avoids overheating of the starter). Turning ends automatically after this time if the CAN telegram is not canceled beforehand.

Setting parameters

The following table specifies the numbers of all parameters belonging to the internal starting procedure. For the two applications Genset and C&I, the order-specific settings can be entered.

Parameter No.	Designation	Status	Marine	Rail	Genset	C&I
2.1090.100	Using internal start procedure	S1	□	□	X	X
2.1090.101	Stored start	S1	Not relevant	Not relevant		
2.1090.102	Stop deletes start locking time	S1	Not relevant	Not relevant		

Parame-ter No.	Designation	Status	Marine	Rail	Genset	C&I
2.1090.103	Prelubrication during engine start	S2	Not relevant	Not relevant		
2.1090.104	Manual prelubrication	S2	Not relevant	Not relevant		
2.1090.105	Enable manual turning	S1				
2.1090.106	Coolant alarm suppression/engine is stationary	-	Not relevant	Not relevant		
2.1090.107	Enable intermittent oil prelubrication	S1	Not relevant	Not relevant		
2.1090.131	Starter speed to be reached	S6	Not relevant	Not relevant		
2.1090.132	Time up to starter speed	S6	Not relevant	Not relevant		
2.1090.133	Starter pause	S6	Not relevant	Not relevant		
2.1090.134	Number of starting attempts	S6	Not relevant	Not relevant		
2.1090.135	Starter release speed	S7	Not relevant	Not relevant		
2.1090.136	Time up to disengagement speed	S7	Not relevant	Not relevant		
2.1090.137	Time up to idle speed	S8	Not relevant	Not relevant		
2.1090.138	Restarting locking time after engine stop	S9	Not relevant	Not relevant		
2.1090.142	Prelubrication period	S2	Not relevant	Not relevant		
2.1090.143	Waiting time for start button	S3	Not relevant	Not relevant		
2.1090.144	Maximum manual turning period	S6	Not relevant	Not relevant		
2.1090.150	Prelubrication interval	S6	Not relevant	Not relevant		
2.1090.151	P-oil prelubrication limit	S2	Not relevant	Not relevant		
2.1090.155	P-oil alarm prelubrication limit value	S2	Not relevant	Not relevant		
2.1090.156	Time to Alarm-prelube oil pressure	S2	Not relevant	Not relevant		
2.1090.157	T-oil Alarm-prelube limit value	-	Not relevant	Not relevant		
2.1090.159	Maximum prelubrication period	S2	Not relevant	Not relevant		
2.1090.303	T-preheating L1 limit value	-				
2.1090.304	T-preheating L1 hysteresis	-				
2.1090.305	T-preheating L2 limit value	-				
2.1090.306	T-preheating L2 hysteresis	-				

Parame-ter No.	Designation	Status	Marine	Rail	Genset	C&I
2.1090.307	T-preheating L2 start termination	-				
2.1090.308	T-preheating L2 override possible	-				

Alarm parameters

The following listed parameters are assigned to the starting sequence. They consist of alarms, which can possibly occur during a starting procedure and can, for example, be routed to specific outputs (see section "Editing settings of inputs and outputs"). The table specifies the default settings for these alarms.

ZKP No.	Alarm designation	Status	Marine	Rail	Genset	C&I
2.1090.920	AL prelubrication error	S2	Not relevant	Not relevant	-	-
2.1090.921	LO T-preheat	S1	Not relevant	Not relevant	-	-
2.1090.922	SS T-preheat	S1	Not relevant	Not relevant	-	-
2.1090.923	SS starter speed not reached	S6	Not relevant	Not relevant	-	-
2.1090.924	SS release speed not reached	S7	Not relevant	Not relevant	-	-
2.1090.925	SS idle speed not reached	S8	Not relevant	Not relevant	-	-
2.1090.926	AL starter not engaged	-	Not relevant	Not relevant	-	-

4.2 Functions of the engine governor

Idle-maximum-speed governor — variable-speed governor

The engine governor operates either as an idle-maximum-speed governor or as a variable-speed governor. The selection is made via parameter 2.1010.001. Two 2D parameters (2.0401.010 and 2.0401.012) serve to establish the relation between voltage or current value and speed and torque, see table "2D parameters" in the chapter "2D parameters" (→ Page 185).

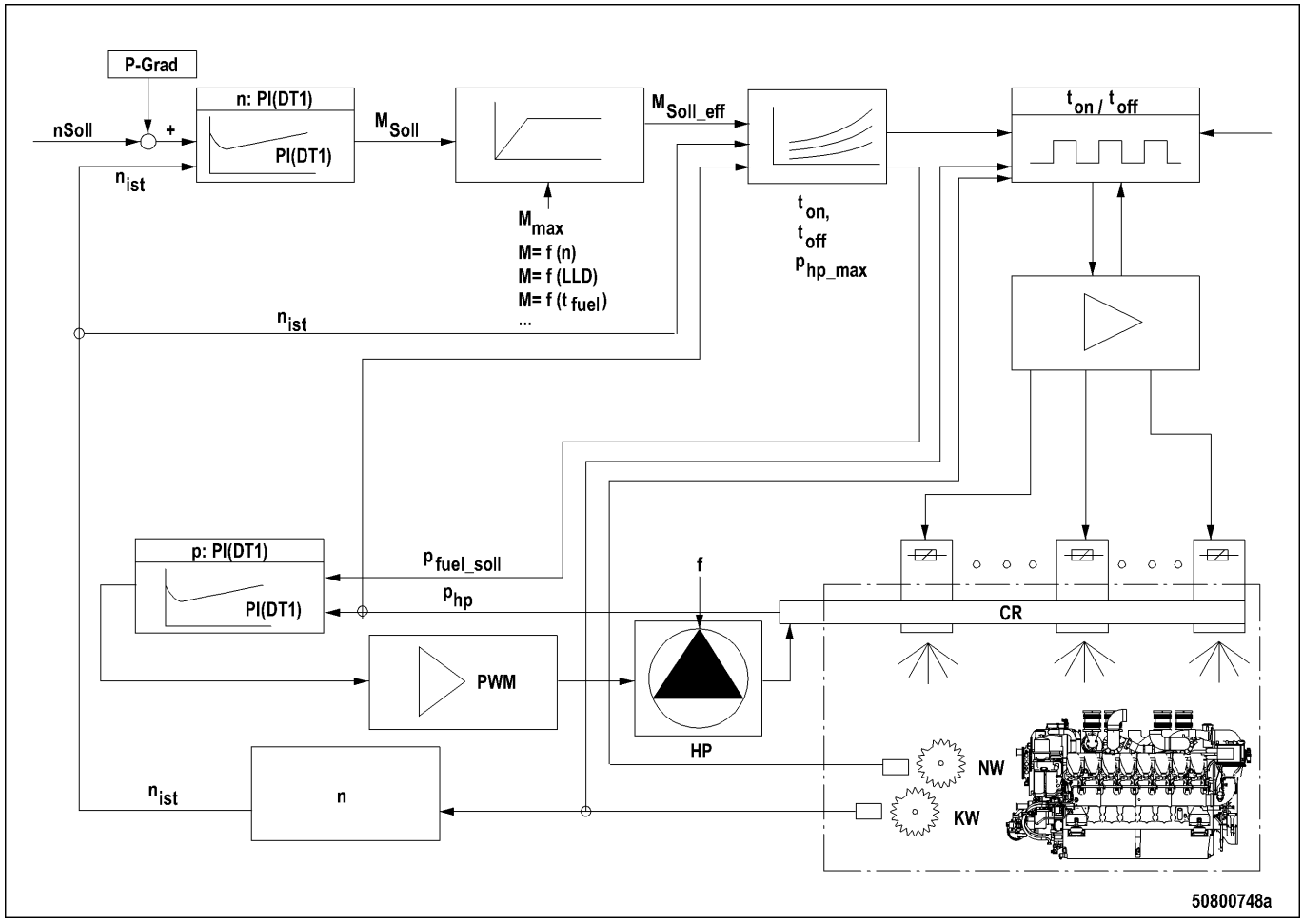
Parameter No. 2.1010.004 serves as a reference value, also refer to table "1D parameters" in the chapter "1D parameters" (→ Page 103).

Whereas the variable-speed governor controls to a specific speed, the idle-maximum-speed governor only controls to two values, between which specified fuel injection takes place, whereby the speed governor is bypassed. The setting is made via parameter 2.0401.026 and/or 2.0401.027, refer to table "2D parameters" in the chapter "2D parameters" (→ Page 185).

The (automatic) switchover between operation as a fuel injection governor to operation as a speed governor is always carried out via speed.

The (automatic) switchover between operation as a speed governor to operation as a fuel injection governor is always carried out via torque.

Common Rail injection system



n_{soll}: Engine specified speed
Speed droop
n: PI(DT1): Speed governor
M_{Soll}: Specified torque
M_{Max}: Torque limitation:
- M = f (speed)
- M = f (charge air pressure)
- M = f (fuel temperature)
- etc.

M_{Soll_eff}: Effective specified quantity

t_{on}, t_{off}, p_{hp_max} :
Characteristics maps for start-of-injection/end-of-injection and high-pressure controllers
t_{on}: Start of injection
t_{off}: End of injection
p_{hp_max}: Specified fuel high pressure
t_{on}/t_{off}: Firing Sequence
n: Engine speed
n_{ist}: Engine actual speed

PWM: Pressure controller
p: PI(DT1) high-pressure controller
p_{fuel_soll}: Specified fuel high pressure
p_{hp}: Fuel high pressure
f: Fuel
CR: Common Rail
HP: High-pressure pump
NW: Camshaft gear
KW: Crankshaft gear

The speed setpoint (specified speed and speed droop) is compared by the speed governor with the actual engine speed. In case of deviations, it adapts its output signal (injection specified quantity). The PID characteristic guarantees a quick response to changes and an exact speed adjustment.

The dynamic quantity limitation independent of the operating point protects the engine against overloading.

The specified quantity after quantity limitation is the input signal for the characteristics-map-controlled start-of-injection/end-of-injection controller. The power electronics activates the individual cylinders according to its specifications. The engine governor also regulates the injection pressure of the Common Rail system.

Angle measurement/determination of injection timing

Injection timing is determined in the electronics using the information from inductive sensors on two measuring wheels. One measuring wheel is mechanically coupled to the crankshaft and the other to the camshaft.

In normal operation, the crankshaft sensor supplies the exact angular position of the crankshaft for determining injection timing and, derived from this, the engine speed.

In normal operation, the camshaft sensor provides both the intake and ignition stroke.

Crankshaft:

The crankshaft measuring wheel rotates as a function of engine speed. In the inductive sensor, each tooth of the measuring wheel generates a pulse. This determines the engine speed. It is also used for determining the angle of the crankshaft. The count is synchronized by a tooth gap (i.e. missing pulse at the sensor) at a defined angular position.

Camshaft:

The camshaft measuring wheel rotates at half engine speed. In controlled operation, the engine governor only evaluates the tooth gap.

Using this tooth gap, the electronics can distinguish between the intake and ignition stroke of cylinder A1.

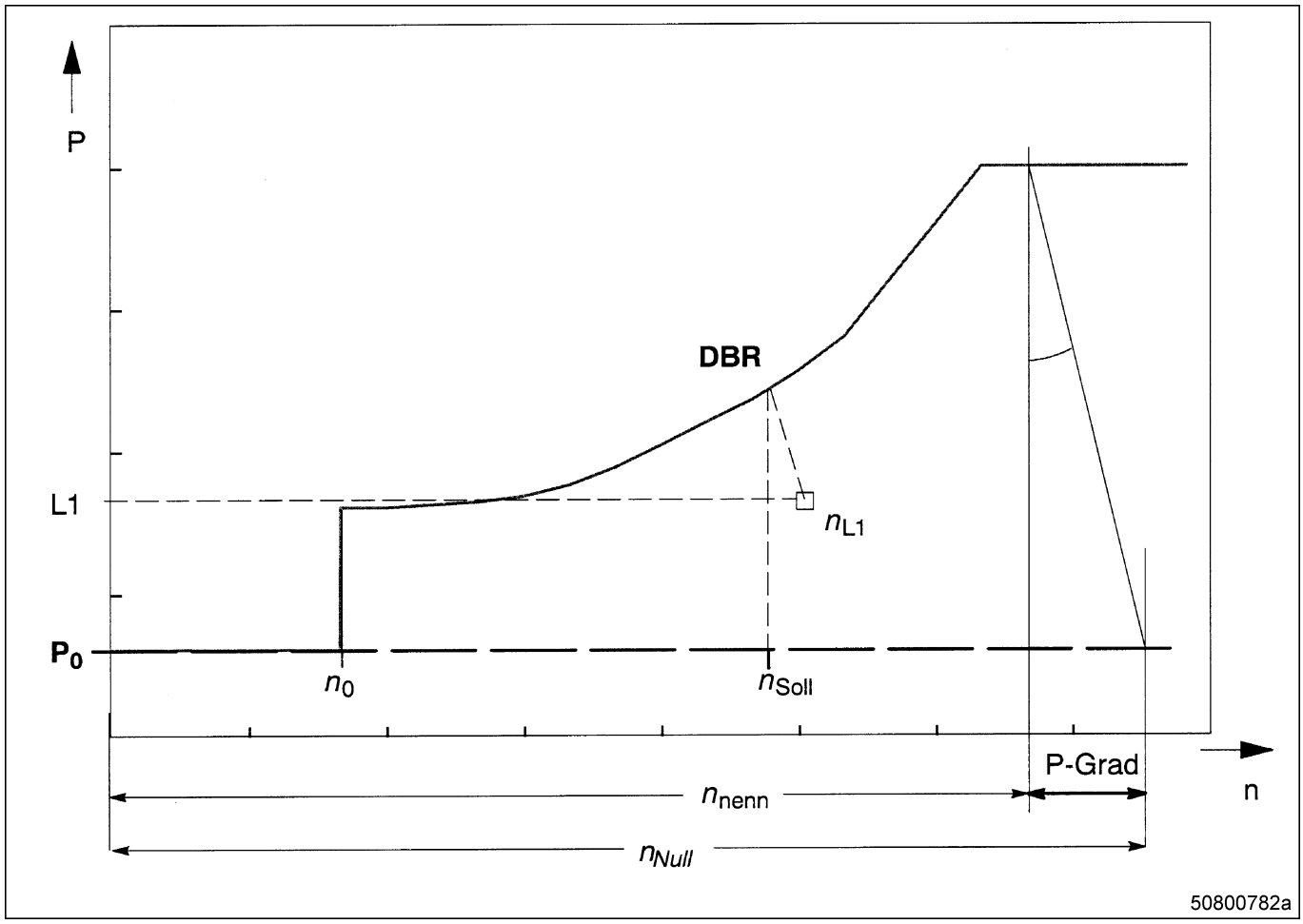
Adjustable speed droop

The following illustration shows the principle control area of the engine governor and the effect of the adjustable speed droop (load-dependent change in speed setpoint).

Among other things, the speed droop is required to achieve load equalization with coupled drive machines. The speed droop setting is dependent on the plant and can be altered via the dialog unit.

The speed droop is defined as a relative speed change during relief of the engine. The speed droop is based on the rated speed (= maximum speed at maximum power output). Every point of the operating range is influenced during a load change.

The speed droop is calculated by subtracting the rated speed n_{nenn} from the maximum speed (zero load) n_{Null} and then dividing this by rated speed n_{nenn} and multiplying the result by 100.



L1: Load
DBR: Limitation curve
n_{L1}: Resulting speed at load L1
n_0: Zero load

n_L: Idle speed
n_{soll}: Speed setpoint
n_{nenn}: Rated speed
n_{Null} Maximum speed at zero load

Speed droop
n: Engine speed

Power limitations

Power limitations are effected via the Monitoring and Protection module and its specified settings (→ Page 218).

Exhaust turbocharger

The exhaust turbochargers (ETCs) supply the diesel engine with the air volume with excess pressure required for combustion. This achieves higher efficiency and a performance increase of the engine.

The ETC control ensures optimized turbocharging over a wide power range.

The number of turbochargers that can be connected is specified by a parameter (1.3011.090. unalterable). Turbochargers that can not be connected operate as basic turbochargers as soon as the engine runs.

Overspeed protection:

To protect the turbochargers, the behavior of the engine is influenced during turbocharger overspeed in accordance with the settings of the Monitoring and Protection module (→ Page 218).

Connectable turbochargers are cut in/out by opening and closing a hydraulically actuated turbocharger control valve. Activation of the turbocharger control valve(s) is effected by solenoid valve(s) controlled by the governor.

Cylinder cutout

If the cylinder cutout is active, the engine governor will activate only one half of the injectors alternately. The cylinder cutout is only active in idle mode. It guarantees engine operation free of white smoke.

The following criteria must be fulfilled for cylinder cutout:

- Engine is running at idle speed.

- Injection quantity is smaller than the max. injection quantity for operation with cylinder cutout.
- The plant "Cylinder cutout Off" is not active.

Overspeed

The overspeed limit of the engine is specified by MTU and set by means of a parameter.

4.3 Test functions

Bedia level sensors

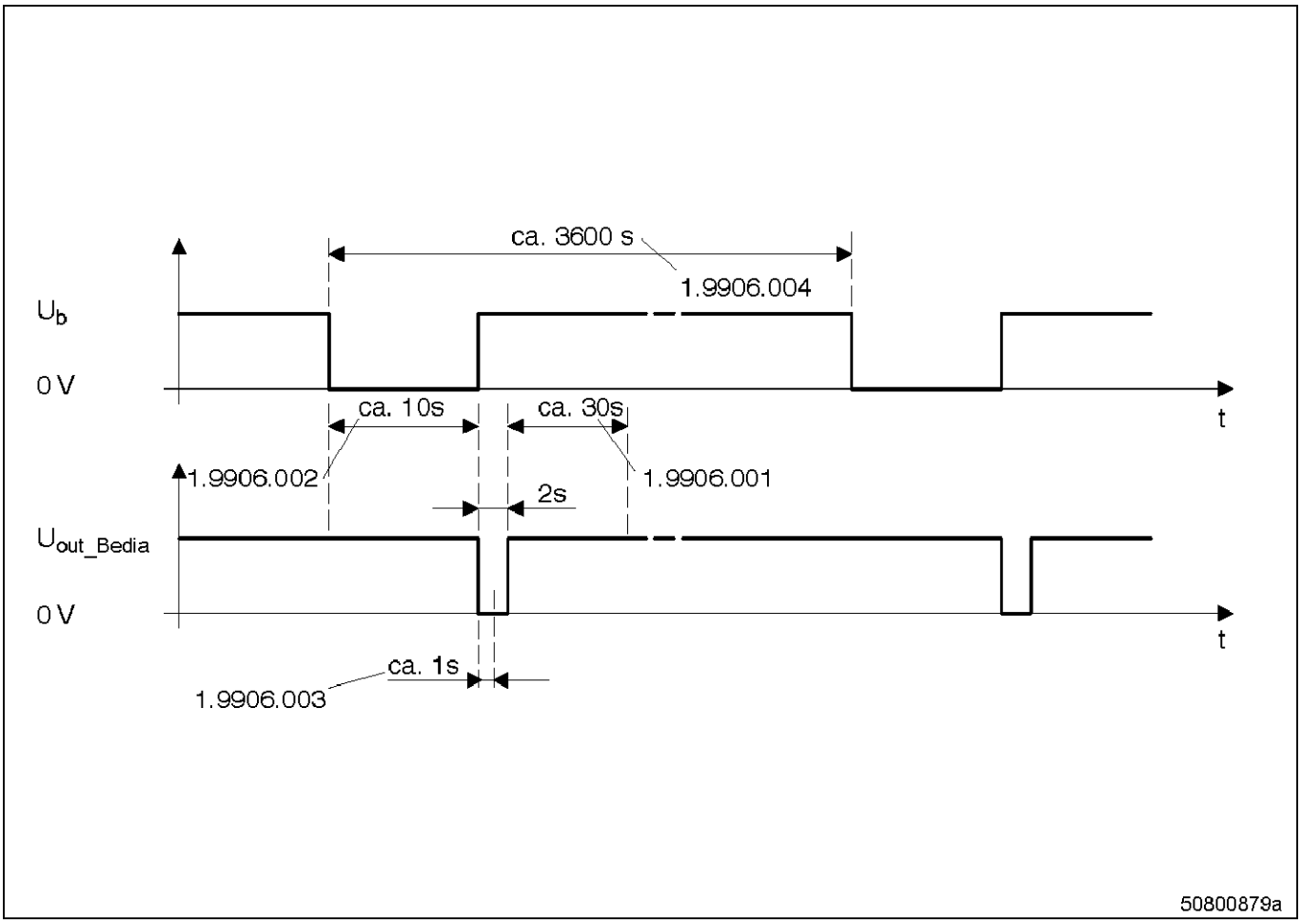
Bedia level sensors (used to measure the fuel and water level in the fuel prefilter) have a self-test function. The self-test is tripped if the operating voltage is interrupted for at least 10s. This self-test is thus carried out every time the governor is switched on and during operation when the supply voltage to the sensor is periodically interrupted. The periodical tests are required to exclude the possibility of a sensor malfunction (and thus ensure that the sensor output signal is a measured value and not a fixed level due to a sensor defect).

To configure the sensor test for the Bedia sensors, you have to know at which governor input (LSI1, LSI2 or LSI3) such a sensor is located:

Parameter No.	Function of the parameter	Default setting for the applications			
		Marine	Rail	Genset	C&I
1.9906.010	LevSensTest LSI 1 active	¤	¤	¤	¤
1.9906.011	LevSensTest LSI 2 active	X	¤	¤	¤
1.9906.012	LevSensTest LSI 3 active	¤	¤	¤	¤

Further values must also be specified for the test:

- How long should the input signal be interpreted as a test signal at the governor input (fur this period, alarm processing is "frozen" and level changes are not recorded)?
- How long should the operating voltage for the sensors be switched off?
- At what point should the query for a correct output signal be carried out during the self-test?
- How long should the time interval be in which the sensors are checked?



U_B Operating voltage for the sensor
U_{out_Bedia} Output voltage of sensor for the governor

The following settings apply to all LSI inputs at which the sensor test is active:

Parameter No.	Function of the parameter	Default settings
1.9906.001	LevSensTest Test-Time	30 s
1.9906.002	LevSensTest Time Power Off	10 s
1.9906.003	LevSensTest Scan after PowerON	1 s
1.9906.004	LevSensTest Testinterval	3600 s (corresponds to 1 h)

Binary outputs

When the binary outputs are tested (parameter No. 2.1050.020 active, e.g. whereby it is routed to a DI and the DI is activated), for the duration of the test all outputs released for a test are switched to +24 VDC. Which outputs are involved is controlled via parameters:

Parameter No.	Function of the parameter	Default setting for the applications			
		Marine	Rail	Genset	C&I
2.1050.014	TOP1 Select for Test	¤	¤	¤	¤
2.1050.015	TOP2 Select for Test	¤	¤	¤	¤
2.1050.016	TOP3 Select for Test	¤	¤	¤	¤
2.1050.017	TOP4 Select for Test	¤	¤	¤	¤

Overspeed

During an overspeed test, the shutdown function is checked, which is designed to bring the engine to a standstill if the maximum permissible engine speed is exceeded.

To configure the overspeed test function, the following values have to be specified:

- A speed limit for the test function (2.2510.001):

  Activation speed for overspeed test: An overspeed test can only be activated in the engine speed window of (nTest, 2.2510.001 +- nTestHyst, 2.2510.002). The activation speed "nTest" is entered here, the associated hysteresis "nTestHyst" at PR "Test Overspeed Activ. Speed Hyst."
- Hysteresis value (2.2510.002)
- Test Overspeed Limit Factor (2.2510.003)

  Provided that the switch for selecting the overspeed test method (02.2510.004) is not set (no "X"), the following applies: If the overspeed test is activated, the engine shuts down when x % of engine overspeed has been reached. The factor x % is entered here.
- Method for performing the overspeed test (2.2510.004):

  "X" set: When the overspeed test is activated, the engine shuts down immediately

  No "X" set: If the overspeed test is activated, the engine shuts down when x % ("Test Overspeed Limit Factor") of engine overspeed has been reached.

Parameter No.	Function of the parameter	Default setting for the applications			
		Marine	Rail	Genset	C&I
2.2510.001	Test Overspeed Activ. Speed	¤	¤	¤	¤
2.2510.002	Test Overspeed Activ. Speed Hyst.	¤	¤	¤	¤
2.2510.003	Test Overspeed Limit Factor	¤	¤	¤	¤
2.2510.004	Test Overspeed Method	¤	¤	¤	¤

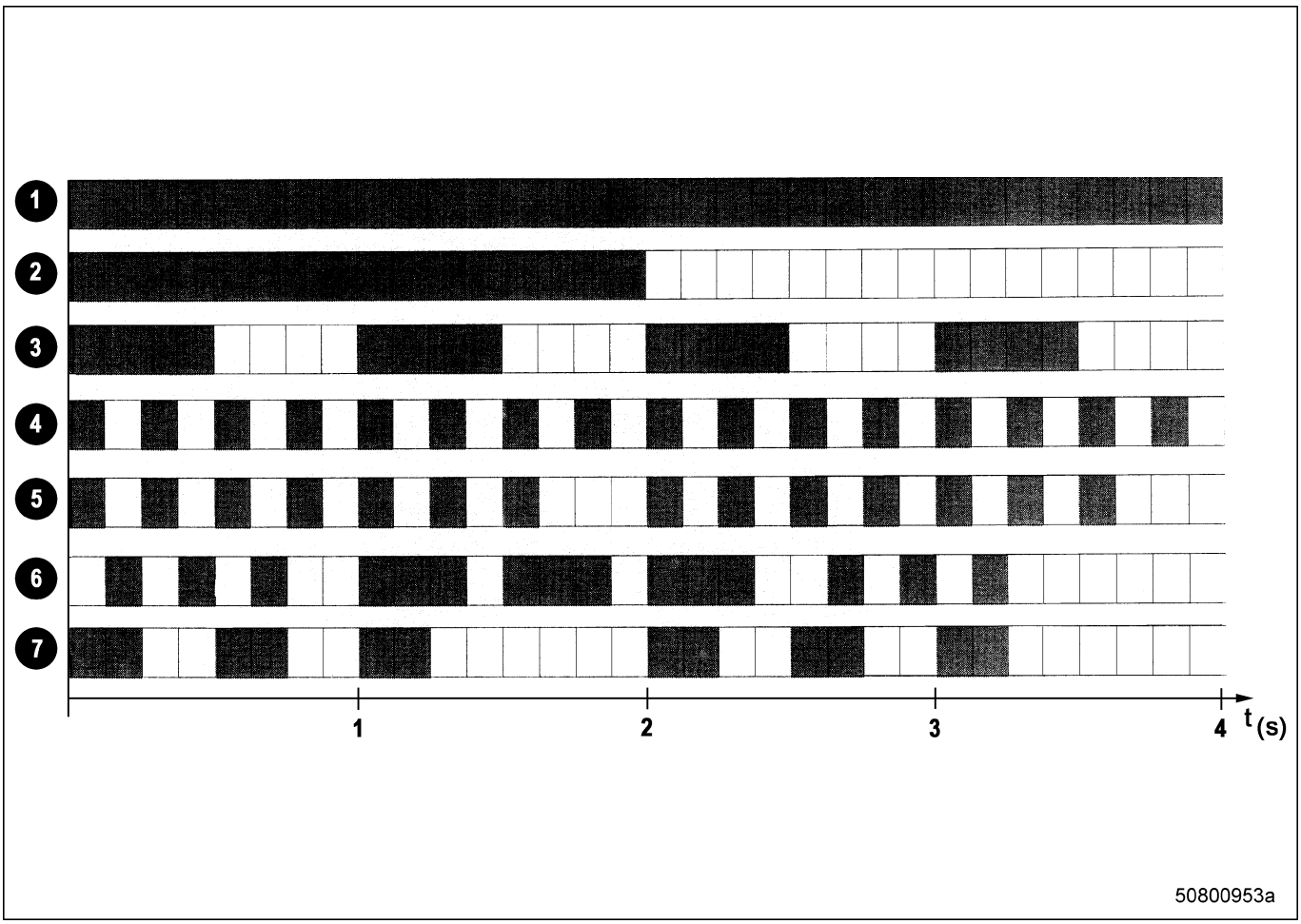
Integrated test system – diagnosis lamp DILA

An indicator lamp ("DILA") is located near connector X4 whose status provides information on the current status of the engine governor.

- Continuous light:

  The governor is ready for operation.
- Indicator lamp dark:
  - No operating voltage applied.
  - The governor is defective.
- Flashing

  The various flashing sequences have the following meanings:
  - Flashing frequency 0.25 Hz: Application loader is active
  - Flashing frequency 1 Hz: Internal error determined by ITS
  - Flashing frequency 4 Hz: External RAM faulty
  - Flashing frequency 4 Hz with pause after 7 x flashes: External flash faulty
  - 3 x short flashes, followed by 3 x long flashes: No firmware
  - 3 x flashes, followed by 0.75 s pause: Application crashed; following the crash, the application loader becomes active



1 The governor is ready for operation.
2 Application loader is active
3 Internal error determined by ITS
4 External RAM faulty
5 External flash faulty
6 No firmware
7 Application crashed

4.4 Specified speed formation functional description

General information

The specified speed is the setpoint value for the speed control loop of the engine governor. This value is calculated from a speed setpoint raw value. Depending on the application (marine, rail, vehicle or genset), the speed setpoint raw value comes from one of the following sources:

- Propulsion control lever
- Stepping switch
- Up/Down button

The effective specified speed is calculated from the speed setpoint raw value, making allowance for additional conditions, e.g.

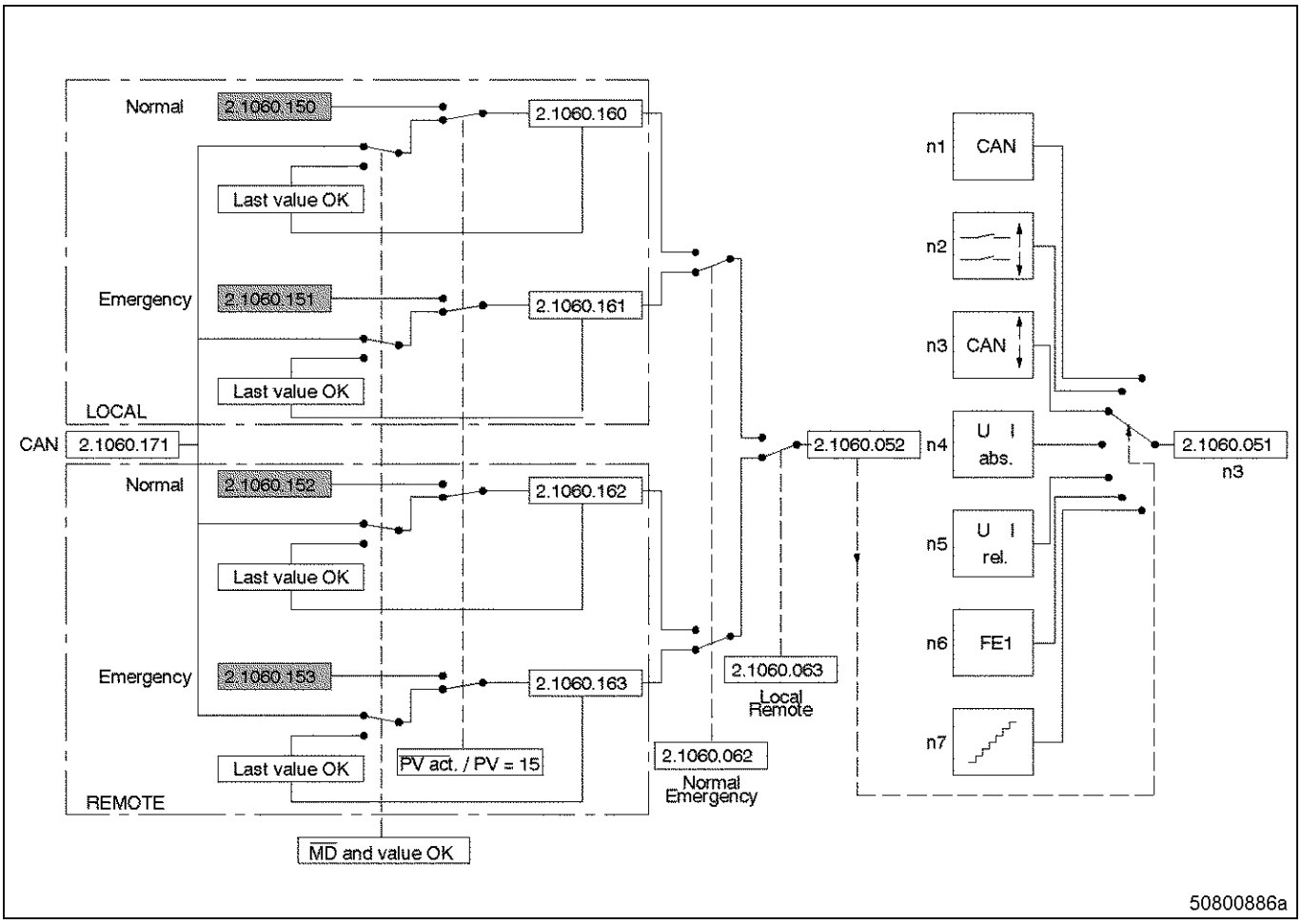
- speed ramp
- speed droop
- limit values.

The Fixed speed function can be activated via an external signal. It increases the minimum specified speed.

Selection of the speed setpoint source

There are three ways of determining how the selection of the speed setpoint source is made:

- The source is determined by means of a specification from a connected SAM with a CCB2 plug-in circuit board. Parameter 500 of the SAM must be set to a value between 1 and 7. This value determines the speed setpoint source ((→ Page 52)):
  - 1: ECU Up/Down signal
  - 2: CANOpen Up/Down signal
  - 3: ECU analog specification absolute
  - 4: ECU analog specification relative
  - 5: ECU frequency input
  - 6: CANOpen analog specification
  - 7: CANOpen speed specification switch
- The source is specified by one of the parameters 2.1060.150 to 2.1060.153. A prerequisite for this is that parameter 500 of the SAM is set to the value 0 (this means that the settings of the parameters in the ECU are relevant). The final selection of the setpoint value depends on further switches (see illustration).
- An encoded CAN telegram (process variable 2.1060.171) transmits the value to which the process variables 2.1060.160 to 2.1060.163 are to be switched. The final selection depends, as with the previous version, on further switches (see illustration).



Input parameters are the gray shaded fields 2.1060.150 to 2.1060.153. These values are transferred if:

- no valid PV value is applied or
- the PV value is 15 (FFFF → CAN = Off)

Otherwise, the PV values from the CAN process variable 2.1060.171 are transferred to the process variables 2.1060.160 to 2.1060.163 ((→ Page 54)). However, the prerequisite for this is:

- No missing data has been determined
- The value is valid

In the case of missing data or invalid values, the last value detected as valid will be transferred.

The further selection of which of the process variables 2.1060.160 to 2.1060.163 is further transferred, depends on process variable 2.1060.062. This can be transferred via CAN or (by routing onto a binary input, (→ Page 54)) can be changed by an external signal. Process variable 2.1060.062 is always transferred via CAN.

The value (between 0 and 6) thus transferred to process variable 2.1060.052 ultimately determines the speed setpoint that is transferred to process variable 2.1060.051 (value in rpm).

Specified speed formation

Speed setpoint source

Depending on the application, different sources can be selected for specifying the speed setpoint raw value. This is carried out via the process variable 2.1060.052. There are seven different options for selecting the speed setpoint source:

- 0: Analog speed setpoint via CAN
- 1: Up/Down buttons on the engine governor (corresponding DI inputs thus configured)
- 2: Up/Down button signals on the CAN bus
- 3: Analog absolute speed setpoint at one analog input of the governor
- 4: Analog relative speed setpoint at one analog input of the governor
- 5: Analog absolute speed setpoint at one frequency input of the governor

- 6: Control lever positions via CAN

The individual settings have the following functions:

- Analog speed setpoint via CAN (2.1060.052 = 0)

  As with the analog, absolute speed setpoint on an analog or frequency input, the analog value is assigned a speed setpoint raw value. This is transferred, however, on the CAN bus.
- Up/down buttons (binary inputs of the engine governor (2.1060.052 = 1) or via CAN (2.1060.052 = 2))

  The current speed setpoint value is increased or reduced via the corresponding signal; if the signal is pending for a long time, the setpoint is changed along a ramp. With genset applications, the speed setpoint is made about the fixed rated speed. The Up/Down buttons are used to make speed changes around the rated speed - within defined limits.
- Analog, absolute speed setpoint on one analog- (2.1060.052 = 3) or frequency input (2.1060.052 = 5) of the governor

  A speed setpoint raw value is assigned to one analog signal (current, voltage or frequency).
- Analog, relative speed setpoint (2.1060.052 = 4) at one analog input of the governor

  A speed difference is added to (or subtracted from) a fixed rated speed; this speed difference is calculated from the analog signal (current, voltage or frequency).
- Control lever positions via CAN (2.1060.052 = 6)

  A speed value is assigned to a specific control lever position. The control lever position value is transferred on the CAN bus.

Selection of the input

Parameter 2.0280.002 is used to set the ECU input (AI1 or AI2) that is used for evaluation of the signal applied there (current or voltage, see above):

Parameter No.	Function	At "1": T (True) set	At "0": T (False) set
2.0280.002	AI1 or AI2	Use AI 1	Use AI 2

Setting the inputs for analog specified speed at the governor

The engine governor has 2 analog inputs (AI1, AI2). The parameters must be set with the help of the dialog system "DiaSys" as follows:

Parameter No.	AI1		AI2	
	Sensor type: 2.9901.200	Current mode: 2.9901.001	Sensor type: 2.9901.201	Current mode: 2.9901.011
Voltage specification absolute	16	F ( )	16	F ( )
Current specification absolute	18	T (X)	18	T (X)
Voltage specification relative	24	F ( )	24	F ( )
Current specification relative	25	T (X)	25	T (X)
Voltage specification 60 Hz	26	F ( )	26	F ( )
Current specification 60 Hz	26	T (X)	26	T (X)

Legend:

- F ( ): False, do not set an X
- T (X): True, set an X

Selector switch

There are four options available for selecting the speed setpoint:

- Local - normal operation
- Local - emergency operation
- Remote - normal operation
- Remote - emergency operation

The speed setpoint used depends on two "switches":

Process variable	Function	At "1": T (True) set	At "0": T (False) set
2.1060.062 (this process variable can be routed directly onto a binary input) (→ Page 65)	Normal operation or emergency operation	Emergency operation	Normal operation
2.1060.063 (this process variable is transferred via the CAN bus)	Local - Remote	Local	Remote

To select from which source the specified speed for each of the four options is to come from, four further process variables have been provided (designated as "Demand Switch 1 ... 4" (→ Page 51)), which specify the respective source:

Parameter No.	Function	Value — Selection
2.1060.150	Source for local – normal operation	0 – analog value from CAN bus 1 – evaluate Up/Down button signals on binary inputs 2 – evaluate Up/Down button signals on CAN bus 3 – evaluate analog value, absolute, on analog input 4 – evaluate analog value, relative, on analog input 5 – evaluate frequency value on frequency input 6 – evaluate control lever position
2.1060.151	Source for local – emergency operation	0 – analog value from CAN bus 1 – evaluate Up/Down button signals on binary inputs 2 – evaluate Up/Down button signals on CAN bus 3 – evaluate analog value, absolute, on analog input 4 – evaluate analog value, relative, on analog input 5 – evaluate frequency value on frequency input 6 – evaluate control lever position

Parameter No.	Function	Value — Selection
2.1060.152	Source for remote – normal operation	0 – analog value from CAN bus 1 – evaluate Up/Down button signals on binary inputs 2 – evaluate Up/Down button signals on CAN bus 3 – evaluate analog value, absolute, on analog input 4 – evaluate analog value, relative, on analog input 5 – evaluate frequency value on frequency input 6 – evaluate control lever position
2.1060.153	Source for remote – emergency operation	0 – analog value from CAN bus 1 – evaluate Up/Down button signals on binary inputs 2 – evaluate Up/Down button signals on CAN bus 3 – evaluate analog value, absolute, on analog input 4 – evaluate analog value, relative, on analog input 5 – evaluate frequency value on frequency input 6 – evaluate control lever position

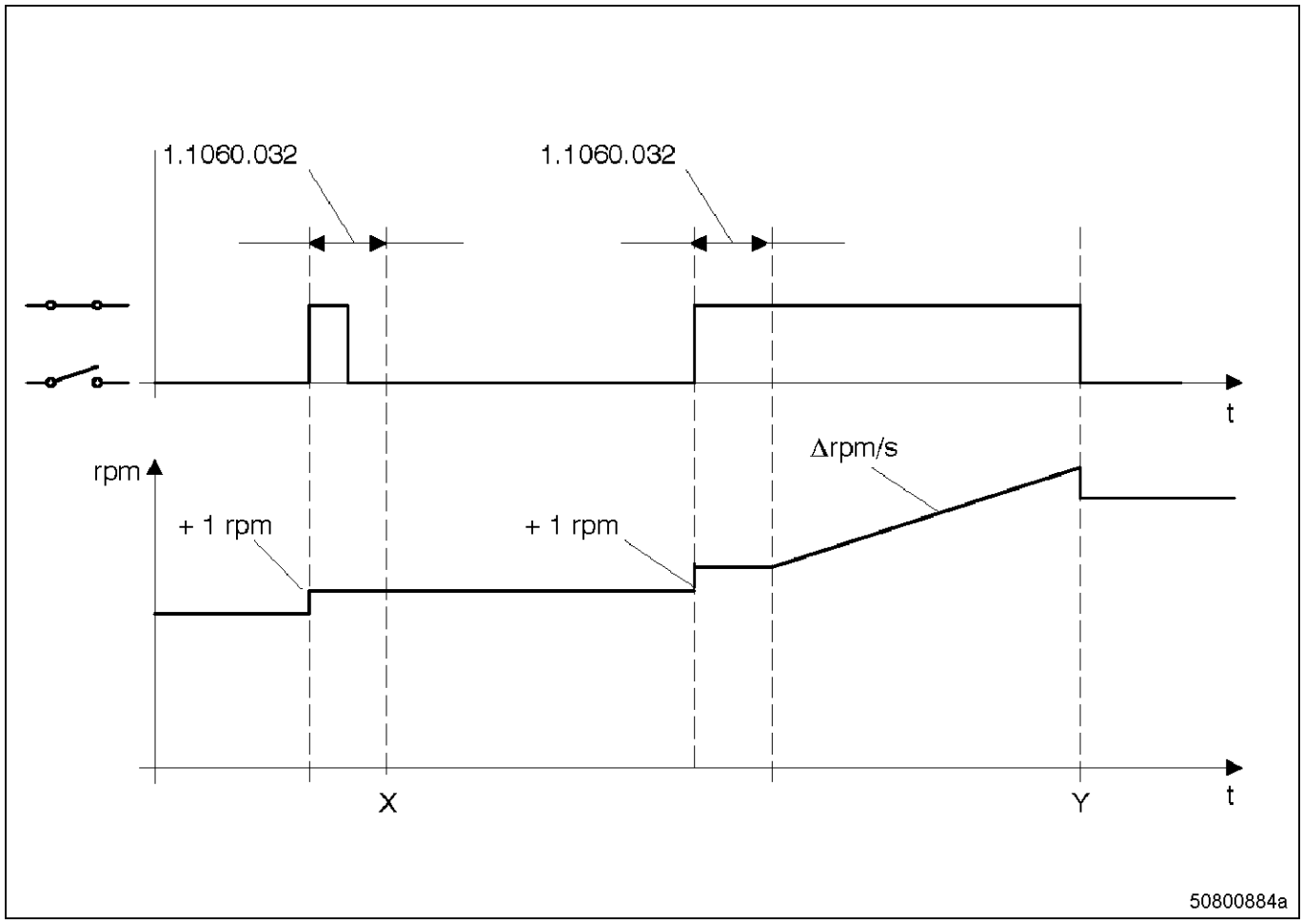
The process variables 2.1060.160 ... 163 are not set directly. Their value depends on the setting parameters 2.1060.150 ... 153 or the CAN parameter 2.1060.171. The value that is connected to 2.1060.160 ... 163 depends on whether the system has been configured for a CAN specification. If CAN has been configured, the setting parameters 2.1060.150 ... 153 are ignored and the settings from the CAN parameter 2.1060.171 are transferred to the process variables 2.1060.160 ... 163 (exception: If "15" is transferred in the CAN configuration, this means that the setting parameters 2.1060.150 ... 153 are to be transferred to the parameters 2.1060.160 ... 163). If no CAN is configured, the setting parameters 2.1060.150 ... 153 are transferred automatically to the process variables 2.1060.160 ... 163.

If CAN is configured, CAN parameter 2.1060.171 will be evaluated. If this is missing (missing data), or if it has an invalid value, the last valid specification will be adopted and transferred to the respective process variables 2.1060.160 ... 163.

Up/Down button

If a speed change is made using an Up/Down button signal, the speed setpoint per pulse is increased or reduced by one revolution per minute. If the button signal is pending for a long time without a break (e.g. if an illuminated pushbutton "Speed Up" is pressed and held in), the speed setpoint changes continuously along a ramp. The time the button signal has to be applied to activate the ramp function is specified via a parameter:

Parameter No.	Function	Analog value
2.1060.032	Time until start of ramp function	Time specification in s



Speed limits

The speed setpoint can have an upper and lower limit. If the calculated specified speed is outside these limits, the setpoint is set to the limit value:

Parameter No.	Function	Analog value
2.1060.042	Minimum permissible speed setpoint	Speed value in rpm
2.1060.043	Maximum permissible speed setpoint	Speed value in rpm

Sensor defect

During processing of the analog input values, continuous monitoring for a sensor defect is carried out. This monitoring can be interrupted for a specific period when switching over between different signal specification sources. This is necessary, for example, if a signal source only supplies a valid signal after a delay. The following parameters are available for this purpose:

Parameter No.	Function	Value
2.1060.018	Suppress monitoring	Binary value: T (True): Function ON Binary value: F (False): Function OFF
2.1060.031	Duration of suppression	Analog value in s

Default value mode

If no more valid values are received (SD), the speed setpoint value will be frozen at the current actual speed (minus speed droop). This value is maintained until a valid value is received again, or a switch is made to another input for speed setpoint.

The "Default value mode" function can be used to determine that a specific (predefined) speed is set in the event of a loss of the speed setpoint value. The following parameters are available for this purpose:

Parameter No.	Function	Value
2.1060.013	Switch on default value mode; use default value	Binary value: T (True): Function ON Binary value: F (False): Function OFF
2.1060.012	Specification of the default value	Speed value in rpm

Idle speed increase

If idle speed is not reached after an engine start, idle speed is increased for a settable period by a settable value. At the same time, an amount for the idle speed increase is determined as a function of the engine coolant temperature.

The set and the determined amounts for the speed increase are compared and the higher value is selected. Idle speed is then increased by this amount.

The following parameters are available for these functions:

Parameter No.	Function	Value
2.1060.047	Time for which the idle speed increase is to be active after engine start.	Analog value in s
2.1060.046	Specification of the amount	Speed value in rpm
2.1060.048	Curve for the idle speed increase	$n_{Leerlauf\ Motor}$ (engine idle) = $f(t_{Kühlmittel})$(coolant), support points

If parameters 2.1060.047 and 2.1060.046 are set to "0", only one idle speed increase takes place as a function of engine coolant temperature. If all support points here are set to the amount "0", there will be no idle speed increase.

Specified speed ramp

The change speed of the speed setpoint is alterable. For this purpose, a "ramp" consisting of three segments is activated with the help of the speed raw value. The gradient can be set for each segment. The actual speed at which a switch is made from one segment to the next is also set. There are a total of four different ramps:

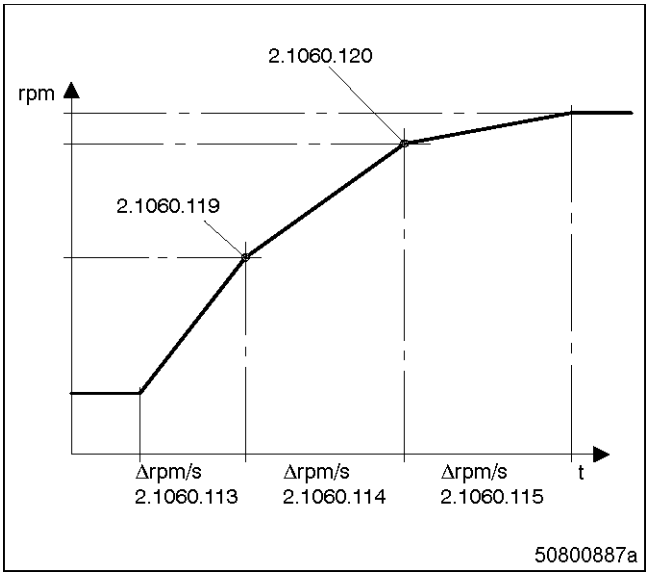
- Speed increase with activation through speed setpoint
- Speed reduction with activation through speed setpoint

- Speed increase with activation through Up buttons
- Speed reduction with activation through Down buttons

The following parameters are required for the settings:

Parameter No.	Function of the parameter	Setting value
Speed increase with activation through speed setpoint		
2.1060.113	Gradient of ramp in first segment	rpm per s
2.1060.119	Switchover point from first segment to second	rpm
2.1060.114	Gradient of ramp in second segment	rpm per s
2.1060.120	Switchover point from second segment to third	rpm
2.1060.115	Gradient of ramp in third segment	rpm per s
Speed reduction with activation through speed setpoint		
2.1060.116	Gradient of ramp in first segment	rpm per s
2.1060.119	Switchover point from first segment to second segment (same trip point as with increasing speed)	rpm
2.1060.117	Gradient of ramp in second segment	rpm per s
2.1060.120	Switchover point from second segment to third segment (same trip point as with increasing speed)	rpm
2.1060.118	Gradient of ramp in third segment	rpm per s
Speed increase with activation through Up buttons		
2.1060.122	Gradient of ramp in first segment	rpm per s
2.1060.128	Switchover point from first segment to second	rpm
2.1060.123	Gradient of ramp in second segment	rpm per s
2.1060.129	Switchover point from second segment to third	rpm
2.1060.124	Gradient of ramp in third segment	rpm per s
Speed reduction with activation through Down buttons		
2.1060.125	Gradient of ramp in first segment	rpm per s
2.1060.128	Switchover point from first segment to second segment (same trip point as with increasing speed)	rpm
2.1060.126	Gradient of ramp in second segment	rpm per s
2.1060.129	Switchover point from second segment to third segment (same trip point as with increasing speed)	rpm
2.1060.127	Gradient of ramp in third segment	rpm per s

The illustration uses the example "Increase in speed with activation through speed setpoint" to show which features of the curve are influenced by the individual parameters.



There are restrictions on the distance between the specified and actual speed. If a settable difference value (of actual and specified speed) is exceeded, the specified speed ramp generator is stopped until the maximum deviation between actual and setpoint has fallen below the set value.

This parameter is specified separately in two parameters for running up and deceleration of the engine:

Parameter No.	Function	Value
2.1060.130	Maximum speed deviation between actual and specified speed during acceleration	Speed value in rpm
2.1060.131	Maximum speed deviation between actual and specified speed during deceleration of the engine	Speed value in rpm

Speed droop

The speed droop influences the specified speed as a function of the engine power. There is no influence as long as the specified engine power is limited by the DBR or MCR curve. If the engine power falls below these two curves, the effective specified speed increases.

It is possible to switch between two different (adjustable) speed droops.

The speed droop (and, if required, the switchover option) is determined by the following parameters:

Parameter No.	Function	Value
2.1060.202	Speed droop 1	Value in %
2.1060.204	Speed droop 2	Value in %
2.1060.205	Dynamic speed droop	
2.1060.214	Speed droop switchover at constant speed	Binary value: T (True): Function ON Binary value: F (False): Function OFF
2.1060.215	Rated speed, if speed droop 1 is switched over to speed droop 2	Binary value: T (True): Function ON Binary value: F (False): Function OFF
2.1060.216	Rated speed, if speed droop 2 is switched over to speed droop 1	Binary value: T (True): Function ON Binary value: F (False): Function OFF
2.1060.217	Speed droop switchover possible	Binary value: T (True): Function ON Binary value: F (False): Function OFF

Limitation of the effective speed setpoint

The speed setpoint can have an upper and lower limit:

Parameter No.	Function	Analog value
2.1060.044	Minimum permissible speed setpoint	Speed value in rpm
2.1060.045	Maximum permissible speed setpoint	Speed value in rpm

Speed increase (Genset application)

By means of an external request, the unlimited speed setpoint can be increased by a specific value:

Parameter No.	Function	Analog value
2.1060.320	Amount of increase	Speed value in rpm

Idle speed increase

A binary signal (binary input of the ECU or CAN) can be used to increase the minimum effective specified speed (and thus the idle speed) by an adjustable value. The specified speed is changed along two adjustable ramps (separately for speed increase with activated binary input and speed decrease with deactivation of the input):

Parameter No.	Function	Analog value
2.1060.147	Value of the increased speed	Speed value in rpm
2.1060.148	Gradient of the ramp for the speed increase after activation of the binary signal	rpm per s
2.1060.149	Gradient of the ramp for the speed decrease after activation of the binary signal	rpm per s

Specified speed limitation

The Protection module can be used to limit the specified speed to a maximum speed (e.g. if the max. coolant temperature is exceeded or a turbocharger speed sensor fails, further conditions are also possible):

Parameter No.	Function	Analog value
2.1060.430	Limited specified speed	Speed value in rpm

Example

The following function is to be programmed:

- In remote-normal operation, the speed setpoint is to be controlled via a CAN signal as an absolute value.
- In remote-emergency operation, the speed setpoint is to be effected via an absolute voltage at AI1.
- In local-normal operation, the speed setpoint is to be effected via an absolute voltage at AI1.
- In local-emergency operation, the speed setpoint is effected via Up/Down buttons at an operating panel (e.g. LOP).

It is CAN-configured, although a "15" is transferred for the specifications (i.e. use setting parameters). In local-emergency operation, the ramp function for speed change should start after 5 s.

The following settings must be made:

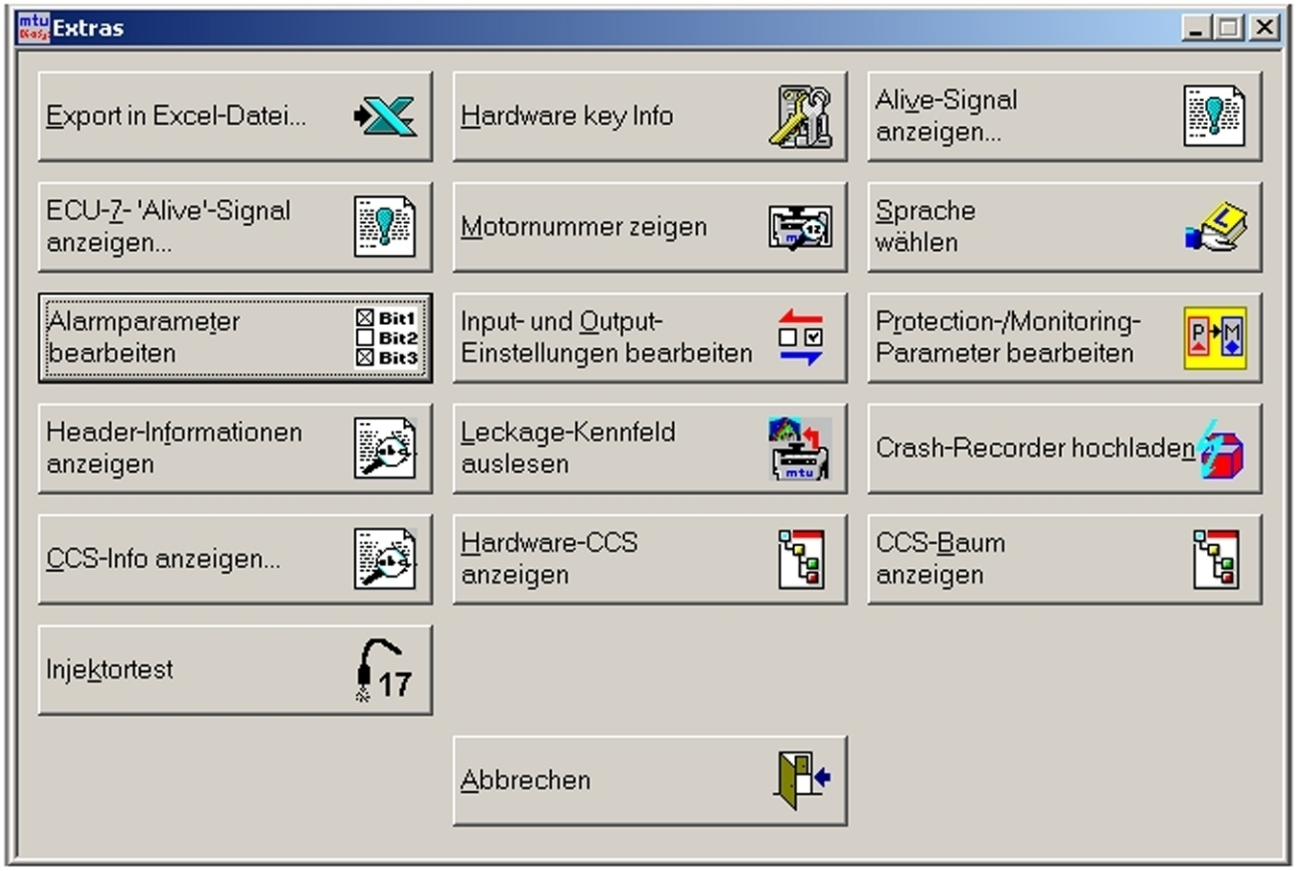
Parameter No.	Function of the parameter	Setting value
2.9901.200	Sensor type at AI1	16
2.9901.001	Activate current mode at AI1	False (no X)
2.0280.002	Use AI1 or AI2	0
2.1060.150	Local-normal operation specification source	3
2.1060.151	Local-emergency operation specification source	1
2.1060.152	Remote-normal operation specification source	0
2.1060.153	Remote-emergency operation specification source	3
2.1060.032	Time until start of ramp function	5

The values of the other parameters (e.g. for AI2) are not relevant.

5 Configurations of the function areas

5.1 Editing the input and output setting

Function area in the Diasys



The function area for setting the inputs and outputs of the ECU can be reached via the dialog system DiaSys® using the following the following menus:

- ECU-7
- ECU-7 editing the input and output settings

The window for this function area has four tabs:

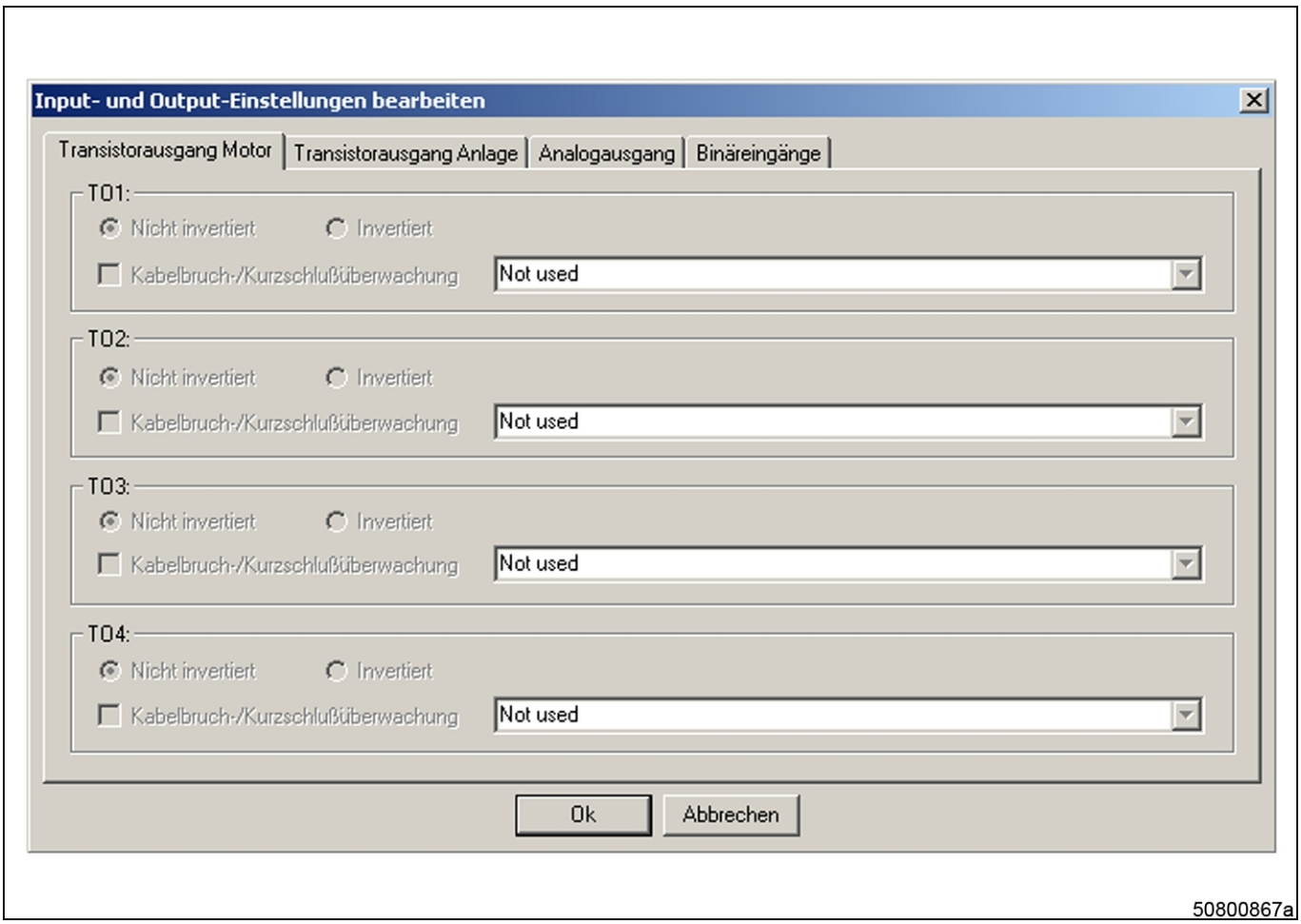
- Transistor outputs, engine
- Transistor outputs, plant
- Analog outputs
- Binary outputs

General information

To adapt the engine governor to the operating environment, the inputs and outputs on the plant side are programmable. It is not only possible to define which signal is applied to a certain input or output, but also the characteristics of the output.

Outputs on the engine side can not be changed, although they can be viewed.

Transistor outputs, engine

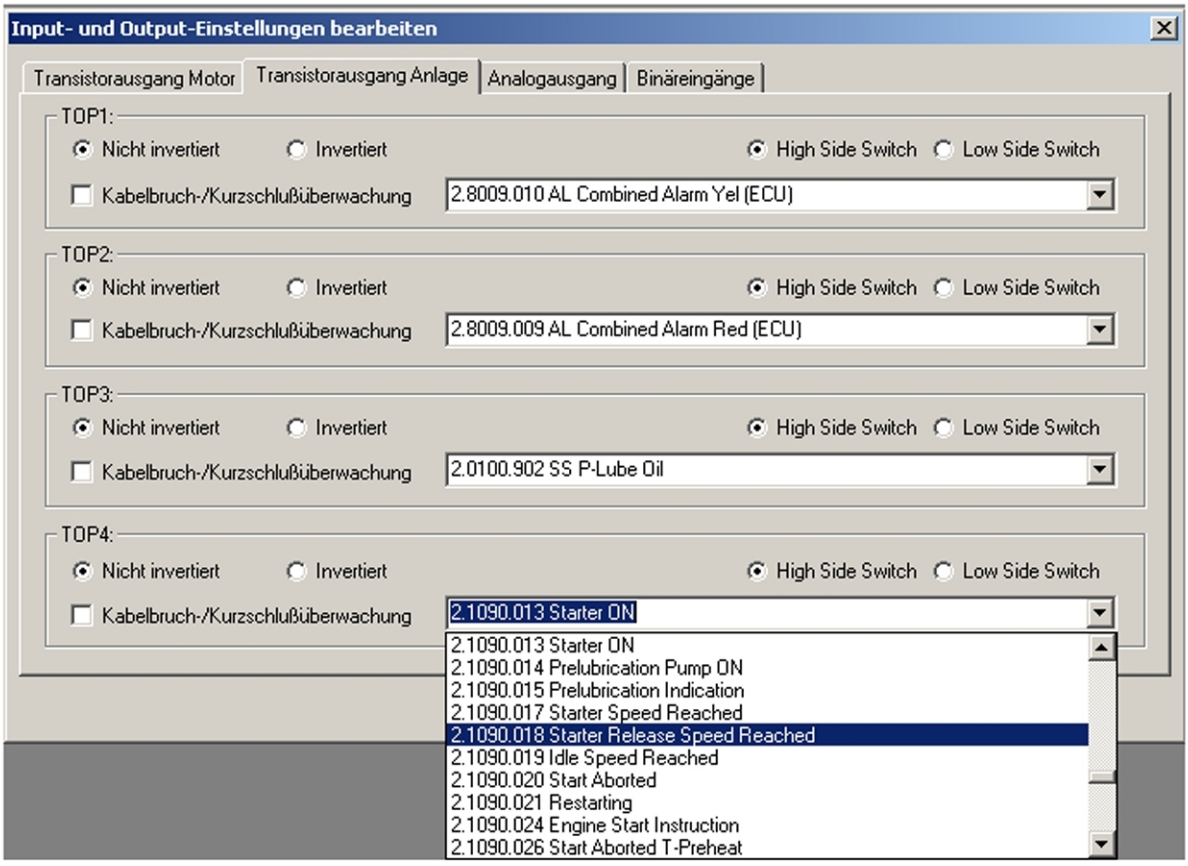


These settings can not be changed using the DiaSys®

The following settings are provided for the various application cases:

Channel	Application	ZKP No.	Designation
TO1	Marine		Valve, turbocharger 1
	Rail	Not used	Not used
	Genset	Not used	Not used
	C&I	Not used	Not used
TO2	Marine		Air transfer
	Rail	Not used	Not used
	Genset	Not used	Not used
	C&I	Not used	Not used
TO3	Marine		Valve, turbocharger 2
	Rail	Not used	Not used
	Genset	Not used	Not used
	C&I		Oil priming pump on
TO4	Marine		Valve, turbocharger 3
	Rail	Not used	Not used
	Genset	Not used	Not used
	C&I	Not used	Not used

Transistor outputs, plant



50800868a

Settings

The (binary) signal which is routed to an output, and how the output is to behave when the signal is active, is specified here.

IMPORTANT: A binary signal must be selected from the list as an output signal. Although analog signals can also be selected, they then result in an undefined status of the corresponding transistor output.

The following settings must be made:

- The signal to be output is specified in the pop-up window of the test line
- Inverter/non-inverted
  - Non-inverted: The output switches when the associated signal is active.
  - Inverted: The output switches when the associated signal is inactive.
- High Side Switch/Low Side Switch
  - High Side Switch:
    - When the associated output is inactive, it is highly resistive
    - When the associated output is active, it connects to +24 VDC
  - Low Side Switch:
    - When the associated output is inactive, it is highly resistive
    - When the associated output is active, it connects to GND
- Cable breakage/short-circuit monitoring

  In order that this function can be selected, there must be a resistor with 33 kΩ in the signal path.

  When the cable breakage/short-circuit monitoring system is switched on, the ECU checks whether this resistance is applied. If this is not the case, the alarm "Open Load" is issued for the corresponding channel.

  If, on the other hand, the output can not be connected because there is a short to ground or +24 V is present, the "Short Circuit" alarm is issued.

Example 1

A signal is to be selected that switches on the oil priming pump. The transistor output should connect to 24 V when the pump is to be activated. There is no cable breakage monitoring:

- 2.1090.014 Prelubrication Pump ON
- Non-inverted
- High Side Switch
- No "X" with cable breakage/short-circuit monitoring

Example 2

A signal is to be selected that indicates that the prelubrication is currently running. The transistor output should connect to ground when the lamp is to go on. There is no cable breakage monitoring (for detecting whether the lamp is defective):

- 2.1090.015 Prelubrication Indication
- Non-inverted
- Low Side Switch
- "X" with cable breakage/short-circuit monitoring

Example 3

A signal is to be selected that indicates start termination because preheat temperature is too low. The output should connect to ground when an external system is to detect that the starting procedure is running. If the starting procedure is terminated, the corresponding transistor output should become highly resistive and thus indicate the start termination. There is no cable breakage monitoring:

- 2.1090.026 Start Aborted T-Preheat
- Inverted
- Low Side Switch
- No "X" with cable breakage/short-circuit monitoring

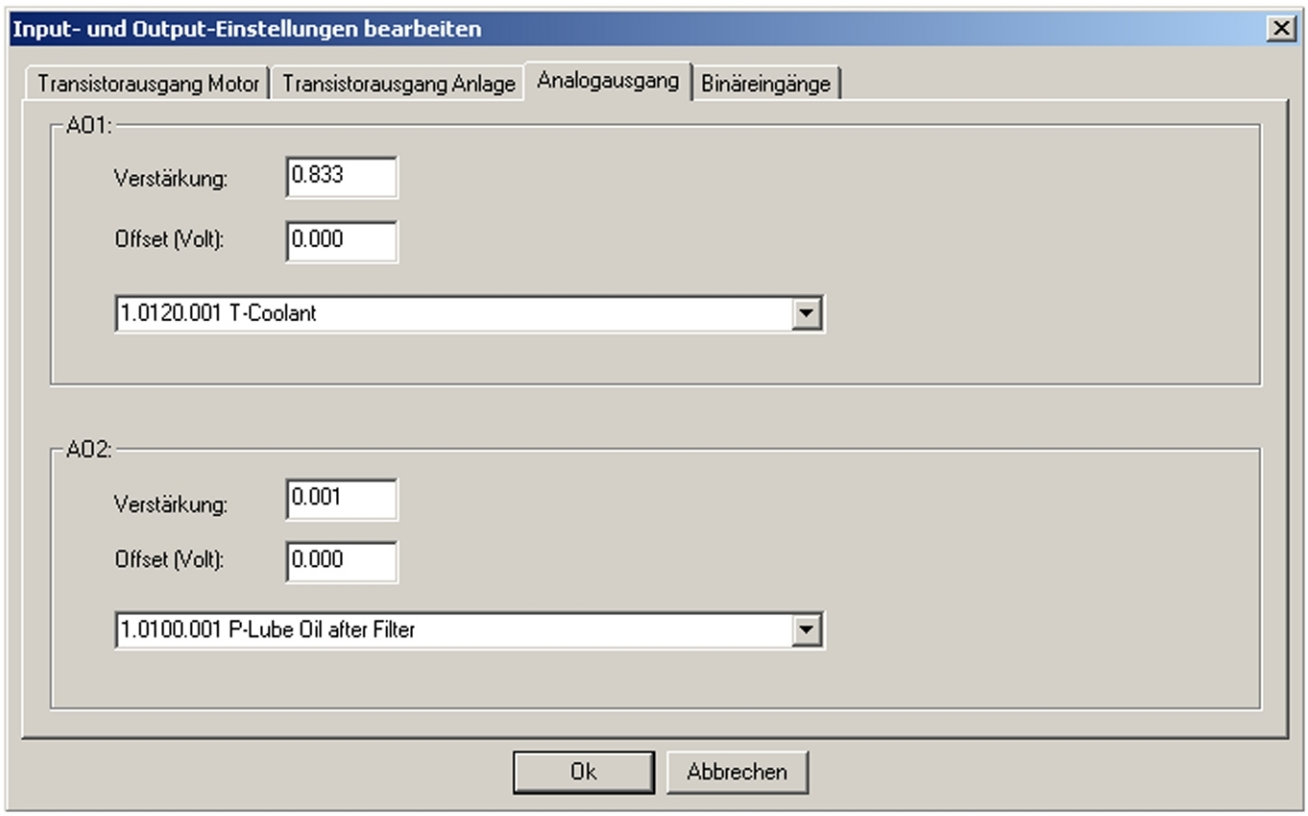
Default values

The following settings are provided for the various application cases:

Channel	Application	ZKP No.	Designation
TOP1	Marine	2.7001.007	ECU Emergency Stop
	Rail	2.8009.010	Yellow alarm
	Genset	2.8009.010	Yellow alarm
	C&I	2.8009.010	Yellow alarm
TOP2	Marine	2.7001.010	Automatic stop
	Rail	2.8009.009	Red alarm
	Genset	2.8009.009	Red alarm
	C&I	2.8009.009	Red alarm
TOP3	Marine	2.2500.050	Engine running
	Rail		N-gradient negative
	Genset	2.0100.902	Stop due to insufficient lube oil pressure
	C&I	2.7010.001	Engine cold
TOP4	Marine	2.1051.001	Speed in speed window
	Rail	2.1090.013	Starter on
	Genset	2.1090.013	Starter on, engine running or speed window
	C&I	2.1090.013	Starter on

The settings that are possible can be obtained from the table (→ Page 74).

Analog outputs



Settings

The (analog) signal which is routed to an output, and the range in which the output voltage of the corresponding analog output is to move, are specified here.

IMPORTANT: An analog signal must be selected from the list as an output signal. Although binary signals can also be selected, they then result in an undefined status of the corresponding transistor output.

The following settings must be made:

- The signal to be output is specified in the pop-up window of the test line.
- Amplification

  The factor used to amplify a read-in analog signal is specified here.
- Offset

  The voltage amount added to the read-in analog signal is specified here.

Example

A display instrument is to be connected that indicates a pressure from 0...10 bar (e.g. for the lube oil pressure downstream of the filter). The instrument indicates 0 bar at a voltage of one Volt. End-scale deflection is reached at 10 V. The corresponding sensor outputs 0 to 5 V for a pressure range of 0...10 bar (linear, 0 Volt at 0 bar and 5 V at 10 bar). The following settings must be made:

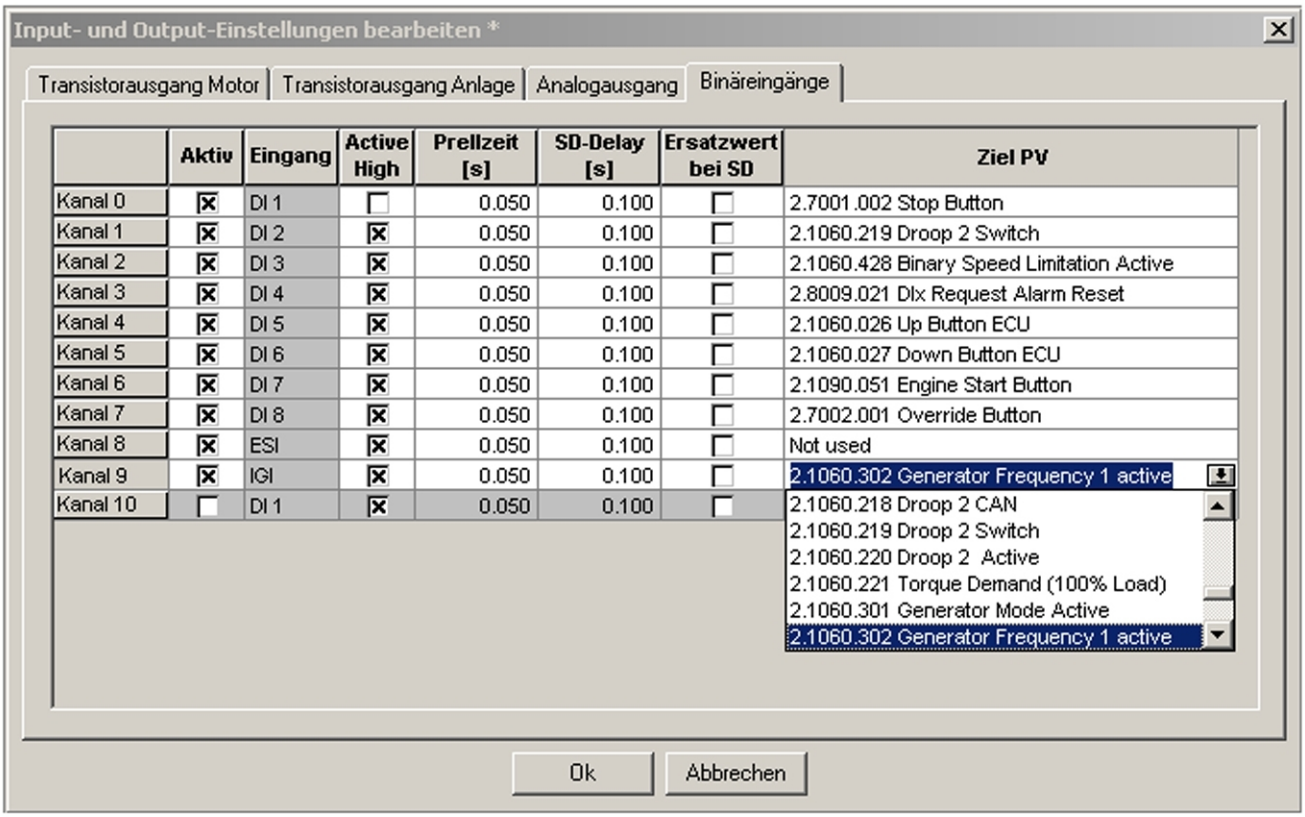
- 1.0100.001 P-Lube Oil after Filter
- Offset 1.000 V (output has 1 V at an input voltage 0 V)
- Factor 1.666 (end-scale deflection analog output reached at 10 V if input voltage 5 V + 1 V offset = 6 V; 10 V/6 V=1.666)

Default values

Channel	Application	ZKP No.	Designation
AO1	Marine	1.2500.044	Engine speed
	Rail	1.2500.044	Engine speed
	Genset	1.0120.001	Coolant temperature
	C&I	2.2700.080	Fan speed
AO1	Marine	2.1000.049	Torque
	Rail		Optimum Load Curve
	Genset	1.0100.001	Lube oil pressure after filter
	C&I		Optimum Load Curve

The settings that are possible can be obtained from the table (→ Page 74).

Binary outputs



Channel assignment

The ECU has 10 internal input channels. These input channels (channel 0 ... 10) are routed to the various physically existing inputs (DI 1 ... 8, ESI and IGI).

Via the fields in the right-hand column, a specific signal is then assigned with the input, the so-called "Target PV". After selection of a field, a pull-down window opens from which the desired value can be selected.

Default values

The following values are usually preassigned for the various applications:

ECU channel	Routed to	Application	ZKP No.	Designation
Channel 0	DI1	Marine	2.1001.010	ECU stop
		Rail	2.7001.002	Engine stop
		Genset	2.7001.002	Engine stop
		C&I	2.7001.002	Engine stop
Channel 1	DI2	Marine	2.2010.107	Cylinder cutout on
		Rail	2.2010.107	Cylinder cutout on
		Genset	2.1060.219	Switchover speed droop 2
		C&I	2.1060.221	Torque limitation
Channel 2	DI3	Marine		Increase idle speed
		Rail		Increase idle speed
		Genset	2.1060.428	Binary request speed limitation
		C&I		Increase idle speed
Channel 3	DI4	Marine	—	Not used
		Rail	—	Not used
		Genset	2.8009.021	DIx Request Alarm Reset
		C&I	2.8009.021	Alarm acknowledg-ment
Channel 4	DI5	Marine	2.1060.026	Speed increase button
		Rail		Wheel spin
		Genset	2.1060.026	Speed increase button
		C&I	2.0291.911	Activate engine protection auxiliary input

ECU channel	Routed to	Application	ZKP No.	Designation
Channel 5	DI6	Marine	2.1060.027	Speed decrease button
		Rail	2.1060.062	Speed switchover
		Genset	2.1060.027	Speed decrease button
		C&I	2.2700.062	Rockford fan, manual
Channel 6	DI7	Marine	2.0450.001	Coolant level
		Rail	2.1090.051	Start
		Genset	2.1090.051	Start
		C&I	2.1090.051	Start
Channel 7	DI8	Marine	2.1060.062	Switch over speed
		Rail	2.7002.001	Override
		Genset	2.7002.001	Override
		C&I	2.7002.001	Override
Channel 8	ESI	Marine	2.7001.007	Emergency stop
		Rail	Not used	Not used
		Genset	Not used	Not used
		C&I	Not used	Not used
Channel 9	IGI	Marine		+24 V fixed
		Rail	2.7001.007	Emergency stop
		Genset	2.7001.007	Emergency stop
		C&I	2.7001.007	Emergency stop
Channel 10	—	Marine	Not used	Not used
		Rail	Not used	Not used
		Genset	2.1090.001	Ignition input IGI active
		C&I	Not used	Not used

The settings that are possible can be obtained from the table (→ Page 74).

ZKP numbers that can be used for the various inputs and outputs

The ZKP numbers offered for selection in the drop-down menus of the individual lines are not filtered, i.e. when selecting a number (with the corresponding signal), you have to ensure that a "plausible" entry is made. For example, you have to avoid an analog signal being routed to a binary channel.

The following table specifies which ZKP numbers (with the corresponding signal) can be routed to the two output channel types AO and TOP and the input channel type DI.

ZKP No.	Designation	AO	TOP	DI
1.0100.001	Lube oil pressure after filter	√		
1.0100.015	First lower limit value for lube oil pressure (engine governor)	√		
1.0100.016	Second lower limit value for lube oil pressure (engine governor)	√		
1.0101.001	Coolant pressure	√		
1.0101.015	First lower limit value for coolant pressure	√		
1.0101.016	Second lower limit value for coolant pressure	√		
1.0102.001	Fuel pressure	√		
1.0102.015	First lower limit value for fuel pressure	√		
1.0102.016	Second lower limit value for fuel pressure	√		
1.0103.001	Charge air pressure	√		
1.0103.015	First lower limit value for charge air pressure	√		
1.0103.016	Second lower limit value for charge air pressure	√		
1.0104.001	Pressure on H.P. side (Common Rail)	√		
1.0104.015	First lower limit value for P-high pressure	√		
1.0104.017	First upper limit value for P-high pressure	√		
1.0105.001	Pressure on H.P. side (Common Rail) unfiltered	√		
1.0106.001	Crankcase pressure	√		
1.0106.016	First upper limit value for crankcase pressure	√		
1.0106.018	Second upper limit value for crankcase pressure	√		
1.0107.001	Intercooler coolant pressure	√		
1.0107.015	First lower limit value for intercooler coolant pressure	√		
1.0107.016	Second lower limit value for intercooler coolant pressure	√		
1.0108.001	Ambient air pressure	√		
1.0109.001	Lube oil pressure before filter	√		
1.0110.001	Pressure, auxiliary 1	√		
1.0110.015	First limit value for pressure, auxiliary 1	√		
1.0110.016	Second limit value for pressure, auxiliary 1	√		
1.0112.001	Lube oil pressure after filter, redundant	√		
1.0120.001	Coolant temperature	√		

ZKP No.	Designation	AO	TOP	DI
1.0120.017	First upper limit value for coolant temperature (engine governor)	√		
1.0120.018	Second upper limit value for coolant temperature (engine governor)	√		
1.0120.019	Third limit value for coolant temperature (engine governor)	√		
1.0120.020	Fourth limit value for coolant temperature (engine governor)	√		
1.0121.001	Charge air temperature	√		
1.0121.017	First upper limit value for charge air temperature	√		
1.0121.018	Second upper limit value for charge air temperature	√		
1.0122.001	Fuel temperature	√		
1.0122.017	First upper limit value for fuel temperature	√		
1.0122.018	Second upper limit value for fuel temperature	√		
1.0123.001	Intake air temperature	√		
1.0124.001	Intercooler coolant temperature	√		
1.0124.017	First upper limit value for intercooler coolant temperature	√		
1.0124.018	Second upper limit value for intercooler coolant temperature	√		
1.0125.001	Lube oil temperature	√		
1.0125.017	First upper limit value for lube oil temperature	√		
1.0125.018	Second upper limit value for lube oil temperature	√		
1.0126.001	Exhaust temperature A-side	√		
1.0126.017	First upper limit value for exhaust manifold temperature A-side	√		
1.0126.018	Second upper limit value for exhaust manifold temperature A-side	√		
1.0127.001	Exhaust temperature B-side	√		
1.0127.017	First upper limit value for exhaust manifold temperature B-side	√		
1.0127.018	Second upper limit value for exhaust manifold temperature B-side	√		
1.0128.001	Air transfer temperature	√		
1.0128.017	First upper limit value for air transfer temperature	√		
1.0128.018	Second upper limit value for air transfer temperature	√		
1.0129.001	Coolant temperature, redundant	√		
1.0130.001	Temperature, auxiliary 1	√		
1.0130.015	First limit value for temperature, auxiliary 1	√		
1.0130.016	Second limit value for temperature, auxiliary 1	√		

ZKP No.	Designation	AO	TOP	DI
1.0132.001	Engine governor temperature	√		
1.0132.017	First upper limit value for T-engine governor	√		
1.0138.001	PWM 2 actual current	√		
1.0139.001	Intake restrictor actual current	√		
1.0141.001	Actual voltage final stage	√		
1.0141.015	First lower limit value for UPDU injector voltage	√		
1.0141.016	Second lower limit value for UPDU injector voltage	√		
1.0141.017	First upper limit value for UPDU injector voltage	√		
1.0141.018	Second upper limit value for UPDU injector voltage	√		
1.0151.001	Leak-off fuel level sensor	√		
1.0151.015	First upper limit value for fuel level	√		
1.0152.001	Coolant level	√		
1.0152.015	First upper limit value for coolant level	√		
1.0153.001	Intercooler coolant level	√		
1.0153.015	First upper limit value for intercooler coolant level	√		
1.0154.001	Oil filter differential pressure	√		
1.0154.017	First limit value for lube oil filter differential pressure, analog	√		
1.0154.018	Second limit value for lube oil filter differential pressure, analog	√		
1.0155.001	Oil filter differential pressure switch	√		
1.0155.015	Limit value for oil filter differential pressure switch	√		
1.0156.001	Water level in fuel prefilter	√		
1.0156.015	First upper limit value for water level in fuel prefilter	√		
1.0160.001	Auxiliary 1	√		
1.0160.015	First limit value, auxiliary 1	√		
1.0160.016	Second limit value, auxiliary 1	√		
1.0600.500	Exhaust temperature deviation EMU HI	√		
1.0600.501	Exhaust temperature deviation EMU LO	√		
1.0600.502	Coolant temperature deviation EMU HI	√		
1.0600.900	Limit value for EMU temperature	√		
1.1005.010	Delay after start active		√	

ZKP No.	Designation	AO	TOP	DI
1.1005.011	Delay after switch-on active		√	
1.1005.012	Engine power	√		
1.1005.021	Rated power	√		
1.1005.023	Engine optimized	√		
1.1020.200	Specified torque 0-120%	√		
1.1020.201	Upper limit value for torque 0-120%	√		
1.1020.202	Current torque in relation to DBR	√		
1.1020.500	Cylinder synchronous counter	√		
1.1020.501	Counter synchronization procedure	√		
1.1020.502	Result of synchronization procedure	√		
1.1020.503	Synchronization value fault	√		
1.1020.504	Start of pre-injection	√		
1.1020.505	Duration of pre-injection (time)	√		
1.1020.506	Start of main injection	√		
1.1020.507	Duration of main injection (time)	√		
1.1020.508	Start of post injection	√		
1.1020.509	Duration of post injection (time)	√		
1.1020.510	Duration of boost current	√		
1.1020.511	Rapid de-energization duration	√		
1.1020.513	Voltage correction for injection	√		
1.1020.514	Injection active		√	
1.1020.515	Enable injection with cylinder cutout		√	
1.1020.516	Synchronization phase rotated		√	
1.1020.517	Defective crankshaft speed sensor		√	
1.1020.518	Defective camshaft speed sensor		√	
1.1020.519	Injection data input fault status	√		
1.1020.520	Injector time of flight cylinder A1	√		
1.1020.521	Injector time of flight cylinder A2	√		
1.1020.522	Injector time of flight cylinder A3	√		
1.1020.523	Injector time of flight cylinder A4	√		

ZKP No.	Designation	AO	TOP	DI
1.1020.524	Injector time of flight cylinder A5	√		
1.1020.525	Injector time of flight cylinder A6	√		
1.1020.526	Injector time of flight cylinder A7	√		
1.1020.527	Injector time of flight cylinder A8	√		
1.1020.528	Injector time of flight cylinder A9	√		
1.1020.529	Injector time of flight cylinder A10	√		
1.1020.530	Injector time of flight cylinder B1	√		
1.1020.531	Injector time of flight cylinder B2	√		
1.1020.532	Injector time of flight cylinder B3	√		
1.1020.533	Injector time of flight cylinder B4	√		
1.1020.534	Injector time of flight cylinder B5	√		
1.1020.535	Injector time of flight cylinder B6	√		
1.1020.536	Injector time of flight cylinder B7	√		
1.1020.537	Injector time of flight cylinder B8	√		
1.1020.538	Injector time of flight cylinder B9	√		
1.1020.539	Injector time of flight cylinder B10	√		
1.1020.540	Injector time of flight too low	√		
1.1020.541	Injector time of flight too high	√		
1.1020.542	Final stage fault category low	√		
1.1020.543	Final stage fault category high	√		
1.1020.544	Final stage fault category critical	√		
1.1020.545	Duration of main injection (angle)	√		
1.1020.546	Minimum valid time of flight value	√		
1.1020.547	Maximum valid time of flight value	√		
1.1020.548	Inexact start of injection	√		
1.1020.549	Misfiring	√		
1.1020.550	Undefined injection	√		
1.1020.551	Inexact start of injection, limit value	√		
1.1020.552	Misfiring, limit value	√		
1.1020.553	Undef. injection, limit value	√		

ZKP No.	Designation	AO	TOP	DI
1.1020.600	Pre-injection fuel mass	√		
1.1020.601	Main injection fuel mass	√		
1.1020.602	Post injection fuel mass	√		
1.1020.603	Fuel volume standard temp. (total)	√		
1.1020.604	Correction volume, overall injection	√		
1.1020.605	Correction volume, pre-injection	√		
1.1020.606	Correction volume, main injection	√		
1.1020.607	Correction volume, post injection	√		
1.1021.031	Injector test status	√		
1.1021.032	Injector test filled injection quantity	√		
1.1021.041	Injector test is active		√	
1.1021.042	Injector test interruption by operator		√	
1.1021.043	Injector test enable governor		√	
1.1021.048	Injector test interruption due to speed setpoint		√	
1.1021.049	Injector test enable speed setpoint		√	
1.1030.004	Virtual temperature post injection correction	√		
1.1030.008	Virtual temperature start of injection, warm-up correction	√		
1.1030.012	Virtual temperature friction torque correction	√		
1.1030.016	Virtual temperature with cylinder cutout	√		
1.1030.020	Virtual measured value output PV	√		
1.1075.040	Current starting torque	√		
1.1075.041	DBR torque at rated speed	√		
1.1075.042	Torque limitation value LDA	√		
1.1075.043	Torque limitation value Protection	√		
1.1075.044	Active Protection module	√		
1.1075.045	DBR torque from curve	√		
1.1075.046	DBR torque corrected	√		
1.1075.050	Torque limitation correction (ambient temperature)	√		
1.1075.051	Torque limitation correction (sea level)	√		
1.1075.052	Torque limitation correction (air volume)	√		

ZKP No.	Designation	AO	TOP	DI
1.1075.054	MCR torque at rated speed	√		
1.1075.055	MCR torque from curve	√		
1.1075.056	MCR torque corrected	√		
1.1075.061	Charge air mass	√		
1.1075.062	Fuel mass LDA	√		
1.1075.065	Number of torque limitation	√		
1.1080.001	Maximum torque DBR/MCR	√		
1.1085.010	MCR/DBR reduction active		√	
1.1085.011	MCR exceeded		√	
1.1085.012	Status of DBR/MCR function	√		
1.1085.013	Counter for DBR/MCR function	√		
1.1085.030	Alarm MCR exceeded (CAN)		√	
1.1100.501	Start of injection correction, height	√		
1.1100.502	Start of injection correction, unsteady	√		
1.1100.503	Start of injection, standard	√		
1.1100.504	Start of injection, hot engine	√		
1.1100.505	Start of injection, cold engine	√		
1.1100.506	Standard air mass	√		
1.1100.507	Air mass ratio trans./standard	√		
1.1100.508	Pre-injection pause duration	√		
1.1100.509	Post injection pause injection	√		
1.1100.510	Filter specified torque of standardized start of injection characteristics map	√		
1.1100.512	Air mass ratio trans./standard filtered	√		
1.1100.514	Relative specified torque	√		
1.1200.501	Corrected fuel mass (total)	√		
1.1200.502	Specified torque friction-compensated	√		
1.1200.503	Standardized fuel mass efficiency	√		
1.1200.504	Specific fuel consumption	√		
1.1200.505	Corrected standard fuel mass	√		
1.1200.506	Frictional torque correction during warm-up	√		

ZKP No.	Designation	AO	TOP	DI
1.1200.507	Unsteady efficiency correction	√		
1.1200.508	Current first y-value effective characteristics map	√		
1.1200.509	Delta start of injection efficiency correction	√		
1.1300.100	Specified high pressure (characteristics map)	√		
1.1300.101	Air-dependent correction, specified high pressure	√		
1.1300.102	Specified high pressure before filter	√		
1.1300.103	Specified high pressure	√		
1.1300.104	High pressure control deviation	√		
1.1300.105	Number of active cylinders	√		
1.1300.106	Filtered specified quantity (area dist. var.)	√		
1.1300.107	Filtered specified quantity (area of t1 pump)	√		
1.1300.108	Fuel consumption	√		
1.1300.109	I-component, high-pressure controller	√		
1.1300.110	Current leak, leak characteristics map	√		
1.1300.111	PI(DT1)-component, high-pressure controller	√		
1.1300.112	Specified volume flow	√		
1.1300.113	Maximum specified volume flow	√		
1.1300.116	PWM duty cycle high-pressure controller	√		
1.1300.117	kpDyn high-pressure controller	√		
1.1300.118	tv-volume flow	√		
1.1300.119	High-pressure gradient during engine start	√		
1.1300.120	High-pressure gradient during engine stop	√		
1.1300.121	High-pressure emergency operation active		√	
1.1300.122	High-pressure emergency operation flash program active		√	
1.1300.123	FLASH faulty		√	
1.1300.124	Control mode, high-pressure controller		√	
1.1300.125	High-pressure emergency operation, filtered specified quantity	√		
1.1300.126	PWM period duration	√		
1.1300.128	Specified coil current	√		
1.1300.129	Coil current governing deviation	√		

ZKP No.	Designation	AO	TOP	DI
1.1300.130	I-component, current controller	√		
1.1300.131	Specified coil voltage (pilot control)	√		
1.1300.132	Specified coil voltage (current controller)	√		
1.1300.133	Specified coil voltage (total)	√		
1.1300.134	Coil resistance	√		
1.1300.135	Temperature PWM specified status	√		
1.2500.026	Idle speed	√		
1.2500.030	Engine stationary (crankshaft)		√	
1.2500.031	Engine stationary		√	
1.2500.032	Engine stationary (camshaft)		√	
1.2500.033	Emergency operation speed recording		√	
1.2500.034	Crankshaft engine speed	√		
1.2500.035	Inj. speed, crankshaft	√		
1.2500.036	Test speed 1 crankshaft	√		
1.2500.037	Test speed 2 crankshaft	√		
1.2500.039	Engine speed, camshaft	√		
1.2500.040	Inj. speed, camshaft	√		
1.2500.041	Test speed 1 camshaft	√		
1.2500.044	Engine speed (governor)	√		
1.2500.045	Result. inj. speed	√		
1.2500.050	Engine running		√	
1.2500.051	Engine in starting phase		√	
1.2510.001	Current engine overspeed	√		
1.2510.002	Engine overspeed limit	√		
1.3000.012	Cylinder cutout active		√	
1.3000.013	Active cylinder A-bank	√		
1.3000.014	Active cylinder B-bank	√		
1.3000.017	Cylinder cutout encoded	√		
1.3010.001	Exhaust turbocharger 1 speed	√		
1.3010.002	Exhaust turbocharger 2 speed	√		

ZKP No.	Designation	AO	TOP	DI
1.3010.003	Exhaust turbocharger 2 On		√	
1.3010.004	Exhaust turbocharger 3 On		√	
1.3010.005	Air transfer On		√	
1.3010.019	First upper limit value for exhaust turbocharger 2 speed	√		
1.3010.020	First upper limit value for exhaust turbocharger 1 speed	√		
1.3010.024	Second upper limit value for exhaust turbocharger 2 speed	√		
1.3010.025	Second upper limit value for exhaust turbocharger 1 speed	√		
1.3010.026	Exhaust turbocharger 2 speed switching limit	√		
1.3010.027	Exhaust turbocharger 3 speed switching limit	√		
1.3010.030	Turbocharger control status	√		
1.3010.031	Number of active turbochargers	√		
1.8000.003	Alarm timing cylinder A1		√	
1.8000.004	Alarm wiring cylinder A1		√	
1.8000.005	Alarm interruption cylinder A1		√	
1.8000.006	Alarm timing cylinder A2		√	
1.8000.007	Alarm wiring cylinder A2		√	
1.8000.008	Alarm interruption cylinder A2		√	
1.8000.009	Alarm timing cylinder A3		√	
1.8000.010	Alarm wiring cylinder A3		√	
1.8000.011	Alarm interruption cylinder A3		√	
1.8000.012	Alarm timing cylinder A4		√	
1.8000.013	Alarm wiring cylinder A4		√	
1.8000.014	Alarm interruption cylinder A4		√	
1.8000.015	Alarm timing cylinder A5		√	
1.8000.016	Alarm wiring cylinder A5		√	
1.8000.017	Alarm interruption cylinder A5		√	
1.8000.018	Alarm timing cylinder A6		√	
1.8000.019	Alarm wiring cylinder A6		√	
1.8000.020	Alarm interruption cylinder A6		√	
1.8000.021	Alarm timing cylinder A7		√	

ZKP No.	Designation	AO	TOP	DI
1.8000.022	Alarm wiring cylinder A7		√	
1.8000.023	Alarm interruption cylinder A7		√	
1.8000.024	Alarm timing cylinder A8		√	
1.8000.025	Alarm wiring cylinder A8		√	
1.8000.026	Alarm interruption cylinder A8		√	
1.8000.027	Alarm timing cylinder A9		√	
1.8000.028	Alarm wiring cylinder A9		√	
1.8000.029	Alarm interruption cylinder A9		√	
1.8000.030	Alarm timing cylinder A10		√	
1.8000.031	Alarm wiring cylinder A10		√	
1.8000.032	Alarm interruption cylinder A10		√	
1.8000.033	Alarm injector end stage low		√	
1.8000.036	Alarm timing cylinder B1		√	
1.8000.037	Alarm wiring cylinder B1		√	
1.8000.038	Alarm interruption cylinder B1		√	
1.8000.039	Alarm timing cylinder B2		√	
1.8000.040	Alarm wiring cylinder B2		√	
1.8000.041	Alarm interruption cylinder B2		√	
1.8000.042	Alarm timing cylinder B3		√	
1.8000.043	Alarm wiring cylinder B3		√	
1.8000.044	Alarm interruption cylinder B3		√	
1.8000.045	Alarm timing cylinder B4		√	
1.8000.046	Alarm wiring cylinder B4		√	
1.8000.047	Alarm interruption cylinder B4		√	
1.8000.048	Alarm timing cylinder B5		√	
1.8000.049	Alarm wiring cylinder B5		√	
1.8000.050	Alarm interruption cylinder B5		√	
1.8000.051	Alarm timing cylinder B6		√	
1.8000.052	Alarm wiring cylinder B6		√	
1.8000.053	Alarm interruption cylinder B6		√	

ZKP No.	Designation	AO	TOP	DI
1.8000.054	Alarm timing cylinder B7		√	
1.8000.055	Alarm wiring cylinder B7		√	
1.8000.056	Alarm interruption cylinder B7		√	
1.8000.057	Alarm timing cylinder B8		√	
1.8000.058	Alarm wiring cylinder B8		√	
1.8000.059	Alarm interruption cylinder B8		√	
1.8000.060	Alarm timing cylinder B9		√	
1.8000.061	Alarm wiring cylinder B9		√	
1.8000.062	Alarm interruption cylinder B9		√	
1.8000.063	Alarm timing cylinder B10		√	
1.8000.064	Alarm wiring cylinder B10		√	
1.8000.065	Alarm interruption cylinder B10		√	
1.8000.066	Alarm injector end stage high		√	
1.8000.069	Alarm stop injector end stage		√	
1.8000.070	Alarm stop solenoid valve-wiring ground		√	
1.8000.071	Alarm stop sensor defective, camshaft		√	
1.8000.072	Defective crankshaft sensor		√	
1.8000.073	Defective camshaft sensor		√	
1.8000.078	Limit value exceeded, exhaust turbocharger idle speed too high		√	
1.8000.079	Alarm exhaust turbocharger 2 cut-in error		√	
1.8000.080	Alarm exhaust turbocharger synchronous running deviation		√	
1.8000.081	Alarm system leak		√	
1.8000.082	Defective lube oil pressure sensor		√	
1.8000.083	Defective coolant pressure sensor		√	
1.8000.084	Defective fuel pressure sensor		√	
1.8000.085	Defective charge air pressure sensor		√	
1.8000.086	Defective pressure sensor on H.P. side (Common Rail)		√	
1.8000.087	Defective crankcase pressure sensor		√	
1.8000.088	Defective intercooler coolant pressure sensor		√	
1.8000.089	Defective coolant temperature sensor		√	

ZKP No.	Designation	AO	TOP	DI
1.8000.090	Defective charge air temperature sensor		√	
1.8000.091	Defective fuel temperature sensor		√	
1.8000.092	Defective intake air temperature sensor		√	
1.8000.093	Defective intercooler coolant temperature sensor		√	
1.8000.094	Defective lube oil temperature sensor		√	
1.8000.095	Defective exhaust temperature sensor, A-side		√	
1.8000.096	Defective exhaust temperature sensor, B-side		√	
1.8000.097	Defective sensor U-PDU		√	
1.8000.098	Defective intake restrictor sensor		√	
1.8000.099	Defective ambient air pressure sensor		√	
1.8000.102	Defective sensor air transfer temperature		√	
1.8000.103	Defective intercooler coolant level sensor		√	
1.8000.104	Defective leak-off fuel level sensor		√	
1.8000.105	Defective coolant level sensor		√	
1.8000.106	Defective lube oil differential pressure sensor		√	
1.8000.107	Defective sensor for auxiliary 1 temperature		√	
1.8000.109	Defective engine governor temperature sensor		√	
1.8000.110	Defective sensor for auxiliary 1		√	
1.8000.112	Defective sensor for auxiliary 1 pressure		√	
1.8000.114	Measured value deviation between first and second lube oil pressure sensor		√	
1.8000.115	Measured value deviation between first and second coolant temperature sensor		√	
1.8000.153	Defective sensor for turbocharger speed 1		√	
1.8000.154	Defective sensor for turbocharger speed 2		√	
1.8000.155	Defective sensor for oil pressure before filter		√	
1.8000.156	Defective oil pressure sensor (redundant sensor)		√	
1.8000.157	Defective coolant temperature sensor (redundant sensor)		√	
1.8000.158	Alarm operating hours counter fault		√	
1.8000.159	Alarm consumption counter fault		√	
1.8000.160	Alarm wiring TO 1		√	

ZKP No.	Designation	AO	TOP	DI
1.8000.161	Alarm wiring TO 2		√	
1.8000.162	Alarm wiring TO 3		√	
1.8000.163	Alarm wiring TO 4		√	
1.8000.168	Alarm MCR exceeded		√	
1.8000.169	Alarm wiring PWM_CM2		√	
1.8000.170	Defective water level sensor in fuel prefilter		√	
1.8009.001	Engine governor operating hours in seconds, total	√		
1.8009.002	Engine governor operating hours [hours]	√		
1.8009.003	Engine governor operating hours [minutes]	√		
1.8009.004	Engine governor operating hours [seconds]	√		
1.8009.005	Idle mode trip seconds, total			
1.8009.011	Current fuel consumption	√		
1.8009.016	Fuel consumption, total	√		
1.8009.017	Travel distance fuel consumption	√		
1.8009.020	Mean travel distance consumption	√		
1.8009.027	Travel time	√		
1.8009.028	CAN reset travel distance consumption		√	
1.8009.030	Engine governor active fault	√		
1.8009.040	Fault code FLASH	√		
1.8009.041	Old FLASH	√		
1.8010.005	Crash recorder trigger	√		
1.8010.008	Alarm crash recorder initialization error		√	
1.8010.010	Alarm CR engine shutdown trigger		√	
1.9905.004	Test value, analog, raw value, channel [m]	√		
1.9905.005	Test value, finite state machine [m]	√		
1.9905.006	Test value, failure counter [m]	√		
1.9905.007	Test value, time counter high	√		
1.9905.008	Test value, time counter low	√		
1.9905.009	Test value, filter input value [n]	√		
1.9905.010	Test value, filter filling time [n]	√		

ZKP No.	Designation	AO	TOP	DI
1.9905.011	Test value, raw value filtered [n]	√		
1.9905.012	Test value, output value [n]	√		
1.9905.013	Test value, finite state machine [n]	√		
1.9906.005	Level sensor 1 self-test active		√	
1.9906.006	Level sensor 2 self-test active		√	
1.9906.007	Level sensor 3 self-test active		√	
2.0100.901	Lube oil pressure limit value undershot		√	
2.0100.902	Safety system responded: Lube oil pressure		√	
2.0101.901	Coolant pressure limit value undershot		√	
2.0101.902	Safety system responded: Coolant pressure		√	
2.0102.901	Fuel pressure limit value undershot		√	
2.0102.902	Safety system responded: Fuel pressure		√	
2.0103.911	Charge air pressure limit value exceeded		√	
2.0103.912	Safety system responded: Charge air pressure		√	
2.0104.901	Fuel pressure (Common Rail) limit value undershot		√	
2.0104.911	Fuel pressure (Common Rail) limit value exceeded		√	
2.0106.911	Crankcase pressure limit value exceeded		√	
2.0106.912	Safety system responded: Crankcase pressure		√	
2.0107.901	Intercooler coolant pressure limit value undershot		√	
2.0107.902	Safety system responded: Intercooler coolant pressure		√	
2.0110.901	Alarm first limit value P-auxiliary 1		√	
2.0110.911	Alarm second limit value P-auxiliary 1		√	
2.0112.901	Lube oil pressure limit value undershot (redundant sensor)		√	
2.0112.902	Safety system responded: Lube oil pressure (redundant sensor)		√	
2.0120.911	Coolant temperature limit value exceeded		√	
2.0120.912	Safety system responded: Coolant temperature second limit value		√	
2.0120.913	Safety system responded: Coolant temperature third limit value		√	
2.0120.914	Safety system responded: Coolant temperature fourth limit value		√	
2.0121.911	Charge air temperature limit value exceeded		√	
2.0121.912	Safety system responded: Charge air temperature		√	

ZKP No.	Designation	AO	TOP	DI
2.0122.911	Fuel temperature limit value exceeded		√	
2.0122.912	Safety system responded: Fuel temperature		√	
2.0124.911	Intercooler coolant temperature limit value exceeded		√	
2.0124.912	Safety system responded: Intercooler coolant temperature		√	
2.0125.911	Lube oil temperature limit value exceeded		√	
2.0125.912	Safety system responded: Lube oil temperature		√	
2.0126.911	Exhaust temperature A-side limit value exceeded		√	
2.0126.912	Safety system responded: Exhaust temperature A-side		√	
2.0127.911	Exhaust temperature B-side limit value exceeded		√	
2.0127.912	Safety system responded: Exhaust temperature B-side		√	
2.0128.911	Limit value exceeded air transfer temperature	√		
2.0128.912	Safety system responded: Air transfer temperature	√		
2.0129.911	Coolant temperature (redundant sensor) limit value exceeded		√	
2.0129.912	Safety system responded: Coolant temperature (redundant sensor)		√	
2.0130.901	Alarm first limit value T-auxiliary 1		√	
2.0130.902	Alarm second limit value T-auxiliary 1		√	
2.0132.911	T-engine governor limit value exceeded		√	
2.0140.001	Engine governor supply voltage	√		
2.0140.015	Second lower limit value for engine governor supply voltage	√		
2.0140.016	First lower limit value for engine governor supply voltage	√		
2.0140.017	First upper limit value for engine governor supply voltage	√		
2.0140.018	Second upper limit value for engine governor supply voltage	√		
2.0140.901	Engine governor supply voltage limit value undershot		√	
2.0140.902	Engine governor supply voltage second limit value undershot		√	
2.0140.911	Engine governor supply voltage limit value exceeded		√	
2.0140.912	Engine governor supply voltage second limit value exceeded		√	
2.0141.901	Limit value undershot U-PDU		√	
2.0141.902	Second limit value undershot U-PDU		√	
2.0141.911	Limit value exceeded U-PDU		√	
2.0141.912	Second limit value exceeded U-PDU		√	

ZKP No.	Designation	AO	TOP	DI
2.0151.911	Leak-off fuel level limit value exceeded		√	
2.0152.901	Coolant level limit value undershot		√	
2.0152.902	Safety system responded: Coolant level		√	
2.0153.901	Intercooler coolant level limit value undershot	√		
2.0154.911	Lube oil differential pressure limit value exceeded		√	
2.0154.912	Safety system responded: Lube oil differential pressure		√	
2.0156.911	Water level in fuel prefilter limit value exceeded		√	
2.0160.901	Alarm first limit value auxiliary 1		√	
2.0160.902	Alarm second limit value auxiliary 1		√	
2.0280.001	Engine governor speed setpoint	√		
2.0283.001	Load signal %	√		
2.0286.001	Frequency-speed input	√		
2.0287.001	Filling signal as a percentage	√		
2.0288.001	Generator voltage	√		
2.0289.001	Generator power	√		
2.0290.001	Auxiliary 1 plant	√		
2.0290.115	Auxiliary 1 plant first limit value	√		
2.0290.116	Auxiliary 1 plant second limit value	√		
2.0291.001	Plant-side engine protection		√	√
2.0291.015	Plant-side engine protection limit	√		
2.0291.911	Alarm external engine protection		√	√
2.0305.129	Limit stop SD	√		
2.0450.001	Coolant level binary input	√		
2.0450.015	Limit, coolant level, binary	√		
2.0500.175	CAN FCB carrier	√		
2.0500.180	Alarm CAN1 node failure		√	
2.0500.181	Alarm CAN1 node failure		√	
2.0500.182	Alarm CAN incorrect parameterization		√	
2.0500.183	Alarm CAN no PU data		√	
2.0500.184	Alarm CAN PU data flash error		√	

ZKP No.	Designation	AO	TOP	DI
2.0500.186	Alarm CAN1 bus Off		√	
2.0500.187	Alarm CAN1 error passive		√	
2.0500.188	Alarm CAN2 bus Off		√	
2.0500.189	Alarm CAN2 error passive		√	
2.0500.190	Alarm EMU parameter not supported		√	
2.0500.201	CAN PU data initial. status	√		
2.0500.202	CAN1 monitored nodes	√		
2.0500.203	CAN1 failed nodes	√		
2.0500.204	CAN2 monitored nodes	√		
2.0500.205	CAN2 failed nodes	√		
2.0500.206	CAN PU data module version	√		
2.0500.207	CAN transmit basic ID	√		
2.0500.208	CAN parameter 2.0500.001 OK		√	
2.0500.209	CAN parameter 2.0500.004 OK		√	
2.0500.210	CAN PCS-5 active bus	√		
2.0500.211	CAN status EMU data handling	√		
2.0500.212	CAN ECU type No.	√		
2.0500.213	CAN number of changed EMU-PRs	√		
2.0500.214	CAN EMU PR set version	√		
2.0500.215	CAN GSW PPS to EMU		√	
2.0500.216	CAN PU data PPS to EMU		√	
2.0500.300	CAN specification node monitoring	√		
2.0500.900	CAN Test 1	√		
2.0500.901	CAN Test 2	√		
2.0500.902	CAN Test 3	√		
2.0500.903	CAN Test 4	√		
2.0500.904	CAN Test 5	√		
2.0555.002	Alarm, call MTU Field Service		√	
2.0555.004	Alarm configuration changed		√	
2.1000.040	Torque limitation active		√	

ZKP No.	Designation	AO	TOP	DI
2.1000.041	Specified speed (speed governor)	√		
2.1000.042	Speed control deviation	√		
2.1000.043	Speed governor (kpStat)	√		
2.1000.044	Speed governor (kpDyn)	√		
2.1000.045	Speed governor (tv)	√		
2.1000.046	Governor I-component	√		
2.1000.047	Speed governor PI-component	√		
2.1000.048	Maximum specified torque	√		
2.1000.049	Specified torque	√		
2.1000.050	CAN load signal input variable	√		
2.1000.051	CAN load signal compensated	√		
2.1000.053	CAN torque signal	√		
2.1000.054	Stationary load signal	√		
2.1000.055	Dynamic load signal	√		
2.1000.056	Resulting load signal	√		
2.1000.061	Temporary torque specification function active		√	
2.1000.062	Temporary torque specification status	√		
2.1000.063	CAN control parameter switchover	√		
2.1010.025	I-component default value, speed governor	√		
2.1010.026	PI-component default value, speed governor	√		
2.1010.027	Idle/maximum-speed governor mode	√		
2.1010.028	Filling signal in Nm	√		
2.1010.029	Speed governor specified torque	√		
2.1010.030	Idle governor filtered specified torque	√		
2.1010.031	Maximum-speed governor filtered specified torque	√		
2.1010.032	Current speed gradient	√		
2.1010.033	Filtered speed gradient	√		
2.1010.046	Idle/maximum-speed governor: Effective idle speed	√		
2.1010.047	Idle/maximum-speed governor: Effective maximum speed	√		
2.1010.048	Idle/maximum-speed governor: Minimum speed	√		

ZKP No.	Designation	AO	TOP	DI
2.1010.049	Idle/maximum-speed governor: Maximum speed	√		
2.1010.050	Target deceleration active		√	
2.1050.018	CAN request test binary inputs		√	
2.1050.019	CAN Test BinOut active		√	
2.1050.020	DIx request test binary outputs		√	√
2.1051.001	Speed window 1		√	
2.1051.002	Speed window 2		√	
2.1060.001	Speed setpoint limitation status	√		
2.1060.002	Speed setpoint	√		
2.1060.003	Effective specified speed	√		
2.1060.004	Max. effective specified speed	√		
2.1060.005	Min. effective specified speed	√		
2.1060.006	Effective specified speed, unlimited	√		
2.1060.007	CAN speed setpoint	√		
2.1060.008	Speed setpoint Up/Down	√		
2.1060.010	Specified speed frequency input	√		
2.1060.011	Speed setpoint, source	√		
2.1060.014	Maximum effective specified speed, Protection	√		
2.1060.022	CAN request local control		√	
2.1060.024	Speed Up		√	
2.1060.025	Speed Down		√	
2.1060.026	Speed Up button		√	√
2.1060.027	Speed Down button		√	√
2.1060.028	CAN speed Up		√	
2.1060.029	CAN speed Down		√	
2.1060.033	Fixed speed binary active		√	
2.1060.040	Rated speed	√		
2.1060.049	Current idle speed	√		
2.1060.050	Speed setpoint before ramp	√		
2.1060.051	Selected speed setpoint	√		

ZKP No.	Designation	AO	TOP	DI
2.1060.053	Effective idle speed	√		
2.1060.054	Effective maximum speed	√		
2.1060.059	Maximum speed setpoint CAN	√		
2.1060.062	External specified speed switch		√	√
2.1060.063	CAN local active		√	
2.1060.070	Speed setpoint feedback	√		
2.1060.071	Local control feedback		√	
2.1060.072	Increase speed feedback		√	
2.1060.073	Reduce speed feedback		√	
2.1060.075	Virtual ramp value (ACT speed)	√		
2.1060.093	Reduced DBR/MCR	√		
2.1060.100	Current specified speed ramp value	√		
2.1060.140	Active speed Protection module	√		
2.1060.142	CAN idle increase active		√	
2.1060.146	Idle increase active		√	
2.1060.160	Local normal switch position	√		
2.1060.161	Local Emergency switch position			
2.1060.162	Remote normal switch position	√		
2.1060.163	Remote Emergency switch position	√		
2.1060.171	CAN specified speed selector switch	√		
2.1060.200	Current speed droop %	√		
2.1060.201	Current speed droop RPM	√		
2.1060.203	Speed setpoint before speed droop	√		
2.1060.206	MCR [Nm] at specified speed	√		
2.1060.218	Speed droop 2 CAN		√	
2.1060.219	Speed droop 2 switch		√	√
2.1060.220	Speed droop 2 active		√	
2.1060.221	Torque specification at 100 %	√		
2.1060.301	Generator mode is active		√	√
2.1060.302	Generator frequency 1 active		√	

ZKP No.	Designation	AO	TOP	DI
2.1060.303	Switch at frequency 1 active		√	√
2.1060.304	Generator start active		√	
2.1060.312	Generator mode enable		√	√
2.1060.315	CAN 50/60 Hz switch		√	
2.1060.321	Request speed increase		√	√
2.1060.428	Binary request speed limitation		√	√
2.1060.429	CAN request speed limitation		√	
2.1060.950	Alarm failure speed setpoint remote control system		√	
2.1061.001	Engine load signal voltage	√		
2.1061.002	Engine load signal PWM	√		
2.1061.015	MLS deflection (voltage)	√		
2.1061.025	MLS deflection (PWM)	√		
2.1061.027	Engine load signal PWM frequency	√		
2.1061.030	Power curve deviation	√		
2.1061.040	Limited power curve torque	√		
2.1061.050	Power curve limitation torque	√		
2.1061.056	External power curve limitation		√	√
2.1061.057	CAN external power curve limitation		√	
2.1061.060	Effective power curve torque	√		
2.1061.070	Acceleration reserve	√		
2.1061.071	Acceleration detected		√	
2.1061.080	Corrected power curve torque	√		
2.1061.090	DBR power correction	√		
2.1061.100	Torque from power curve	√		
2.1075.001	Torque limitation value, plant	√		
2.1075.002	No. of torque limitation, plant	√		
2.1075.003	CAN torque limitation 1	√		
2.1075.004	CAN torque limitation 2	√		
2.1075.005	CAN torque limitation 3	√		
2.1075.006	CAN rating switch 1		√	

ZKP No.	Designation	AO	TOP	DI
2.1075.007	CAN rating switch 2		√	
2.1075.008	Active rating	√		
2.1080.002	DIx request DBR, plant		√	√
2.1090.001	Ignition input IGI active		√	
2.1090.010	Engine start enable		√	
2.1090.012	Start sequence active		√	
2.1090.013	Starter ON		√	
2.1090.014	Prelubrication ON		√	
2.1090.015	Prelubrication lamp		√	
2.1090.017	Starter speed reached		√	
2.1090.018	Release speed reached		√	
2.1090.019	Idle speed reached		√	
2.1090.020	Start termination		√	
2.1090.021	Start repeat		√	
2.1090.024	Engine start instruction		√	
2.1090.026	Start termination coolant temperature		√	
2.1090.027	Start termination lube oil pressure		√	
2.1090.028	Abort manual turning		√	
2.1090.029	Manual turning active		√	
2.1090.036	Start button lamp		√	
2.1090.050	Engine start requested		√	
2.1090.051	Engine start button		√	√
2.1090.054	Starter turning		√	
2.1090.055	Request prelubrication		√	√
2.1090.058	Start repeat		√	
2.1090.059	Remaining starting attempts	√		
2.1090.060	Preheat temperature NOT reached		√	
2.1090.061	Request for manual turning		√	√
2.1090.062	Starting sequence function status	√		
2.1090.063	Intermittent prelubrication function status	√		

ZKP No.	Designation	AO	TOP	DI
2.1090.200	CAN engine start (SAM)		√	
2.1090.201	CAN engine start (LOP)		√	
2.1090.202	CAN engine start (MCS)		√	
2.1090.203	CAN Prelubrication during engine start		√	
2.1090.204	CAN intermittent prelubrication		√	
2.1090.205	CAN SAM ready to start		√	
2.1090.301	First lower limit value for preheat temperature	√		
2.1090.302	Second lower limit value for preheat temperature	√		
2.1090.900	Alarm prelubrication error		√	
2.1090.901	Preheat temperature limit value undershot		√	
2.1090.902	Safety system responded: Preheat temperature		√	
2.1090.903	Safety system responded: Starter speed not reached		√	
2.1090.904	Safety system responded: Release speed not reached		√	
2.1090.905	Safety system responded: Idle speed not reached		√	
2.2010.001	Alarm engine governor fault/see fault code		√	
2.2010.002	Engine governor info text	√		
2.2010.100	Intercooler coolant temperature limit value exceeded		√	
2.2010.101	Generator mode enable		√	
2.2010.102	Pressure on H.P. side (Common Rail)	√		
2.2010.103	Speed Up		√	
2.2010.104	Speed Down		√	
2.2010.105	Engine running		√	
2.2010.106	P-diff lube oil limit value exceeded		√	
2.2010.107	Cylinder cutout active		√	
2.2010.108	Lube oil pressure before filter	√		
2.2010.109	Exhaust turbocharger 3 On		√	
2.2010.110	Fuel prefilter water level limit value exceeded		√	
2.2010.111	Intercooler coolant pressure limit value undershot		√	
2.2010.112	Safety system responded: Intercooler coolant pressure		√	
2.2010.114	Safety system responded: Intercooler coolant temperature		√	

ZKP No.	Designation	AO	TOP	DI
2.2010.115	MCR/DBR reduction active		√	
2.2510.010	Overspeed test active		√	
2.2510.020	CAN request test overspeed		√	
2.2510.021	CAN version overspeed test	√		
2.2510.912	Safety system responded: Engine overspeed test		√	
2.2700.057	PWM frequency, fan	√		
2.2700.060	PWM output, fan	√		
2.2700.061	PWM specified value, fan	√		
2.2700.062	Manual fan on		√	√
2.2700.063	CAN manual fan on		√	
2.2700.064	Feedback manual fan on		√	
2.3000.030	Request full engine active		√	√
2.3000.031	Request full engine, governor		√	
2.3000.035	CAN request full engine 1		√	
2.3000.036	CAN request full engine 2		√	
2.3012.911	Limit value exceeded exhaust turbocharger 1 overspeed		√	
2.3012.912	Safety system responded: Exhaust turbocharger 1 overspeed		√	
2.3013.911	Limit value exceeded exhaust turbocharger 2 overspeed		√	
2.3013.932	Safety system responded: Exhaust turbocharger 2 overspeed		√	
2.4000.002	LifeData status	√		
2.4000.005	Alarm LifeData not available		√	
2.4000.007	Alarm LifeData restoration incomplete		√	
2.4000.008	LifeData condition	√		
2.7000.001	CAN torque limitation 1	√		
2.7000.002	CAN torque limitation 2	√		
2.7000.003	CAN torque limitation 3	√		
2.7000.004	Engine power reserve	√		
2.7000.005	Safety system responded: Power limitation active		√	
2.7000.007	Speed setpoint failure mode	√		
2.7000.008	Fault status transistor outputs	√		

ZKP No.	Designation	AO	TOP	DI
2.7000.010	TO function status	√		
2.7001.001	Stop activated		√	
2.7001.002	Stop button		√	√
2.7001.003	Stop FBFE		√	
2.7001.004	Stop CAN		√	
2.7001.005	Stop Protection		√	
2.7001.006	Stop engine overspeed			
2.7001.007	Emergency stop input ESI active		√	√
2.7001.008	External stop activated		√	
2.7001.010	Automatic stop activated		√	
2.7001.011	CAN request engine stop 1		√	
2.7001.012	CAN request engine stop 2		√	
2.7001.013	CAN request engine stop 3		√	
2.7001.014	CAN request engine stop 4		√	
2.7001.015	Stop start sequence		√	
2.7001.016	Stop manual turning		√	√
2.7001.020	Stop with sensor defect	√		
2.7001.901	Safety system responded: Engine speed too low		√	
2.7002.001	Override button		√	√
2.7002.003	Override active		√	
2.7002.011	Alarm override actuated		√	
2.7003.011	Mode 2 active		√	
2.7003.012	CAN mode switch signal		√	
2.7003.013	CAN override signal		√	
2.7003.014	DIx request mode switch		√	
2.7003.015	Feedback CAN mode switch signal		√	
2.7010.001	Request operating mode "Engine cold"		√	√
2.8002.003	Defective speed setpoint sensor		√	
2.8002.005	Defective load profile sensor, analog filtered		√	
2.8002.006	Defective engine governor supply voltage sensor		√	

ZKP No.	Designation	AO	TOP	DI
2.8002.007	Defective frequency input sensor		√	
2.8002.009	Defective sensor for filling signal as a percentage		√	
2.8002.010	Alarm open line input DI 1		√	
2.8002.011	Alarm open line input DI 2		√	
2.8002.012	Alarm open line input DI 3		√	
2.8002.013	Alarm open line input DI 4		√	
2.8002.014	Alarm open line input DI 5		√	
2.8002.015	Alarm open line input DI 6		√	
2.8002.016	Alarm open line input DI 7		√	
2.8002.017	Alarm open line input DI 8		√	
2.8002.018	Alarm open line emergency stop input ESI		√	
2.8002.019	Alarm wiring TOP 1		√	
2.8002.020	Alarm wiring TOP 2		√	
2.8002.021	Alarm wiring TOP 3		√	
2.8002.022	Alarm wiring TOP 4		√	
2.8002.023	Alarm wiring FO		√	
2.8002.050	Alarm CAN plant	√		
2.8002.160	Alarm first limit value auxiliary 1 plant		√	
2.8002.161	Alarm second limit value auxiliary 1 plant		√	
2.8002.162	Exhaust temperature EMU limit value exceeded		√	
2.8002.163	Exhaust temperature EMU limit value undershot		√	
2.8002.164	Coolant temperature EMU limit value exceeded		√	
2.8002.165	Alarm stop SD		√	
2.8002.600	CAN alarm reset		√	
2.8002.700	Alarm, combined alarm yellow (plant)		√	
2.8002.701	Alarm, combined alarm red (plant)		√	
2.8009.009	Alarm, combined alarm red (governor)		√	
2.8009.010	Alarm, combined alarm yellow (governor)		√	
2.8009.011	Alarm, combined alarm Stop soon (governor)		√	
2.8009.012	Alarm engine governor fault		√	

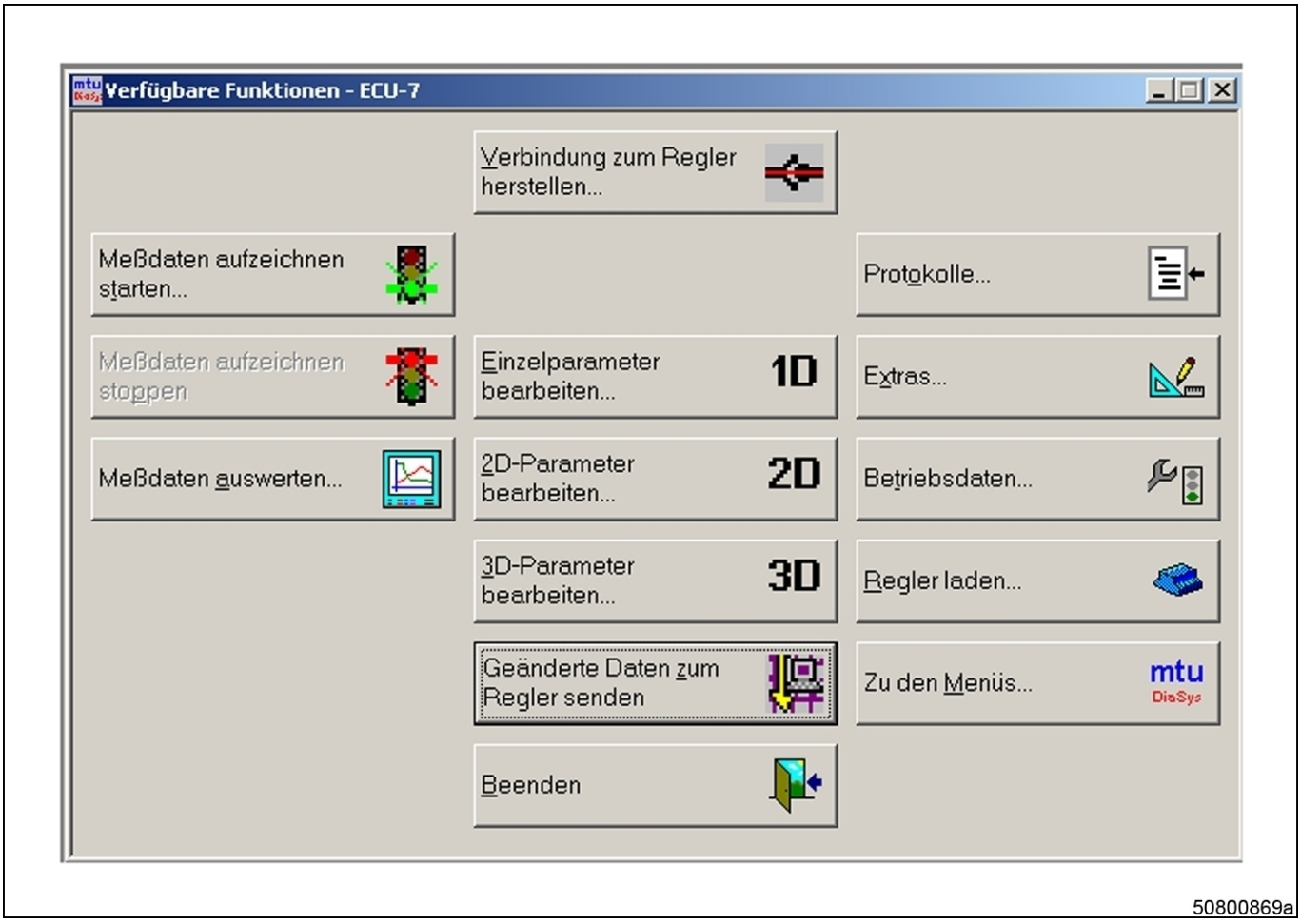
ZKP No.	Designation	AO	TOP	DI
2.8009.013	Alarm power limitation expected		√	
2.8009.015	Fault number	√		
2.8009.020	Diagnostic Request Switch		√	
2.8009.021	DIx Request Alarm Reset		√	√
2.8009.022	Feedback alarm reset		√	
2.9900.100	Engine governor AI 1 raw value	√		
2.9900.101	Engine governor AI 2 raw value	√		
2.9900.102	Engine governor FIP raw value	√		
2.9902.100	Status of binary inputs/outputs	√		

5.2 1D parameters

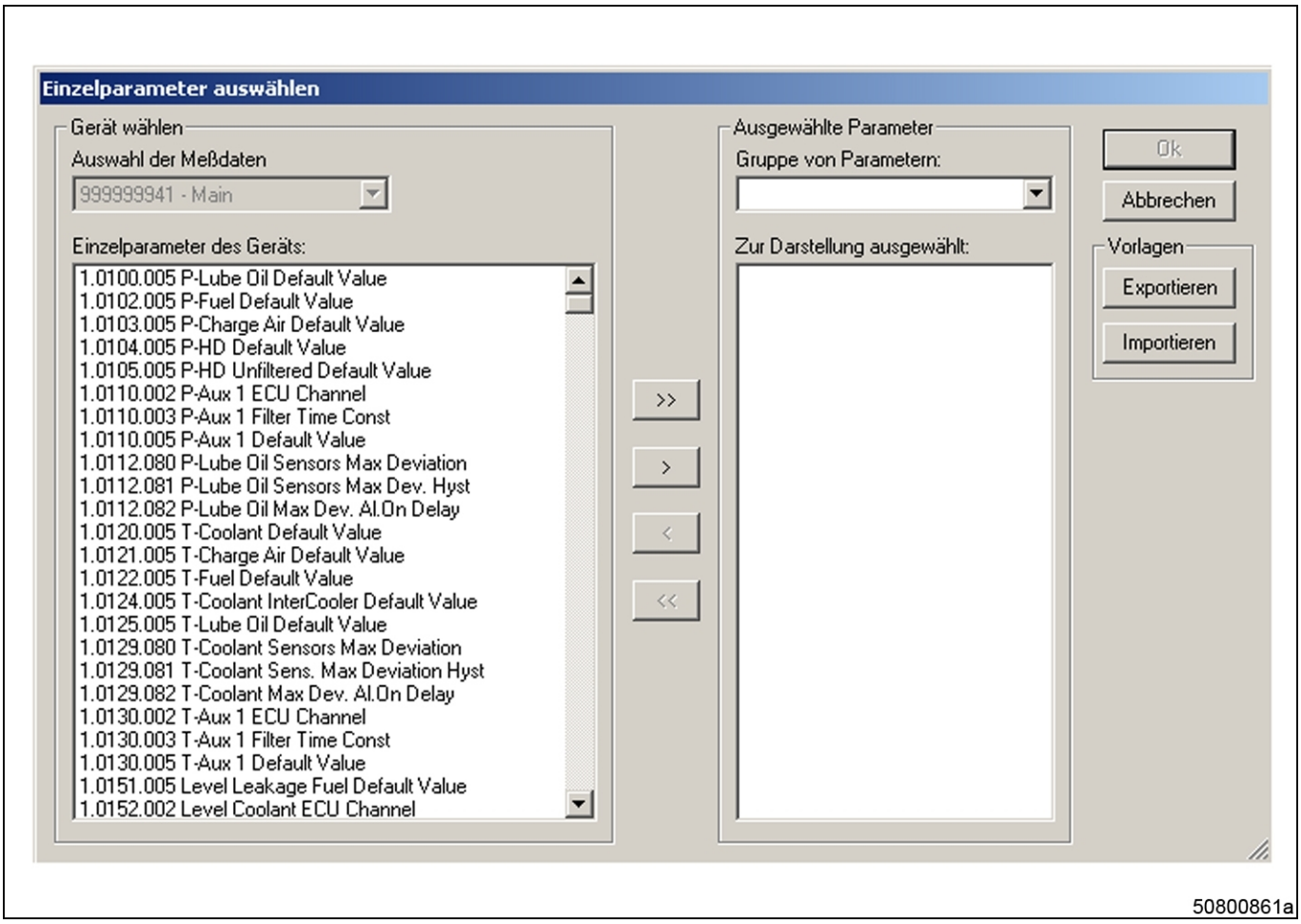
Definition

Single parameters or 1D parameters ("unidimensional" parameters) is the designation given to parameters to which a fixed value is assigned, which is valid for all operating points of the engine. Such a parameter can either contain an analog numerical value (e.g. for static limit values for the selection of sensors) or only a binary status (e.g. for the selection of specific functions). They are therefore also designated 1D analog parameters and 1D bin parameters.

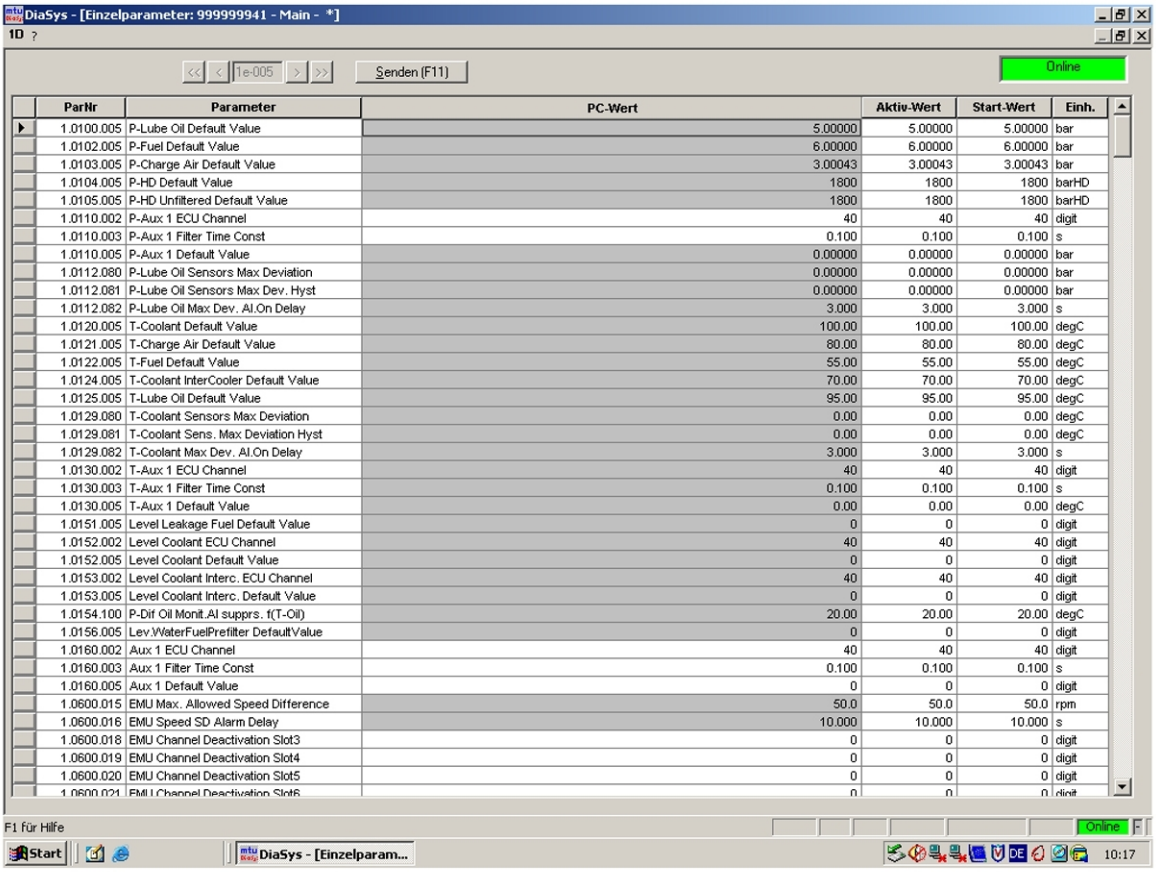
Function area in the Diasys



The function area 1D parameters is reached via the Dialog system (DiaSys®) from the main menu of the ECU-7 ("Edit single parameters... 1D").



The first window for this function area has a selection window on the left for selecting one or several parameters. All parameters marked here are entered in the right-hand window using the ">" button. These parameters are then transferred into the following list with the "OK" button, where they can then be changed:



ParNr	Parameter	PC-Wert	Aktiv-Wert	Start-Wert	Einh.
1.0100.005	P-Lube Oil Default Value	5.00000	5.00000	5.00000	bar
1.0102.005	P-Fuel Default Value	6.00000	6.00000	6.00000	bar
1.0103.005	P-Charge Air Default Value	3.00043	3.00043	3.00043	bar
1.0104.005	P-HD Default Value	1800	1800	1800	barHD
1.0105.005	P-HD Unfiltered Default Value	1800	1800	1800	barHD
1.0110.002	P-Aux 1 ECU Channel	40	40	40	digit
1.0110.003	P-Aux 1 Filter Time Const	0.100	0.100	0.100	s
1.0110.005	P-Aux 1 Default Value	0.00000	0.00000	0.00000	bar
1.0112.080	P-Lube Oil Sensors Max Deviation	0.00000	0.00000	0.00000	bar
1.0112.081	P-Lube Oil Sensors Max Dev. Hyst	0.00000	0.00000	0.00000	bar
1.0112.082	P-Lube Oil Max Dev. Al.On Delay	3.000	3.000	3.000	s
1.0120.005	T-Coolant Default Value	100.00	100.00	100.00	degC
1.0121.005	T-Charge Air Default Value	80.00	80.00	80.00	degC
1.0122.005	T-Fuel Default Value	55.00	55.00	55.00	degC
1.0124.005	T-Coolant InterCooler Default Value	70.00	70.00	70.00	degC
1.0125.005	T-Lube Oil Default Value	95.00	95.00	95.00	degC
1.0129.080	T-Coolant Sensors Max Deviation	0.00	0.00	0.00	degC
1.0129.081	T-Coolant Sens. Max Deviation Hyst	0.00	0.00	0.00	degC
1.0129.082	T-Coolant Max Dev. Al.On Delay	3.000	3.000	3.000	s
1.0130.002	T-Aux 1 ECU Channel	40	40	40	digit
1.0130.003	T-Aux 1 Filter Time Const	0.100	0.100	0.100	s
1.0130.005	T-Aux 1 Default Value	0.00	0.00	0.00	degC
1.0151.005	Level Leakage Fuel Default Value	0	0	0	digit
1.0152.002	Level Coolant ECU Channel	40	40	40	digit
1.0152.005	Level Coolant Default Value	0	0	0	digit
1.0153.002	Level Coolant Interc. ECU Channel	40	40	40	digit
1.0153.005	Level Coolant Interc. Default Value	0	0	0	digit
1.0154.100	P-Dif Oil Monit.Al supprs. f(T-Oil)	20.00	20.00	20.00	degC
1.0156.005	Lev.WaterFuelPrefilter DefaultValue	0	0	0	digit
1.0160.002	Aux 1 ECU Channel	40	40	40	digit
1.0160.003	Aux 1 Filter Time Const	0.100	0.100	0.100	s
1.0160.005	Aux 1 Default Value	0	0	0	digit
1.0600.015	EMU Max. Allowed Speed Difference	50.0	50.0	50.0	rpm
1.0600.016	EMU Speed SD Alarm Delay	10.000	10.000	10.000	s
1.0600.018	EMU Channel Deactivation Slot3	0	0	0	digit
1.0600.019	EMU Channel Deactivation Slot4	0	0	0	digit
1.0600.020	EMU Channel Deactivation Slot5	0	0	0	digit
1.0600.021	EMU Channel Deactivation Slot6	0	0	0	digit

50800846a

The individual columns of this window have the following meaning:

- ParNo

  This is the corresponding ZKP number of the parameter.
- Parameter

  The designation of the parameter in plain text is shown here.
- PC value

  This column shows the value currently entered in the PC. Desired changes are entered in this column.
- Active value

  Here is the specification of which value is currently saved in the governor. This value is updated every time the DiaSys is connected to the governor and linked to the governor via the function "Establish connection to governor".
- Start value

  This is the preset default value. It is transferred when the associated parameter value is invalid.
- Unit

  The unit of the corresponding numerical value is specified here. In the case of 1D bin (binary) parameters, the field is empty.

The following units are used for 1D parameters:

Unit	**Meaning**
bar	bar
barHD	Bar on high-pressure side
digit	Numerical value
s	Seconds with decimal points
degC	Degrees Celsius
rpm	Revolutions per minute
%	Percent
rpm/s	Revolutions per minute per second
kW	Kilowatt
sec	Seconds without decimal points
pts	Factor (points)
mm3/H	Cubic millimeter per hour
PV	Process variable
Nm	Newtonmeter
bHD/s	Bar on high-pressure side per second
deg	Angle degrees
h	Hour

Sensor types

If a sensor is connected to an input of the governor, the type of sensor must be specified. This is carried out by entering a number at the corresponding parameter (Parameter No. 1.9901.100 to 1.9901.134 and 2.9901.200 to 2.9901.204). It must be between -1 and 40. Each number stands for a specific sensor type:

Sensor type No.	Sensor	Sensor type No.	Sensor
–1	No sensor connected	20	KTY temperature sensor
0	Pt 1000	21	Frequency input
1	Pt 100	22	PWM current
2	4 bar	23	Resistor
3	0.5 – 4.5 bar	24	Relative speed setpoint (voltage)
4	6 bar	25	Relative speed setpoint (current)
5	10 bar	26	Speed setpoint 60 Hz (voltage)
6	15 bar	27	Speed setpoint 60 Hz (current)
7	50 bar	28	Load % (current)
8	1600 bar	29	0.5 – 1.2 bar
9	2000 bar	30	Voltage
10	+/- 70 mbar	31	0.5 – 6 bar
11	0 – 5 V	32	Fuel % (current)
12	0 – 10 V	33	Fuel % (voltage)
13	0 – 50 V	34	Curve from 1.041.004 AUX sensor scaling
14	Level sensor (e.g. Bedia)	35	Generator voltage (voltage) 0 – 1000 V
15	Load % (voltage)	36	Generator output (voltage) 0 – 5000 kW
16	Specified speed voltage setpoint (0 – 10 V)	37	Voltage in percent (0.5 – 4.5 V → 0–100 %)
17	Specified speed voltage setpoint for test stand	38	N.N.
18	Specified speed current setpoint (4 – 20 mA)	39	N.N.
19	Specified speed current setpoint for test stand	40	N.N.

Reference ECU input channel - channel No.

For each signal transmitted to the ECU, the ECU channel where the signal is applied must be specified. Specific parameters are available for this purpose, e.g. No. 1.0127.002 "T-exhaust gas B ECU channel". This position specifies the location of the sensor for measuring exhaust temperature on the B-side. If the sensor, for example, is connected to TI2, a "20" must be entered here.

Channel No.	ECU input channel	Channel No.	ECU input channel
0	PI1	21	TI3
1	PI2	22	TI4
2	PI3	23	TI5
3	PI4	24	TI6
4	PI5	25	TI7
5	PI6	26	TI8
6	PI7	27	TI9
7	PI8	28	TI10
8	PI9	29	TI11
9	PI10	30	TI12
10	PI11	31	KTY
11	PI12	32	U_PDU
12	PI13	33	PWM_CM1_I
13	PI14	34	PWM_CM2_I
14	PTI1	35	—
15	PTI2	36	—
16	LSI1	37	—
17	LSI2	38	—
18	LSI3	39	—
19	TI1	40	Channel is not used; no monitoring for sensor defect
20	TI2		

The abbreviations of the sensor inputs have the following meaning:
- PI: Pressure Input
- LSI: Level Sensor Input
- TI: Temperature Input
- KTY: Input for KTY temperature sensor
- U_PDU: Voltage measurement input
- PWM_CM: Pulse-width modulated input

1D parameters

The following parameters explained below are available. Note that only parameters with a white background can be changed. Parameters shaded gray are only displayed. Alteration with the dongle (user level) inserted is not possible.

In certain circumstances, not all parameters are displayed. This depends on the attributes preset by the MTU specialist department.

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.0100.005	P-Lube Oil Default Value	P-lube oil default value	Default value with faulty sensor.	bar	0,00001	
1.012.005	P-Fuel Default Value	P-fuel default value	Default value with faulty sensor.	bar	0,00001	
1.0103.005	P-Charge Air Default Value	P-charge air default value	Default value with faulty sensor.	bar	0,00001	
1.0104.005	P-HD Default Value	P-high pressure default value	Default value with faulty sensor.	barHD	1	
1.0105.005	P-HD Unfiltered Default Value	P-high pressure unfiltered default value	Default value with faulty sensor.	barHD	1	
1.0110.002	P-Aux 1 ECU Channel	P-auxiliary 1 ECU channel	ECU channel via which the sensor for P-aux 1 is recorded; if the input value = 40, the channel is not used; no monitoring of faulty sensor.	digit	1	(→ Page 108)
1.0110.003	P-Aux 1 Filter Time Const	P-auxiliary 1 filter time constant	Filter time constant for PT1 filter in the input circuit.	s	0,001	
1.0110.005	P-Aux 1 Default Value	P-auxiliary 1 default value	Default value with faulty sensor.	bar	0,00001	
1.0112.080	P-Lube Oil Sensors Max Deviation	P-lube oil maximum deviation of sensors	Max. deviation between "Lube oil pressure after filter" and "Lube oil pressure after filter redundant".	bar	0,00001	
1.0112.081	P-Lube Oil Sensors Max Dev. Hyst	P-lube oil maximum deviation of sensors, hysteresis	Hysteresis	bar	0,00001	
1.0112.082	P-Lube Oil Max Dev. Al.On Delay	P-lube oil maximum deviation alarm ON delay	The alarm is set after this time has elapsed.	s	0,001	
1.0120.005	T-Coolant Default Value	T-coolant default value	Default value with faulty sensor.	degC	0,01	
1.0121.005	T-Charge Air Default Value	T-charge air default value	Default value with faulty sensor.	degC	0,01	
1.0122.005	T-Fuel Default Value	T-fuel default value	Default value with faulty sensor.	degC	0,01	
1.0124.005	T-Coolant InterCooler Default Value	T-coolant intercooler default value	Default value with faulty sensor.	degC	0,01	
1.0125.005	T-Lube Oil Default Value	T-lube oil default value	Default value with faulty sensor.	degC	0,01	
1.0129.080	T-Coolant Sensors Max Deviation	T-coolant maximum deviation of sensors	Max. deviation between "Coolant temperature" and "Coolant temperature".	degC	0,01	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.0129.081	T-Coolant Sens. Max Deviation Hyst	T-coolant maximum deviation of sensors hysteresis	Hysteresis	degC	0,01	
1.0129.082	T-Coolant Max Dev. Al.On Delay	T-coolant maximum deviation alarm ON delay	The alarm is set after this time has elapsed.	s	0,001	
1.0130.002	T-Aux 1 ECU Channel	T-auxiliary 1 ECU channel	ECU channel via which the sensor for T-aux 1 is recorded; if the input value = 40, the channel is not used; no monitoring of faulty sensor.	digit	1	(→ Page 108)
1.0130.003	T-Aux 1 Filter Time Const	T-auxiliary 1 filter time constant	Filter time constant for PT1 filter in the input circuit.	s	0,001	
1.0130.005	T-Aux 1 Default Value	T-auxiliary 1 default value	Default value with faulty sensor.	degC	0,01	
1.0151.005	Level Leakage Fuel Default Value	Leak-off fuel level default value	Default value with faulty sensor.	digit	1	
1.0152.002	Level Coolant ECU Channel	Coolant level ECU channel	ECU channel via which the coolant level sensor is recorded; if the input value = 40, the channel is not used; no monitoring of faulty sensor.	digit	1	(→ Page 108)
1.0152.005	Level Coolant Default Value	Coolant level default value	Default value with faulty sensor.	digit	1	
1.0153.002	Level Coolant Interc. ECU Channel	Intercooler coolant level ECU channel	ECU channel via which the intercooler coolant level sensor is recorded; if the input value = 40, the channel is not used; no monitoring of faulty sensor.	digit	1	(→ Page 108)
1.0153.005	Level Coolant Interc. Default Value	Intercooler coolant level default value	Default value with faulty sensor.	digit	1	
1.0154.100	P-Dif Oil Monit.Al supprs. f(T-Oil)	P-Diff. oil Al suppression f(T-oil)	Enable of oil pressure differential monitoring only from this oil temp. limit value.	degC	0,01	
1.0156.005	Lev.WaterFuelPrefil-ter DefaultValue	Water-fuel prefilter level default value	Default value with faulty sensor.	digit	1	
1.0160.002	Aux 1 ECU Channel	Auxiliary 1 ECU channel	ECU channel via which the sensor for aux 1 is recorded; if the input value = 40, the channel is not used; no monitoring of faulty sensor.	digit	1	(→ Page 108)
1.0160.003	Aux 1 Filter Time Const	Auxiliary 1 filter time constant	Filter time constant for PT1 filter in the input circuit.	s	0,001	
1.0160.005	Aux 1 Default Value	Auxiliary 1 default value	Default value with faulty sensor.	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.0600.015	EMU Max. Allowed Speed Difference	EMU maximum permissible speed differential	If the difference between engine speed EMU and engine speed ECU is greater than this parameter, then a sensor defect will be set at engine speed EMU.	rpm	0,1	
1.0600.016	EMU Speed SD Alarm Delay	EMU speed SD alarm delay	Response delay for alarm "SD engine speed EMU".	s	0,001	
1.0600.018	EMU Channel Deactivation Slot3	EMU channel deactivation slot 3	Bit-encoded value which deactivates the recording channels of slot 3. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	
1.0600.019	EMU Channel Deactivation Slot4	EMU channel deactivation slot 4	Bit-encoded value which deactivates the recording channels of slot 4. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	
1.0600.020	EMU Channel Deactivation Slot5	EMU channel deactivation slot 5	Bit-encoded value which deactivates the recording channels of slot 5. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	
1.0600.021	EMU Channel Deactivation Slot6	EMU channel deactivation slot 6	Bit-encoded value which deactivates the recording channels of slot 6. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	
1.0600.022	EMU Channel Deactivation Slot7	EMU channel deactivation slot 8	Bit-encoded value which deactivates the recording channels of slot 7. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	
1.0600.022	EMU Channel Deactivation Slot8	EMU channel deactivation slot 8	Bit-encoded value which deactivates the recording channels of slot 7. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.0600.023	EMU Channel Deactivation Slot9	EMU channel deactivation slot 9	Bit-encoded value which deactivates the recording channels of slot 9. A channel is deactivated if the corresponding bit is set to 1. Bit 0 deactivates channel 1... bit 15 deactivates channel 16.	digit	1	
1.1005.001	Delay after Start	Delay after start	If the parameter "Alarm delay after start" is set for a protection module, after idle speed has been reached the alarm for any possible limit value violation is suppressed for the time entered here. For example, pumps require a certain time until the necessary pressure is built up.	s	0,001	
1.1005.020	Rated Power	Rated power	Rated power transmitted on the CAN bus via process variable 219 for external devices.	kW	0,001	
1.1005.022	Engine Optimized	Engine optimized	Input of engine optimization for displaying on the CAN bus. The content is defined as follows: 1: BE-OPTIMIZED 2: TAL 1986 3: EPA TIER 1 4: EPA TIER 2 5: BE/EPA TIER 1 6: TAL/EPA TIER 1 7: EPA/EPA TIER 1 8: BE/BE 9: EPA/EPA	digit	1	
1.1020.017	DC/DC Boost Converter active	Final stage step-up converter active	If this bit is activated, the step-up converter of the HW final stage is switched on and the system adjusts to the specified voltage entered in 1.1020.007, which is used as injector voltage. An activated step-up converter is a prerequisite for multiple injection. If this bit is not active, the supply voltage is used directly as injector voltage.		1	
1.1020.018	Pilot / Post Fuel Masses via Dialog	Pilot / post injection mass via dialog	If this bit is set, the pre-injection (1.1020.036) and post injection masses (1.1020.039) can each be specified per dialog as a constant value independent of the operating point. If this bit is not set, the pre- and post-injection masses are taken from the respective characteristics map (1.1020.037 or 1.1020.040).		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1020.019	SRS-SD Emergency Operation allowed	Enable camshaft emergency operation	If this bit is set, the engine continues to run in spite of the loss of the crankshaft transmitter wheel signal - with the camshaft sensor signal alone and thus with reduced injection accuracy. If this bit is not set, the engine stops if the crankshaft transmitter wheel signal is missing.		1	
1.1020.020	IRT-Measuring active (Mode 2)	Time of flight recording active (mode 2)	No "X" set: Without injector time-of-flight measurement (mode0, i.e. time of flight is not measured and not corrected) and the option of multiple injection. "X" set: With injector time-of-flight measurement (mode2) and only single injection. If the time of flight of the injector is measured and corrected, changes to the characteristics maps for start of injection (BOI) and injector characteristics map are also necessary!		1	
1.1020.031	Maximum allowed Speed	Maximum permissible speed	Maximum speed (determined over 15° crankshaft) up to which an injection can take place. Above this speed, the HW final stage no longer issues an injection pulse and ensures, by cutting off the fuel supply (independent of the speed control dynamics) that the engine speed does not exceed this maximum limit.	rpm	0,1	
1.1020.045	PLD-Engine	PLD engine	No "X" set: Common Rail (CR) engine. "X" set: Pump-line nozzle (PLD) engine.		1	
1.1020.047	Short Measure Window (IRT-Detect.)	Short measuring window (PAB measurement)	If this bit is activated, the so-called short measuring window is used. This means that directly after impact of the pilot needle is detected, a switch is made from the measuring current level to the retaining current level. If no impact is detected, the measuring current phase continues for as long as defined in 1.1020.015. If this bit is not active, the so-called long measuring window is used. This means that with every injector energization, the measuring current phase must continue in every case for as long as defined in 1.1020.015, irrespective of whether a pilot needle impact was detected or not.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1020.048	Delete Min-Max-IRT-Values	Delete min.-max. time-of-flight values	If the status of this bit changes, the minimum and maximum valid time-of-flight values measured up to that point are deleted, i.e. 1.1020.546 and 1.1020.547 are set to zero. Immediately after this the minimum and maximum valid time-of-flight times that occurred, incl. the associated cylinder, are collected. Furthermore, the diagnosis variables of the pilot needle impact measurement 1.1020.540 and 1.1020.541 are set to zero and the time-of-flight deviation detection restarts.		1	
1.1021.002	InjTest wait time before test	Injector test waiting time before test	After the injector test has been started, the engine is switched to the corresponding operating mode. Only after the wait time of this measuring point has elapsed, are the initial speed and initial quantity measured.	sec	1	
1.1021.003	InjTest duration per cylinder	Injector test duration per cylinder	Test duration per cylinder for the injector test. An injector is switched off for this period.	sec	1	
1.1021.004	InjTest break time multiplier	Injector test multiplier break time	Test break multiplier for the injector test. The test time per cylinder is multiplied by the factor to determine the break time. No injector is switched off in the break time.	pts	0,001	
1.1021.005	InjTest min. coolant temperature	Injector test min. coolant temperature	Minimum coolant temperature for the injector test. If the current coolant temperature is lower than the value of this measuring point, the test is canceled automatically.	degC	0,01	
1.1021.010	InjTest min. speed full engine	Injector test min. speed in full engine mode	Minimum speed for the injector test in full engine mode. Before an injector is switched off, a check is carried out to determine whether the speed actual value is greater than this minimum value. If this condition is not fulfilled, the test is canceled.	rpm	0,1	
1.1021.011	InjTest max. speed full engine	Injector test max. speed full engine mode	Maximum speed for the injector test in full engine mode. Before an injector is switched off, a check is carried out to determine whether the speed actual value is smaller than this maximum value. If this condition is not fulfilled, the test is canceled.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1021.012	InjTest min. fuel quant. full eng	Injector test min. fuel quantity in full engine mode	Minimum injection quantity for the injector test in full engine mode. Before an injector is switched off, a check is carried out to determine whether the injection quantity is greater than this minimum value. If this condition is not fulfilled, the test is canceled.	mm3/H	0,01	
1.1021.013	InjTest max. fuel quant. full eng	Injector test max. injection quantity in full engine mode	Maximum injection quantity for the injector test in full engine mode. Before an injector is switched off, a check is carried out to determine whether the injection quantity is smaller than this maximum value. If this condition is not fulfilled, the test is canceled.	mm3/H	0,01	
1.1021.014	InjTest opt. speed full eng	Injector test opt. test speed in full engine mode	Proposed value. Optimum speed for the injector test in full engine mode (the test provides the best results at this operating point).	rpm	0,1	
1.1021.015	InjTest opt. quant. full eng	Injector test opt. injection quantity in full engine mode	Proposed value. Optimum injection quantity for the injector test in full engine mode (the test provides the best results at this operating point).	mm3/H	0,01	
1.1021.020	InjTest min. speed half engine	Injector test min. speed in cylinder cutout mode	Minimum speed for the injector test in "Cylinder cutout" mode. Before an injector is switched off, a check is carried out to determine whether the speed actual value is greater than this minimum value. If this condition is not fulfilled, the test is canceled.	rpm	0,1	
1.1021.021	InjTest max. speed half engine	Injector test max. speed cylinder cutout mode	Maximum speed for the injector test in "Cylinder cutout" mode. Before an injector is switched off, a check is carried out to determine whether the speed actual value is smaller than this maximum value. If this condition is not fulfilled, the test is canceled.	rpm	0,1	
1.1021.022	InjTest min. fuel quant. half eng	Injector test min. injection quantity in cylinder cutout mode	Minimum injection quantity for the injector test in "Cylinder cutout" mode. Before an injector is switched off, a check is carried out to determine whether the injection quantity is greater than this minimum value. If this condition is not fulfilled, the test is canceled.	mm3/H	0,01	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1021.023	InjTest max. fuel quant. half eng	Injector test max. injection quantity in cylinder cutout mode	Maximum injection quantity for the injector test in "Cylinder cutout" mode. Before an injector is switched off, a check is carried out to determine whether the injection quantity is smaller than this maximum value. If this condition is not fulfilled, the test is canceled.	mm3/H	0,01	
1.1021.024	InjTest opt. speed half engine	Injector test opt. test speed in cylinder cutout mode	Proposed value. Optimum speed for the injector test in "Cylinder cutout mode" (the test provides the best results at this operating point).	rpm	0,1	
1.1021.025	InjTest opt. fuel quant. half eng	Injector test opt. injection quantity in cylinder cutout mode	Proposed value. Optimum injection quantity for the injector test in "Cylinder cutout mode" (the test provides the best results at this operating point).	mm3/H	0,01	
1.1021.030	InjTest time speed finds level	Injector test speed recovery time	After an injector has been switched off, the recovery time starts. Only after this time has elapsed, is the deviation of the injection quantity and the speed calculated in the injector test.	sec	1	
1.1021.040	InjTest Filter T fuel quant.	Injector test T filter injection quantity	The injection specified quantity is filtered for the calculations in the injector test. The filter time constant is adjustable.	s	0,001	
1.1021.044	Evaluation max. dev. speed	Evaluation of the max. speed deviation	Injector test evaluation. The maximum speed deviation for the evaluation is specified in this measurement point. If the speed is outside the tolerance when an injector is switched off, evaluation is not possible.	%	0,001	
1.1021.045	Evaluation max.dev. fuel quant. neg	Evaluation of the max. negative quantity deviation	Injector test evaluation. The maximum negative deviation of the quantity from the mean value of all injectors. If the quantity deviation of an injector is outside this tolerance, it will be highlighted during the evaluation.	%	0,001	
1.1021.046	Evaluation max.dev. fuel quant. pos	Evaluation of the max. positive quantity deviation	Injector test evaluation. The maximum positive deviation of the quantity from the mean value of all injectors. If the quantity deviation of an injector is outside this tolerance, it will be highlighted during the evaluation.	%	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1021.047	Evaluation inj. test active	Evaluation for injector test active	Automatic evaluation of the injector test results is active. In this case, the DiaSys program processes the data and highlights the injectors that are outside the tolerance.		1	
1.1030.005	Virtual Temp. BOI Warm-Up PV 1	Virtual temperature BOI warm-up PV 1	Source process variable of temperature 1 (T1) for calculating the virtual temperature for the transition from cold to warm engine.	PV	1	
1.1030.006	Virtual Temp. BOI Warm-Up PV 2	Virtual temperature BOI warm-up PV 2	Source process variable of temperature 2 (T2) for calculating the virtual temperature for the transition from cold to warm engine.	PV	1	
1.1030.007	Factor Virtual Temp. BOI Warm-Up	Factor for virtual temperature BOI warm-up	Factor for calculating the virtual temperature for the transition from cold to warm engine according to the following equation: [Tv = factor * T1 + (1-factor) * T2]	pts	0,001	
1.1030.009	Virtual Temp. Friction Torque PV 1	Virtual temperature friction torque PV 1	Source process variable of temperature 1 (T1) for calculating the virtual temperature for the friction torque.	PV	1	
1.1030.010	Virtual Temp. Friction Torque PV 2	Virtual temperature friction torque PV 2	Source process variable of temperature 2 (T2) for calculating the virtual temperature for the friction torque.	PV	1	
1.1030.011	Factor Virtual Temp. FrictionTorque	Factor for virtual temperature friction torque	Factor for calculating the virtual temperature for the friction torque according to the following equation: [Tv = factor * T1 + (1-factor) * T2]	pts	0,001	
1.1030.013	Virtual Temp. Half Engine Mode PV 1	Virtual temperature cylinder cutout mode PV 1	Source process variable of temperature 1 (T1) for calculating the virtual temperature for cylinder cutout.	PV	1	
1.1030.014	Virtual Temp. Half Engine Mode PV 2	Virtual temperature cylinder cutout mode PV 2	Source process variable of temperature 2 (T2) for calculating the virtual temperature for cylinder cutout.	PV	1	
1.1030.015	Factor virtual Temp. Half Engine	Factor for virtual temperature cylinder cutout	Factor for calculating the virtual temperature for cylinder cutout according to the following equation: [Tv = factor * T1 + (1-factor) * T2]	pts	0,001	
1.1040.005	BinOut TO1 Active Level	BinOut TO1 active level	"X" set: Content of process variable is inverted and output to TO (process variable = no "X" set: Current flow to TO).		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1040.006	BinOut TO2 Active Level	BinOut TO2 active level	"X" set: Content of process variable is inverted and output to TO (process variable = no "X" set: Current flow to TO).		1	
1.1040.007	BinOut TO3 Active Level	BinOut TO3 active level	"X" set: Content of process variable is inverted and output to TO (process variable = no "X" set: Current flow to TO).		1	
1.1040.008	BinOut TO4 Active Level	BinOut TO4 active level	"X" set: Content of process variable is inverted and output to TO (process variable = no "X" set: Current flow to TO).		1	
1.1045.001	PWM_CM2 Mode	PWM_CM2 mode	Configuration of the PWM output interface. The PWM channel supports frequencies from 8 Hz to 500 Hz and pulse-width rates from 0 % to 100 %. Depending on the selected mode, the source of "PWM_CM2 source process variable Freq or Period" is interpreted as a frequency or length of period. <0> PWM Off → PWM channel is not used. <1> Frequency → The PV from 'PWM_CM2 source process variable Freq or Period' is interpreted as frequency. <2> Period → The PV from 'PWM_CM2 source process variable Freq or Period' is interpreted as period duration.		1	
1.1045.004	PWM_CM2 Error Handling	PWM_CM2 error handling	Configuration of the reactions to line disconnection and short-circuit in the PWM channel. <0> PWM Active → In the event of a line disconnection, the PWM channel remains active and in the event of a short-circuit the channel is reactivated cyclically to determine whether there is still a short-circuit. <1> Deactivate → If a line disconnection or short-circuit is detected, the PWM channel is switched off. The ECU must be restarted so that the PWM output is active again. <2> No OL-Mon → PWM channel is not monitored for Open Load. This means that no alarm is issued if nothing is connected to the PWM output, or if there is a line disconnection.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1070.003	Engine running Speed Limit	Engine running limit signal	Speed at which the operating hours counter and load profile recorder begin to work.	rpm	0,1	
1.1075.002	Start Torque Min.	Starting torque min.	Starting value of starting torque ramp. During startup, the torque is increased on a ramp from this value up to starting torque (from the start speed-sensitive fuel limiter curve) (DBR curve).	Nm	0,1	
1.1075.003	Start Torque RampUp	Starting torque, ramp Up	Gradient of starting torque ramp in Nm/s.	pts	0,001	
1.1075.005	Torque Limit SD	Max. torque with SD	Torque limiting value with sensor defective (turbocharger speed, intake air temperature, charge air temperature, fuel temperature, ambient air temperature, rail pressure, crankshaft speed)	Nm	0,1	
1.1075.006	Deact. Override Torque Lim. SD	Deactivation of override of torque limitation, with sensor defective	Torque limitation with sensor defective: "X" set: Override deactivated No "X" set: Override possible		1	
1.1075.020	P-Rail Fuel Start Lim	P-high pressure start limitation	In the engine startup phase, torque is limited to the value "P-high pressure torque lim start" if high pressure is lower than the value of this parameter and engine speed has not reached the speed threshold of 300 rpm.	barHD	1	
1.1075.021	P-Rail Fuel Torque Lim Start	P-high pressure torque limitation start	In the engine startup phase, torque is limited to this value if the high pressure is lower than the value "P-high pressure start lim" and engine speed has not reached the speed threshold of 300 rpm.	Nm	0,1	
1.1075.063	Min. Torque Limit Value LDA	Minimum torque limitation value, LDA	Smallest value for torque limitation that the LDA function can supply.	Nm	0,1	
1.1085.001	DBR/MCR Function Active	DBR/MCR function is active	"X" set: DBR/MCR function is ON No "X" set: DBR/MCR function is OFF (as limitation curve, only the MCR curve is in effect).		1	
1.1085.002	DBR/MCR Alarm + Reduct. Delay	DBR/MCR alarm + reduction delay	"X" set: At the start of the reduction to MCR (T1 exceeded), an alarm is generated. The reduction is delayed. No "X" set: No alarm (and no delay).		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1085.004	DBR/MCR Delay Start Reduction (T1)	DBR/MCR start of reduction is delayed (T1)	DBR/MCR function: If the current torque exceeds the current MCR value and remains at this level, after this period elapses the reduction of the current limitation of the DBR value to the MCR value (ramp) begins. Please note: The value of T1 must be smaller than the value of T2!	s	0,001	
1.1085.005	DBR/MCR Duration of Reduction (T2)	DBR/MCR duration of reduction (T2)	DBR/MCR function: If the current torque remains above the current MCR value after it first exceeded this level, after this period elapses the reduction of the current limitation of the DBR value to the MCR value is complete. The current limitation is then equal to the current MCR value. Please note: The value of T2 must be greater than the value of T1!	s	0,001	
1.1085.006	DBR/MCR Recovery Time (T3)	DBR/MCR recovery time (T3)	DBR/MCR function: If the current MCR value is active as limitation (reduction of the DBR/MCR function complete) and the current torque undershoots the current MCR value and remains below the value, after this recovery time has elapsed the current DBR value is active again as current limitation. The enable of the current limitation of the MCR value to the DBR value is carried out via a ramp.	s	0,001	
1.1085.007	DBR/MCR Reduction Recov. Time (T4)	DBR/MCR reduction time (T4)	DBR/MCR function: The recovery time T3 is shortened according to the reduction time T4 as follows: T3eff = T3-{T4 * (MCR current torque)/MCR}, i.e. with complete engine load relief (current torque = 0), the recovery time is reduced by T4.	s	0,001	
1.1085.008	MCR Reduction Delay	MCR reduction delay	DBR/MCR function: When a yellow alarm is generated after T1 has been exceeded, the reduction to MCR will be delayed by the time entered here.	s	0,001	
1.1085.021	BOI - Determination via Dialog	N.N.	MCR curve for mode 2	Nm	0,1	
1.1200.008	Fuel Quantity Factor Half Engine	Quantity factor with cylinder cutout	The injection quantity with cutout cylinders is calculated for: Q = (number of cylinders of engine/number of active cylinders)*factor.	pts	0.001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1300.033	Grad. Monit. Lower Pressure	Gradient monitoring lower high pressure	If the system is not in high-pressure governor emergency operation and parameter ZKP No. 1.1300.039 is set to "True", the high-pressure gradient will be monitored in the engine starting phase if the high pressure is greater or equal to the value of this parameter and has not yet exceeded the value of parameter ZKP No. 1.1300.034.	barHD	1	
1.1300.034	Grad. Monit. Upper Pressure	Gradient monitoring upper high pressure	If the system is not in high-pressure governor emergency operation and parameter ZKP No. 1.1300.039 is set to "True", the high-pressure gradient will be monitored in the engine starting phase if the high pressure is greater or equal to the value of this parameter ZKP No. 1.1300.033 and has not yet exceeded the value of this parameter.	barHD	1	
1.1300.035	Grad. Monit. Period Start	Gradient monitoring period start	If gradient monitoring of the high pressure in the starting phase of the engine is active (parameter ZKP No. 1.1300.039 is set), the high-pressure gradient will be calculated in equidistant time intervals. The time intervals between two calculations can be set using this parameter.	s	0,001	
1.1300.036	Grad. Monit. Limit Start	Gradient monitoring limit value start	If gradient monitoring of the high pressure in the starting phase of the engine is active (parameter ZKP No. 1.1300.039 is set), a check is carried out to determine whether the high-pressure gradient is smaller or equal to the value of this parameter. If this is the case, the error "RAIL LEAKAGE" will be issued.	bHD/s	1	
1.1300.037	Grad. Monit. Period Stop	Gradient monitoring period stop	If there is an engine stop and engine standstill is still not detected, the gradient of the high pressure will be calculated in equidistant time intervals if parameter ZKP No. 1.1300.040 is set to the value "True". The time intervals between two calculations can be specified using this parameter.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.1300.038	Grad. Monit. Limit Stop	Gradient monitoring limit value stop	If high-pressure gradient monitoring is active after engine stop (parameter ZKP No. 1.1300.040 is set), a check is carried out to determine whether the high-pressure gradient is smaller or equal to the value of this parameter. If this is the case, the error "RAIL LEAKAGE" will be issued.	bHD/s	1	
1.1300.039	Grad. Monit.-Start Active	Gradient monitoring at start active	If this parameter has the value "True", the high-pressure gradient will be monitored during the engine startup phase.		1	
1.1300.040	Grad. Monit.-Stop Active	Gradient monitoring with stop active	If this parameter has the value "True", the high-pressure gradient will be monitored after an engine stop.		1	
1.2500.001	Speed Calculation Config.	Configuration of speed calculation	This bit-by-bit encoded parameter can be used to configure the speed calculation. Bits 0, 1 and 2 can be used to configure the crankshaft speed filter. Bits 3, 4 and 5 can be used to configure the camshaft speed filter. Bit 6 can be used to activate the emergency operation speed: If bit 6 is set, emergency operation speed is active; if bit 6 is not set, normal operation speed is active.	digit	1	(→ Page 181)
1.2500.002	Speed Calculation Low Limit	Lower limit of the speed calculation	Lower limit of the engine speed measurement.	rpm	0,1	
1.2500.003	Speed Calculation High Limit	Upper limit of the speed calculation	Upper limit of the engine speed measurement.	rpm	0,1	
1.2500.004	Standstill Time	Standstill time	Engine standstill is detected if the engine speed during this period is below the speed recording limit (ZKP No. 1.2500.002).	s	0,001	
1.2500.005	Speed Filter Switch. Point	Switching point for speed filter	If parameter ZKP No. 1.2500.001 is used to configure the speed filter switchover point, the speed filter will be switched over at this speed when the engine speed increases.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.2500.006	Speed Filter Switch. Hysteresis	Switching hysteresis of speed filter	If parameter ZKP No. 1.2500.001 is used to configure the speed filter switchover point, the speed filter will be switched over at decreasing engine speed if the speed falls below the value defined in parameter ZKP No. 1.2500.005 and, additionally, falls below the value of this parameter (speed hysteresis).	rpm	0,1	
1.2500.007	Filter Angle KW-New Filter	Filter angle crankshaft new filter	If bit 0 of the parameter 1.2500.001 is set, but bits 1 and 2 are not, the engine speed in normal operation is filtered by means of the "New Filter". This filter contains a mean value filter, whose filter angle is specified by this parameter.	deg	0,001	
1.2500.008	t1-New Filter	t1-new filter	If bit 0 of the parameter 1.2500.001 is set, but bits 1 and 2 are not, the engine speed in normal operation is filtered by means of the "New Filter". This filter contains a PT1 filter, whose time constant t1 can be specified by this parameter.	s	0,001	
1.2500.009	Filter Angle KW-Constant Angle	Filter angle crankshaft speed governor	If bits 0, 1 and 2 of parameter 1.2500.001 are not set, the engine speed in normal operation will be filtered by means of the mean value filter, whereby the filter angle can be specified by this parameter. The filtered engine speed is used for speed control.	deg	0,001	
1.2500.011	Filter Angle KW-Test Speed 1	Filter angle crankshaft test speed 1	The crankshaft speed is filtered by means of the mean value filter, whereby the filter angle can be specified by this parameter. The resulting filtered crankshaft speed is only used for display purposes (process variable ZKP No. 1.2500.036).	deg	0,001	
1.2500.012	Filter Angle KW-Test Speed 2	Filter angle crankshaft test speed 2	The crankshaft speed is filtered by means of the mean value filter, whereby the filter angle can be specified by this parameter. The resulting filtered crankshaft speed is only used for display purposes (process variable ZKP No. 1.2500.037).	deg	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.2500.014	Filter Angle KW-Angle 1	Filter angle crankshaft angle 1	If bits 0 and 2 of parameter 1.2500.001 are set and bit 1 is not set, the engine in normal operation (crankshaft sensor not defective) will be calculated by means of filter switchover (switchover angle1 - filter → angle2 - filter). This parameter can be used to specify angle1.	deg	0,001	
1.2500.015	Filter Angle KW-Angle 2	Filter angle crankshaft angle 2	If bits 0 and 2 of parameter 1.2500.001 are set and bit 1 is not set, the engine in normal operation (crankshaft sensor not defective) will be calculated by means of filter switchover (switchover angle1 - filter → angle2 - filter). This parameter can be used to specify angle2.	deg	0,001	
1.2500.017	Filter Angle NW-Test Speed 1	Filter angle camshaft test speed 1	The crankshaft speed is calculated from the camshaft signal and is filtered by means of the mean value filter, whereby the camshaft filter angle can be specified by this parameter. The resulting filtered crankshaft speed is only used for display purposes (process variable ZKP No. 1.2500.041).	deg	0,001	
1.2500.020	Filter Angle NW-Angle 1	Filter angle camshaft angle 1	If bit 3 of parameter 1.2500.001 is set and bits 4 and 5 are not set, the engine in emergency operation (crankshaft sensor not defective) will be calculated from the camshaft signal by means of filter switchover (switchover angle1 - filter ---> angle2 - filter). This parameter can be used to specify angle1.	deg	0,001	
1.2500.021	Filter Angle NW-Angle 2	Filter angle camshaft angle 2	If bit 3 of parameter 1.2500.001 is set and bits 4 and 5 are not set, the engine in emergency operation (crankshaft sensor not defective) will be calculated from the camshaft signal by means of filter switchover (switchover angle1 - filter ---> angle2 - filter). This parameter can be used to specify angle2.	deg	0,001	
1.2500.025	Engine idle speed	Idle speed	Idling speed of engine.	rpm	0,1	
1.3000.001	Full Engine Speed Switchpoint	Full engine speed switchpoint	Above this limit value, the engine switches to full-engine operation.	rpm	0,1	
1.3000.002	Full Engine Speed Hysteresis	Full engine speed hysteresis	Speed hysteresis for switching back to cylinder cutout mode. Trip point is 1.3000.002 hysteresis.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.3000.004	Full Engine Torque Hysteresis	Full engine torque hysteresis	Torque hysteresis for switching back to cylinder cutout mode. Trip point is 1.3000.003 hysteresis.	Nm	0,1	
1.3000.005	Half Engine Delay after Start	Cylinder cutout delay after start	If the engine is in low-load operation (criteria for cylinder cutout fulfilled), after engine start a switch is made to cylinder cutout mode only after this time has elapsed.	s	0,001	
1.3000.006	Half Engine Activation Delay	Cylinder cutout mode activation delay	If the conditions for cylinder cutout are fulfilled in full-engine operation, a switch is made to cylinder cutout mode after this delay time has elapsed.	s	0,001	
1.3000.007	Half Engine Switchover Time	Cylinder cutout mode time during bank change	Delay time after which the engine, in continuous cylinder cutout mode, switches to the other cylinder bank via complete engine.	s	0,001	
1.3000.008	Half Engine Switchover Delay	Switchover time for cylinder cutout bank change	In the case of a bank change in cylinder cutout mode, prior to switchover to the other bank the engine is run in full-engine operation for the time entered here.	s	0,001	
1.3000.009	Alternate Half Engine Mode	Bank switchover with cylinder cutout	"X" set: During every new cylinder cutout procedure, a switch is made between the cylinders in the 1st bank and the 2nd bank configured via parameters 1.3000.010 and 1.3000.011. No "X" set: No bank switchover		1	
1.3000.015	Half Engine Mode Temp Limit	Temperature limit in cylinder cutout mode	Cylinder cutout mode is not possible above this temperature. The temperature from 1.1030.016 is used.	degC	0,01	
1.3000.016	Half Engine Temp Limit Hyst	Cylinder cutout mode temperature limit hysteresis	Cylinder cutout mode is possible below 1.3000.015 hysteresis. The temperature from 1.1030.016 is used.	degC	0,01	
1.8009.050	Op. Hours Injector Change	Operating hours at injector replacement	Operating hour counter reading during injector replacement.	h	1	
1.8009.051	Fuel Cons. Corr. per 1000 h	Aging correction for consumption display/1000 h	Factor for calculating the injector-dependent aging correction of fuel consumption in [%/1000h].	%	0,001	
1.9901.100	Sensortype Input PI1	Sensor type input PI1	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.9901.101	Sensortype Input PI2	Sensor type input PI2	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.102	Sensortype Input PI3	Sensor type input PI3	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.103	Sensortype Input PI4	Sensor type input PI4	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.104	Sensortype Input PI5	Sensor type input PI5	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.105	Sensortype Input PI6	Sensor type input PI6	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.106	Sensortype Input PI7	Sensor type input PI7	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.107	Sensortype Input PI8	Sensor type input PI8	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.108	Sensortype Input PI9	Sensor type input PI9	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.109	Sensortype Input PI10	Sensor type input PI10	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.110	Sensortype Input PI11	Sensor type input PI11	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.111	Sensortype Input PI12	Sensor type input PI12	Measurement range/sensor type of sensor at this input.	digit	1	
1.9901.112	Sensortype Input PI13	Sensor type input PI13	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.113	Sensortype Input PI14	Sensor type input PI14	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.114	Sensortype Input PTI1	Sensor type input PTI1	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.115	Sensortype Input PTI2	Sensor type input PTI2	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.116	Sensortype Input LSI1	Sensor type input LSI1	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.117	Sensortype Input LSI2	Sensor type input LSI2	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.118	Sensortype Input LSI3	Sensor type input LSI3	Measurement range/sensor type of sensor at this input.	digit	1	
1.9901.119	Sensortype Input TI1	Sensor type input TI1	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.120	Sensortype Input TI2	Sensor type input TI2	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.121	Sensortype Input TI3	Sensor type input TI3	Measurement range/sensor type of sensor at this input.	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
1.9901.122	Sensortype Input TI4	Sensor type input TI4	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.123	Sensortype Input TI5	Sensor type input TI5	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.124	Sensortype Input TI6	Sensor type input TI6	Measurement range/sensor type of sensor at this input.	digit	1	
1.9901.125	Sensortype Input TI7	Sensor type input TI7	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.126	Sensortype Input TI8	Sensor type input TI8	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.127	Sensortype Input TI9	Sensor type input TI9	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.128	Sensortype Input TI10	Sensor type input TI10	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.129	Sensortype Input TI11	Sensor type input TI11	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.130	Sensortype Input TI12	Sensor type input TI12	Measurement range/sensor type of sensor at this input.	digit	1	
1.9901.131	Sensortype Input KTY	Sensor type input KTY	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.132	Sensortype Input U_PDU	Sensor type input U_PDU	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.133	Sensortype Input PWM_CM1_I	Sensor type input PWM_CM1_I	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9901.134	Sensortype Input PWM_CM2_I	Sensor type input PWM_CM2_I	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
1.9906.001	LevSensTest Test-Time	Level sensor test duration	Level sensor test: Duration of test from switching on the sensor supply voltage to the start of normal operation.	s	0,001	
1.9906.002	LevSensTest Time Power Off	Level sensor test supply voltage OFF	The sensor power is switched off for this time.	s	0,001	
1.9906.003	LevSensTest Scan after PowerON	Level sensor test scan after power ON	Time up to the signal level check after switching on operating voltage.	s	0,001	
1.9906.004	LevSensTest Testinterval	Level sensor test interval	Time from the start of the test to the next test	s	0,001	
1.9906.010	LevSensTest LSI 1 active	Level sensor test LSI 1 active	"X" set: Self-test activated No "X" set: only normal operation		1	
1.9906.011	LevSensTest LSI 2 active	Level sensor test LSI 2 active	"X" set: Self-test activated No "X" set: only normal operation		1	
1.9906.012	LevSensTest LSI 3 active	Level sensor test LSI 3 active	"X" set: Self-test activated No "X" set: only normal operation		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.0010.010	Order Number Test Bed	Order number, test stand	Order No. for the MCS-5 test stand configuration used.	digit	1	
2.0010.011	Plant Number Test Bed	Plant number, test stand	The plant No. for the order No. for the MCS-5 test stand configuration used.	digit	1	
2.0010.012	Order Number Series	Order number, series	Order No. for the MCS-5 series configuration used.	digit	1	
2.0010.013	Plant Number Series	Plant number, series	The plant No. for the order No. for the MCS-5 series configuration used.	digit	1	
2.0280.002	Speed Demand ECU Channel	Speed setpoint for ECU channel	ECU channel via which the sensor is recorded. Important: A change in the failure limits of the correction curve (X-Min, X-Max) is only effective after a RESET. Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)
2.0280.003	Speed Demand FilterTime Const.	Speed setpoint filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	
2.0280.005	Speed Demand Default Value	Specified speed default value	Default value with faulty sensor.	rpm	0,1	
2.0283.002	Load Signal % ECU Chan	Load signal % ECU channel	ECU channel via which the sensor is recorded. Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)
2.0283.003	Load Signal % FilterTime Const	Load signal % filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	
2.0283.009	Load Signal % Default Value	Load signal % default value	Default value with faulty sensor.	%	0,001	
2.0286.002	Frequency Input RPM ECU Channel	Frequency speed input ECU channel	ECU channel via which the sensor is recorded. Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.0286.003	Freq. Input RPM FilterTime Const	Frequency speed input filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	
2.0286.005	Freq. Input RPM Default Value	Frequency speed input default value	Default value with faulty sensor.	rpm	0,1	
2.0287.002	Idle/End-Torque[%] ECU Channel	Filling signal[%] ECU channel	ECU channel via which the sensor is recorded. Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)
2.0287.003	Idle/End-Torq[%]FilterTime Const	Filling signal[%] filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	
2.0287.005	Idle/End-Torq[%] Default Value	Filling signal[%] default value	Default value with faulty sensor.	Nm	0,1	
2.0288.002	Generator Voltage ECU Channel	Generator voltage ECU channel	ECU channel via which the sensor is recorded. Important: A change in the failure limits of the correction curve (X-Min, X-Max) is only effective after a RESET. Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)
2.0288.003	Generator Voltage FilterTime Const	Generator voltage filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	
2.0288.005	Generator Voltage Default Value	Generator voltage default value	Default value with faulty sensor.	V	0,001	
2.0289.002	Generator Power ECU Channel	Generator power ECU channel	ECU channel via which the sensor is recorded. Important: A change in the failure limits of the correction curve (X-Min, X-Max) is only effective after a RESET. Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)
2.0289.003	Generator Power FilterTime Const.	Generator power filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.0289.005	Generator Power Default Value	Generator power default value	Default value with faulty sensor.	kW	0,001	
2.0290.002	Aux 1 Plant ECU Channel	Auxiliary 1 plant ECU channel	ECU channel via which the sensor is recorded Value 0 → AI_1 analog input 1 Value 1 → AI_2 analog input 2 Value 2 → 24V Value 3 → FIP frequency input Value 40 → channel not used, no monitoring for sensor defect	digit	1	(→ Page 108)
2.0290.003	Aux 1 Plant Filter Time Const	Auxiliary 1 plant filter time constant	Filter time constant for PT1-filter in the input circuit.	s	0,001	
2.0290.005	Aux 1 Plant Default Value	Auxiliary plant default value	Default value with faulty sensor.	digit	1	
2.0500.001	CAN Interface Configuration	Configuration for CAN interfaces	CIC parameter, setting of the CAN configuration used in the respective plant.	digit	1	(→ Page 181)
2.0500.002	CAN ECU Node-No.	CAN ECU node number	Node number under which the ECU communicates on CAN 1 and/or CAN2. If the value 0 is entered here, the fixed default value 2 is used; otherwise, the value entered at this point.	digit	1	
2.0500.003	CAN Transmit Base-ID	CAN transmit basic ID	This parameter specifies the transmission basic identifier with which the page can be sent on CAN 1 or CAN 2. Further pages are sent in each case with the increment of this identifier. When a value > 0 is entered here, this will always also be used as a basic ID. Default or PU data basic IDs will be ignored.	digit	1	
2.0500.004	CAN FSW emulation	CAN FSW emulation	This parameter can be used to specify which FSW is to be simulated with regard to the CAN interface. If the parameter value equals "0", emulation will not take place and the CAN software behaves in accordance with the latest specification status.	digit	1	(→ Page 182)

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.0500.005	CAN Monitored Nodes	CAN-monitored nodes	This parameter is only relevant if Monitor Nodes is set in PR 2.0500.001, CAN Interface Configuration Bit7. If this is the case, all nodes from 1 to 31 are monitored if their bit is set here. The assignment of the nodes to the corresponding bits is as node 1 - 31 corresponding to bit 0 - 30. If it has been determined which nodes are to be monitored, the corresponding bits must be set and used to calculate the corresponding dialog input value: The binary value resulting from the nodes to be monitored simply has to be converted into the resulting positive decimal number.	digit	1	
2.0500.006	CAN System Start Delay Time	CAN system start delay time	A value from 0 to 60 seconds can be entered. The CAN application then waits for this time before the actual initialization of the communication begins. The background to this is that, for example, in PCS-5 bus operation, all alive PDUs are received for a while by nodes at the bus in order that a decision can be made subsequently as to which is the active bus.	sec	1	
2.0500.007	CAN Latest Transmit Repetition	CAN latest transmit repetition	A value from 5 to 60 seconds can be entered. This time specifies when an object is sent, at the latest, if its value has not changed over a long period. If a binary value does not change, therefore, over several hours, then it will always be sent periodically after this set time.	sec	1	
2.0500.008	CAN PU-Module Type/No.	CAN PU data module type/No.	Module type and serial configuration No. of a permanently configured PU data module for operating the ECU in systems in which no BDM is required, or present, due to the fixed configuration.	digit	1	(→ Page 182)
2.0500.009	CAN PPS StartMon-itorDelayTime	CAN PPS start monitoring delay time	Time for suppression of the node monitoring and defective sensor and/or missing data alarms during setup for nodes of type PPS. A value between 0 and 120 seconds can be entered.	sec	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.0500.010	CAN PIM StartMonitorDelayTime	CAN PIM start monitoring delay time	Time for suppression of the node monitoring and defective sensor and/or missing data alarms during setup for nodes of type PIM. A value between 0 and 60 seconds can be entered.	sec	1	
2.0500.011	CAN EMU GSW Download Time	CAN EMU GSW download time	Anticipated time required to download basic software from the PPS to the EMU. This means that the time has to be calculated so that a GSW download from the PPS to the EMU can be completed reliably within this time. This is important because the ECU completely deactivates EMU data handling for this period to avoid ID collisions with the PPS during a GSW download.	sec	1	
2.0500.012	CAN EMU PU Data Download Time	CAN EMU PU data download time	Anticipated time required to download PU data from the PPS to the EMU. This means that the time has to be calculated so that a PU download from the PPS to the EMU can be completed reliably within this time. This is important because the ECU completely deactivates EMU data handling for this period to avoid ID collisions with the PPS during a PU data download.	sec	1	
2.0500.013	CAN TX-Queue Optimization	CAN TX queue optimization	This parameter can be used to activate the TX queue optimization. 0 = Optimization is deactivated. Optimization is activate if one of the percentage stages 10, 20, ..., 100 % is activated. Example: If the 500 ms queue contains at least 1 object for transmission but no more objects have been sent for 500 ms, then all objects in the queue will be sent at intervals of a parameterized percentage value of 500 ms. At 20 %, therefore, every 100 ms.		1	
2.0500.014	CAN Test Selection	CAN test selection	Selection of the test function which can output CAN test 1-5 values on the test process variables.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.001	CAN Torque Active	CAN torque active	If this bit is set, the torque signal is selected, whereby this signal is transmitted via the CAN bus. The signal is only effective if parameter ZKP No. 2.1000.002 is set in addition and the engine speed (process variable ZKP No. 1.2500.044) is greater than or equal to parameter ZKP No. 2.1000.031.		1	
2.1000.002	Load Signal Active	Load signal active	If this bit is set, the load or torque signal is activated.		1	
2.1000.003	Load Signal Analog Active	Analog load signal is active	If this bit is set, the analog load signal is selected. The signal is only effective if parameter ZKP No. 2.1000.002 is set in addition and the engine speed (process variable ZKP No. 1.2500.044) is greater than or equal to parameter ZKP No. 2.1000.031.		1	
2.1000.004	Load Signal CAN Active	Load signal CAN active	If this bit is set, the CAN load signal is selected. The signal is only effective if parameter ZKP No. 2.1000.002 is set in addition and the engine speed (process variable ZKP No. 1.2500.044) is greater than or equal to parameter ZKP No. 2.1000.031.		1	
2.1000.005	Test Funct.-Speed Demand Ret. Mode	Test function specified speed return mode	If bit 2 of parameter ZKP No. 2.1000.007 is set, "Specified speed jumps" mode is selected. If the parameter ZKP No. 2.1000.006 is set to 'True', after the time specified in parameter ZKP No. 2.1000.036 has elapsed the specified speed (PV ZKP No. 2.1000.041) jumps from the starting value (Par. ZKP No. 2.1000.034) to the full-scale value (Par. ZKP No. 2.1000.035). If this parameter is set to "True", the specified speed, after the time specified in parameter ZKP No. 2.1000.037 has elapsed, jumps back to the starting value.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.006	Test Funct.-Speed Demand Start	Test function specified speed return start	If bit 2 of parameter ZKP No. 2.1000.007 is set, "Specified speed jumps" mode is selected. If this parameter is set to "True", specified speed jump is activated. If a specified speed jump is to be repeated, the parameter must first be set to 'False'. The specified speed then jumps to the starting value (Par. ZKP No. 2.1000.034). To activate the renewed specified speed jump, this parameter must then be set back to 'True'.		1	
2.1000.007	Speed Controller Config.	Configuration of speed governor	This binary-encoded parameter can be used to configure the speed governor.	digit	1	(→ Page 182)
2.1000.008	v-Speed Governor (Gain)	v-Speed governor	If bit 1 of parameter 2.1000.007 is not set, this parameter can be used to specify the stationary closed-loop gain of the open speed control loop. The stationary proportional action factor kpstat (PV 2.1000.043, "Speed Governor (kpStat)") and the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") are calculated in proportion to this parameter. If this parameter is increased, the dynamics of the governor also increase. If this parameter is decreased, the dynamics of the governor also decrease.	digit	1	
2.1000.009	Stat. Adap.-Min. Torque	Stat. adaptation min. torque	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set, the proportional action factors kpstat (PV 2.1000.043, "Speed Governor (kpStat)") and kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the governor are calculated as a function of the specified torque (PV 2.1000.046, "Speed Governor Integral Torque"), the engine speed (PV 1.2500.044, "Engine Speed (ECU)") and the closed-loop gain of the open speed control circuit (Par. 2.1000.008, "v-Speed Governor (Gain)"). In this calculation, the specified torque has a bottom limit restricted to this parameter, i.e. if the specified torque adopts smaller values than this parameter, the specified torque is set to the value of this parameter.	Nm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.010	Stat. Adap.-Min. Speed	Stat. adaptation min. speed	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set, the proportional action factors kpstat (PV 2.1000.043, "Speed Governor (kpStat)") and kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the governor are calculated as a function of the specified torque (PV 2.1000.046, "Speed Governor Integral Torque"), the engine speed (PV 1.2500.044, "Engine Speed (ECU)") and the closed-loop gain of the open speed control circuit (Par. 2.1000.008, "v-Speed Governor (Gain)"). In this calculation, the engine speed has a bottom limit restricted to this parameter, i.e. if the engine speed adopts smaller values than this parameter, the engine speed is set to the value of this parameter.	rpm	0,1	
2.1000.011	Speed Governor (kp)	Speed governor (kp)	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is set, the proportional action factors kpstat (process variable 2.1000.043, "Speed Governor (kpStat)") and kpdyn (process variable 2.1000.044, "Speed Governor (kpDyn)") of the speed governor can be specified at a constant level using this parameter.	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.012	Speed Governor (kpmin)	Speed governor (kpmin)	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set, the proportional action factors kpstat (PV 2.1000.043, "Speed Governor (kpStat)") and kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the governor are calculated as a function of the specified torque (PV 2.1000.046, "Speed Governor Integral Torque"), the engine speed (PV 1.2500.044, "Engine Speed (ECU)") and the closed-loop gain of the open speed control circuit (Par. 2.1000.008, "v-Speed Governor (Gain)"). The dynamic proportional action factor kpdyn is also calculated as a function of the engine speed governing deviation (PV 2.1000.042, "Engine Speed Deviation"). Both kpstat as well as kpdyn have a bottom limit in this calculation restricted to the value of this parameter.	digit	1	
2.1000.013	Speed Governor (tn)	Speed governor (tn)	This parameter can be used to specify the integral action time tn of the speed governor. The integrating component of the speed governor (I-component) is proportional to the reciprocal of the integral action time. For this reason, the integrating process of the speed governor is slowed down with increasing integral action time. On the other hand, the integrating process of the speed governor is faster with decreasing integral action time. With regard to magnitude, the integral action time must be in the range of the control path time constants (time constant of engine and plant). Plants with a very high inertial moment therefore require a long integral action time.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.014	Speed Governor (tv)	Speed governor (tv)	If bit 4 of parameter 2.1000.007 ("Speed Controller Config.") is not set, the rate time tv of the speed governor can be specified constantly with this parameter. The differential component (D-component) of the speed governor is proportional to the rate time. The D-component of the speed governor can therefore be increased by increasing the rate time. Conversely, the D-component of the speed governor can be decreased by decreasing the rate time.	s	0,001	
2.1000.015	Speed Governor (t1)	Speed governor (t1)	This parameter can be used to set the delay time t1 of the differential component (D-component) of the speed governor. If this parameter is increased, the D-component delay is increased. If this parameter is decreased, the D-component delay is decreased.	s	0,001	
2.1000.016	Adap. Speed Gov.-Tqmin	Adapt. speed governor torque min.	If bit 4 of parameter 2.1000.007 ("Speed Controller Config.") is set, the rate time tv (process variable 2.1000.045, "Speed Governor (tv)") can be adjusted linearly via the specified torque. If the specified torque is smaller or equal to this parameter, the rate time tv is identical to Par. 2.1000.018 ("Adap. Speed Gov.- tv(Tqmin)").	Nm	0,1	
2.1000.017	Adap. Speed Gov.-Tqmax	Adapt. speed governor torque max.	If bit 4 of parameter 2.1000.007 ("Speed Controller Config.") is set, the rate time tv (process variable 2.1000.045, "Speed Governor (tv)") can be adjusted linearly via the specified torque. If the specified torque is greater or equal to this parameter, the rate time tv is identical to Par. 2.1000.019 ("Adap. Speed Gov.- tv(Tqmax)").	Nm	0,1	
2.1000.018	Adap. Speed Gov.-tv(Tqmin)	Adapt. speed governor tv (torque min.)	If bit 4 of parameter 2.1000.007 ("Speed Controller Config.") is set, the rate time tv (process variable 2.1000.045, "Speed Governor (tv)") can be adjusted linearly via the specified torque. If the specified torque is smaller or equal to Par. 2.1000.016 ("Adap. Speed Gov.- tv(Tqmin)"), the rate time tv is identical to this parameter.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.019	Adap. Speed Gov.-tv(Tqmax)	Adapt. speed governor tv (torque max.)	If bit 4 of parameter 2.1000.007 ("Speed Controller Config.") is set, the rate time tv (process variable 2.1000.045, "Speed Governor (tv)") can be adjusted linearly via the specified torque. If the specified torque is greater or equal to Par. 2.1000.017 ("Adap. Speed Gov.- tv(Tqmax)"), the rate time tv is identical to this parameter.	s	0,001	
2.1000.020	Dyn. Adaptation-Activation Speed	Dyn. adaptation activation speed	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set, the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the speed governor is adjusted as a function of the speed control deviation (PV 2.1000.042, "Engine Speed Deviation") if the engine actual speed (PV 1.2500.044, "Engine Speed (ECU)") has exceeded the value of this parameter for the first time with disappearing or negative speed control deviation.	rpm	0,1	
2.1000.021	Dyn. Adaptation-Low Lim. Load On	Dyn. adaptation lower limit load On	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set and the speed control deviation (PV 2.1000.042, "Engine Speed Deviation") is positive, greater than this parameter and smaller than Par. 2.1000.023 ("Dyn. Adaption-High Limit"), the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the speed governor is increased by (Par. 2.1000.024 * Number of cylinders * 0.1 * (speed control deviation in [rpm] - Par. 2.1000.021)).	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.022	Dyn. Adaptation-Low Lim Load Off	Dyn. adaptation low limit load Off	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set and the speed control deviation (PV 2.1000.042, "Engine Speed Deviation") is negative, with a value greater than this parameter and smaller than Par. 2.1000.023 ("Dyn. Adaption-High Limit"), the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the speed governor is increased by (Par. 2.1000.025 * Number of cylinders * 0.1 * (speed control deviation in [rpm] - Par. 2.1000.022)).	rpm	0,1	
2.1000.023	Dyn. Adaptation-High Limit	Dyn. adaptation high limit	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set and the speed control deviation (PV 2.1000.042, Engine Speed Deviation") is positive and greater than parameter 2.1000.021 ("Dyn. Adaption-Low Lim. Load On"), the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the speed governor is increased with rising speed control deviation until the speed control deviation reaches the value of this parameter. If the speed control deviation keeps increasing, kpdyn will no longer be increased. If the speed control deviation is negative and has a value greater than (PV 2.1000.022, "Dyn. Adaption-Low Lim Load Off"), with a decreasing speed control deviation kpdyn is correspondingly increased until the value of the speed control deviation reaches this parameter.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.024	Dyn. Adaption-Param. Load On	Dyn. adaptation param. load On	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set and the speed control deviation (PV 2.1000.042, "Engine Speed Deviation") is positive, with a value greater than Par. 2.1000.021 ("Dyn. Adaption-Low Limit") and smaller than Par. 2.1000.023 ("Dyn. Adaption-High Limit"), the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the speed governor is increased by (Par. 2.1000.024 * Number of cylinders * 0.1 * (speed control deviation in [rpm] - Par. 2.1000.021)).	digit	1	
2.1000.025	Dyn. Adaption-Param. Load Off	Dyn. adaptation param. load Off	If bit 1 of parameter 2.1000.007 ("Speed Controller Config.") is not set and the speed control deviation (PV 2.1000.042, "Engine Speed Deviation") is negative, with a value greater than Par. 2.1000.022 ("Dyn. Adaption-Low Lim Load Off"), the dynamic proportional action factor kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the speed governor is increased by (Par. 2.1000.025 * Number of cylinders * 0.1 * (|speed control deviation in [rpm]| - Par. 2.1000.022)).	digit	1	
2.1000.026	tv-Load Signal	tv load signal	The load signal is processed by a DT1 algorithm. This parameter can be used to set the rate time tv of this algorithm.	s	0,001	
2.1000.027	t1-Load Signal	t1 load signal	Delay time t1 of the DT1 algorithm, which processes the load signal.	s	0,001	
2.1000.028	Load Signal Upper Limit Hyst.	Load signal upper limit hysteresis	The load signal is only switched on when the (dynamic) torque corresponding to the load signal during load imposition exceeds the value of this parameter for the first time.	Nm	0,1	
2.1000.029	Load Signal Lower Limit Hyst.	Load signal lower limit hysteresis	The load signal is only switched on when the (dynamic) torque corresponding to the load signal during load shedding falls below the value of this parameter for the first time.	Nm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.030	Load Signal Min. Torque	Load signal minimum torque	If the load signal is switched on and if the torque corresponding to the load signal falls below the value of this parameter, the load signal will be switched off.	Nm	0,1	
2.1000.031	Load Signal Release Speed	Load signal release speed	If parameter 2.1000.002 ("Load Signal Active") is set and the engine actual speed (process variable 1.2500.044, "Engine Speed (ECU)") exceeds the value of this parameter, the load or torque signal will be switched on.	rpm	0,1	
2.1000.032	Load Signal Max. Requ. Torque	Load signal reference torque	The curves 2.0401.015 ("Analog Loadsignal Curve [Voltage]") and 2.0401.023 ("Analog Loadsignal Curve [mA]") can be used to convert the recorded analog load signal from the physical signal (current or voltage) to the unit [%]. The output value of curve 2.1000.052 ("CAN Loadsignal Curve") represents the CAN Loadsignal in the unit [%]. In each case, this parameter converts from the unit [%] into a corresponding specified torque. In this case, 100 [%] corresponds to the value of this parameter.	Nm	0,1	
2.1000.033	CAN Torque Max. Requ. Torque	CAN torque reference torque	The torque signal specified in the unit [%] is converted using this parameter to a corresponding specified torque. In this case, 100 [%] corresponds to the value of this parameter.	Nm	0,1	
2.1000.034	Test Funct.-Init. Speed	Test function initial speed	If bit 2 of parameter 2.1000.007 ("Speed Controller Config.") is set, specified speed jumps can be carried out. This parameter can be used to specify the initial speed.	rpm	0,1	
2.1000.035	Test Funct.-End Speed	Test function maximum speed	If bit 2 of parameter 2.1000.007 ("Speed Controller Config.") is set, specified speed jumps can be carried out. This parameter can be used to specify the maximum speed.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1000.036	Test Funct.-Forw. Delay	Test function forward delay	If bit 2 of parameter 2.1000.007 ("Speed Controller Config.") is set, specified speed jumps can be carried out. If the parameter 2.1000.006 is set to 'True' and parameter 2.1000.005 is set to 'False', after the delay time specified by this parameter has elapsed the specified speed jumps from the starting value (Par. 2.1000.034) to the full-scale value (Par. 2.1000.035).	s	0,001	
2.1000.037	Test Funct.-Return Delay	Test function return delay time	If bit 2 of parameter 2.1000.007 ("Speed Controller Config.") is set, specified speed jumps can be carried out. If parameters 2.1000.005 and 2.1000.006 are set to 'True', after the delay time specified by parameter 2.1000.036 has elapsed the specified speed jumps from the starting value (Par. 2.1000.034) to the full-scale value (Par. 2.1000.035) and, after the delay time specified by this parameter has elapsed, jumps from the full-scale value back to the starting value.	s	0,001	
2.1000.038	Requested Torque Input	Dialog specification, specified torque	If bit 3 of parameter 2.1000.007 ("Speed Controller Config.") is set, the specified torque (process variable 2.1000.049, "Requested Torque") can be defined constantly using this parameter.	Nm	0,1	
2.1000.039	Torque at Zero Fuel Quantity	Torque at zero fuel quantity	The efficiency characteristics map (par. 1.1200.001, "Efficiency-Table 1 ETC Mode 1" or par. 1.1200.009, "Efficiency-Table 1 ETC Mode 2") presents the injection mass as a function of engine speed and specified torque. This parameter defines the specified torque corresponding to the injection mass "0 mg".	Nm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.004	Idle/End-Max. Torque Input	Reference torque for idle/max-speed governor	The curves 2.0401.026 ("Fuel Input Idle/End (Current)") and 2.0401.027 ("Fuel Input Idle/End (Voltage)") can be used to convert the recorded analog filling signal from the physical signal (current or voltage) to the unit [%]. This parameter converts from the unit [%] into a corresponding specified torque. In this case, 100 [%] corresponds to the value of this parameter.	Nm	0,1	
2.1010.005	Hysteresis Idle Governor	Hysteresis idle speed governor	The transition from idle speed governor to filling specification is carried out when the filling specification (process variable 2.1010.028, "Idle/End-Torque Input [Nm]") is greater than the sum of the filtered idle-specified torque (process variable 2.1010.030, "Idle Gov.-Requ. Torque Filt.") and this parameter becomes: Par. 2.1010.028 > (PV 2.1010.030 + Par. 2.1010.005) → transition from idle speed control to filling specification	Nm	0,1	
2.1010.006	Par. Grad. Idle Act. Speed	Parameter gradient current speed controller	This parameter can be used to make the transition from filling specification to idle speed control dependent on the gradients of engine speed. The transition from filling specification to idle speed control is made when the following condition is fulfilled: Engine actual speed < (PV 2.1060.053 - (Par. 2.1010.006 * PV 2.1010.033/1000) - Par. 2.1010.007) → transition from filling specification to idle speed control	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.007	Speed Deviation Idle Governor	Idle governor speed control deviation	This parameter can be used to initialize speed control deviation during the transition from filling specification to idle speed control. The transition from filling specification to idle speed control is made when the following condition is fulfilled for engine actual speed: Engine actual speed < (PV 2.1060.053 - (Par. 2.1010.006 * PV 2.1010.033/1000) - Par. 2.1010.007) In this case, the specified speed is set to the following value (target deceleration): Engine specified speed = PV 2.1060.053 - (Par. 2.1010.008 * PV 2.1010.033/1000) If this parameter is greater than zero and parameters 2.1010.006 and 2.1010.008 are identical, the speed control deviation is initialized with a positive value during the transition from filling specification to idle speed control.	rpm	0,1	
2.1010.008	Par. Grad. Idle Requ. Speed	Parameter gradient target deceleration idle	This parameter can be used to increase the engine specified speed as a function of engine speed gradients ("target deceleration") during the transition from filling specification to idle speed control: Engine specified speed = PV 2.1060.053 - (Par. 2.1010.008 * PV 2.1010.033/1000)	digit	1	
2.1010.009	Par. Grad. Idle Integral-Part	Parameter gradient idle I-component	Bits 5 and 6 of parameter 2.1000.007 (“Speed Controller Config.“) can be used to initialize the I-component during the transition from filling specification to idle speed control.	digit	1	(→ Page 184)
2.1010.010	I-Part Demand Idle Speed	Specification of I-component idle speed	Bits 5 and 6 of parameter 2.1000.007 ("Speed Controller Config.") can be used to initialize the I-component during the transition from filling specification to idle speed control. If either bit 5 is set and bit 6 is not set, or if both bits are set, this parameter can be used to specify a constant I-component.	Nm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.011	t1-Requ. Torque Idle Governor	t1 idle speed governor specified torque	The transition from idle speed governor to filling specification is carried out when the filling specification (process variable 2.1010.028, "Idle/End-Torque Input [Nm]") is greater than the sum of the filtered idle-specified torque (process variable 2.1010.030, "Idle Gov.-Requ. Torque Filt.") and parameter 2.1010.005 becomes: PV 2.1010.028 > (PV 2.1010.030 + Par. 2.1010.005) → transition from idle speed control to filling specification The filtered idling specified torque results from the idling specified torque (PV 2.1010.029, "Idle/End-Torque Speed Governor") through filtering with the PT1 filter. The time constant t1 of this filter can be specified using this parameter.	s	0,001	
2.1010.012	Par. Grad. End Act. Speed	Parameter gradient current end speed governor	This parameter can be used to make the transition from filling specification to maximum speed control dependent on the gradients of engine speed. The transition from filling specification to maximum speed control is made when the following condition is fulfilled: Engine actual speed > (PV 2.1060.054 - (Par. 2.1010.012 * PV 2.1010.033/1000) + Par. 2.1010.013) → transition from filling specification to maximum speed control	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.013	Speed Deviation End Governor	Speed control deviation of maximum-speed governor	This parameter can be used to initialize speed control deviation during the transition from filling specification to maximum-speed control. The transition from filling specification to maximum speed control is made when the following condition is fulfilled for engine actual speed: Engine actual speed > (PV 2.1060.054 - (Par. 2.1010.012 * PV 2.1010.033/1000) - Par. 2.1010.013) In this case, the specified speed is set to the following value (target deceleration): Engine specified speed = PV 2.1060.054 - (Par. 2.1010.014 * PV 2.1010.033/1000) If this parameter is greater than zero and parameters 2.1010.012 and 2.1010.014 are identical, the speed control deviation is initialized with a negative value during the transition from filling specification to maximum speed control.	rpm	0,1	
2.1010.014	Par. Grad. End Requ. Speed	Parameter gradient target deceleration max. speed	This parameter can be used to decrease the engine specified speed as a function of engine speed gradients ("target deceleration") during the transition from filling specification to maximum speed control: Engine specified speed = PV 2.1060.054 - (Par. 2.1010.014 * PV 2.1010.033/1000)	digit	1	
2.1010.015	Par. Grad. End Integral-Part	Parameter gradient max. speed I-component	This parameter can be used to define the initialization of I-component as a function of engine speed gradients during the transition from filling specification to maximum speed control. I-component = current specified torque - (Par. 2.1010.015 * PV 2.1010.033 * Number of cylinders / 1000) - P(DT1)-component if following applies: Par. 2.1010.002 = "True" I-component = current specified torque - (Par. 2.1010.015 * PV 2.1010.033 * Number of cylinders / 1000) if following applies: Par. 2.1010.002 = "False"	digit	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.016	Hysteresis End Governor	Maximum-speed governor hysteresis	The transition from maximum speed governor to filling specification is carried out when the filling specification (process variable 2.1010.028, "Idle/End-Torque Input [Nm]") is smaller than the difference of the filtered maximum speed specified torque (process variable 2.1010.031, "End Gov.-Requ. Torque Filt.") and this parameter becomes: PV 2.1010.028 < (PV 2.1010.031 - Par. 2.1010.016) → transition from maximum speed control to filling specification	Nm	0,1	
2.1010.017	t1-Requ. Torque End Governor	t1 maximum speed governor specified torque	The transition from maximum speed governor to filling specification is carried out when the filling specification (process variable 2.1010.028, "Idle/End-Torque Input [Nm]") is smaller than the difference of the filtered maximum speed specified torque (process variable 2.1010.031, "End Gov.-Requ. Torque Filt.") and Par. 2.1010.016 becomes: PV 2.1010.028 < (PV 2.1010.031 - Par. 2.1010.016) → transition from maximum speed control to filling specification The filtered maximum speed specified torque results from the maximum speed specified torque (PV 2.1010.029, "Idle/End-Torque Speed Governor") through filtering with the PT1 filter. The time constant t1 of this filter can be specified using this parameter.	s	0,001	
2.1010.018	Grad. Calculation Period	Calculation period for gradient	The current engine speed gradient (process variable 2.1010.032, "Speed Gradient Actual") is calculated from the difference between the current engine speed (process variable 1.2500.044, "Engine Speed (ECU)") and an older engine speed. The time frame between both speeds can be specified using this parameter.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.019	Speed Grad. Filter Time	Filter time speed gradient	The mean engine speed gradient (process variable 2.1010.033, "Speed Gradient Filtered") is calculated by averaging the current engine speed gradients over a period defined by this parameter.	s	0,001	
2.1010.020	t1-Speed Gov. I-Part Repl.	t1 substitute I-component	With the idle-maximum-speed governor active, the I-component of the speed governor is no longer calculated in the entire operating range of the engine. As the I-component of the speed governor is required by the high-pressure controller, an appropriate substitute value (PV 2.1010.025, "Speed Gov. I-Part Replacem.") is calculated, which results from the specified torque (PV 2.1000.049, "Requested Torque") through filtering with the PT1 filter. The time constant of this PT1 filter can be specified using this parameter.	s	0,001	
2.1010.021	t1-Speed Gov. PI-Part Repl.	t1 substitute PI-component	With the idle-maximum-speed governor active, the PI-component of the speed governor is no longer calculated in the entire operating range of the engine. As the I-component of the speed governor is required by the high-pressure controller, an appropriate substitute value (PV 2.1010.026, "Speed Gov. PI-Part Replacem.") is calculated, which results from the specified torque (PV 2.1000.049, "Requested Torque") through filtering with the PT1 filter. The time constant of this PT1 filter can be specified using this parameter.	s	0,001	
2.1010.040	Idle/End Gov.-Idle Speed 50 Hz	Idle/max-speed governor - idle speed 50 Hz	Idle speed of the idle-maximum-speed governor during 50 Hz operation.	rpm	0,1	
2.1010.041	Idle/End Gov.-End Speed 50 Hz	Idle/max.-speed governor - max. speed 50 Hz	Maximum speed of the idle-maximum-speed governor during 50 Hz operation.	rpm	0,1	
2.1010.042	Idle/End Gov.-Idle Speed 60 Hz	Idle/max.-speed governor - idle speed 60 Hz	Idle speed of the idle-maximum-speed governor during 60 Hz operation.	rpm	0,1	
2.1010.043	Idle/End Gov.-End Speed 60 Hz	Idle/max.-speed governor - max. speed 60 Hz	Maximum speed of the idle-maximum-speed governor during 60 Hz operation.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1010.044	Idle/End Gov.-Idle Speed Ramp	Idle/max.-speed governor - idle speed ramp	With target deceleration active, the specified speed in idle speed governor mode is run using this adjustment ramp following initial deviation up to the minimum specified speed of the idle-maximum-speed governor (process variable 2.1010.048 , "Idle/End Gov.-Min. Speed").	rpm/s	0,1	
2.1010.045	Idle/End Gov.-End Speed Ramp	Idle/max.-speed governor - max. speed ramp	With target deceleration active, the specified speed in maximum-speed governor mode is run using this adjustment ramp following initial deviation up to the maximum specified speed of the idle-maximum-speed governor (process variable 2.1010.049, "Idle/End Gov.-Max. Speed").	rpm/s	0,1	
2.1050.001	BinOut TOP1 PV-Number	BinOut TOP1 source PV number	Process variable which is output at transistor output TOP1.	PV	1	Extras, inputs and out-puts
2.1050.002	BinOut TOP2 PV-Number	BinOut TOP2 source PV number	Process variable which is output at transistor output TOP2.	PV	1	Extras, inputs and out-puts
2.1050.003	BinOut TOP3 PV-Number	BinOut TOP3 source PV number	Process variable which is output at transistor output TOP3.	PV	1	Extras, inputs and out-puts
2.1050.004	BinOut TOP4 PV-Number	BinOut TOP4 source PV number	Process variable which is output at transistor output TOP4.	PV	1	Extras, inputs and out-puts
2.1050.005	BinOut TOP1 Active Level	BinOut TOP1 active level	"X" set: Content of process variable is inverted and output at TOP. No "X" set: Current flow to TOP.		1	Extras, inputs and out-puts
2.1050.006	BinOut TOP2 Active Level	BinOut TOP2 active level	"X" set: Content of process variable is inverted and output at TOP. No "X" set: Current flow to TOP.		1	Extras, inputs and out-puts
2.1050.007	BinOut TOP3 Active Level	BinOut TOP3 active level	"X" set: Content of process variable is inverted and output at TOP. No "X" set: Current flow to TOP.		1	Extras, inputs and out-puts

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1050.008	BinOut TOP4 Active Level	BinOut TOP4 active level	"X" set: Content of process variable is inverted and output at TOP. No "X" set: Current flow to TOP.		1	Extras, inputs and outputs
2.1050.009	BinOut TOP Monitoring Config.	BinOut TOP monitoring configuration	Configuration of monitoring of the TOP outputs.	digit	1	(→ Page 184)
2.1050.010	TOP1 Low Side Switch	Transistor TOP1 connecting to ground	No "X" set: TOP connects operating voltage. "X" set: Transistor connects to ground.		1	Extras, inputs and outputs
2.1050.011	TOP2 Low Side Switch	Transistor TOP2 connecting to ground	No "X" set: TOP connects operating voltage. "X" set: Transistor connects to ground.		1	Extras, inputs and outputs
2.1050.012	TOP3 Low Side Switch	Transistor TOP3 connecting to ground	No "X" set: TOP connects operating voltage. "X" set: Transistor connects to ground.		1	Extras, inputs and outputs
2.1050.013	TOP4 Low Side Switch	Transistor TOP4 connecting to ground	No "X" set: TOP connects operating voltage. "X" set: Transistor connects to ground.		1	Extras, inputs and outputs
2.1050.014	TOP1 Select for Test	TOP1 test selection	"X" set: Test of binary channels ("Lamp test") includes TOP1.		1	
2.1050.015	TOP2 Select for Test	TOP2 test selection	"X" set: Test of binary channels ("Lamp test") includes TOP2.		1	
2.1050.016	TOP3 Select for Test	TOP3 test selection	"X" set: Test of binary channels ("Lamp test") includes TOP3.		1	
2.1050.017	TOP4 Select for Test	TOP4 Test selection	"X" set: Test of binary channels ("Lamp test") includes TOP4.		1	
2.1051.990	Speed Window 1 Delay In	Speed window 1 delay In	Upon entry to speed window 1, the status "Speed window 1" (process variable 2.1051.001) is only updated after this delay time has elapsed.	s	0,001	
2.1051.991	Speed Window 2 Delay In	Speed window 2 delay In	Upon entry to speed window 2, the status "Speed window 2" (process variable 2.1051.002) is only updated after this delay time has elapsed.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1051.992	Speed Window 1 Delay Out	Speed window 1 delay Out	When exiting speed window 1, the status "Speed window 1" (process variable 2.1051.001) is only updated after this delay time has elapsed.	s	0,001	
2.1051.993	Speed Window 2 Delay Out	Speed window 2 delay Out	When exiting speed window 2, the status "Speed window 2" (process variable 2.1051.002) is only updated after this delay time has elapsed.	s	0,001	
2.1051.994	Speed Window 1 Top	Speed window 1 top limit	Speed window 1 If engine actual speed is within this speed window, which is defined by an upper limit (to be entered here) and a lower limit, a "Speed window 1 active" signal is generated as follows and sent via CAN: If the speed window is reached or exited, the signal is switched on or off. If one of the two limits is exceeded coming from higher speeds, the hysteresis comes into effect, i.e. the respective limit value is reduced by the hysteresis value.	rpm	0,1	
2.1051.995	Speed Window 1 Bottom	Speed window 1 bottom limit	Lower limit of speed window 1	rpm	0,1	
2.1051.996	Speed Window 1 Hysteresis	Speed window 1 hysteresis	Hysteresis for the limit values of speed window 1.	rpm	0,1	
2.1051.997	Speed Window 2 Top	Speed window 2 top limit	Speed window 2 If engine actual speed is within this speed window, which is defined by an upper limit (to be entered here) and a lower limit, a "Speed window 2 active" signal is generated as follows and sent via CAN: If the speed window is reached or exited, the signal is switched on or off. If one of the two limits is exceeded coming from higher speeds, the hysteresis comes into effect, i.e. the respective limit value is reduced by the hysteresis value.	rpm	0,1	
2.1051.998	Speed Window 2 Bottom	Speed window 2 bottom limit	Lower limit of speed window 2	rpm	0,1	
2.1051.999	Speed Window 2 Hysteresis	Speed window 2 hysteresis	Hysteresis for the limit values of speed window 2.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1052.001	Analog Out 1 PV-Number	Analog output 1 source PV number	Process variable which is output at analog output 1.	PV	1	Extras, inputs and out-puts
2.1052.002	Analog Out 2 PV-Number	Analog output 2 source PV number	Process variable which is output at analog output 2.	PV	1	Extras, inputs and out-puts
2.1052.003	Analog Out 1 Scaling	Analog output 1 scaling	Scaling for analog output in mV/digit. The internal presentation for speed is, e.g. 10 digit/rpm. Example: 0 .. 2000 rpm should be 0 .. 10 V -> Scaling = 10000 mV / 20000 digits = 0.5.	pts	0,001	Extras, inputs and out-puts
2.1052.004	Analog Out 2 Scaling	Analog output 2 scaling	Scaling for analog output in mV/digit. The internal presentation for speed is, e.g. 10 digit/rpm. Example: 0 .. 2000 rpm should be 0 .. 10 V -> Scaling = 10000 mV / 20000 digits = 0.5.	pts	0,001	Extras, inputs and out-puts
2.1052.005	Analog Out 1 Offset	Analog output 1 offset	Offset for analog output 1. Output = process variable * scaling + offset. Value corresponds to mV/digit of the configured output variable. Example for temperature: 0 to 100 degrees should be 0-10 Volt -> 0 to 100000 digit (scaling for temperatures is 1000) = 0 to 10000 mV.	V	0.001	Extras, inputs and out-puts
2.1052.006	Analog Out 2 Offset	Analog output 2 offset	Offset for analog output 2. Output = process variable * scaling + offset. Value corresponds to mV/digit of the configured output variable. Example for temperature: 0 to 100 degrees should be 0-10 Volt -> 0 to 100000 digit (scaling for temperatures is 1000) = 0 to 10000 mV.	V	0,001	Extras, inputs and out-puts
2.1055.002	FO Source PV Freq or Period	FO source PV frequency or period	ZKP No. of the source process variable that supplies the frequency or length of period for setting the frequency output interface. Whether the source process variable is interpreted as a frequency or length of period depends on the setting in the frequency output configuration. A value of 0 results in the use of the basic setting of the frequency for the FO channel of 8Hz.	PV	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1055.003	FO Source PV Ratio	FO source PV pulse-width factor	ZKP No. of the source process variable that supplies the pulse-width rate for the frequency output interface. A value of 0 results in the use of the basic setting of the pulse-width rate for the FO channel of 0 %, i.e. no frequency signal is generated.	PV	1	
2.1060.012	SD-ReqEngSpeed-Dem. Def. Value	Specified speed default value	Specified speed default value with faulty sensor.	rpm	0,1	Specified speed functional description
2.1060.013	SD-ReqEngSp.Dem. Def. Value Active	Default value mode	"X" set: Default value. No "X" set: In event of faulty sensor, the specification is set to actual speed.		1	Specified speed functional description
2.1060.018	Speed Dem SD-Monitoring Suppression	Specified speed analog SD suppression	"X" set: Alarm suppression for unselected specified speed channels active. No "X" set: All configured channels are monitored.		1	Specified speed functional description
2.1060.031	SpeedDemand Monit. Delay	Specified speed delay monitoring ON	Delay time for specified speed monitoring.	s	0,001	Specified speed functional description
2.1060.032	Delay Button Request-Change	Delay button continuous signal	Delay time in up-down operation between increase by 1 revolution for ramp operation.	s	0,001	Specified speed functional description
2.1060.034	Fixed Speed Mode On	Fixed speed mode active	"X" set: Fixed speed mode active; No "X" set: No fixed speed with "Fixed Speed Mode On": The fixed speed can be activated via an external signal that acts on process variable 2.1060.033.		1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.035	Fixed Speed Value	Fixed speed value	With "Fixed Speed Mode On": T, the speed setpoint is set to this input value independent of which setpoint has been selected with the selector switch.	rpm	0,1	Specified speed functional description
2.1060.038	Rated Speed Genset 50 Hz	Rated speed of genset 50 Hz	Rated speed for genset operation: Usually 1500 rpm for 50 Hz.	rpm	0,1	Specified speed functional description
2.1060.039	Rated Speed Genset 60 Hz	Rated speed of genset 60 Hz	Rated speed for genset operation: Usually 1800 rpm for 60 Hz.	rpm	0,1	Specified speed functional description
2.1060.041	Rated Speed	Rated speed	Parameter for rated speed if 2.1060.300 [Generator mode active] is at FALSE.	rpm	0,1	Specified speed functional description
2.1060.042	Engine Speed Demand Min	Min. specified speed	Minimum reachable specified speed.	rpm	0,1	Specified speed functional description
2.1060.043	Engine Speed Demand Max	Max. specified speed	Maximum reachable specified speed.	rpm	0,1	Specified speed functional description
2.1060.044	Engine Speed Demand Min Eff	Min. effective specified speed	Minimum reachable effective specified speed.	rpm	0,1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.045	Engine Speed Demand Max Eff	Max. effective specified speed	Maximum reachable effective specified speed.	rpm	0,1	Specified speed functional description
2.1060.046	Idle Increase Value (Start)	Idle increase value after start	Value of idle increase after start.	rpm	0,1	Specified speed functional description
2.1060.047	Duration of Idle Increase (Start)	Duration of idle increase after start	Duration of idle increase after start.	s	0,001	Specified speed functional description
2.1060.055	Requ. Engine Speed Modif.Limit	Specified speed adjustment range	Change radius for specified speed about rated speed in Up/Down mode.	rpm	0,1	Specified speed functional description
2.1060.090	DBR/MCR speed offset	DBR/MCR speed offset	Generator mode: No dynamic DBR/MCR calculation is carried out up to this percentage speed offset and the DBR/MCR value is taken from the corresponding curve as a maximum limitation.	%	0,001	Specified speed functional description
2.1060.091	DBR/MCR delta speed	DBR/MCR delta speed	Generator mode: For calculation of the dynamic DBR/MCR limitation independent of the speed droop.	rpm	0,1	Specified speed functional description
2.1060.092	DBR/MCR Delta Speed active	DBR/MCR delta speed active	Generator mode: Activation of the speed droop-independent dynamic DBR/MCR limitation calculation.		1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.095	Dyn. DBR Adjustment active	Dyn. DBR adjustment is active	"X" set: The dynamic DBR adjustment is active (GENSET).		1	Specified speed functional description
2.1060.113	RampUp1 Speed Demand	Specified speed ramp Up1	Second ramp gradient Up of specified speed below switchover speed 1-2.	rpm/s	0,1	Specified speed functional description
2.1060.114	RampUp2 Speed Demand	Specified speed ramp Up2	Second ramp gradient Up of specified speed below switchover speed 1-2.	rpm/s	0,1	Specified speed functional description
2.1060.115	RampUp3 Speed Demand	Specified speed ramp Up3	Second ramp gradient Up of specified speed above switchover speed 2-3.	rpm/s	0,1	Specified speed functional description
2.1060.116	RampDown1 Speed Demand	Specified speed ramp Down1	First ramp gradient Down of specified speed below switchover speed 1-2.	rpm/s	0,1	Specified speed functional description
2.1060.117	RampDown2 Speed Demand	Specified speed ramp down2	Second ramp gradient Down of specified speed above switchover speed 1-2.	rpm/s	0,1	Specified speed functional description
2.1060.118	RampDown3 Speed Demand	Specified speed ramp down3	Second ramp gradient Down of specified speed above switchover speed 2-3.	rpm/s	0,1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.119	Ramp12SwitchPoint SpeedDemand	Specified speed trip point ramp12	Switchover speed of ramp speed (ramp 1 <==> ramp 2).	rpm	0,1	Specified speed functional description
2.1060.120	Ramp23SwitchPoint SpeedDemand	Specified speed trip point ramp23	Switchover speed of ramp speed (ramp 2 <==> ramp 3).	rpm	0,1	Specified speed functional description
2.1060.122	RampUp1 Up-Button	Ramp Up1 Up button	First ramp gradient Up of specified speed below switchover speed (for Up-Down button operation).	rpm/s	0,1	Specified speed functional description
2.1060.123	RampUp2 Up-Button	Ramp Up2 Up button	Second ramp gradient Up of specified speed below switchover speed (for Up-Down button operation).	rpm/s	0,1	Specified speed functional description
2.1060.124	RampUp3 Up-Button	Ramp Up3 Up button	Second ramp gradient Up of specified speed above switchover speed 2-3 (for Up-Down button operation).	rpm/s	0,1	Specified speed functional description
2.1060.125	RampDown1 Down-Button	Ramp down1 Down button	First ramp gradient Down of specified speed below switchover speed 1-2 (for Up-Down button operation).	rpm/s	0,1	Specified speed functional description
2.1060.126	RampDown2 Down-Button	Ramp down2 Down button	Second ramp gradient Down of specified speed above switchover speed 1-2 (for Up-Down button operation).	rpm/s	0,1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.127	RampDown3 Down-Button	Ramp down3 Down button	Third ramp gradient Down of specified speed above switchover speed 2-3 (for Up-Down button operation).	rpm/s	0,1	Specified speed functional description
2.1060.128	RampSwitch12Point UpDownButton	Trip point ramp12 Up/Down buttons	Switchover speed of ramp speed (ramp 1 <==> ramp 2).	rpm	0,1	Specified speed functional description
2.1060.129	RampSwitch23Point UpDownButton	Trip point ramp23 Up/Down buttons	Switchover speed of ramp speed (ramp 2 <==> ramp 3)	rpm	0,1	Specified speed functional description
2.1060.130	Speed Demand Ramp Window Up	Specified speed ramp window Up	Value by which the specified speed ramp can precede the ACTUAL speed.	rpm	0,1	Specified speed functional description
2.1060.131	Speed Demand Ramp Window Down	Specified speed ramp window Down	Value by which the specified speed ramp can run behind the ACTUAL speed.	rpm	0,1	Specified speed functional description
2.1060.132	RampUpQuickSpeedRatio	Steep gradient ramp Up	Steep ramp gradient if the "ACTUAL speed droop" is less than the "Setpoint" AND the "ACTUAL speed droop" is greater than the "Specified speed ramp + distance".	rpm/s	0,1	Specified speed functional description
2.1060.133	Quick Ramp Stopp Distance	Distance for steep ramp Up stop	If the steep ramp is active and the ramp is greater than the engine actual speed minus this distance, the normal parameters are used again.	rpm	0,1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.134	RampDownQuick-SpeedRatio	Steep gradient ramp Down	Steep negative ramp gradient if the "ACTUAL speed minus speed droop" is less than the setpoint AND the "ACTUAL speed minus speed droop" is less than the "Specified speed ramp minus distance".	rpm/s	0,1	Specified speed functional description
2.1060.135	Quick Ramp Stopp Distance Ramp Down	Distance for steep ramp Down stop	Smallest distance on the "steep ramp" to the engine actual speed. If this distance is undershot, operation continues with the normal pump parameters.	rpm	0,1	Specified speed functional description
2.1060.143	CAN Increased Idle Limit	CAN idle increase limit value	If idle speed increase is actively requested via PV 2.1060.142 CAN Idle Speed Increase, the idle speed is increased via the ramp set in PR 2.1060.145 CAN Idle Speed Increase Up Ramp to the value from this parameter. When the request is canceled, the speed is lowered again via the ramp set in PR 2.1060.144 CAN Idle Speed Increase Ramp Down to the original idle speed.	rpm	0,1	Specified speed functional description
2.1060.144	CAN Increased Idle Ramp Up	CAN idle increase ramp Up	This ramp gradient is used to lower the increased idle speed following cancelation of the request to the previous idle speed.	rpm/s	0,1	Specified speed functional description
2.1060.145	CAN Increased Idle Ramp Down	CAN idle increase ramp Down	This ramp gradient is used after a request to raise the idle speed to the value from PR 2.1060.143 CAN Idle Speed Increase Limit Value.	rpm/s	0,1	Specified speed functional description
2.1060.147	Increased Idle Limit Value	Idle increase absolute value	Absolute value for idle increase.	rpm	0,1	Specified speed functional description
2.1060.148	Increased Idle Ramp	Idle increase ramp	The increase speed is run with this ramp gradient.	rpm/s	0,1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.149	Increased Idle Ramp Down	Idle increase ramp Down	The idle speed is reduced with this ramp gradient.	rpm/s	0,1	Specified speed functional description
2.1060.150	Local Normal Demand Switch Default	Local normal switch default value	Specification of a fixed specified speed source is active if MD or SD or no CAN module is available or if CAN Demand Switch is On [2.1060.015].		1	Specified speed functional description
2.1060.151	Local Emergency DemandSwitchDefault	Local emergency switch default value	Specification of a fixed specified speed source is active if MD or SD or no CAN module is available or if CAN Demand Switch is On [2.1060.015].		1	Specified speed functional description
2.1060.152	Remote Normal DemandSwitch Default	Remote normal switch default value	Specification of a fixed specified speed source is active if MD or SD or no CAN module is available or if CAN Demand Switch is On [2.1060.015].		1	Specified speed functional description
2.1060.153	Remote Emergency-DemandSwitchDefault	Remote emergency switch default value	Specification of a fixed specified speed source is active if MD or SD or no CAN module is available or if CAN Demand Switch is On [2.1060.015].		1	Specified speed functional description
2.1060.202	Droop	Speed droop	Input in %	%	0,001	Specified speed functional description
2.1060.204	Droop2	Speed droop2	Value of speed droop 2	%	0,001	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.207	Torque Demand 50 Hz (100 % Load)	Torque specification 50 Hz (100 % load)	Generator mode with 50 Hz: Torque at 100 % load	Nm	0,1	Specified speed functional description
2.1060.209	Torque Demand 60 Hz (100 % Load)	Torque specification 60 Hz (100 % load)	Generator mode with 60 Hz: Torque at 100 % load	Nm	0,1	Specified speed functional description
2.1060.210	RatedSpeed Frequency 1 Default	Rated speed frequency 1 active	"X" set: Rated speed frequency 1 active		1	Specified speed functional description
2.1060.211	Frequency Switch active	Frequency switch active	"X" set: Frequency switch active		1	Specified speed functional description
2.1060.213	Speed Demand Adj. Active (Up/Down)	Target-actual adjustment active (Up/Down)	"X" set: If the button is released, the effective specified speed is set to the current ACTUAL speed. No "X" set: The following applies: The current ramp status + speed droop equals the eff. specified speed.		1	Specified speed functional description
2.1060.214	Droop Switch with const.Speed	Speed droop switchover with constant speed	"X" set: With a speed droop switchover, the effective specified speed remains constant (specified speed is changed).		1	Specified speed functional description
2.1060.215	Rated Speed if Droop 1 -> 2	Rated speed at speed droop 1 -> 2	Jump of specified speed setpoint value to rated speed if "X" is set when switching over from speed droop 1 to speed droop 2.		1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.216	Rated Speed if Droop 2 -> 1	Rated speed at speed droop 2 -> 1	Jump of specified speed setpoint value to rated speed if "X" is set when switching over from speed droop 2 to speed droop 1.		1	Specified speed functional description
2.1060.217	Droop Switch active	Speed droop switch active	"X" set: External speed droop switch activated. No "X" set: External speed droop switch deactivated.		1	Specified speed functional description
2.1060.300	Generator Mode Active	Generator mode is active	"X" set: Generator mode. No "X" set: Vehicle operation.		1	Specified speed functional description
2.1060.306	Genset Start Ramp 1	Genset start ramp 1	First start ramp gradient below switchover speed.	rpm/s	0,1	Specified speed functional description
2.1060.307	Genset Start Ramp 2	Genset start ramp 2	Second start ramp gradient above switchover speed.	rpm/s	0,1	Specified speed functional description
2.1060.308	GensetStartRamp SwitchPoint12	Genset start ramp trip point12	Switchover speed of ramp speed (ramp 1 <==> ramp 2).	rpm	0,1	Specified speed functional description
2.1060.309	Genset Idle Delay	Genset idle delay	Start delay of ramp at idle speed.	s	0,001	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.310	Genset StartFinish Sync.Window	Genset start finish synchr. window	The end of generator mode is reached when the actual speed minus the speed droop is within this window.	rpm	0,1	Specified speed functional description
2.1060.311	Delay Generator On	Delay generator ON	Delay for the "Generator ON" signal after rated speed is reached.	s	0,001	Specified speed functional description
2.1060.313	SwitchPoint Generator OFF	Generator OFF trip point	ACTUAL speed < trip point → generator OFF With "Generator mode enable" (ZKP No. 2.1060.312) set, if engine speed is lower than this trip point a switch is made to generator start mode, i.e. with analog specification: The specified speed runs on the specified speed start ramp to the current setpoint - with up/down buttons: The specified speed runs to the rated speed. This trip point should be selected therefore so that it is always lower than the adjustment range.	rpm	0,1	Specified speed functional description
2.1060.316	Frequency Switch via CAN Signal	Frequency switchover by means of a CAN signal	No "X" set: Frequency switchover via digital input of the ADEC. "X" set: Frequency switchover via a CAN signal		1	Specified speed functional description
2.1060.320	Speed Demand Increase Value	Speed increase value	The effective specified speed is increased by this value as soon as speed demand is received to allow reaction to a load imposition in good time.	rpm	0,1	Specified speed functional description
2.1060.430	Speed Demand Limitation Value	Speed limitation value	Specified speed approaches this value on a ramp if the speed limitation demand is active. The ramp gradient is defined in parameter [2.1060.429].	rpm	0,1	Specified speed functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1060.431	Speed Demand Limitation Ramp	Ramp speed limitation	This ramp gradient is used to lower the specified speed to the limitation value when it is over the limit.	rpm/s	0,1	Specified speed functional description
2.1060.432	Speed Demand Limit. Off Ramp	Ramp speed limitation Off	This ramp gradient is used to increase the limitation value to the maximum specified speed limit if the limitation is no longer active.	rpm/s	0,1	Specified speed functional description
2.1061.003	OLS Output Selection	Engine load signal output selection	Selection menu for output of engine load signal. <0> Off → engine load signal is not issued. <1> Voltage → engine load signal is only written to voltage process variable. <2> PWM Signal → engine load signal is only written to PWM PV. <3> Both → engine load signal is depicted on both PVs.		1	
2.1061.005	OLS Enabling Speed	Engine load signal enabling speed	Engine speed above which the engine load signal is issued. Below this, the zero position is output.	rpm	0,1	
2.1061.008	OLS Min Speed Overshoot	Engine load signal min. speed overshoot	Minimum speed difference between engine actual speed and effective specified speed for detecting actual speed overshooting.	rpm	0,1	
2.1061.009	Enable OLS for Engine Stopped	Activate engine load signal for engine stopped	If activated and the engine is stationary, the special output value is issued as engine load signal instead of the calculated value from the power curve.		1	
2.1061.012	OLS Center Zero (Voltage)	Engine load signal zero position (voltage)	The zero position indicates a deviation from the power curve. The engine operates along the power curve.	V	0,001	
2.1061.013	OLS min Output (Voltage)	Engine load signal minimum output (voltage)	Minimum output value for the engine load signal.	V	0,001	
2.1061.014	OLS max Output (Voltage)	Engine load signal maximum output (voltage)	Maximum output value for the engine load signal.	V	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1061.019	Special OLS EngineStopped (Volt)	Special engine load signal engine stopped (Volt)	Special output value for the engine load signal if the engine is stopped. Only effective if the function is also activated.	V	0,001	
2.1061.022	OLS Center Zero (PWM)	Engine load signal zero position (PWM)	The zero position indicates a deviation from the power curve. The engine operates along the power curve.	%	0,001	
2.1061.023	OLS min Output (PWM)	Engine load signal minimum output (PWM)	Minimum output value for the engine load signal.	%	0,001	
2.1061.024	OLS max Output (PWM)	Engine load signal maximum output (PWM)	Maximum output value for the engine load signal.	%	0,001	
2.1061.026	OLS PWM Frequency	Engine load signal PWM frequency	Fundamental frequency of the PWM signal for the engine load signal.	Hz	0,001	
2.1061.029	Special OLS EngineStopped (PWM)	Special engine load signal engine stopped (PWM)	Special output value for the engine load signal if the engine is stopped. Only effective if the function is also activated.	%	0,001	
2.1061.051	PowerCurve LDA Offset	Power curve offset LDA	Offset for power curve limitation with charge air pressure cut-back (LDA).	Nm	0,1	
2.1061.052	PowerCurve Protection Offset	Power curve offset protection	Offset for power curve limitation with active protection module.	Nm	0,1	
2.1061.055	External PowerCurve Limit	External power curve limit	External limiting torque of the power curve for reduction of the generator load. The function is activated either via a binary input of the ECU (2.1061.056 External power curve limitation) or the CAN signal (2.1061.057 CAN external power curve limitation) (Index 857).	Nm	0,1	
2.1061.066	Speed Demand Gradient Up	Speed gradient Up	Increase in effective specified speed that has to be reached to activate the acceleration reserve.	rpm/s	0,1	
2.1061.072	Acceleration Reserve Factor	Factor for acceleration reserve	Percentage of the difference between power curve limiting torque and correct power curve torque, which forms the acceleration reserve.	%	0,001	
2.1061.073	Acceleration Speed Diff	Minimum target-actual speed difference.	Minimum difference between effective specified speed and engine actual speed for activating the acceleration reserve.	rpm	0,1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1061.102	Power Curve Rating Factor 1	Power curve rating factor 1	Factor used for weighting the power curve when rating 1 is active.	%	0,001	
2.1061.103	Power Curve Rating Factor 2	Power curve rating factor 2	Factor used for weighting the power curve when rating 2 is active.	%	0,001	
2.1061.104	Power Curve Rating Factor 3	Power curve rating factor 3	Factor used for weighting the power curve when rating 3 is active.	%	0,001	
2.1075.009	Rating selection via CAN	Rating selection via CAN	"X" set: The switchover between the rating curves is by means of rating switches 1 and 2 (i.e. via CAN). No "X" set: Switchover is by means of parameter No. 2.1075.010 “Select Rating Value”.		1	
2.1075.010	Select Rating Value	Select Rating Value	This parameter is only active if 2.1075.009 "Rating Select. via CAN" = 0 is set. It determines which of the rating curves applies to the torque limitation.	digit	1	
2.1090.100	Enable Starting Procedure	Using internal start procedure	Activate the ECU-controlled starting procedure as opposed to a system-controlled starting procedure.		1	Starting procedure functional description
2.1090.101	Start Signal Stored	Stored start	Cross off to activate the "Stored start" mode. A single actuation of the start button (either local or from the system via CAN) starts the engine automatically. Activated prelubrication is an exception: In this case, press again when the prelube display has disappeared. Otherwise, the start button must be held in until the release speed is reached.		1	Starting procedure functional description
2.1090.102	Stopp Resets Lock Time	Stop deletes start locking time	External stop deletes the start locking after a stop if a starting procedure was interrupted and the engine can be restarted immediately.		1	Starting procedure functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1090.103	Enable Prelubrication on Start	Prelubrication during engine start	Cross off to activate prelubrication during engine start as long as an oil priming pump is available. This function is deactivated if interval prelubrication is configured.		1	Starting procedure functional description
2.1090.104	Enable Manual Prelubrication	Manual prelubrication	Cross off to permit manual prelubrication using a button. Not crossed off: Prelubrication is carried out automatically if configured with "Prelubrication available".		1	Starting procedure functional description
2.1090.105	Enable Manual Turning	Enable manual turning	Cross off to permit manual turning using the turning button.		1	Starting procedure functional description
2.1090.106	Coolant Alarm Suppression /EngStop	Coolant alarm suppression/engine is stationary	Cross off to suppress coolant alarms with the engine stationary. Alarms are then only issued with start request.		1	Starting procedure functional description
2.1090.107	Enable Intermittent Oil Priming	Enable intermittent oil prelubrication	Cross off to deactivate repeated lubrication with the engine stationary. This function deactivates the prelubrication prior to an engine start and can only be activated if the starting procedure is configured as the oil priming pump and starter must not be energized at the same time because this would draw too much current from the battery. Only use if the oil priming pump is installed on the engine. Parameters 2.1090.140ff are used for the configuration.		1	Starting procedure functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1090.131	Requested Starter Speed	Starter speed to be reached	Speed that the engine must reach within the time up to starter speed; otherwise, an alarm is issued.	rpm	0,1	Starting procedure functional description
2.1090.132	Starter Time Interval	Time up to starter speed	Time for engine to reach starter speed; otherwise an alarm is issued.	s	0,001	Starting procedure functional description
2.1090.133	Starter Pause	Starter pause	Pause following unsuccessful start attempt after which the starter is restarted. Also used after cancelation of manual turning.	s	0,001	Starting procedure functional description
2.1090.134	Number of Starting Attempts	Number of starting attempts	Number of attempts that have been carried out to start the engine. At least 1 attempt.	digit	1	Starting procedure functional description
2.1090.135	Starter Release Speed	Starter release speed	Speed at which the starter is disengaged again. Speed must be reached by the engine within the time up to release speed; otherwise, an alarm is issued.	rpm	0,1	Starting procedure functional description
2.1090.136	Starter Release Time Interval	Time up to disengagement speed	Time for engine to reach release speed after starter speed has been reached.	s	0,001	Starting procedure functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1090.137	Idle Speed Time Interval	Time up to idle speed	Time for engine to reach idle speed after release speed has been reached.	s	0,001	Starting procedure functional description
2.1090.138	Restart Lock Time After Stop	Restarting locking time after engine stop	Time following start termination after which the engine can be restarted.	s	0,001	Starting procedure functional description
2.1090.142	Prelubrication Period	Prelubrication period	Parameter has different functions for various configurations. Prelubrication during engine start: Time that the prelubrication has to run before the engine can be started. For intermittent prelubrication: The prelubrication time continues after the P-oil prelubrication limit value has been reached.	s	0,001	Starting procedure functional description
2.1090.143	Start Button Waiting Period	Waiting time for start button	Time that you have to wait before actuating the start button again if the prelubrication is activated.	s	0,001	Starting procedure functional description
2.1090.144	Maximum Manual Turning Period	Maximum manual turning period	Time without a break in which the starter can turn the engine manually for maintenance purposes without causing damage to the starter.	s	0,001	Starting procedure functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1090.150	Prelubrication Interval	Prelubrication interval	Parameter has different functions for various configurations. Prelubrication during engine start: After successful completion of prelubrication, with a new engine start no further prelubrication will be carried out for this period. For intermittent prelubrication: Time interval for cyclical oil lubrication of the engine.	min	1	Starting procedure functional description
2.1090.151	P-LubeOil Prelubrication Limit	P-oil prelubrication limit	Parameter has different functions for various configurations. Prelubrication during engine start: When the limit value is reached, the oil priming pump is switched off. If pressure is not built up during the prelubrication period, the starting procedure is interrupted. For intermittent prelubrication: Differential limit value for lube oil pressure when starting the oil priming pump. When the limit value is reached, the prelubrication period begins.	bar	0,00001	Starting procedure functional description
2.1090.155	P-LubeOil PreLube Alarm Limit	P-oil alarm prelubrication limit value	Intermittent prelubrication: This value is a differential pressure for lube oil pressure. The alarm "Prelubrication fault" is set if the oil pressure has not risen by this value ("P-oil alarm prelubrication limit value") within the period up to the Alarm-prelube pressure.	bar	0,00001	Starting procedure functional description
2.1090.156	Time to PreLube Alarm Pressure	Time to prelube oil pressure alarm	The alarm "Prelubrication fault" is set if the oil pressure has not reached the ("P-oil alarm prelubrication limit value") within the period up to the prelube pressure alarm.	s	0,001	Starting procedure functional description
2.1090.157	T-LubeOil PreLube Alarm Limit	T-oil prelube limit value alarm	The alarm "Prelubrication fault" is not set if the oil temperature is above this value because warm oil does not necessarily reach the "P-oil alarm prelube limit value".	degC	0,01	Starting procedure functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1090.159	Maximum Prelubrication Period	Maximum prelubrication period	Intermittent prelubrication: Maximum period that the oil priming pump can run. When this time has expired, the pump is switched off irrespective of other statuses.	s	0,001	Starting procedure functional description
2.1090.303	T-Preheat L1 Input Value	T-preheating L1 limit value	Lower limit value 1 of coolant temperature for an engine start.	degC	0,01	Starting procedure functional description
2.1090.304	T-Preheat L1 Hysteresis	T-preheating L1 hysteresis	Hysteresis value for limit value 1.	degC	0,01	Starting procedure functional description
2.1090.305	T-Preheat L2 Input Value	T-preheating L2 limit value	Lower limit value 2 of coolant temperature for an engine start.	degC	0,01	Starting procedure functional description
2.1090.306	T-Preheat L2 Hysteresis	T-preheating L2 hysteresis	Hysteresis value for limit value 2.	degC	0,01	Starting procedure functional description
2.1090.307	T-Preheat L2 Aborts Start	T-preheating L2 start termination	If an "X" is set, the starting procedure will be interrupted if the limit value of T-preheating L2 is violated.		1	Starting procedure functional description

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.1090.308	T-Preheat L2 Override Possible	T-preheating L2 override possible	Set an "X" to permit override in the event of a start termination through violation of the limit value of T-Preheat L2. Is only effective if T-Preheat L2 Aborts Start is configured.		1	Starting procedure functional description
2.2500.027	Limit Engine Speed Low	Speed limit for stalling	If engine speed in normal operation falls below this limit value, this means that the engine will be stalled. The engine is then stopped intentionally for reasons of safety.	rpm	0,1	
2.2510.001	Test Overspeed Activ. Speed	Active speed overspeed test	Activation speed for overspeed test An overspeed test can only be activated in the engine speed window of (nTest +- nTestHyst). The activation speed "nTest" is entered here, the associated hysteresis "nTestHyst" at PR "Test Overspeed Activ. Speed Hyst." For selection of the overspeed test method, refer to PR 'Overspeed test version'.	rpm	0,1	
2.2510.002	Test Overspeed Activ. Speed Hyst.	Active speed hysteresis for overspeed test	Hysteresis for PR "Active speed overspeed test"	rpm	0,1	
2.2510.003	Test Overspeed Limit Factor	Overspeed limit factor	Precondition: Switch for selecting the overspeed test method (22.510.004) is not set to "X". The following then applies: If the overspeed test is activated, the engine shuts down when x % of engine overspeed has been reached. The factor x % is entered here.	%	0,001	
2.2510.004	Test Overspeed Method	Overspeed test version	Selection of overspeed test method: "X" is set: When the overspeed test is activated, the engine shuts down immediately. No "X" set: If the overspeed test is activated, the engine shuts down when x % ("Test Overspeed Limit Factor") of engine overspeed has been reached.		1	
2.2700.001	Enable Cooler Fan Control	Use of cooler fan control	Set an "X" to activate temperature-controlled cooler fan, if available.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.2700.010	T-Coolant FanControl LL	T-coolant fan control LL	Lower limit value of T-coolant for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.011	T-Coolant FanControl UL	T-coolant fan control UL	Upper limit value of T-coolant for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.020	T-ChargeAir FanControl LL	T-charge air fan control LL	Lower limit value of T-charge air for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.021	T-ChargeAir FanControl UL	T-charge air fan control UL	Upper limit value of T-charge air for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.030	T-LubeOil FanControl LL	T-oil fan control LL	Lower limit value of T-lube oil for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.031	T-LubeOil Fan Control UL	T-oil fan control UL	Upper limit value of T-lube oil for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.040	T-Cool-InterCooler FanCtrl LL	T-coolant intercooler fan control LL	Lower limit value of intercooler coolant temperature for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.041	T-Cool-InterCooler FanCtrl UL	T-coolant intercooler fan control UL	Upper limit value of intercooler coolant temperature for forming the PWM signal for controlling cooler fan speed.	degC	0,01	
2.2700.050	Inverse PWM Signal	Inverted PWM signal	Normal, or uninverted, behavior is designed for couplings during whose activation the minimum PWM ratio effects the maximum fan speed and the maximum PWM ratio effects the minimum fan speed. Inverse behavior is designed for couplings during whose activation the minimum PWM ratio effects the minimum fan speed and the maximum PWM ratio effects the maximum fan speed.		1	
2.2700.051	Min PWM Ratio for FanControl	Minimum PWM ratio for fan control	Lower limit value for the PWM ratio for forming the PWM signal for controlling cooler fan speed.	%	0,001	
2.2700.052	Max PWM Ratio for FanControl	Maximum PWM ratio for fan control	Upper limit value for the PWM ratio for forming the PWM signal for controlling cooler fan speed.	%	0,001	
2.2700.053	Manual PWM Ratio active	Manual PWM ratio is active	Set an "X" to use the "Manual PWM ratio" parameter as an output variable.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.2700.054	Manual PWM Ratio	Manual PWM ratio	Manual input value for PWM output. Is activated with "Manual PWM ratio active". At the same time, the output is limited by the parameters Minimum PWM ratio fan and Maximum PWM ratio fan.	%	0,001	
2.2700.055	PWM Ramp Time FanControl	PWM ramp time for fan control	Rising period for the crossfading curve. This time applies to the change from the minimum PWM ratio to the maximum PWM ratio for the fan. It serves as the basis for all value changes within these limits.	s	0,001	
2.2700.056	PWM Frequency FanControl	PWM frequency for fan	Fundamental frequency of the PWM signal.	Hz	0,001	
2.4000.001	LifeData Function	LifeData function	"X" set: LifeData function is activated. No "X" set: LifeData function is not activated		1	
2.4000.003	LifeData Fail Delay	LifeData failure delay	LifeData failure delay.	s	0,001	
2.7001.009	Stopp Signal Stored	Stored stop signal	Cross off to activate the "Stored stop" mode. A single actuation of the stop button (either local or from the system via CAN) brings the engine to a standstill. Stop request is deleted if the engine is stationary. Press the start button to cancel the stop signal again. Otherwise, hold in the stop button until the engine stops.		1	
2.7001.031	Stopp SD T-Coolant activated	Stop SD T-coolant activated	"X" set: A run-on stop is initiated if a sensor is defective. No "X" set: No reaction with defective sensor		1	
2.7001.032	Stopp SD T-Charge Air activated	Stop SD T-charge air activated	"X" set: A run-on stop is initiated if a sensor is defective. No "X" set: No reaction with defective sensor		1	
2.7001.033	Stopp SD T-Oil activated	Stop SD T-oil activated	"X" set: A run-on stop is initiated if a sensor is defective. No "X" set: No reaction with defective sensor		1	
2.7001.034	Stopp SD P-Oil activated	Stop SD P-oil activated	"X" set: A run-on stop is initiated if a sensor is defective. No "X" set: No reaction with defective sensor		1	
2.7001.035	Stopp SD P-Fuel activated	Stop SD P-fuel activated	"X" set: A run-on stop is initiated if a sensor is defective. No "X" set: No reaction with defective sensor		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.7002.006	Override Mode	Override mode	In the case of an override request (e.g. via CAN), the mode set here determines the reaction. Mode 1: Set: Override is active as long as it is requested. Mode 2: Override is active up to "Ignition off". Mode 3: Override is active for the configured time "Override period". The timer can be retriggered by a new request (flank).	digit	1	
2.7003.001	Mode switch via CAN	Mode switch via CAN	"X" set: External mode switch via CAN active. No "X" set: Internal mode switch active.		1	
2.7003.002	Mode 2 Default Active	Mode 2 active	Mode switchover valid with an internal mode switch (PR "Mode Switch via CAN" = False). "X" set: Mode 2 is activated No "X" set: Mode 1 is activated		1	
2.7003.003	Mode Switch via Bin. In	Mode switch via binary input	"X" set: Mode switch via bin. input activated.		1	
2.7010.002	Cold Engine Function Active	Cold-start engine operation function active	"X" set: Function activated.		1	
2.7010.010	Cold Eng. Thresh. T-Intake Air	Cold engine threshold T-intake air	Temperature threshold of intake air temperature at which the "Cold Engine" signal is activated.	degC	0,01	
2.7010.011	Cold Eng. Thresh. T-Coolant	Cold engine threshold T-coolant	Temperature threshold of coolant temperature at which the "Cold Engine" signal is activated.	degC	0,01	
2.7010.012	Cold Eng. Thresh. T-Intercooler	Cold engine threshold T-intercooler	Temperature threshold of intercooler coolant temperature at which the "Cold Engine" signal is activated.	degC	0,01	
2.7010.013	Cold Eng. Thresh. T-Oil	Cold engine threshold T-oil	Temperature threshold of oil temperature at which the "Cold Engine" signal is activated.	degC	0,01	
2.7010.014	Cold Eng. Temp. Hysteresis	Cold engine temperature hysteresis	Hysteresis for all temperature thresholds with deactivation of the "Cold Engine" signal.	degC	0,01	
2.8008.111	Lock Crash Recorder after Trigg.	Lock crash recorder after trigger	"X" set: The alarm characteristic "Lock Crash Rec. after Trigger" can be set in all alarm configuration parameters.		1	
2.9901.200	Sensortype Input AI1	Sensor type input AI1	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.9901.201	Sensortype Input AI2	Sensor type input A12	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
2.9901.204	Sensortype Input FIP	Sensor type input FIP	Measurement range/sensor type of sensor at this input.	digit	1	(→ Page 107)
2.9902.001	Monitor Open Load DI1	Monitoring open load DI1	If "X" is set, the input is monitored for cable breakage.		1	(→ Page 107)
2.9902.011	Monitor Open Load DI2	Monitoring open load DI2	If "X" is set, the input is monitored for cable breakage.		1	
2.992.021	Monitor Open Load DI3	Monitoring open load DI3	If "X" is set, the input is monitored for cable breakage.		1	
2.9902.031	Monitor Open Load DI4	Monitoring open load DI4	If "X" is set, the input is monitored for cable breakage.		1	(→ Page 107)
2.9902.041	Monitor Open Load DI5	Monitoring open load DI5	If "X" is set, the input is monitored for cable breakage.		1	
2.9902.051	Monitor Open Load DI6	Monitoring open load DI6	If "X" is set, the input is monitored for cable breakage.		1	
2.9902.061	Monitor Open Load DI7	Monitoring open load DI7	If "X" is set, the input is monitored for cable breakage.		1	
2.9902.071	Monitor Open Load DI8	Monitoring open load DI8	If "X" is set, the input is monitored for cable breakage.		1	
2.9902.081	Monitor Open Load ESI	Monitoring open load ESI	If "X" is set, the input is monitored for cable breakage.		1	
2.9910.001	Bin-Input 0 Target PV Number	Bin input 0 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.002	Bin-Input 0 Bouncing Time	Bin input 0 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.003	Bin-Input 0 SD Delay	Bin input 0 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.004	Bin-Input 0 Module Active	Bin input 0 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.005	Bin-Input 0 Active High	Bin input 0 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.006	Bin-Input 0 Default Value	Bin input 0 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.007	Bin-Input 0 Input Channel	Bin input 0 DI channel number	Associated ECU-7 input.		1	
2.9910.011	Bin-Input 1 Target PV Number	Bin input 1 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.012	Bin-Input 1 Bouncing Time	Bin input 1 bouncing time	Bouncing time for this channel.	s	0,001	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.9910.013	Bin-Input 1 SD Delay	Bin input 1 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.014	Bin-Input 1 Module Active	Bin input 1 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.015	Bin-Input 1 Active High	Bin input 1 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.016	Bin-Input 1 Default Value	Bin input 1 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.017	Bin-Input 1 Input Channel	Bin input 1 DI channel number	Associated ECU-7 input.		1	
2.9910.021	Bin-Input 2 Target PV Number	Bin input 2 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.022	Bin-Input 2 Bouncing Time	Bin input 2 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.023	Bin-Input 2 SD Delay	Bin input 2 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.024	Bin-Input 2 Module Active	Bin input 2 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.025	Bin-Input 2 Active High	Bin input 2 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.026	Bin-Input 2 Default Value	Bin input 2 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.027	Bin-Input 2 Input Channel	Bin input 2 DI channel number	Associated ECU-7 input.		1	
2.9910.031	Bin-Input 3 Target PV Number	Bin input 3 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.032	Bin-Input 3 Bouncing Time	Bin input 3 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.033	Bin-Input 3 SD Delay	Bin input 3 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.034	Bin-Input 3 Module Active	Bin input 3 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.035	Bin-Input 3 Active High	Bin input 3 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.036	Bin-Input 3 Default Value	Bin input 3 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.9910.037	Bin-Input 3 Input Channel	Bin input 3 DI channel number	Associated ECU-7 input.		1	
2.9910.041	Bin-Input 4 PV Number	Bin input 4 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.042	Bin-Input 4 Bouncing Time	Bin input 4 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.043	Bin-Input 4 SD Delay	Bin input 4 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.044	Bin-Input 4 Module Active	Bin input 4 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.045	Bin-Input 4 Active High	Bin input 4 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.046	Bin-Input 4 Default Value	Bin input 4 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.047	Bin-Input 4 Input Channel	Bin input 4 DI channel number	Associated ECU-7 input.		1	
2.9910.051	Bin-Input 5 Target PV Number	Bin input 5 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.052	Bin-Input 5 Bouncing Time	Bin input 5 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.053	Bin-Input 5 SD Delay	Bin input 5 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.054	Bin-Input 5 Module Active	Bin input 5 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.055	Bin-Input 5 Active High	Bin input 5 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.056	Bin-Input 5 Default Value	Bin input 5 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.057	Bin-Input 5 Input Channel	Bin input 5 DI channel number	Associated ECU-7 input.		1	
2.9910.061	Bin-Input 6 Target PV Number	Bin input 6 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.062	Bin-Input 6 Bouncing Time	Bin input 6 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.063	Bin-Input 6 SD Delay	Bin input 6 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.064	Bin-Input 6 Module Active	Bin input 6 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.9910.065	Bin-Input 6 Active High	Bin input 6 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.066	Bin-Input 6 Default Value	Bin input 6 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.067	Bin-Input 6 Input Channel	Bin input 6 DI channel number	Associated ECU-7 input.		1	
2.9910.071	Bin-Input 7 Target PV Number	Bin input 7 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.072	Bin-Input 7 Bouncing Time	Bin input 7 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.073	Bin-Input 7 SD Delay	Bin input 7 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.074	Bin-Input 7 Module Active	Bin input 7 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.075	Bin-Input 7 Active High	Bin input 7 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.076	Bin-Input 7 Default Value	Bin input 7 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.077	Bin-Input 7 Input Channel	Bin input 7 DI channel number	Associated ECU-7 input.		1	
2.9910.081	Bin-Input 8 Target PV Number	Bin input 8 target PV number	Target process variable for this binary channel.	PV	1	
2.9910.082	Bin-Input 8 Bouncing Time	Bin input 8 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.083	Bin-Input 8 SD Delay	Bin input 8 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.084	Bin-Input 8 Module Active	Bin input 8 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.085	Bin-Input 8 Active High	Bin input 8 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.086	Bin-Input 8 Default Value	Bin input 8 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.087	Bin-Input 8 Input Channel	Bin input 8 DI channel number	Associated ECU-7 input.		1	
2.9910.091	Bin-Input 9 Target PV Num	Bin input 9 target PV number	Target process variable for this binary channel.	PV	1	

ZKP No.	Display text	Meaning	Explanation	Unit	Scal.	See
2.9910.092	Bin-Input 9 Bouncing Time	Bin input 9 bouncing time	Bouncing time for this channel.	s	0,001	
2.9910.093	Bin-Input 9 SD Delay	Bin input 9 time up to SD	Time for sensor defect detection.	s	0,001	
2.9910.094	Bin-Input 9 Module Active	Bin input 9 module active	"X" set: Channel activated. No "X" set: Channel not activated.		1	
2.9910.095	Bin-Input 9 Active High	Bin input 9 high active	"X" set: Channel high activated. No "X" set: Channel low activated.		1	
2.9910.096	Bin-Input 9 Default Value	Bin input 9 default value	"X" set: With sensor defect, the default value is ON. No "X" set: With sensor defect, the default value is OFF.		1	
2.9910.097	Bin-Input 9 Input Channel	Bin input 9 DI channel number	Associated ECU-7 input.		1	

Details on the parameters

ZKP No. 1.2500.001

Bits 0, 1 and 2 can be used to configure the crankshaft speed filter:

Bit			Function
2	**1**	**0**	
0	0	0	Mean value filter, specification of the filter angle using parameter ZKP No. 1.2500.009
0	0	1	New filter, specification of the filter angle using parameter ZKP No. 1.2500.007 and the time constants t1 using parameter ZKP No. 1.2500.008
0	1	0	Switchover 1-rotation filter → 2-rotation filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006
0	1	1	Switchover of new filter → 2-rotation filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006
1	0	0	Switchover 288 -filter → 2-rotation filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006
1	0	1	Switchover angle1 - filter → angle2 -filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006, specification of angle1 using parameter ZKP No. 1.2500.014 and angle2 using parameter ZKP No. 1.2500.015.
1	1	0	Switchover 1-rotation filter → 2-rotation filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006
1	1	1	Switchover 1-rotation filter → 2-rotation filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006

Bits 3, 4 and 5 can be used to configure the camshaft speed filter.

Bit			Function
5	**4**	**3**	
0	0	0	Switchover 1-rotation filter → 2-rotation filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006
0	0	1	Switchover angle1 - filter → angle2 -filter, specification of the switchover speed using parameter ZKP No. 1.2500.005 and the speed hysteresis using parameter ZKP No. 1.2500.006, specification of angle1 using parameter ZKP No. 1.2500.020 and angle2 using parameter ZKP No. 1.2500.021.

Bit 6 can be used to activate the emergency operation speed: If bit 6 is set, emergency operation speed is active; if bit 6 is not set, normal operation speed is active.

ZKP No. 2.0500.001

Examples:

- 0: No MCS-5 communication of any kind is established.
- 15: PCS 5 bus; both buses are active; if valid configuration data is available, it is used to establish the communication. If a PPS is detected, the PU data is verified and, if applicable, new PU data is received.
- 143: Ditto; selective node monitoring can be set via parameter 2.0500.005
- 271: As 15; fault code display function is supported if PV 175 is selected via PU.

- 399: As 31 plus additional features from 143 and 271.
- 10: CAN 1 active; if valid configuration data is available, it is used to establish the communication. If a PPS is detected, the PU data is verified and, if applicable, new PU data is received.
- 138: As 10; selective node monitoring can be set via parameter 2.0500.005. 266 : As 10; fault code display function is supported if CAN transmission measurement point PV 175 is selected via PU.
- 394: As 10 plus additional features from 138 and 266.
- 66: CAN 1 active; no download possible; all available PVs are transmitted.
- 322: Ditto; fault code display function is supported if CAN transmission measurement point PV 175 is selected via PU. If EMU data handling is to be deactivated, bit 10 (counting starting at bit 0) must be set, which is the same as the addition of 1024 to the previous parameter value.
- 0: EMU data handling is activated.
- 1: EMU data handling is deactivated although input parameters are available in the data record. Is currently only used to switch off the data handling if a replacement engine with EMU, but old PU configuration (different sequence of EMU parameters), has to be supplied. If the CAN application is not to generate an Acknowledge warning if no further node is connected, bit must be set, which is the same as the addition of 16384 to the previous parameter value. This function is not used in the MCS system, but, up to the present, only with DDC applications in conjunction with Sturdy Controls.
- 0: No function
- 1: There are no more fault messages generated on the respectively active CAN buses (187, CAN 1; 189, CAN 2) if the ECU is currently the only node on the respective bus. All other causes that could lead to these fault messages are still activated.

ZKP No. 2.0500.004

The numerical value has the following structure:
- Decimal places, units and tens: Edition Minor
- Decimal places, hundreds and thousands: Edition Major
- Decimal places, ten thousands to millions: Version
- Decimal place, ten millions: Category

The identification numbers for category and version can be obtained from the CCS database! In this example, 4 = category ECU4, 001 = version 2000 Marine.

ZKP No. 2.0500.008

The module selection function is only activated if UseFixed DloadMod is set in PR 2.0500.001 CAN Interface Configuration Bit 9. The lower-order 2 decimal places specify the current configuration No. and the higher-order 2 decimal places the module type No.

An exception here is operation with automatic transmission of all available PVs if bit 6 in parameter 2.0500.001 is set. To find out on which module type No. the transmission object scope is to be based, 00 is specified in the lower-order 2 decimal places and the module type No. in the higher-order 2 decimal places. Bit 9 in parameter 2.0500.001 then does not have to be set because, of course, there is to be no access to a module with fixed configuration. For each new fixed configuration, a serial number beginning with 1 is assigned on a device-, series- and application-specific basis. The number is defined in the same way as the contents of the modules in the document CANFixedModulesPU.doc.

Example: If the fixed-configuration module with module type No. 3 and the serial configuration No. 2 is selected, the value 302 must be entered.

ZKP No. 2.1000.007

Meaning:
- Bit 0: If this bit is set, the differential component of the speed governor is calculated from the speed; otherwise from the speed control deviation.
- Bit 1: If this bit is set, the proportional action factors kpstat (PV 2.1000.043, "Speed Governor (kpStat)") and kpdyn (PV 2.1000.044, "Speed Governor (kpDyn)") of the governor are specified constantly using parameter 2.1000.011 ("Speed Governor (kp)"), otherwise kpstat and kpdyn are calculated as a function of the specified torque (PV 2.1000.046, "Speed Governor Integral Torque"), the engine speed (PV 1.2500.044, "Engine Speed (ECU)") and the closed-loop gain of the open speed control loop (Par. 2.1000.008, "v-Speed Governor (Gain)"). The dynamic proportional action factor kpdyn is also calculated as a function of the engine speed governing deviation (PV 2.1000.042, "Engine Speed Deviation").
- Bit 2: If this bit is set, specified speed jumps can be carried out. Two different mode of operations can be selected:
  - If the parameter 2.1000.006 is set to 'True' and parameter 2.1000.005 is set to 'False', after the delay time specified by parameter 2.1000.036 has elapsed the specified speed jumps from the starting value (Par. 2.1000.034) to the full-scale value (Par. 2.1000.035).

- If parameters 2.1000.005 and 2.1000.006 are set to ’True’, after the delay time specified by parameter 2.1000.036 has elapsed the specified speed jumps from the starting value (Par. 2.1000.034) to the full-scale value (Par. 2.1000.035) and, after the delay time specified Par. 2.1000.037 has elapsed, jumps from the full-scale value back to the starting value. If a specified speed jump is to be repeated, parameter 2.1000.006 must first be set to ’False’. The specified speed then jumps to the starting value (Par. 2.1000.034). To activate the renewed specified speed jump, parameter 2.1000.006 must then be set back to ’True’.

- Bit 3: If this bit is set, specified torque (PV 2.1000.049, "Requested Torque") can be specified constantly using Par. 2.1000.038 ("Requested Torque Input").
- Bit 4: If this bit is set, the rate time tv (process variable 2.1000.045, "Speed Governor (tv)") can be adjusted linearly via the specified torque. If the specified torque is smaller or equal to parameter 2.1000.016 ("Adap. Speed Gov.-Tqmin"), the rate time tv is identical to Par. 2.1000.018 ("Adap. Speed Gov.- tv(Tqmin)"). If the specified torque is smaller or equal to parameter 2.1000.017 ("Adap. Speed Gov.-Tqmax"), the rate time tv is identical to Par. 2.1000.019 ("Adap. Speed Gov.- tv(Tqmax)"). If the specified torque is greater than Par. 2.1000.016 and lower than Par. 2.1000.017, the rate time tv will be adjusted linearly via the specified torque.
- Bits 5 and 6: These bits can be used to define the initialization of the I-component during the transition from filling specification to idle speed control if the idle-maximum-speed governor is active:

  If both bits are set, the I-component is initialized as follows:

  I-component = Max. {Par. 2.1010.010; Difference} with
  - Difference = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000)-component if following applies: Par. 2.1010.003 = "True"
  - Difference = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000) if following applies: Par. 2.1010.003 = "False"

  If bit 5 is set and bit 6 is not set, the I-component is initialized with Par. 2.1010.010 ("I-Part Demand Idle Speed"). If bit 5 is not set and 6 is set, the I-component is initialized as follows:
  - I-component = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000) - P(DT1)-component if following applies: Par. 2.1010.003 = "True"
  - I-component = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000) if following applies: Par. 2.1010.003 = "False". Of both bits are set, the I-component is initialized with Par. 2.1010.010 ("I-Part Demand Idle Speed").

The value of Par. 2.1000.007 ("Speed Controller Config.") results from adding the values of the individual bits:

Bit	Value
0	1
1	2
2	3
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024
11	2048
12	4096
13	8192
14	16384

If, e.g., bits 0, 3 and 6 are set, Par. 2.1000.007 has the value 73 (73 = 1 + 8 + 64).

ZKP No. 2.1010.009

This can be used to initialize the I-component as a function of the engine speed gradients if either both bits are not set, or bit 6 is set and bit 5 is not set. If both bits are not set, the I-component is initialized according to the following equation:

I-component = Max. {Par. 2.1010.010; Difference} with

- Difference = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000)-component if following applies: Par. 2.1010.003 = "True"
- Difference = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000) if following applies: Par. 2.1010.003 = "False"

If bit 5 is not set and 6 is set, the I-component is initialized as follows:

- I-component = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000) - P(DT1)-component if following applies: Par. 2.1010.003 = "True"
- I-component = current specified torque - (Par. 2.1010.009 * PV 2.1010.033 * Number of cylinders / 1000) if following applies: Par. 2.1010.003 = "False"

ZKP No. 2.1050.009

The 4 transistor outputs, plant (TOP) can be monitored for wire breakage or short circuit. Each of the 4 lowest bits of this parameter is assigned to a TOP.

- Bit 0 (= 2^0 = 1): TOP1
- Bit 1 (= 2^1 = 2): TOP2
- Bit 2 (= 2^2 = 4): TOP3
- Bit 3 (= 2^3 = 8): TOP4

By setting a bit to 0, monitoring of the corresponding output is switched off. By setting a bit to 1, monitoring of the corresponding output is switched on.

Example: To switch on the monitoring for TOP1 and TOP3, the values of the corresponding bits (TOP1 = 1, TOP3 = 4) are simply added and the sum (1 + 4 = 5) is entered in this parameter.

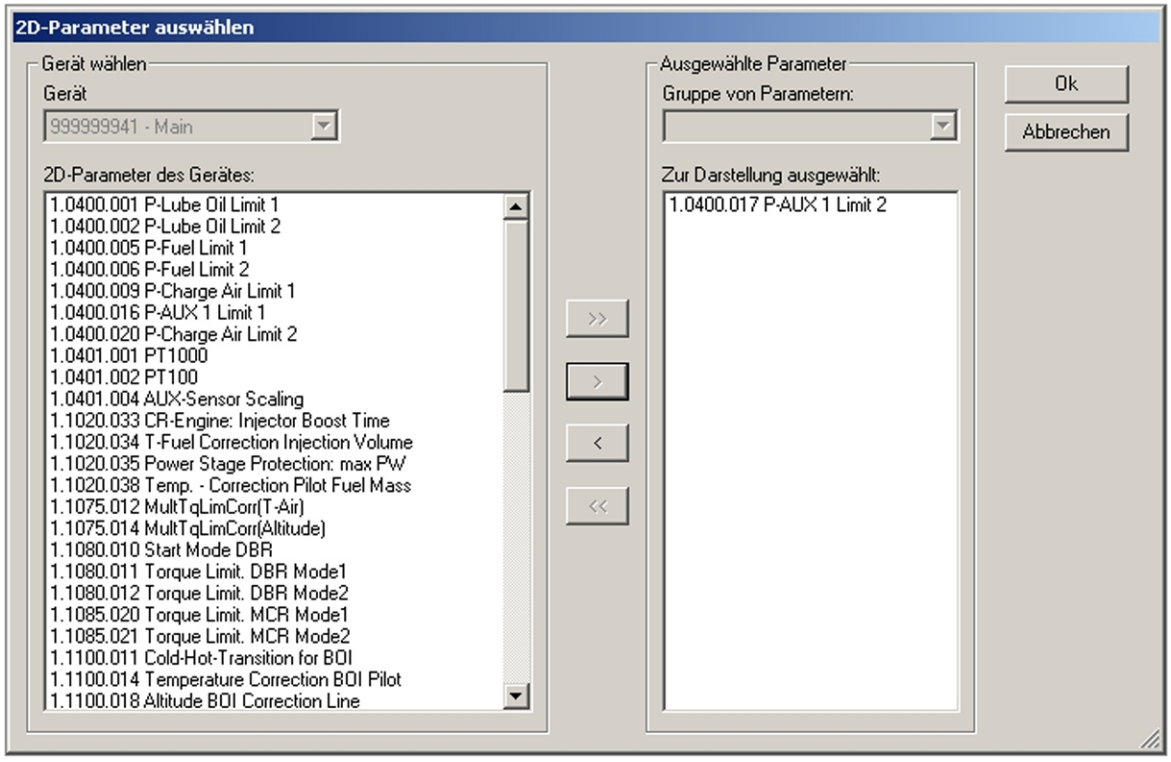
5.3 2D parameters

Definition

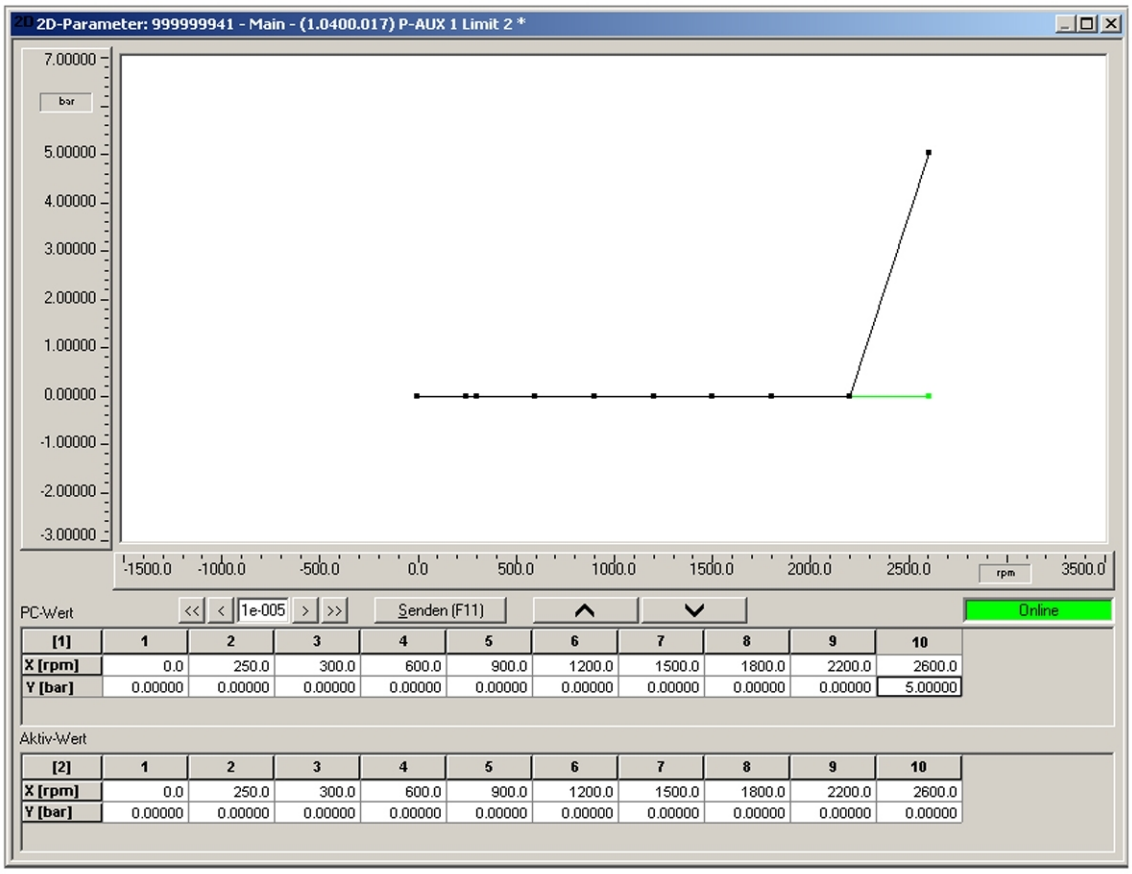
2D parameters ("Two-dimensional" parameters") are parameters for which a curve has been stored. This means that a value can alter as a function of another value. A pressure limit value, for example, can be depicted as a function of engine speed. If a fixed value is desired, the same analog value must be entered for all support points of the curve.

Function area in the Diasys

The function area 2D parameters is reached via the Dialog system (DiaSys ®) from the main menu of the ECU-7 ("Edit 2D parameters... 2D").



The first window for this function area has a selection window on the left for selecting a parameter. The parameter marked here is entered in the right-hand window using the ">" button.



50800848a

This parameter is then transferred to the window for alteration using the "OK" button.

The data below the curve diagram in this window means the following:

- PC value

  This matrix shows the value currently entered in the PC. The desired changes are entered here. Confirm the input and the altered curve is displayed.
- Active value

  Here is the specification of which values are currently saved in the governor. These values are updated every time the DiaSys is connected to the governor and linked to the governor via the function "Establish connection to governor".

Curves (2D parameters)

The following curves explained below are available. Note that only values with a white background can be changed. Values shaded gray are only displayed. Alteration with the dongle (user level) inserted is not possible.

In certain circumstances, not all curves are displayed. This depends on the attributes preset by the MTU specialist department.

ZKP No. of the curve	Designation	Function	Also refer to:
1.0400.001	P-Lube Oil Limit 1	Lube oil pressure limit value curve	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.738

ZKP No. of the curve	Designation	Function	Also refer to:
1.0400.002	P-Lube Oil Limit 2	Lube oil pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.778
1.0400.003	P-Coolant Limit 1	Coolant pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.418
1.0400.004	P-Coolant Limit 2	Coolant pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.458
1.0400.005	P-Fuel Limit 1	Fuel pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.578
1.0400.006	P-Fuel Limit 2	Fuel pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.618
1.0400.007	P-Crankcase Limit 1	Crankcase pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.498
1.0400.008	P-Crankcase Limit 2	Crankcase pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.538
1.0400.009	P-Charge Air Limit 1	Charge air pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.898
1.0400.010	P-Dif-Lube Oil Limit 1	Lube oil differential pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.818
1.0400.011	P-Dif-Lube Oil Limit 2	Lube oil differential pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.858
1.0400.012	T-ExhaustA L1 Limit Curve	Exhaust gas engine A side limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0312.458
1.0400.013	T-ExhaustA L2 Limit Curve	Exhaust gas engine A side limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0312.498

ZKP No. of the curve	Designation	Function	Also refer to:
1.0400.014	T-ExhaustB L1 Limit Curve	Exhaust gas engine B side limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0312.538
1.0400.015	T-ExhaustB L2 Limit Curve	Exhaust gas engine B side limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0312.578
1.0400.016	P-AUX 1 Limit 1	Pressure AUX 1 limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.978
1.0400.017	P-AUX 1 Limit 2	Pressure AUX 1 limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0312.018
1.0400.018	P-Coolant Intercooler Limit 1	Coolant pressure at intercooler limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0320.338
1.0400.019	P-Coolant Intercooler Limit 1	Coolant pressure at intercooler limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0320.378
1.0400.020	P-Charge Air Limit 2	Charge air pressure limit value curve as a function of engine speed	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.0311.938
1.0401.001	PT1000	Correction curve for resistor PT 1000 as a function of temperature	—
1.0401.002	PT100	Correction curve for resistor PT 100 as a function of temperature	—
1.0401.004	AUX-Sensor Scaling	Standardization curve for AUX sensor; voltage as a function of pressure	—
1.0600.001	EMU T-Exhaust Limit Curve HI	Exhaust gas temperature limit value curve as a function of engine speed (for EMU)	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.032.898

ZKP No. of the curve	Designation	Function	Also refer to:
1.0600.002	EMU T-Exhaust Limit Curve LO	Exhaust gas temperature limit value curve as a function of engine speed (for EMU)	Functional description Monitoring/Protection module, Monitoring module ZKP No. 2.032.938
1.0600.003	EMU P-Raw Water Limit Curve LO	Raw water pressure limit value curve as a function of engine speed (for EMU)	—
1.1020.033	CR-Engine: Injector Boost Time	Correction curve	—
1.1020.034	T-Fuel Correction Injection Volume	Correction curve	—
1.1020.035	Power Stage Protection: max PW		—
1.1020.038	Temp. - Correction Pilot Fuel Mass	Correction curve	—
1.1020.041	Temp. - Correction Post Fuel Mass	Correction curve	—
1.1075.012	MultTqLimCorr(T-Air)	Torque limitation curve as a function of charge air temperature	—
1.1075.014	MultTqLimCorr(Altitude)	Torque limitation curve as a function of altitude	—
1.1080.010	Start Mode DBR	DBR at start	—
1.1080.011	Torque Limit. DBR Mode1	Torque limitation DBR mode 1	—
1.1080.012	Torque Limit. DBR Mode2	Torque limitation DBR mode 2	—
1.1085.020	Torque Limit. MCR Mode1	Torque limitation MCR mode 1	—
1.1085.021	Torque Limit. MCR Mode2	Torque limitation MCR mode 2	—
1.1100.011	Cold-Hot-Transition for BOI	Hot/cold reference for begin of injection	—
1.1100.014	Temperature Correction BOI Pilot	Correction curve for begin of injection as a function of temperature	v
1.1100.017	Temperature Correction BOI Post	Correction curve for begin of injection as a function of temperature	—

ZKP No. of the curve	Designation	Function	Also refer to:
1.1100.018	Altitude BOI Correction Line	Correction curve for begin of injection as a function of altitude	—
1.1100.019	Weighting Altitude BOI Correction	Correction curve for begin of injection as a function of temperature	—
1.1100.025	Weighting Transient BOI Corr	Correction curve for begin of injection as a function of temperature	—
1.1200.004	ETA-Correction T-Ambient	Correction curve of ambient temperature for ETA	—
1.1200.005	ETA-Correction T-Fuel	Correction curve for fuel temperature for ETA	—
1.1200.006	ETA-Correction P-Ambient	Correction curve of ambient air pressure for ETA	—
1.1200.007	End-of-line correction		—
1.1200.014	Weight Trans. Efficiency Corr		—
1.1300.041	Pump Characteristic	Pump characteristics	—
1.1300.042	t1-Pump		—
1.3000.003	Full Engine Torque Switchpoint	Cylinder cutout switchover characteristics: Trip point as a function of torque	—
1.8009.052	Fuel Quantity Correction	Correction curve for fuel quantity	—
2.0401.003	Scaling Curve Voltage	Voltage scaling	—
2.0401.010	Curve Speed Demand [Voltage]	Specified speed curve: Speed as a function of voltage	Speed setpoint functional description
2.0401.012	Curve Speed Demand [Current]	Specified speed curve: Speed as a function of current	Speed setpoint functional description
2.0401.014	Curve Speed Demand FIP	Specified speed curve: Speed as a function of frequency	Speed setpoint functional description

ZKP No. of the curve	Designation	Function	Also refer to:
2.0401.015	Analog Loadsignal Curve	Load signal curve: Torque as a function of speed	—
2.0401.019	Crv Speed Demand relative [V]	Specified speed curve: Speed as a function of voltage with relative specified speed	Speed setpoint functional description
2.0401.020	Crv Speed Demand relative [C]	Specified speed curve: Speed as a function of current with relative specified speed	Speed setpoint functional description
2.0401.021	Crv Speed Demand 60Hz [V]	Specified speed curve: Speed as a function of voltage with generator mode 60 Hz	—
2.0401.022	Crv Speed Demand 60Hz [C]	Specified speed curve: Speed as a function of current with generator mode 60 Hz	—
2.0401.023	Analog Loadsignal Curve [mA]	Load signal	—
2.0401.024	AUX1 L1 Curve [digit/rpm]	Limit value curve 1st limit value AUX1	—
2.0401.025	AUX1 L2 Curve [digit/rpm]	Limit value curve 2nd limit value AUX1	—
2.0401.026	Fuel Input Idle/End (Current)	Fuel quantity idle/maximum-speed governor (current)	—
2.0401.027	Fuel Input Idle/End (Voltage)	Fuel quantity idle/maximum speed governor (voltage)	—
2.1000.052	CAN Loadsignal Curve	Load signal on CAN	—
2.1060.048	Idle Increase f(T-Cool.)	Amount of idle speed increase as a function of coolant temperature	—
2.1060.180	Plant DBR Rating1	Plant DBR rating 1	—
2.1060.181	Plant DBR Rating2	Plant DBR rating 2	—
2.1060.182	Plant DBR Rating3	Plant DBR rating 3	—

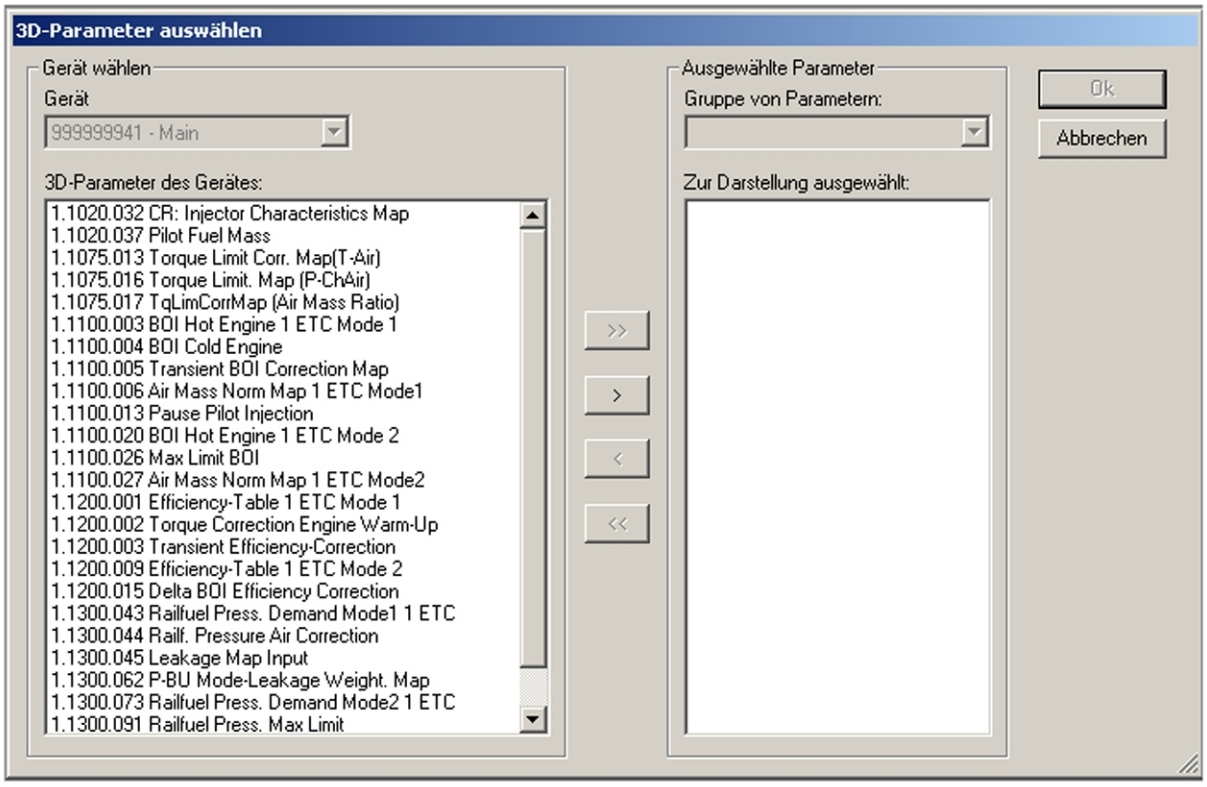
5.4 3D parameters

Definition

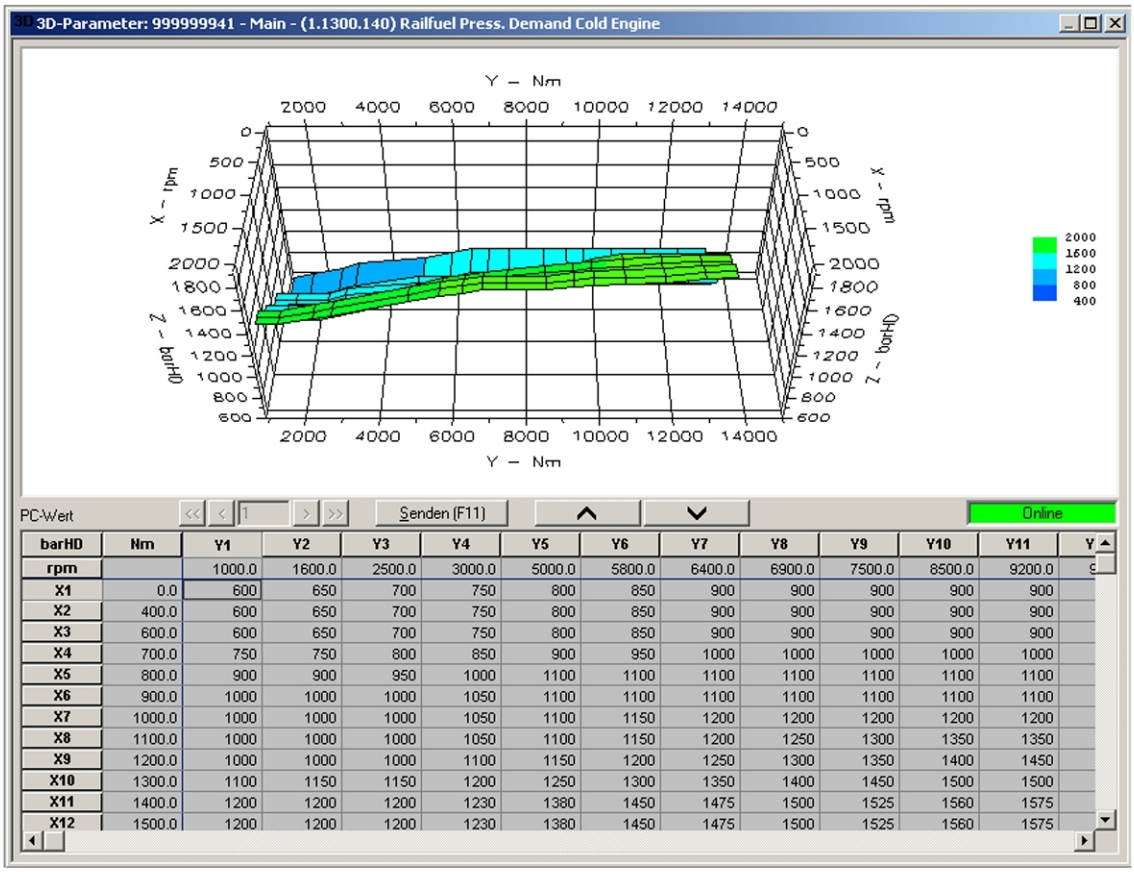
3D parameters ("Three-dimensional" parameters") are parameters for which several curves have been stored. This means that a value can alter as a function of two other values. A pressure limit value, for example, can be depicted as a function of engine speed and a temperature. If fixed values are desired for a variable, the same analog value must be specified for all support points of this variable. This creates a 2D parameter. If all values are set to the same analog value, a fixed limit value is created.

Function area in the Diasys

The function area 3D parameters is reached via the Dialog system (DiaSys®) from the main menu of the ECU-7 ("Edit 3D parameters... 3D").



The first window for this function area has a selection window on the left for selecting a parameter. The parameter marked here is entered in the right-hand window using the ">" button.



barHD	Nm	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11
rpm		1000.0	1600.0	2500.0	3000.0	5000.0	5800.0	6400.0	6900.0	7500.0	8500.0	9200.0
X1	0.0	600	650	700	750	800	850	900	900	900	900	900
X2	400.0	600	650	700	750	800	850	900	900	900	900	900
X3	600.0	600	650	700	750	800	850	900	900	900	900	900
X4	700.0	750	750	800	850	900	950	1000	1000	1000	1000	1000
X5	800.0	900	900	950	1000	1100	1100	1100	1100	1100	1100	1100
X6	900.0	1000	1000	1000	1050	1100	1100	1100	1100	1100	1100	1100
X7	1000.0	1000	1000	1000	1050	1100	1150	1200	1200	1200	1200	1200
X8	1100.0	1000	1000	1000	1050	1100	1150	1200	1250	1300	1350	1350
X9	1200.0	1000	1000	1000	1100	1150	1200	1250	1300	1350	1400	1450
X10	1300.0	1100	1150	1150	1200	1250	1300	1350	1400	1450	1500	1500
X11	1400.0	1200	1200	1200	1230	1380	1450	1475	1500	1525	1560	1575
X12	1500.0	1200	1200	1200	1230	1380	1450	1475	1500	1525	1560	1575

50800850a

This parameter is then transferred to the window for alteration using the "OK" button.

The data below the curve diagram in this window means the following:

- PC value

  This matrix shows the value currently entered in the PC. The desired changes are entered here. Confirm the input and the altered curve is displayed.
- Active value (scroll down)

  Here is the specification of which values are currently saved in the governor. These values are updated every time the DiaSys is connected to the governor and linked to the governor via the function "Establish connection to governor".

3D parameters can generally not be altered by OEMs or customers. Their presentation simply provides information on how the characteristics maps look. This is why all values are usually shown shaded gray (and can therefore not be changed).

The following curves are available:

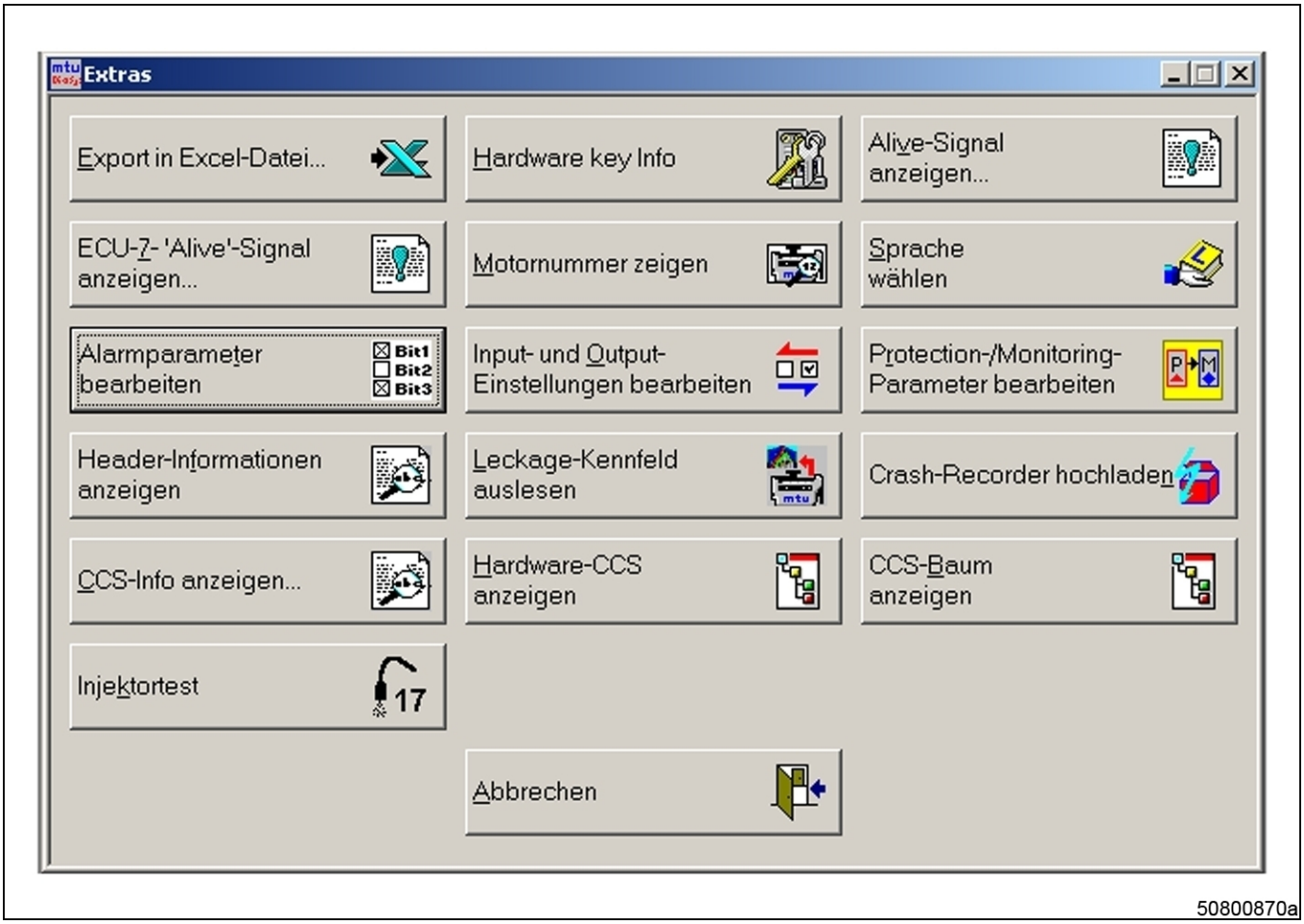
ZKP No. of the curve	Designation
1.1020.032	CR: Injector Characteristics Map
1.1020.037	Pilot Fuel Mass
1.1020.040	Post Fuel Mass
1.1020.043	PLD: Accupump Characteristics Map
1.1020.044	PLD-Engine: IRT-Detect. Delay Time
1.1075.013	Torque Limit Corr. Map(T-Air)

ZKP No. of the curve	Designation
1.1075.015	Torque Limit Corr. Map(Alti.)
1.1075.016	Torque Limit. Map (P-ChAir)
1.1075.017	TqLimCorrMap (Air Mass Ratio)
1.1100.003	BOI Hot Engine Mode 1
1.1100.004	BOI Cold Engine
1.1100.005	Transient BOI Correction Map
1.1100.006	Air Mass Norm Map 1 ETC
1.1100.007	Air Mass Norm Map 2 ETC
1.1100.008	Air Mass Norm Map 3 ETC
1.1100.013	Pause Pilot Injection
1.1100.016	Pause Post Injection
1.1100.020	BOI Hot Engine Mode 2
1.1100.021	BOI Hot Engine 2 ETC Mode 1
1.1100.022	BOI Hot Engine 2 ETC Mode 2
1.1100.023	BOI Hot Engine 3 ETC Mode 1
1.1100.024	BOI Hot Engine 3 ETC Mode 2
1.1100.026	Max Limit BOI
1.1200.001	Efficiency-Table Mode 1
1.1200.002	Torque Correction Engine Warm-Up
1.1200.003	Transient Efficiency-Correction
1.1200.009	Efficiency-Table Mode 2
1.1200.010	Efficiency-Table 2 ETC Mode 1
1.1200.011	Efficiency-Table 2 ETC Mode 2
1.1200.012	Efficiency-Table 3 ETC Mode 1
1.1200.013	Efficiency-Table 3 ETC Mode 2
1.1300.043	Railfuel Press. Demand Mode 1
1.1300.044	Railf. Pressure Air Correction
1.1300.045	Leakage Map Input
1.1300.062	P-BU Mode-Leakage Weight. Map
1.1300.073	Railfuel Press. Demand Mode 2
1.1300.091	Railfuel Press. Max Limit
1.1300.136	P-Railfuel Demand (Map) Mode1 ATL2
1.1300.137	P-Railfuel Demand (Map) Mode1 ATL3

ZKP No. of the curve	Designation
1.1300.138	P-Railfuel Demand (Map) Mode2 ATL2
1.1300.139	P-Railfuel Demand (Map) Mode2 ATL3

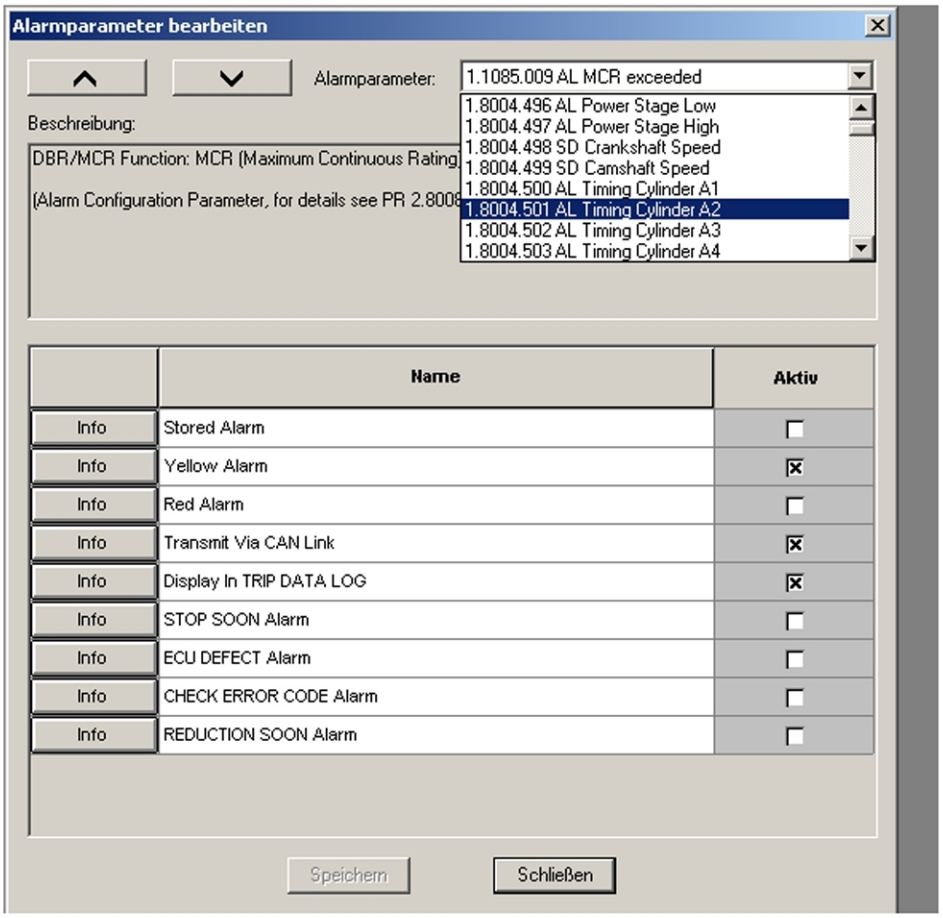
5.5 Alarm parameters

Function area in the Diasys



The function area Monitoring and Protection can be reached via the dialog system DiaSys® using the following the following menus:

- ECU-7
- ECU-7 Available functions - editing alarm parameters.



The window for this function area has a drop-down selection window in the top right corner for selecting one of the available alarm measurement point.

The following alarm measurement points are available for the different application cases:

Setting options for each alarm measurement point

Each alarm measurement point has an input field. This field is used to set how an alarm is to be treated, or to define which reactions take place after an alarm has occurred. There are a total of nine setting options, which are activated or deactivated by setting an "X":

- Stored Alarm (→ Page 200)

  Table column SA, Stored Alarm

  If this option is selected, an entry is made in the fault memory when the corresponding alarm occurs. Acknowledgment does not delete the alarm from the fault memory, nor the automatic reset of the alarm (if, for example, a limit value violation is no longer present)
- Yellow Alarm (→ Page 200)

  Table column YA, Yellow Alarm

  This setting specifies that the occurrence of the corresponding fault triggers a yellow alarm at the same time. This setting should not be selected at the same time as the following setting.
- Red Alarm (→ Page 200)

  Table column RA, Red Alarm

  This setting specifies that the occurrence of the corresponding fault triggers a red alarm at the same time. This setting should not be selected at the same time as the previous setting.
- Transmit via CAN link (→ Page 200)

  Table column CAN column, Controller Area Network

  This setting specifies that the alarm is issued on the (MTU) CAN bus.
- Display in TRIP DATA LOG (→ Page 200)

Table column TDL, Trip Data Log column

Operating data of the engine is saved in an "Operating data recorder". This setting instructs the governor to save the occurrence of the corresponding alarm in addition in the operating data recorder.

- STOP SOON Alarm (→ Page 200)

  Table column STP, STOP soon column

  When this function is selected, after the occurrence of the alarm an additional message is issued stating that an automatic engine stop will occur in a short time if the alarm is still pending. This setting should match the data specified in the Monitoring/Protection module for the corresponding measured value.
- ECU DEFECT Alarm (→ Page 200)

  Table column ECD, Engine Controller unit Defect column

  This setting specifies that after the occurrence of the corresponding alarm an additional message is issued stating that the fault is a fault of the governor itself.
- CHECK ERROR CODE Alarm (→ Page 200)

  Table column ERR, ERRor code column

  This setting specifies that after the occurrence of the corresponding alarm an additional message is issued stating that a check of the fault code list is necessary.
- REDUCTION SOON Alarm (→ Page 200)

  Table column RED, REDuction soon column

  When this function is selected, after the occurrence of the corresponding alarm an additional message is issued stating that a power reduction will occur in a short time if the alarm is still pending. This setting should match the data specified in the Monitoring/Protection module for the corresponding measured value.

The following three setting options can not be changed by the user (permanently specified internally):

- Recording faults in chronological fault memory (→ Page 200), table column CF, Chronological fault memory
- Fault trips the trigger for the crash recorder (→ Page 200)

  Table column TCR, Trigger Crash-Recorder column
- Lock Crash Recorder, recording after trigger (→ Page 200)

  Table column SCR column

Standard settings

The following section specifies the values of the application cases that are usually set (using the example of the 4000 series with default or presetting!). Empty lines indicate that the value of this parameter is at 0.

Marine application

The use of this engine governor for marine applications in the 4000 series is still in the trial and development phase. Marine-typical settings can only be specified following series launch.

Rail application

The use of this engine governor for rail applications is still in the trial and development phase.
Rail-typical settings can only be specified following series launch.

Genset application

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
1.1085.009	AL MCR exceeded	√			√		√	√					
1.3011.128	SD Charger 1 Speed												
1.3011.129	SD Charger 2 Speed												
1.8004.046	AL Rail Leakage												
1.8004.496	AL Power Stage Low	√			√		√	√					
1.8004.497	AL Power Stage High	√			√		√	√					

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
1.8004.498	SD Crankshaft Speed	√			√		√	√					
1.8004.499	SD Camshaft Speed	√			√		√	√					
1.8004.500	AL Timing Cylinder A1	√			√		√	√					
1.8004.501 ... 519	AL Timing Cylinder A2 ... B10	√			√		√	√					
1.8004.520	AL Wiring Cylinder A1	√			√		√	√					
1.8004.521 ... 539	AL Wiring Cylinder A2 ... B10	√			√		√	√					
1.8004.540	AL Open Load Cylinder A1	√			√		√	√					
1.8004.541 ... 559	AL Open Load Cylinder A2 ... B10	√			√		√	√					
1.8004.560	AL Stop Power Stage	√				√	√	√					
1.8004.561	AL Stop MV-Wiring Ground	√				√	√	√					
1.8004.562	AL Stop Camshaft Sensor Defect	√				√	√	√					
1.8004.563	SD P-Lube Oil	√		√		√	√	√					
1.8004.564	SD P-Coolant	√		√		√	√	√					
1.8004.565	SD P-Fuel	√		√		√	√	√					
1.8004.566	SD P-Charge Air	√		√		√	√	√					
1.8004.567	SD P-HD	√		√		√	√	√					
1.8004.568	SD P-CrankCase	√		√		√	√	√					
1.8004.569	SD P-Coolant Intercooler	√		√		√	√	√					
1.8004.570	SD T-Coolant	√				√	√	√					
1.8004.571	SD T-Charge Air	√				√	√	√					
1.8004.572	SD T-Fuel	√			√		√	√					
1.8004.573	SD T-Intake Air	√			√		√	√					
1.8004.574	SD T-Coolant Intercooler	√			√		√	√					
1.8004.575	SD T-Lube Oil	√			√		√	√					
1.8004.576	SD T-Exhaust A	√			√		√	√					
1.8004.577	SD T-Exhaust B	√			√		√	√					

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
1.8004.578	SD U-PDU	√			√		√	√					
1.8004.579	SD T-AUX 1	√			√		√	√					
1.8004.580	SD P-Ambient Air	√			√		√	√					
1.8004.581	SD T-Charge Air Seq Ctrl	√			√		√	√					
1.8004.582	SD Level Leakage Fuel	√			√		√	√					
1.8004.583	SD Level Coolant Intercooler	√			√		√	√					
1.8004.584	SD Level Coolant Water	√			√		√	√					
1.8004.585	SD Dif Lube Oil	√			√		√	√					
1.8004.586	SD T-AUX 2	√			√		√	√					
1.8004.587	SD T-ECU	√			√		√	√					
1.8004.588	SD P-AUX 2	√			√		√	√					
1.8004.589	SD P-AUX 1	√			√		√	√					
1.8004.590	SD AUX 1	√			√		√	√					
1.8004.591	SD AUX 2												
1.8004.592	SD Coil Current												
1.8004.593	AL Wiring PWM_CM2												
1.8004.594	SD Level Water Fuel Prefilter												
1.8004.620	SD P-Lube Oil before Filter												
1.8004.621	SD P-Lube Oil redund.	√			√		√	√					
1.8004.622	SD T-Coolant redundant												
1.8004.623	AL Eng Hours Counter Defect	√			√		√	√					
1.8004.624	AL Fuel Cons. Counter Defect	√			√		√	√					
1.8004.625	AL P-Lube Oil Max Dev.												
1.8004.626	AL T-Coolant Max Dev.												
1.8004.634	AL Wiring TO 1												

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
1.8004.635	AL Wiring TO 2												
1.8004.636	AL Wiring TO 3												
1.8004.637	AL Wiring TO 4												
1.8010.007	AL Crash Rec. Init. Error	√			√		√	√					
1.8010.009	AL CR Trigger Engine Stop		√				√	√					
2.0100.921	LO P-Lube Oil	√			√		√	√					
2.0100.922	SS P-Lube Oil	√		√		√	√	√					
2.0101.921	LO P-Coolant												
2.0101.922	SS P-Coolant												
2.0102.921	LO P-Fuel	√			√		√	√					
2.0102.922	SS P-Fuel	√		√		√	√	√					
2.0103.931	HI P-Charge Air												
2.0103.932	SS P-Charge Air												
2.0104.921	LO P-Fuel (Common Rail)	√			√		√	√					
2.0104.931	HI P-Fuel (Common Rail)	√			√		√	√					
2.0106.931	HI P-Crank Case												
2.0106.932	SS P-Crank Case												
2.0107.921	LO P-Coolant InterCooler												
2.0107.922	SS P-Coolant InterCooler												
2.0110.921	L1 P-Aux 1	√			√		√	√					
2.0110.931	L2 P-Aux 1	√			√		√	√					
2.0112.921	LO P-Lube Oil redundant	√			√		√	√					
2.0112.922	SS P-Lube Oil redundant	√				√	√	√					
2.0120.931	HI T-Coolant	√			√		√	√					
2.0120.932	SS T-Coolant	√				√	√	√					
2.0120.933	Shut Down T-Coolant L3	√			√		√	√					

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
2.0120.934	Shut Down T-Coolant L4	√			√		√	√					
2.0121.931	HI T-Charge Air	√			√		√	√					
2.0121.932	SS T-Charge Air	√				√	√	√					
2.0122.931	HI T-Fuel	√			√		√	√					
2.0122.932	SS T-Fuel	√		√		√	√	√					
2.0124.931	AL L1 T-Coolant Intercooler	√			√		√	√					
2.0124.932	AL L2 T-Coolant Intercooler	√				√	√	√					
2.0125.931	HI T-Lube Oil	√			√		√	√					
2.0125.932	SS T-Lube Oil	√		√		√	√	√					
2.0126.931	HI T-Exhaust A												
2.0126.932	SS T-Exhaust A												
2.0127.931	HI T-Exhaust B												
2.0127.932	SS T-Exhaust B												
2.0128.931	HI T-Air Transfer												
2.0128.932	HIHI T-Air Transfer												
2.0129.931	HI T-Coolant redundant												
2.0129.932	SS T-Coolant redundant												
2.0130.921	L1 T-Aux 1	√			√		√	√					
2.0130.922	L2 T-Aux 1	√		√		√	√	√					
2.0130.931	HI T-Aux 1	√			√		√	√					
2.0130.932	HIHI T-Aux 1	√		√		√	√	√					
2.0131.921	L1 T-Aux 2												
2.0131.922	L2 T-Aux 2												
2.0131.931	HI T-Aux 2												
2.0131.932	HIHI T-Aux 2												
2.0132.921	HI T-ECU												
2.0140.921	LO ECU Power Supply Voltage	√			√		√	√					

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
2.0140.922	LOLO ECU Power Supply Voltage	√			√		√	√					
2.0140.931	HI ECU Power Supply Voltage	√			√		√	√					
2.0140.932	HH ECU Power Supply Voltage	√		√		√	√	√					
2.0141.921	LO U-PDU	√			√		√	√					
2.0141.922	LOLO U-PDU	√			√		√	√					
2.0141.931	HI U-PDU	√			√		√	√					
2.0141.932	HIHI U-PDU	√			√		√	√					
2.0151.931	HI Level Leakage Fuel	√			√		√	√					
2.0152.921	LO Coolant Level	√		√		√	√	√					
2.0153.921	L1 Level Coolant Intercooler	√		√		√	√	√					
2.0154.931	HI P-Diff-Lube Oil												
2.0154.932	SS P-Diff-Lube Oil												
2.0156.931	HI Level Water Fuel Prefilter												
2.0160.921	L1 Aux 1												
2.0160.922	L2 Aux 1												
2.0500.680	AL CAN1 Node Lost	√			√		√	√					
2.0500.681	AL CAN2 Node Lost	√			√		√	√					
2.0500.682	AL CAN Wrong Parameters	√			√		√	√					
2.0500.683	AL CAN No PU-Data	√			√		√	√					
2.0500.684	AL CAN PU-Data Flash Error	√			√		√	√					
2.0500.686	AL CAN1 Bus Off	√			√		√	√					
2.0500.687	AL CAN1 Error Passive	√			√		√	√					
2.0500.688	AL CAN2 Bus Off	√			√		√	√					
2.0500.689	AL CAN2 Error Passive	√			√		√	√					
2.0500.690	AL EMU Parameter Not Supported	√			√		√	√					

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
2.0555.001	AL Call MTU Field-Service	√			√		√	√					
2.0555.002	AL Configuration changed	√			√		√	√					
2.0555.005	AL Multiple FDH	√			√		√	√					
2.1060.012	SD-ReqEngSpd Def. Value					√	√						
2.1060.013	SD-ReqEngSpd Def. Active					√	√						
2.1090.920	AL Prelubrication Fault	√			√		√	√					
2.1090.921	LO T-Preheat	√					√	√					
2.1090.922	SS T-Preheat	√		√		√	√	√					
2.1090.923	SS Starter Speed Not Reached	√		√		√	√	√					
2.1090.924	SS Release Speed Not Reached	√		√		√	√	√					
2.1090.925	SS Idle Speed Not Reached	√		√		√	√	√					
2.1090.926	AL Starter not engaged	√			√		√	√					
2.2500.030	AL Engine Speed Low	√			√		√	√					
2.2510.932	SS Engine Overspeed	√		√		√	√	√					
2.3011.931	HI ETC1 Overspeed												
2.3012.932	SS ETC1 Overspeed												
2.3013.912	SS ETC2 Overspeed												
2.3013.931	HI ETC2 Overspeed												
2.4000.004	AL LifeData not available	√			√		√	√					
2.4000.006	AL LifeData restore incomplete	√			√		√	√					
2.7000.011	SS Power Reduction Active	√		√		√	√	√					
2.7002.010	AL Override applied												
2.8006.001	AL Comb. Alarm Yel (Plant)	√			√			√					
2.8006.002	AL Comb. Alarm Red (Plant)	√			√			√					

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
2.8006.586	SD Speed Demand	√			√		√	√					
2.8006.588	SD Loadp.Analog filt	√			√		√	√					
2.8006.589	SD ECU Power Supply Voltage	√			√		√	√		√			
2.8006.590	SD Frequency Input	√			√		√	√					
2.8006.592	SD Idle/End-Torque Input [%]	√			√		√	√					
2.8006.593	AI Stop SD	√		√		√	√	√					
2.8006.625	AL Open Load Digital Input 1	√			√		√	√					
2.8006.626	AL Open Load Digital Input 2	√			√		√	√					
2.8006.627	AL Open Load Digital Input 3	√			√		√	√					
2.8006.628	AL Open Load Digital Input 4	√			√		√	√					
2.8006.629	AL Open Load Digital Input 5	√			√		√	√					
2.8006.630	AL Open Load Digital Input 6	√			√		√	√					
2.8006.631	AL Open Load Digital Input 7	√			√		√	√					
2.8006.632	AL Open Load Digital Input 8	√			√		√	√					
2.8006.633	AL Open Load Emerg. Stop Input ESI	√			√		√	√					
2.8006.638	AL Wiring TOP 1	√			√		√	√					
2.8006.639	AL Wiring TOP 2	√			√		√	√					
2.8006.640	AL Wiring TOP 3	√			√		√	√					
2.8006.641	AL Wiring TOP 4	√			√		√	√					
2.8006.650	AL Aux 1 Plant	√			√		√	√					
2.8006.651	AL Aux 2 Plant	√			√		√	√					
2.8006.652	AL Exhaust EMU High												
2.8006.653	AL Exhaust EMU Low												
2.8006.654	AL Coolant EMU L1												

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	SCR	RED
2.8006.655	AL Wiring FO	√			√		√	√					
2.8009.005	Time Interval Flash ErrCodes												

Application C&I

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
1.1085.009	AL MCR exceeded												
1.3011.128	SD Charger 1 Speed	√			√		√	√			√		
1.3011.129	SD Charger 2 Speed												
1.8004.046	AL Rail Leakage												
1.8004.496	AL Power Stage Low	√			√		√	√			√		
1.8004.497	AL Power Stage High	√			√		√	√			√		
1.8004.498	SD Crankshaft Speed	√			√		√	√			√		
1.8004.499	SD Camshaft Speed	√			√		√	√			√		
1.8004.500 ... 519	AL Timing Cylinder A1 ... B10												
1.8004.520 ... 539	AL Wiring Cylinder A1 ... B10	√			√		√	√			√		
1.8004.540 ... 559	AL Open Load Cylinder A1 ... B10	√			√		√	√			√		
1.8004.560	AL Stop Power Stage	√				√	√	√					
1.8004.561	AL Stop MV-Wiring Ground	√				√	√	√					
1.8004.562	AL Stop Camshaft Sensor Defect	√				√	√	√					
1.8004.563	SD P-Lube Oil	√			√		√	√			√		
1.8004.564	SD P-Coolant	√			√		√	√			√		
1.8004.565	SD P-Fuel	√			√		√	√			√		
1.8004.566	SD P-Charge Air	√			√		√	√			√		
1.8004.567	SD P-HD	√			√		√	√			√		
1.8004.568	SD P-CrankCase	√			√		√	√			√		

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
1.8004.569	SD P-Coolant Intercooler	√			√		√	√			√		
1.8004.570	SD T-Coolant	√			√		√	√			√		
1.8004.571	SD T-Charge Air	√			√		√	√			√		
1.8004.572	SD T-Fuel	√			√		√	√			√		
1.8004.573	SD T-Intake Air	√			√		√	√			√		
1.8004.574	SD T-Coolant Intercooler	√			√		√	√			√		
1.8004.575	SD T-Lube Oil	√			√		√	√			√		
1.8004.576	SD T-Exhaust A												
1.8004.577	SD T-Exhaust B												
1.8004.578	SD U-PDU	√			√		√	√			√		
1.8004.579	SD T-AUX 1												
1.8004.580	SD P-Ambient Air												
1.8004.581	SD T-Charge Air Seq Ctrl												
1.8004.582	SD Level Leakage Fuel												
1.8004.583	SD Level Coolant Intercooler												
1.8004.584	SD Level Coolant Water	√			√		√	√			√		
1.8004.585	SD Dif Lube Oil												
1.8004.586	SD T-AUX 2												
1.8004.587	SD T-ECU	√			√		√	√			√		
1.8004.588	SD P-AUX 2												
1.8004.589	SD P-AUX 1												
1.8004.590	SD AUX 1												
1.8004.591	SD AUX 2												
1.8004.592	SD Coil Current	√			√		√	√			√		
1.8004.593	AL Wiring PWM_CM2	√				√	√	√					
1.8004.594	SD Level Water Fuel Prefilter	√			√		√	√			√		

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
1.8004.620	SD P-Lube Oil before Filter												
1.8004.621	SD P-Lube Oil redund.												
1.8004.622	SD T-Coolant redundant												
1.8004.623	AL Eng Hours Counter Defect	√			√		√	√			√		
1.8004.624	AL Fuel Cons. Counter Defect	√			√		√	√			√		
1.8004.625	AL P-Lube Oil Max Dev.												
1.8004.626	AL T-Coolant Max Dev.												
1.8004.634	AL Wiring TO 1												
1.8004.635	AL Wiring TO 2												
1.8004.636	AL Wiring TO 3	√			√		√	√			√		
1.8004.637	AL Wiring TO 4												
1.8010.007	AL Crash Rec. Init. Error	√			√		√	√			√		
1.8010.009	AL CR Trigger Engine Stop	√			√		√	√			√		
2.0100.921	LO P-Lube Oil	√			√		√	√					
2.0100.922	SS P-Lube Oil	√	√	√		√	√	√					√
2.0101.921	LO P-Coolant	√			√		√	√					
2.0101.922	SS P-Coolant	√		√		√	√	√					
2.0102.921	LO P-Fuel	√			√		√	√					
2.0102.922	SS P-Fuel	√				√	√	√					
2.0103.931	HI P-Charge Air												
2.0103.932	SS P-Charge Air												
2.0104.921	LO P-Fuel (Common Rail)	√				√	√	√					
2.0104.931	HI P-Fuel (Common Rail)	√				√	√	√					
2.0106.931	HI P-Crank Case	√			√		√	√					
2.0106.932	SS P-Crank Case	√	√	√		√	√	√					√

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
2.0107.921	LO P-Coolant InterCooler	√			√		√	√					
2.0107.922	SS P-Coolant InterCooler	√		√		√	√	√					
2.0110.921	L1 P-Aux 1												
2.0110.931	L2 P-Aux 1												
2.0110.932	HIHI P-Aux 1												
2.0111.921	L1 P-Aux 2												
2.0111.922	L2 P-Aux 2												
2.0111.931	HI P-Aux 2												
2.0111.932	HIHI P-Aux 2												
2.0112.921	LO P-Lube Oil redundant												
2.0112.922	SS P-Lube Oil redundant												
2.0120.931	HI T-Coolant	√			√		√	√					
2.0120.932	SS T-Coolant	√		√		√	√	√					
2.0121.931	HI T-Charge Air	√			√		√	√					
2.0121.932	SS T-Charge Air	√				√	√	√					
2.0122.931	HI T-Fuel	√			√		√	√					
2.0122.932	SS T-Fuel	√		√		√	√	√					
2.0124.931	AL L1 T-Coolant Intercooler	√			√		√	√					
2.0124.932	AL L2 T-Coolant Intercooler	√		√		√	√	√					
2.0125.931	HI T-Lube Oil	√			√		√	√					
2.0125.932	SS T-Lube Oil	√		√		√	√	√					
2.0126.931	HI T-Exhaust A												
2.0126.932	SS T-Exhaust A												
2.0127.931	HI T-Exhaust B												
2.0127.932	SS T-Exhaust B												
2.0128.931	HI T-Air Transfer												
2.0128.932	HIHI T-Air Transfer												

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
2.0129.931	HI T-Coolant redundant												
2.0129.932	SS T-Coolant redundant												
2.0130.921	L1 T-Aux 1												
2.0130.922	L2 T-Aux 1												
2.0130.931	HI T-Aux 1												
2.0130.932	HIHI T-Aux 1												
2.0131.921	L1 T-Aux 2												
2.0131.922	L2 T-Aux 2												
2.0131.931	HI T-Aux 2												
2.0131.932	HIHI T-Aux 2												
2.0132.921	HI T-ECU	√			√		√	√					
2.0140.921	LO ECU Power Supply Voltage	√			√		√	√					
2.0140.922	LOLO ECU Power Supply Voltage	√				√	√	√					
2.0140.931	HI ECU Power Supply Voltage	√			√		√	√					
2.0140.932	HH ECU Power Supply Voltage	√				√	√	√					
2.0141.921	LO U-PDU	√			√		√	√		√			
2.0141.922	LOLO U-PDU	√				√	√	√		√			
2.0141.931	HI U-PDU	√			√		√	√		√			
2.0141.932	HIHI U-PDU	√				√	√	√					
2.0151.931	HI Level Leakage Fuel												
2.0152.912	SS Coolant Level												
2.0152.921	LO Coolant Level	√			√		√	√					
2.0153.921	L1 Level Coolant Intercooler												
2.0154.931	HI P-Diff-Lube Oil	√			√		√	√			√		
2.0154.932	SS P-Diff-Lube Oil												
2.0156.931	HI Level Water Fuel Prefilter	√			√		√	√					
2.0160.921	L1 Aux 1												

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
2.0160.922	L2 Aux 1												
2.0160.931	HI Aux 1												
2.0160.932	HIHI Aux 1												
2.0500.680	AL CAN1 Node Lost	√			√		√	√			√		
2.0500.681	AL CAN2 Node Lost	√			√		√	√			√		
2.0500.682	AL CAN Wrong Parameters	√			√		√	√			√		
2.0500.683	AL CAN No PU-Data	√			√		√	√			√		
2.0500.684	AL CAN PU-Data Flash Error	√			√		√	√			√		
2.0500.686	AL CAN1 Bus Off	√			√		√	√			√		
2.0500.687	AL CAN1 Error Passive	√			√		√	√			√		
2.0500.688	AL CAN2 Bus Off	√			√		√	√			√		
2.0500.689	AL CAN2 Error Passive	√			√		√	√			√		
2.0500.690	AL EMU Parameter Not Supported												
2.0555.001	AL Call MTU Field-Service												
2.0555.001	AL Configuration changed												
2.1060.012	SD-ReqEngSpd Def. Value												
2.1060.013	SD-ReqEngSpd Def. Active												
2.1090.920	AL Prelubrication Fault	√				√	√	√					
2.1090.921	LO T-Preheat	√			√		√	√			√		
2.1090.922	SS T-Preheat	√			√		√	√			√		
2.1090.923	SS Starter Speed Not Reached	√			√		√	√			√		
2.1090.924	SS Release Speed Not Reached	√			√		√	√			√		
2.1090.925	SS Idle Speed Not Reached	√			√		√	√			√		
2.2500.030	AL Engine Speed Low	√			√		√	√			√		

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
2.2510.932	SS Engine Overspeed	√				√	√	√					
2.3011.931	HI ETC1 Overspeed	√			√		√	√					
2.3012.932	SS ETC1 Overspeed	√		√		√	√	√					
2.3013.912	SS ETC2 Overspeed												
2.3013.931	HI ETC2 Overspeed												
2.4000.004	AL LifeData not available	√			√		√	√			√		
2.4000.006	AL LifeData restore incomplete	√			√		√	√			√		
2.7000.011	SS Power Reduction Active	√			√		√	√					
2.7002.010	AL Override applied												
2.8006.001	AL Comb. Alarm Yel (Plant)	√			√		√	√					
2.8006.002	AL Comb. Alarm Red (Plant)	√				√	√	√					
2.8006.586	SD Speed Demand	√				√	√	√					
2.8006.588	SD Loadp.Analog filt												
2.8006.589	SD ECU Power Supply Voltage	√			√		√	√			√		
2.8006.590	SD Frequency Input	√				√	√	√					
2.8006.592	SD Idle/End-Torque Input [%]	√				√	√	√					
2.8006.593	AI Stop SD	√				√	√	√					
2.8006.625	AL Open Load Digital Input 1	√			√		√	√			√		
2.8006.626	AL Open Load Digital Input 2	√			√		√	√			√		
2.8006.627	AL Open Load Digital Input 3	√			√		√	√			√		
2.8006.628	AL Open Load Digital Input 4	√			√		√	√			√		
2.8006.629	AL Open Load Digital Input 5	√			√		√	√			√		
2.8006.630	AL Open Load Digital Input 6	√			√		√	√			√		

ZKP No. of the alarm	Name	CF	TCR	SA	YA	RA	CAN	TDL	STP	ECD	ERR	TCF	RED
2.8006.631	AL Open Load Digital Input 7	√			√		√	√			√		
2.8006.632	AL Open Load Digital Input 8	√			√		√	√			√		
2.8006.633	AL Open Load Emerg. Stop Input ESI												
2.8006.638	AL Wiring TOP 1	√			√		√	√			√		
2.8006.639	AL Wiring TOP 2	√			√		√	√			√		
2.8006.640	AL Wiring TOP 3	√			√		√	√			√		
2.8006.641	AL Wiring TOP 4	√			√		√	√			√		
2.8006.650	AL Aux 1 Plant												
2.8006.651	AL Aux 2 Plant												
2.8006.652	AL Exhaust EMU High												
2.8006.653	AL Exhaust EMU Low												
2.8006.654	AL Coolant EMU L1												
2.8006.655	AL Wiring FO	√			√		√	√			√		

Conversion of exported values

Values of the individual bits

If a file is created using the "Data export" function", a numerical value is output for each alarm message for configuring the alarm messages. This numerical value contains, bit-encoded, the function that is to be tripped when the corresponding alarm occurs.

The following bit values have been assigned for the individual functions:

- Bit 0: Value 1

  Record fault in chronological fault memory.
- Bit 1: Value 2

  Fault trips the trigger for the crash recorder.
- Bit 2: Value 4

  Reserved
- Bit 3: Value 8

  Alarm remains saved until deleted by operator.
- Bit 4: Value 16

  Fault trips yellow alarm.
- Bit 5: Value 32

  Fault trips red alarm.
- Bit 6: Value 64

  Alarm is transferred to CAN.
- Bit 7: Value 128

  Fault is recorded and displayed in the trip memory.
- Bit 8: Value 256

  Fault trips the signal "STOP SOON" (engine start expected).
- Bit 9: Value 512

Fault trips the alarm "ECU faulty".

- Bit 10: Value 1024

  Fault trips the alarm "AL ECU faulty/see fault code".

- Bit 11: Value 2048

  Lock crash recorder after trigger (this bit presupposes that bit 1 "Fault trips trigger for crash recorder" is set)

Example

The exported value for the alarm "SD T-Coolant" (ZKP No. 1.8004.570) is 225. This means:

Set bit	Value	Meaning
Bit 0	1	Fault is recorded in chronological fault memory.
Bit 5	32	Fault trips red alarm.
Bit 6	64	Alarm is transferred to CAN.
Bit 7	128	Fault is recorded and displayed in the trip memory.
Total	225	

5.6 Setting the oil pressure differential measurement

Principle

The oil differential pressure (i.e. the differential in the oil pressures before and after the oil filter) can be determined using two different methods. The setting you select depends on the engine equipment.

- Analog sensors

  There are two analog pressure sensors, one before the oil filter and one after it. These two sensors determine both measured values. By setting the engine governor accordingly, the difference between the two measured values can be calculated. Further settings can be used to adjust the maximum difference value and a hysteresis value. This then allows an alarm to be generated if the difference value is too high.
- Pressure switch

  For this type of determination of the oil pressure difference, a differential pressure switch with a permanently set trip value is installed on the engine. If the oil pressure difference exceeds this value, the engine governor records the trip signal and issues the alarm.

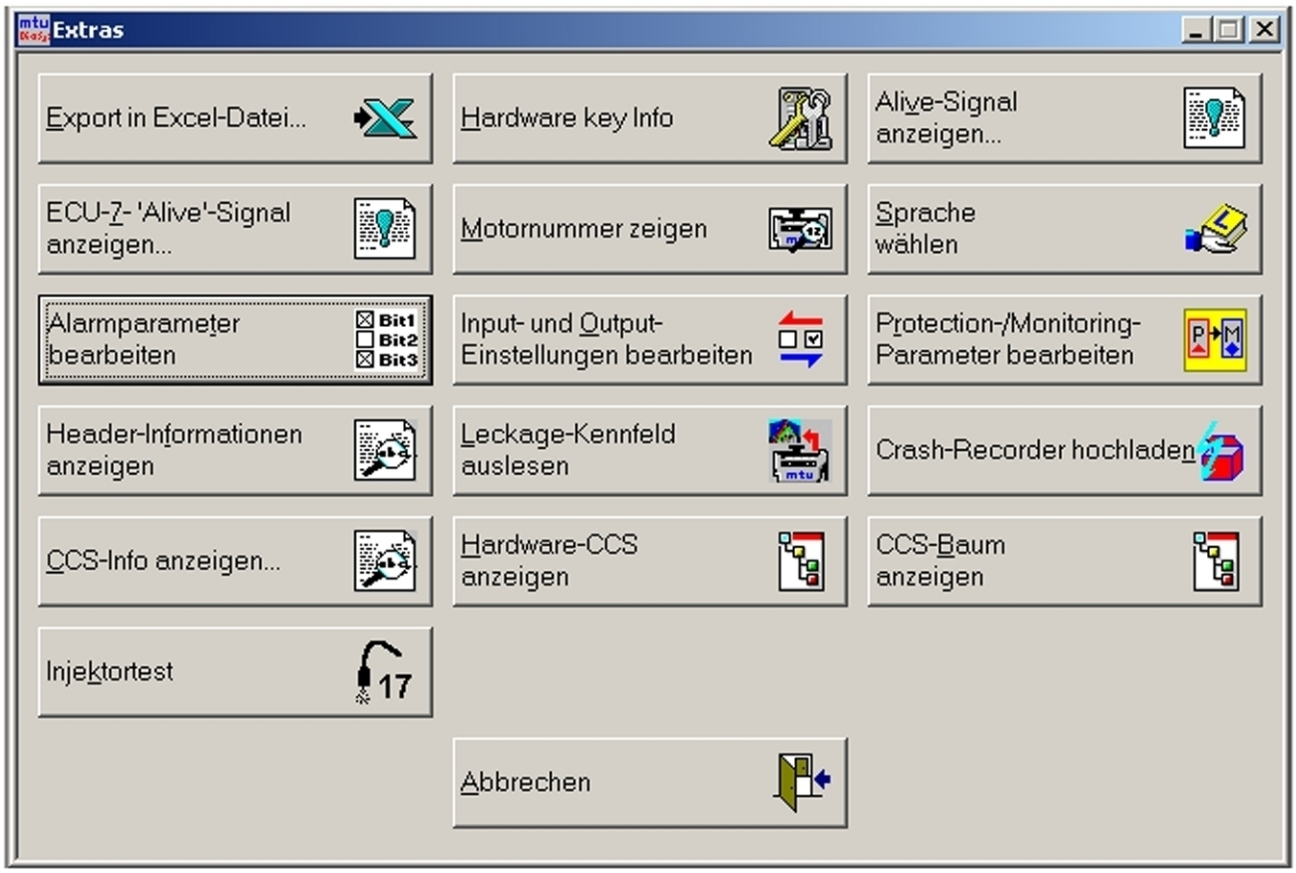
Principally, only one of the above-mentioned measurement procedures must be set on the engine governor.

Parameter

Parameter No.	Function of the parameter	Setting with differential pressure switch	Setting with calculation via two analog pressure sensors
1.0300.407	P-Dif. Lube Oil L1 Monit. Active	¤	X
1.0300.427	P-Dif. Lube Oil L2 Module Active	¤	X
1.0301.257	P-Dif Lube-Oil Switch Monit. Active	X	¤
1.9901.118	Sensortype Input LSI3	23	Not relevant
1.0155.002	P-Dif L-Oil SW ECU Channel	18	Not relevant
1.0301.253	P-Dif Lube-Oil Switch Limit Value	2.5 Ω	Enter absolute value
1.0301.256	P-Dif Lube-Oil Switch Lim Hysteresis	0.5 Ω	Enter absolute value

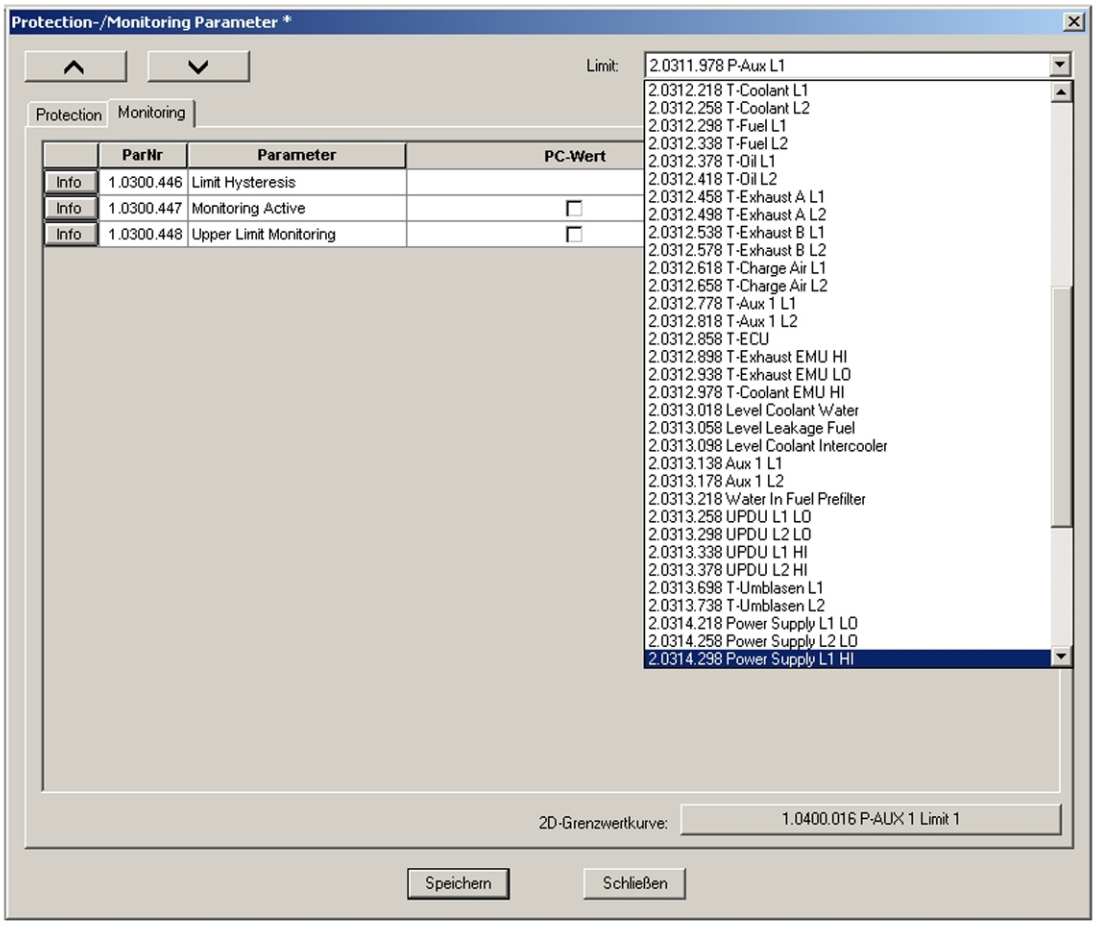
5.7 Monitoring and Protection Module

Function area in the Diasys®



The function area Monitoring and Protection can be reached via the dialog system DiaSys® using the following the following menus:

- ECU-7
- ECU-7 Available functions - extras
- Extras - editing Protection/Monitoring parameters.



The window for this function area has a drop-down selection window in the top right corner for selecting one of the available measurement variables. The name of the measurement variable is here, preceded by a ZKP No. (the so-called LINK number).

The following measurement variables are available for the different application cases:

ZKP No. (LINK No.) of the measurement variable	**Designation**	**Function**
2.0311.018	Turbocharger 1 L1	Settings for exhaust turbocharger 1, first limit value
2.0311.058	Turbocharger 1 L2	Settings for exhaust turbocharger 1, second limit value
2.0311.098	Turbocharger 2 L1	Settings for exhaust turbocharger 2, first limit value
2.0311.138	Turbocharger 2 L2	Settings for exhaust turbocharger 2, second limit value
2.0311.378	Engine overspeed	Settings for engine speed too high
2.0311.418	P-coolant L1	Settings for coolant pressure, first limit value
2.0311.458	P-coolant L2	Settings for coolant pressure, second limit value

ZKP No. (LINK No.) of the measurement variable	Designation	Function
2.0311.498	P-crankcase L1	Settings for crankcase pressure, first limit value
2.0311.538	P-crankcase L2	Settings for crankcase pressure, second limit value
2.0311.578	P-fuel L1	Settings for fuel pressure, first limit value
2.0311.618	P-fuel L2	Settings for fuel pressure, second limit value
2.0311.658	P-high pressure L1	Settings for high pressure (common rail), first limit value
2.0311.698	P-high pressure L2	Settings for high pressure (common rail), second limit value
2.0311.738	P-oil L1	Settings for lube oil pressure, first limit value
2.0311.778	P-oil L2	Settings for lube oil pressure, second limit value
2.0311.818	P-diff. oil L1	Settings for oil pressure differential (pressure before and after oil filter), first limit value
2.0311.858	P-diff. oil L2	Settings for oil pressure differential (pressure before and after oil filter), second limit value
2.0311.898	P-charge air L1	Settings for charge air pressure, first limit value
2.0311.938	P-charge air L2	Settings for charge air pressure, second limit value
2.0311.978	P-aux. L1	Settings for pressure auxiliary channel, first limit value
2.0312.018	P-aux. L2	Settings for pressure auxiliary channel, second limit value
2.0312.058	P-oil L1 redundant	Settings for lube oil pressure (redundant recording), first limit value
2.0312.098	P-oil L2 redundant	Settings for lube oil pressure (redundant recording), second limit value
2.0312.138	T-coolant L1 redundant	Settings for coolant temperature (redundant recording), first limit value
2.0312.178	T-coolant L2 redundant	Settings for coolant temperature (redundant recording), second limit value
2.0312.218	T-coolant L1	Settings for coolant temperature, first limit value
2.0312.258	T-coolant L2	Settings for coolant temperature, second limit value
2.0312.298	T-fuel L1	Settings for fuel temperature, first limit value
2.0312.338	T-fuel L2	Settings for fuel temperature, second limit value
2.0312.378	T-oil L1	Settings for lube oil temperature, first limit value
2.0312.418	T-oil L2	Settings for lube oil temperature, second limit value
2.0312.458	T-exhaust gas A L1	Settings for exhaust manifold temperature, A-side, first limit value
2.0312.498	T-exhaust gas A L2	Settings for exhaust manifold temperature, A-side, second limit value

ZKP No. (LINK No.) of the measurement variable	Designation	Function
2.0312.538	T-exhaust gas B L1	Settings for exhaust manifold temperature, B-side, first limit value
2.0312.578	T-exhaust gas B L2	Settings for exhaust manifold temperature, B-side, second limit value
2.0312.618	T-charge air L1	Settings for charge air temperature, first limit value
2.0312.658	T-charge air L2	Settings for charge air temperature, second limit value
2.0312.778	T-Aux 1 L1	Settings for temperature auxiliary channel 1, first limit value
2.0312.818	T-Aux 1 L2	Settings for temperature auxiliary channel 1, second limit value
2.0312.858	T-ECU	Setting for engine governor temperature
2.0312.898	T-exhaust gas EMU HI	Settings for exhaust gas temperature (recorded by EMU) too high
2.0312.938	T-exhaust gas EMU LO	Settings for exhaust gas temperature (recorded by EMU) too low
2.0312.978	T-coolant EMU HI	Settings for coolant temperature (recorded by EMU) too high
2.0313.018	Coolant level	Settings for coolant level too low
2.0313.058	Leak-off fuel level	Settings for leak-off fuel level too high
2.0313.098	Intercooler coolant level	Settings for coolant level (intercooler) too low
2.0313.138	Aux 1 L1	Settings for auxiliary channel 1, first limit value violated
2.0313.178	Aux 1 L2	Settings for auxiliary channel 1, second limit value violated
2.0313.218	Water level in fuel prefilter	Settings for water in fuel prefilter
2.0313.258	UPDU L1 LO	Settings for injector voltage for 42-V injectors too low, first limit value
2.0313.298	UPDU L2 LO	Settings for injector voltage for 42-V injectors too low, second limit value
2.0313.338	UPDU L1 HI	Settings for injector voltage for 42-V injectors too high, first limit value
2.0313.378	UPDU L2 HI	Settings for injector voltage for 42-V injectors too high, second limit value
2.0314.218	U-Bat L1 LO	Settings for battery voltage too low, first limit value
2.0314.258	U-Bat L2 LO	Settings for battery voltage too low, second limit value
2.0314.298	U-Bat L1 HI	Settings for battery voltage too high, first limit value
2.0314.338	U-Bat L2 HI	Settings for battery voltage too high, second limit value
2.0314.378	Coolant level, binary	Settings for coolant level below limit level (switch)
2.0314.418	Aux 1 plant L1	Settings for auxiliary channel 1, plant side, first limit value violated

ZKP No. (LINK No.) of the measurement variable	Designation	Function
2.0314.458	Aux 1 plant L2	Settings for auxiliary channel 1, plant side, second limit value violated
2.0320.018	T-Coolant Intercooler L1	Settings for coolant temperature (intercooler) too high, first limit value
2.0320.058	T-Coolant Intercooler L2	Settings for coolant temperature (intercooler) too high, second limit value
2.0320.338	P-Coolant Intercooler L1	Settings for coolant pressure (intercooler) too low, first limit value
2.0320.378	P-Coolant Intercooler L2	Settings for coolant pressure (intercooler) too low, second limit value
2.0320.418	P-diff. oil switch	Settings for oil pressure differential (pressure before and after oil filter) above limit value (switch)
2.0320.818	Inexact start of injection	Settings for times at which injection starts are too imprecise
2.0320.858	Misfiring	Settings for combustion are not as specified
2.0320.898	Undefined injection	Settings for injection take place at wrong times

General information

To protect the engine against overloading and possible resulting damage, the engine governor "observes" various measurement variables (i.e. current measured temperature, pressure and speed values). The first step involves "Monitoring" the measured value. In a second step, if a limit value is exceeded the governor can trip a specific reaction to protect the engine (Protection).

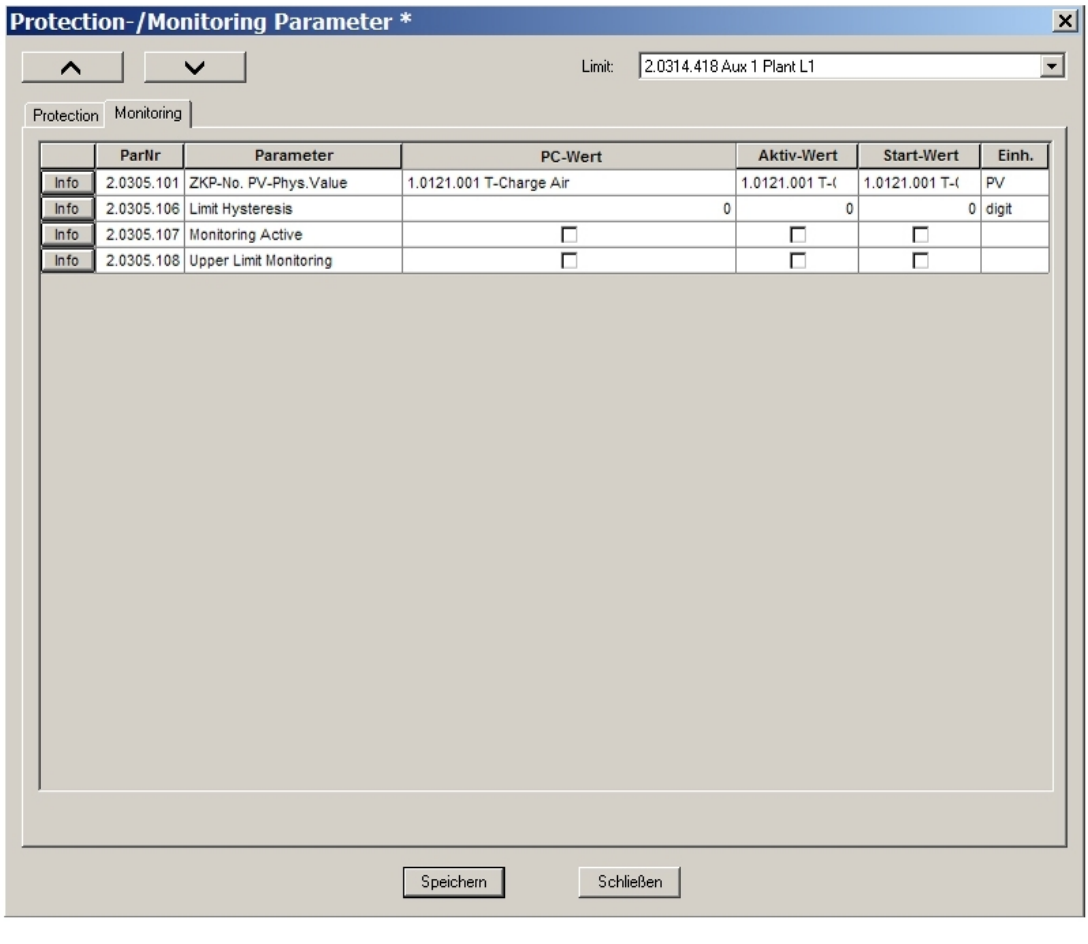
Each measurement variable has its own Monitoring module and an associated Protection module. The two modules for each measurement variable are permanently assigned to each other.

If the Monitoring module determines a limit value violation, the Protection module can trip one of the four following reactions:

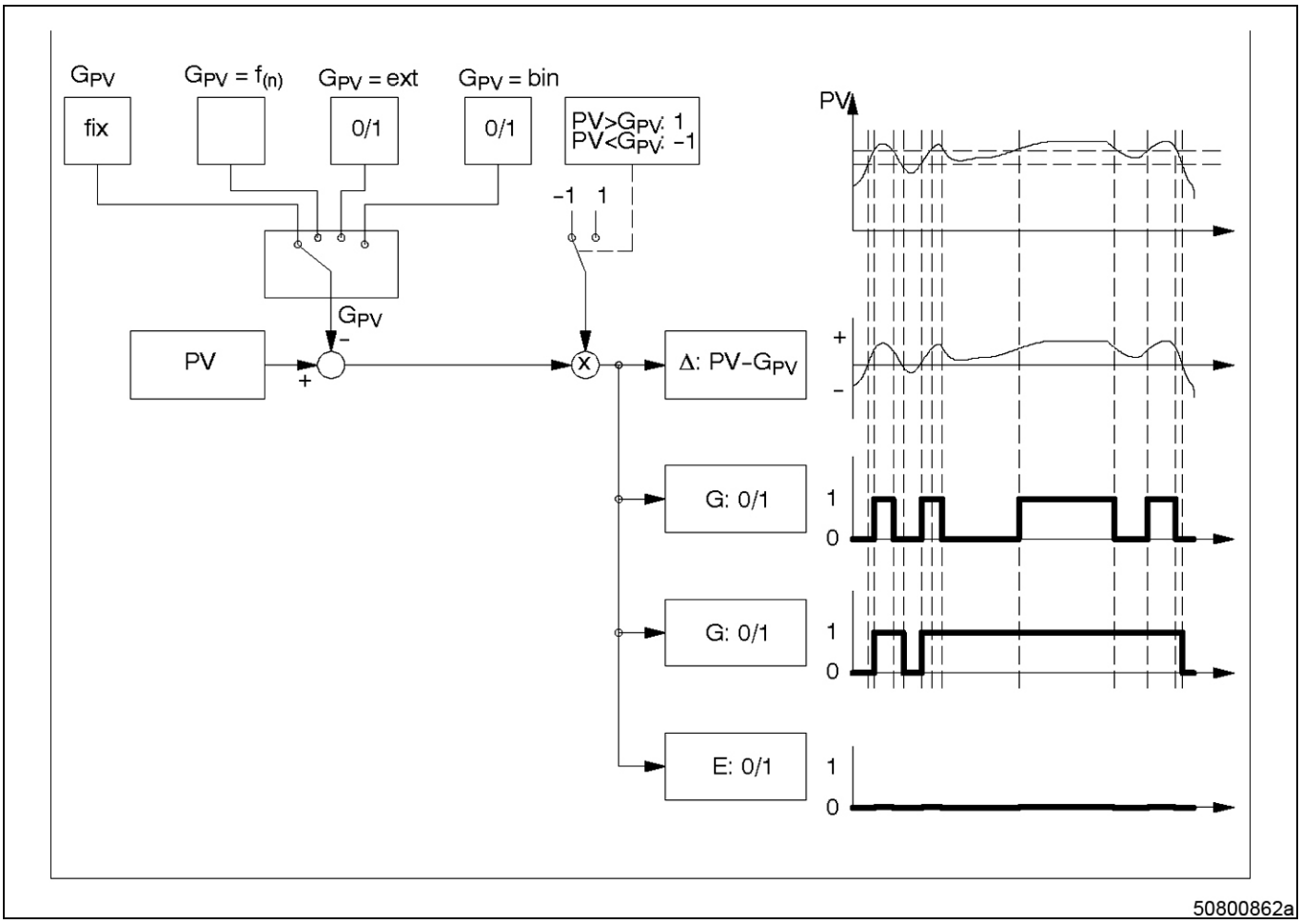
- Warning
- Limitation
- Reduction
- Shutdown

A limitation or reduction can be based on the current specified torque or the effective specified speed.

Structure of the function element "Monitoring"



The parameters belonging to the function element "Monitoring" are displayed if the "Monitoring" tab in the "Protection/Monitoring Parameter *" window is selected. The parameters displayed in the illustration are only intended as an example. Depending on the user level (defined in the dongle) and the selected measurement variable (the "LINK number") further, or different, parameters can be displayed.



PV: Measured value of measurement variable (process variable)

G_{PV}: Limit value
E: Fault (error)
ext.: External

bin.: Binary
$f_{(n)}$: Function of speed

For some measurement variables, the Monitoring module can be switched on or off via the dialog system DiaSys® (e.g. for 2.0312.778 T-aux 1 L1). For engine-related measurement variables, the Monitoring modules are always switched on and can not be switched off with the user level (dongle 1b) provided for Customer Service.

Difference formation

The Monitoring module first calculates a difference from the current measured value and the limit value (if this value is positive, the status "Limit value violation" is set):

- When monitoring for limit value exceeded: Measured value minus limit value
- When monitoring for limit value undershot: Limit value minus measured value

If the measured value exceeds (or undershoots) the limit value again, a hysteresis value must also be exceeded (or undershot) in order to reset the "Limit value violation" status.

Limit value formation

The limit value, which is drawn on to calculate the difference, can be created by four different means:

- Fixed value, programmable via DiaSys®
- Speed-dependent value (e.g. pressure as a function of speed, $p = f_n$); the support values of the curve can be programmed via DiaSys®
- The value can be drawn on by another function; in this case, no limit value calculation will be carried out within the corresponding Monitoring module
- The value can be determined from an internal procedure and is then imported and used by the corresponding Monitoring module ("binary limit value")

The type of limit value generation used for a specific Monitoring module is permanently specified and can not be changed via Diasys® If, however, a fixed limit value is to apply instead of a curve, all support values on the curve can simply be set to the same value; this results in a straight line for the function $x_{limit\ value} = f_n$ and the same value therefore applies for all speeds.

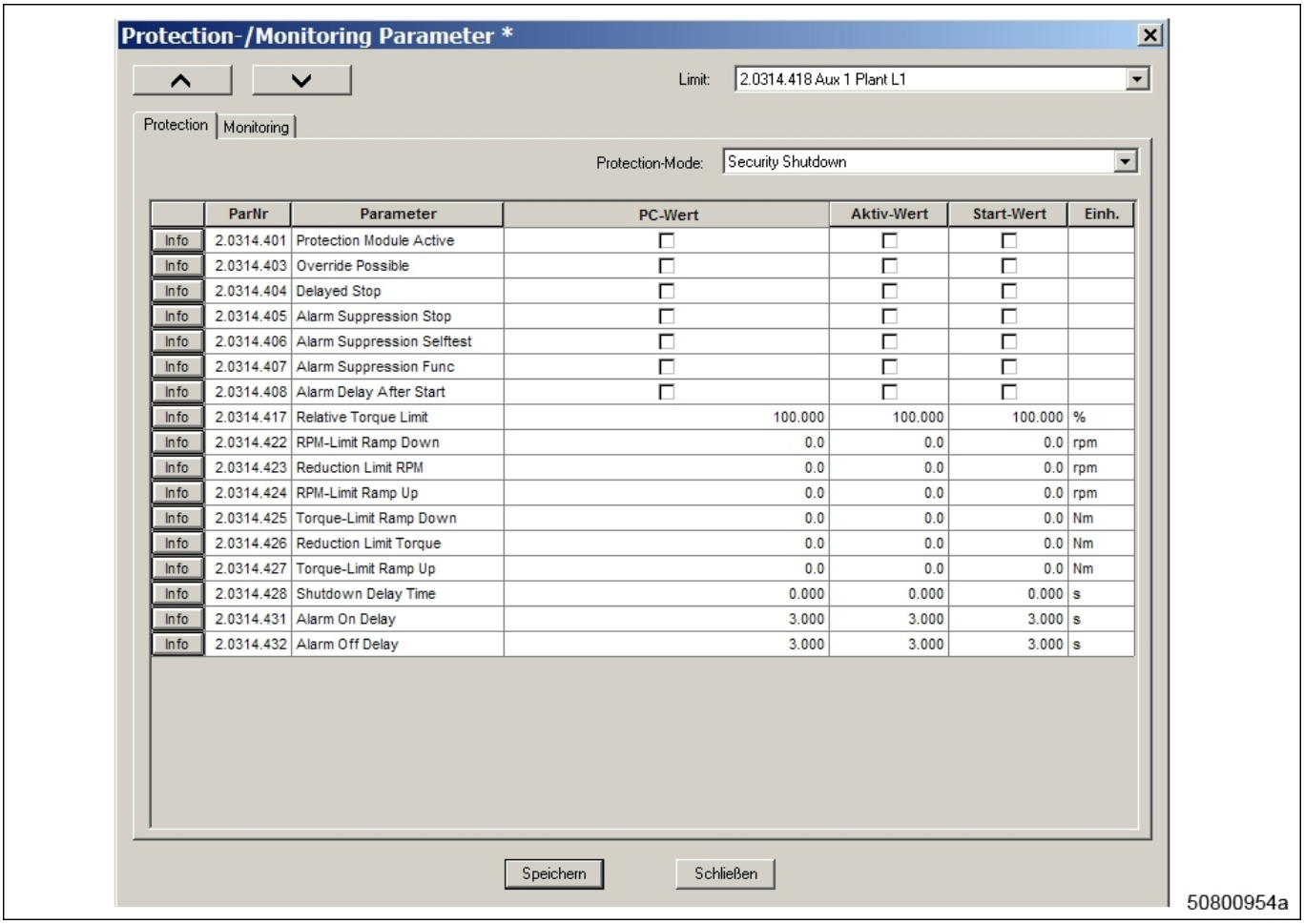
Interface for the function element "Protection"

Each Monitoring module provides the following information as output values (they are then further processed in the Protection module):

- The amount of the difference
- Is the module active?
- "Limit value violation" status
- Is the limit value violation active?
- Limit value is faulty

If a module is not active, all other values are set to 0 automatically.

Structure of the function element "Protection"



The parameters belonging to the function element "Protection" are displayed if the "Protection" tab in the "Protection/Monitoring Parameter *" window is selected. The parameters displayed in the illustration are only intended as an example. Depending on the user level (defined in the dongle) and the selected measurement variable (the "LINK number") further, or different, parameters can be displayed.

Behavior of the Protection module

The Protection module for a measured value is activated via a corresponding bit. The measured values for which the module is switched on is permanently specified for most measured values and can not be changed via Diasys® (exception: AUX channels). Parameters are entered to define the reaction of the engine governor to limit value violations:

- Alarm activation

  If a limit value is violated, only one appropriate alarm is tripped.
- Limitation

  In the event of a limit value violation, the specified speed or torque is limited (adjustable, see below).
- Reduction

In the event of a limit value violation, the engine governor calculates (via an internal PI control loop) a reduction value from the difference amount transferred from the Monitoring module.

- Stop

  If a limit value is violated, an alarm is generated after an alarm delay time (adjustable) has elapsed and an engine stop is initiated. You can also specify a further delay in the engine stop during a temporary reduction or limitation period (see below: "Delayed stop").

After this, depending on which reaction has been programmed, the following settings can be made:

- Switching Protection module on or off (only with specific measured values)
- Limitation with delayed alarm

  If a limitation is set, this takes place immediately after the relevant limit value violation. An additionally generated alarm, however, is only issued after the limit value violation and after a predefined (unalterable) time has elapsed. This prevents an alarm from being constantly switched on and off if the measured value continuously hovers around the limit value.
- Override possible

  This setting defines whether the "Override function" is permitted to influence the corresponding Protection module. If the "Override function" is active, the programmed reaction of the engine governor in the case of a limit value violation of the corresponding measured value is suppressed.
- Delayed stop

  This setting ensures that a stop request from the Protection module is only further processed after a specified (unalterable) time has elapsed. A reduction or limitation can be programmed for this time.
- Alarm suppression with active stop signal

  If the stop signal is active, the engine governor does not react in the case of limit value violation of the corresponding measured value if this setting is selected.
- Alarm suppression with active self-test

  If this setting is active, the status of the corresponding Protection module is not changed during a self-test. An alarm pending when the self-test is tripped remains unchanged; a new alarm can only be tripped after completion of the self-test.
- Alarm suppression via function

  This setting can be used to specify that a further function suppresses an alarm generated by this Protection module.
- Alarm delay after start

  Certain measured values only exceed their lower limit value when the engine is in operation (e.g. pressures). The "Alarm suppression with active stop signal" setting ensures that limit value monitoring is only carried out after idle speed has been reached and after a certain time has elapsed (if, for example, pressure is built up). If the engine is stationary, no fault processing is carried out on the output values transferred by the Monitoring module.
- Limitation of torque or speed

  Here, you define whether a limitation is to act on the specified speed or the specified torque.
- Absolute or relative limitation

  If the above-mentioned setting is used to define that the limitation acts on the specified torque, you can set here whether this torque is to be limited to a fixed value, or whether the limitation is to be based on the DBR/MCR curve, i.e. reduced by a percentage share of the currently valid DBR/MCR value. If the setting defines that the limitation is to act on the specified speed, the setting "Absolute or relative limitation" has no significance.

Characteristics of the Protection module

Concrete values are required for limitation and reduction for defining the manner in which the specified values for the effective specified speed or specified torque are to be changed in the case of limit value violations. Furthermore, delay times must be specified. The characteristics of the Protection module are set via so-called "Configuration parameters". Which of these "Configuration parameters" are available, or are necessary, for a specific value, depends on:

- Application (marine - rail - generator - C&I)
- Selected behavior of the Protection module (alarms - limitation - reduction - stop)
- Measured value

The following "Configuration parameters" influence the characteristics of the Protection module:

- Limit value as % of DBR/MCR value

  This value is required if a relative limitation of the torque is set for the behavior of the Protection module. The specified torque is then lowered to this percentage value of the currently valid DBR/MCR value.
- P-parameter and I-parameter reduction

  These both influence the internal PI control loop, which determines a reduction value from the transferred amount out of the difference (P for proportional component, I for the integral component of the PI control loop).

- Speed limitation ramp, minimum speed limit value with a limitation and speed enable ramp

  In the event of a speed limitation, the speed setpoint value is not changed in jumps but rather along a so-called "speed ramp" with a negative gradient. This means that the speed setpoint value changes as a function of the specified value in rpm/s.

  Furthermore, a value must be specified indicating the minimum level of the limitation - the "minimum speed limit value with limitation".

  If the speed limitation or speed cut-back is canceled, the speed setpoint value is likewise not changed in jumps but rather along a so-called "speed ramp" with a positive gradient. This means that the speed setpoint value changes as a function of the specified value in rpm/s.
- Torque limitation ramp, minimum torque limit value with a limitation and torque enable ramp

  These three parameters have the same function as the three parameters for speed limitation except that they are based on engine torque.
- Emergency stop delay

  A final shutdown of the engine only takes place after the time specified here has elapsed. The set reduction or limitation (of the speed or torque) is effective during this time.
- Speed limit alarm and torque limit alarm

  Reduction or limitation procedures are executed immediately after a limit value violation. However, the values to be specified here (separately for speed and torque) can be used to prevent an alarm until the limit value specified here has been reached. In this manner, an alarm in the event of minor limit value violations can be suppressed.
- Alarm ON delay

  If an alarm is generated, the time specified here must pass before this alarm is signaled. If the alarm is canceled during this time (because the limit value violation no longer applies), the counter is reset and starts again if another alarm is issued. In this manner, an alarm in the event of brief limit value violations can be suppressed.
- Alarm OFF delay

  If an alarm is canceled, the time specified here must pass before the signal is deactivated. In this manner, alarms that only appear for a short period can be made clearly visible.
- P-parameter and I-parameter scaling

  If the P-parameter and I-parameter reduction is very small, serious rounding errors would occur during the calculation. Via the two scaling parameters, factors are specified with which the P-parameters and I-parameters are multiplied and the result divided. This allows you to calculate with small P-parameters and I-parameters as well.

Calculation of the ZKP No. for parameters

Values for calculation

The drop-down selection window displays the ZKP No. of the Monitoring module that belongs to the corresponding measurement variable. The numbers start with 2.311.018 for "Turbocharger 1 L1" (first limit value of turbocharger 1), followed by 2.311.058 for "Turbocharger 1 L2" (second limit value of turbocharger 1). Each associated Protection module occupies a range of 40 numbers starting with 2.311.001 for "Switching on/off Protection module for first limit value of turbocharger 1". The next range starts with 2.311.041 for "Switching on/off Protection module for second limit value of turbocharger 1" etc.

Starting from the ZKP No. of the Monitoring module, which is displayed in the drop-down selection window of DiaSys®, this can be used to calculate parameter numbers.

The following applies to parameters that influence the behavior of the Protection module:
- Switching Protection modules on or off: ZKP No. of the Monitoring module minus 17 (not accessible for all measurement variables but, e.g. 2.0314.401 for "Aux1 plant first limit value: Activate Protection module"
- Limitation with delayed alarm: ZKP No. of the Monitoring module minus 16
- Override possible: ZKP No. of the Monitoring module minus 15
- Delayed stop: ZKP No. of the Monitoring module minus 14
- Alarm suppression with active stop signal: ZKP No. of the Monitoring module minus 13
- Alarm suppression with active self-test: ZKP No. of the Monitoring module minus 12
- Alarm suppression via function: ZKP No. of the Monitoring module minus 11
- Alarm delay after start: ZKP No. of the Monitoring module minus 10
- Limitation of torque or speed: ZKP No. of the Monitoring module minus 7
- Absolute or relative limitation: ZKP No. of the Monitoring module minus 6

The following applies to parameters that influence the characteristics of the Protection module:
- Limit value as % of DBR/MCR value: ZKP No. of the Monitoring module minus 1
- P-parameter reduction: ZKP No. of the Monitoring module plus 2

- I-parameter reduction: ZKP No. of the Monitoring module plus 3
- Speed limitation ramp: ZKP No. of the Monitoring module plus 4
- Minimum speed limit value with a limitation: ZKP No. of the Monitoring module plus 5
- Speed enable ramp: ZKP No. of the Monitoring module plus 6
- Torque limitation ramp: ZKP No. of the Monitoring module plus 7
- Minimum torque limit value with a limitation: ZKP No. of the Monitoring module plus 8
- Torque enable ramp: ZKP No. of the Monitoring module plus 9
- Emergency stop delay: ZKP No. of the Monitoring module plus 10
- Speed limit alarm: ZKP No. of the Monitoring module plus 11
- Torque limit alarm: ZKP No. of the Monitoring module plus 12
- Alarm ON delay: ZKP No. of the Monitoring module plus 13
- Alarm OFF delay: ZKP No. of the Monitoring module plus 14
- P-parameter scaling: ZKP No. of the Monitoring module plus 15
- I-parameter scaling: ZKP No. of the Monitoring module plus 16

Example

The ZKP No. of the Monitoring module for the measurement point "Lube oil pressure first limit value" displayed in the drop-down window of the DiaSys® is 2.0311.738. This results, for example, in the following values for (some) parameters belonging to this measured value:

- Override possible: 2.0311.738 minus 15 equals 2.0311.723
- Delayed stop: 2.0311.738 minus 14 equals 2.0311.724
- Alarm suppression with active stop signal: 2.0311.738 minus 13 equals 2.0311.725
- etc.

These ZKP Nos. are displayed in the corresponding window of the DiaSys®

Setting the various functions

The following section describes how the required reaction is programmed and which parameters have an influence on the operation of the function.

Relevant settings

To program the various functions, the following settings are relevant:

Designation	Parameter No.	Protection				Protection with delayed alarm	
		Warning	Limitation	Reduction	Stop	Limitation	Reduction
Switching on Protection modules	ZKP No. of the Monitoring module minus 17	√	√	√	√		
Limitation with delayed alarm	ZKP No. of the Monitoring module minus 16					√	√
Override possible	ZKP No. of the Monitoring module minus 15		√	√	√		
Delayed stop	ZKP No. of the Monitoring module minus 14				√		
Alarm suppression with active stop signal	ZKP No. of the Monitoring module minus 13	√	√	√	√	√	√
Alarm suppression with active self-test	ZKP No. of the Monitoring module minus 12	√	√	√	√	√	√
Alarm suppression via function	ZKP No. of the Monitoring module minus 11	√	√	√	√	√	√

Designation	Parameter No.	Protection				Protection with delayed alarm	
		Warning	Limitation	Reduction	Stop	Limitation	Reduction
Alarm delay after start	ZKP No. of the Monitoring module minus 10	√	√	√	√	√	√
Limitation of torque or speed	ZKP No. of the Monitoring module minus 7		√	√	√	√	√
Absolute or relative limitation	ZKP No. of the Monitoring module minus 6		√	√	√		
Limit value as % of DBR/MCR value	ZKP No. of the Monitoring module minus 1		√	√	√	√	
P-parameter reduction	ZKP No. of the Monitoring module plus 2			√			
I-parameter reduction	ZKP No. of the Monitoring module plus 3			√			
Speed limitation ramp	ZKP No. of the Monitoring module plus 4		√		√	√	√
Minimum speed limit value with a limitation	ZKP No. of the Monitoring module plus 5		√	√	√	√	√
Speed enable ramp	ZKP No. of the Monitoring module plus 6		√	√	√	√	√
Torque limitation ramp	ZKP No. of the Monitoring module plus 7		√		√	√	√
Minimum torque limit value with a limitation	ZKP No. of the Monitoring module plus 8		√	√	√	√	√
Torque enable ramp	ZKP No. of the Monitoring module plus 9		√	√	√	√	√
Emergency stop delay	ZKP No. of the Monitoring module plus 10				√		
Speed limit alarm	ZKP No. of the Monitoring module plus 11					√	√
Torque limit alarm	ZKP No. of the Monitoring module plus 12					√	√
Alarm ON delay	ZKP No. of the Monitoring module plus 13	√	√	√	√	√	√
Alarm OFF delay	ZKP No. of the Monitoring module plus 14	√	√	√	√	√	√
P-parameter scaling	ZKP No. of the Monitoring module plus 15			√			
I-parameter scaling	ZKP No. of the Monitoring module plus 16			√			

Warning function

If a limit value is violated, an alarm is issued.

A prerequisite is that the limit value violation lasts longer than the set delay time (Alarm ON delay). If the measured value returns to the permitted range within the delay time, the timer for the delay time (Alarm ON delay) is reset. It only starts again at 0 if there is another limit value violation. If the delay time (Alarm ON delay) has expired and the limit value violation still exists, an alarm is issued.

If the measured value returns to the permitted range, the timer for the delay time (Alarm ON delay) is started. If the delay time (Alarm OFF delay) has expired and there is still no limit value violation, the alarm is reset.

Parameter setting for a warning (the behavior of the Protection module)

In the drop-down selection window "Protection Mode" of the DiaSys®, set: "Warning"

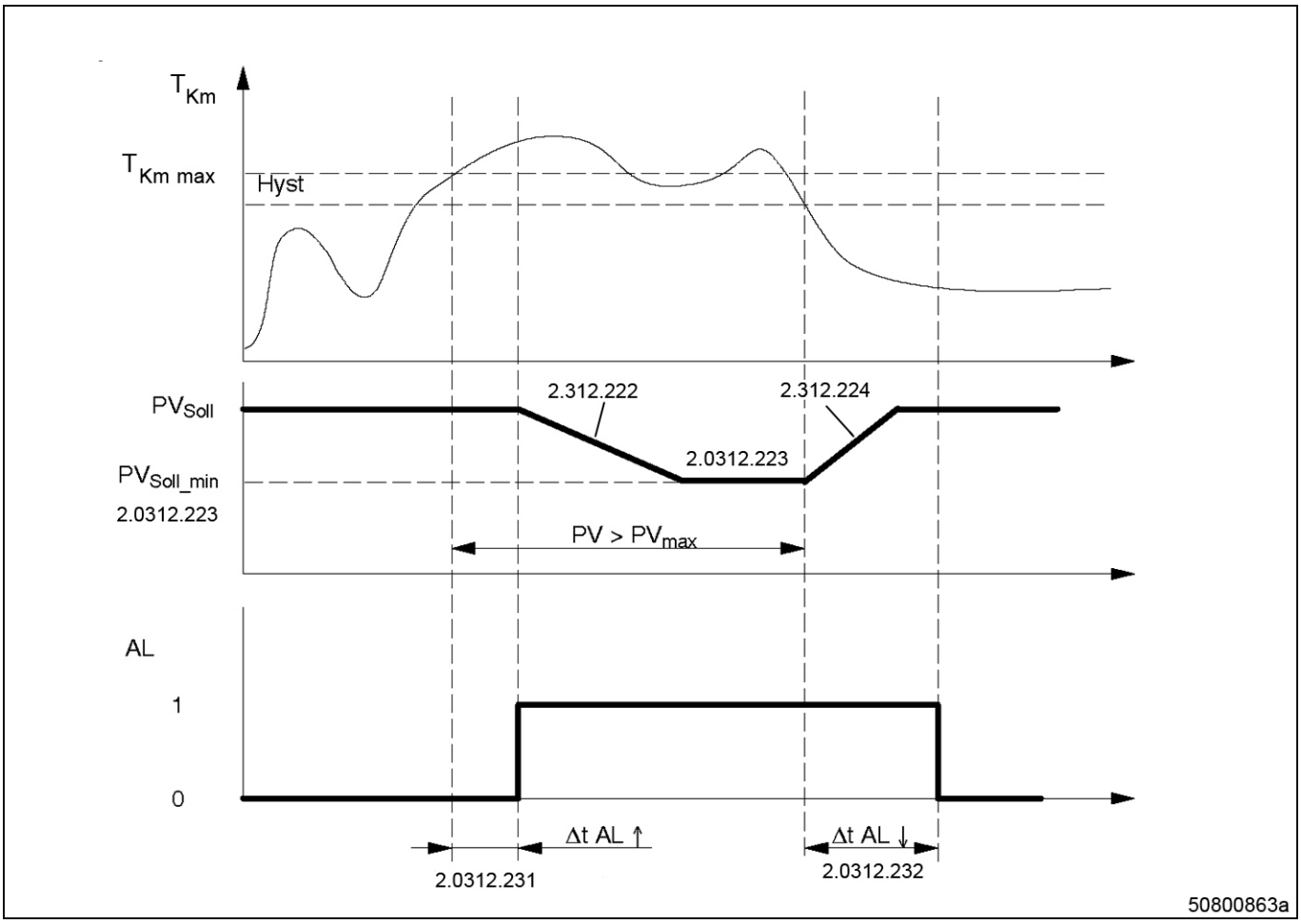
Designation	Parameter No.	Setting	Comment
Switching on Protection modules	ZKP No. of the Monitoring module minus 17	√	If settable with corresponding measured value
Limitation with delayed alarm	ZKP No. of the Monitoring module minus 16	—	Not relevant
Override possible	ZKP No. of the Monitoring module minus 15	—	Not relevant
Delayed stop	ZKP No. of the Monitoring module minus 14	—	Not relevant
Alarm suppression with active stop signal	ZKP No. of the Monitoring module minus 13	√	With speed-dependent measured values
Alarm suppression with active self-test	ZKP No. of the Monitoring module minus 12	√	With sensors that have a self-test function
Alarm suppression via function	ZKP No. of the Monitoring module minus 11	—	
Alarm delay after start	ZKP No. of the Monitoring module minus 10	√	With speed-dependent measured values
Limitation of torque or speed	ZKP No. of the Monitoring module minus 7	√	With torque limitation
Absolute or relative limitation	ZKP No. of the Monitoring module minus 6	√	With absolute limit values

Use "Configuration parameters" (the characteristics of the Protection module)

The following "Configuration parameters" are required for the warning function:

Designation	Parameter No.	Setting	Comment
Limit value as % of DBR/MCR value	ZKP No. of the Monitoring module minus 1	—	Not relevant
P-parameter reduction	ZKP No. of the Monitoring module plus 2	—	Not relevant
I-parameter reduction	ZKP No. of the Monitoring module plus 3	—	Not relevant
Speed limitation ramp	ZKP No. of the Monitoring module plus 4	—	Not relevant
Minimum speed limit value with a limitation	ZKP No. of the Monitoring module plus 5	—	Not relevant
Speed enable ramp	ZKP No. of the Monitoring module plus 6	—	Not relevant
Torque limitation ramp	ZKP No. of the Monitoring module plus 7	—	Not relevant
Minimum torque limit value with a limitation	ZKP No. of the Monitoring module plus 8	—	Not relevant
Torque enable ramp	ZKP No. of the Monitoring module plus 9	—	Not relevant
Emergency stop delay	ZKP No. of the Monitoring module plus 10	—	Not relevant
Speed limit alarm	ZKP No. of the Monitoring module plus 11	—	Not relevant
Torque limit alarm	ZKP No. of the Monitoring module plus 12	—	Not relevant
Alarm ON delay	ZKP No. of the Monitoring module plus 13	Input required	Time specification for duration of the switch-on delay
Alarm OFF delay	ZKP No. of the Monitoring module plus 14	Input required	Time specification for duration of the switch-off delay
P-parameter scaling	ZKP No. of the Monitoring module plus 15	—	Not relevant
I-parameter scaling	ZKP No. of the Monitoring module plus 16	—	Not relevant

Limitation function using the example of engine coolant temperature



T_{KM} Coolant temperature measured value
Hyst: Hysteresis value
PV_{Soll}: Specified value of process variables

$PV > PV_{Max}$: Limit value violation of process variables
PV_{Soll_min}: Minimum specified value of process variables, ZKP No. of the Monitoring module plus 8

AL: Alarm status
Δt AL ↓: Alarm ON delay: ZKP No. of the Monitoring module plus 13
Δt AL ↑: Alarm OFF delay: ZKP No. of the Monitoring module plus 14

In the event of a limit value violation, the specified value (speed or torque, depending on setting) is limited to a fixed value and an alarm is issued.

A prerequisite is that the limit value violation lasts longer than the set delay time (Alarm ON delay). If the measured value returns to the permitted range within the delay time, the timer for the delay time (Alarm ON delay) is reset. It only starts again at 0 if there is another limit value violation. If the delay time (Alarm ON delay) has expired and the limit value violation still exists, the limitation ramp is started and an alarm is issued. If the limit value violation lasts long enough, the limitation ramp reaches a value that is not undershot ("Minimum torque limit value with a limitation" or "Minimum speed limit value with a limitation").

If the measured value returns to the permitted range, the enable ramp is started and the limitation along this ramp is thus raised to the output value of the limitation. Following this, the limitation is canceled completely. Now the timer for delay time (Alarm OFF delay) is started. If the delay time (Alarm OFF delay) has expired and there is still no limit value violation, the alarm is reset.

If an override is pending and the corresponding parameter is set ("Override possible"), no limitation is carried out, or an existing limitation is canceled via the enable ramp. The alarm is issued in spite of this.

Parameter setting for a limitation (the behavior of the Protection module)

In the drop-down selection window "Protection Mode" of the DiaSys®, set: "Limitation"

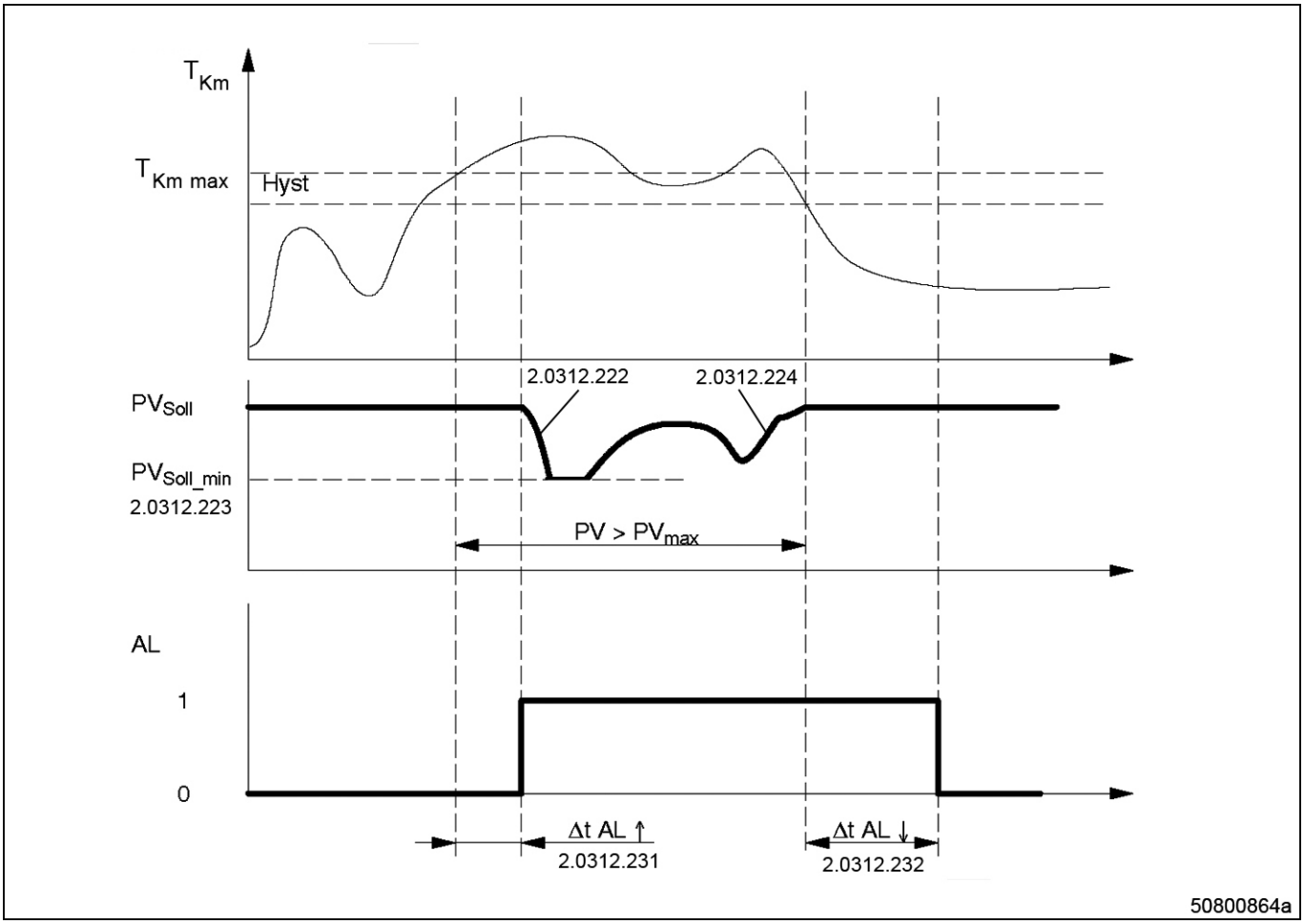
Designation	Parameter No.	Setting	Comment
Switching on Protection modules	ZKP No. of the Monitoring module minus 17	√	If settable with corresponding measured value
Limitation with delayed alarm	ZKP No. of the Monitoring module minus 16	√	If desired, see additional information
Override possible	ZKP No. of the Monitoring module minus 15	√	If desired
Delayed stop	ZKP No. of the Monitoring module minus 14	—	Not relevant
Alarm suppression with active stop signal	ZKP No. of the Monitoring module minus 13	√	With speed-dependent measured values
Alarm suppression with active self-test	ZKP No. of the Monitoring module minus 12	√	With sensors that have a self-test function
Alarm suppression via function	ZKP No. of the Monitoring module minus 11	—	
Alarm delay after start	ZKP No. of the Monitoring module minus 10	√	With speed-dependent measured values
Limitation of torque or speed	ZKP No. of the Monitoring module minus 7	—	With speed limitation
		√	With torque limitation
Absolute or relative limitation	ZKP No. of the Monitoring module minus 6	√	With absolute limit values

Use "Configuration parameters" (the characteristics of the Protection module)

The following "Configuration parameters" are required for the limitation function:

Designation	Parameter No.	Setting	Comment
Limit value as % of DBR/MCR value	ZKP No. of the Monitoring module minus 1	Make input if required	Only if torque limitation is set
P-parameter reduction	ZKP No. of the Monitoring module plus 2	—	Not relevant
I-parameter reduction	ZKP No. of the Monitoring module plus 3	—	Not relevant
Speed limitation ramp	ZKP No. of the Monitoring module plus 4	Input required	Only if speed limitation is set; the specified speed is reduced with this gradient.
Minimum speed limit value with a limitation	ZKP No. of the Monitoring module plus 5	Input required	Only if speed limitation is set
Speed enable ramp	ZKP No. of the Monitoring module plus 6	Input required	Only if speed limitation is set; the specified speed is increased with this gradient.
Torque limitation ramp	ZKP No. of the Monitoring module plus 7	Input required	Only if torque limitation is set; the specified torque is reduced with this gradient.
Minimum torque limit value with a limitation	ZKP No. of the Monitoring module plus 8	Input required	Only if torque limitation is set
Torque enable ramp	ZKP No. of the Monitoring module plus 9	Input required	Only if torque limitation is set; the specified torque is increased with this gradient.
Emergency stop delay	ZKP No. of the Monitoring module plus 10	—	Not relevant
Speed limit alarm	ZKP No. of the Monitoring module plus 11	—	Not relevant
Torque limit alarm	ZKP No. of the Monitoring module plus 12	—	Not relevant
Alarm ON delay	ZKP No. of the Monitoring module plus 13	Input required	Time specification for duration of the switch-on delay for the alarm
Alarm OFF delay	ZKP No. of the Monitoring module plus 14	Input required	Time specification for duration of the switch-off delay for the alarm
P-parameter scaling	ZKP No. of the Monitoring module plus 15	—	Not relevant
I-parameter scaling	ZKP No. of the Monitoring module plus 16	—	Not relevant

Reduction function



T_{KM} Coolant temperature measured value
Hyst: Hysteresis value
PV_{Soll}: Specified value of process variables

$PV > PV_{Max}$: Limit value violation of process variables
PV_{Soll_min}: Minimum specified value of process variables, ZKP No. of the Monitoring module plus 8

AL: Alarm status
Δt AL ↓: Alarm ON delay: ZKP No. of the Monitoring module plus 13
Δt AL ↑: Alarm OFF delay: ZKP No. of the Monitoring module plus 14

In the event of a limit value violation, the specified value (speed or torque, depending on setting) is cut back to a calculated value and an alarm is issued.

A prerequisite is that the limit value violation lasts longer than the set delay time (Alarm ON delay). If the measured value returns to the permitted range within the delay time, the timer for the delay time (Alarm ON delay) is reset. It only starts again at 0 if there is another limit value violation. If the delay time (Alarm ON delay) has expired and the limit value violation still exists, the reduction is started and an alarm is issued. The reduction can not fall below a specific value ("Minimum torque limit value with a limitation" or "Minimum speed limit value with a limitation").

If the measured value moves back close to the permitted range, the specified value is calculated as a function of the limit value violation amount. If the measured value returns to the permitted range, the reduction is canceled completely. Now the timer for delay time (Alarm OFF delay) is started. If the delay time (Alarm OFF delay) has expired and there is still no limit value violation, the alarm is reset.

If an override is pending and the corresponding parameter is set ("Override possible"), no limitation is carried out, or an existing limitation is canceled via the enable ramp. The alarm is issued in spite of this.

Parameter setting for a reduction (the behavior of the Protection module)
In the drop-down selection window "Protection Mode" of the DiaSys®, set: "Reduction"

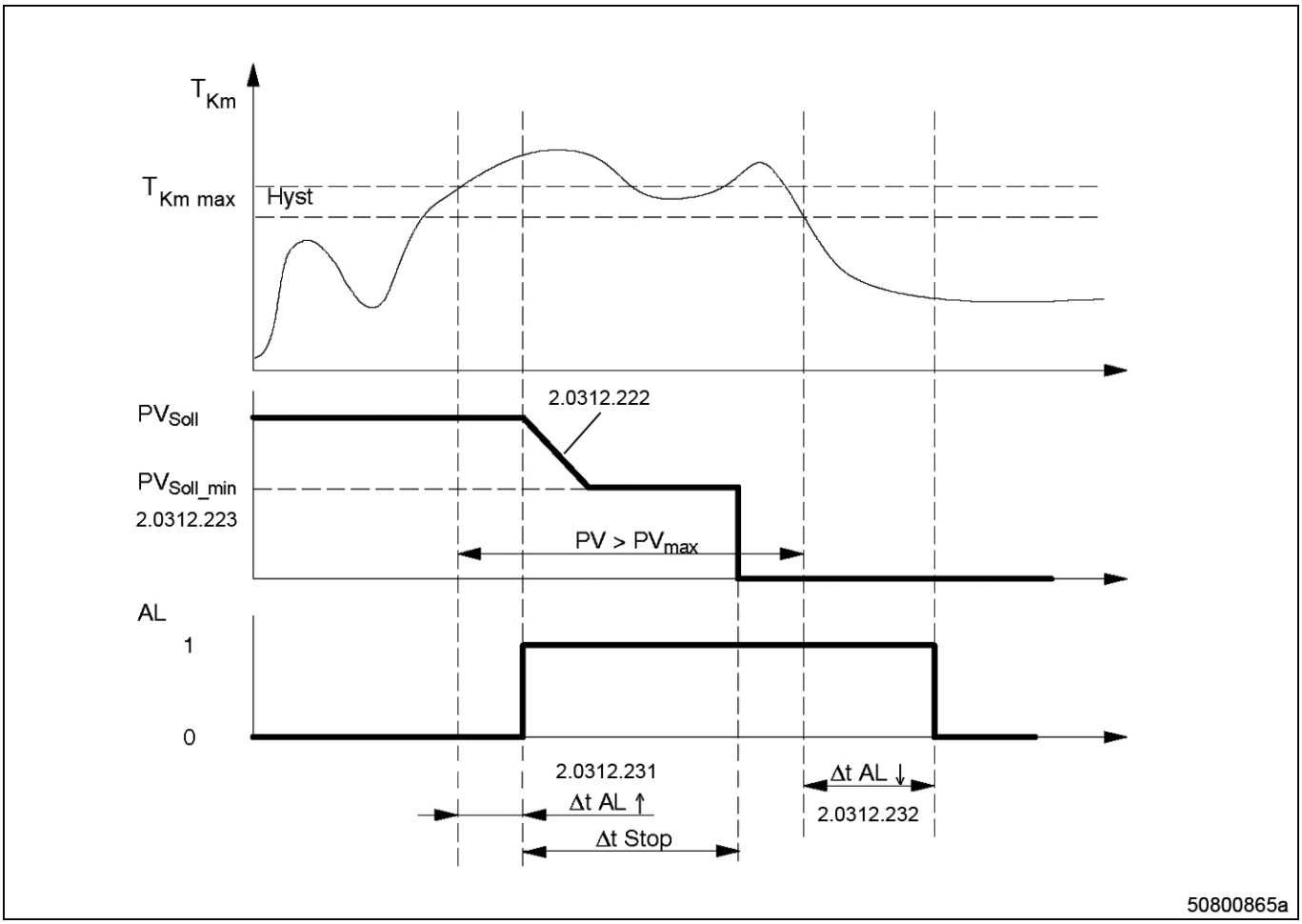
Designation	Parameter No.	Setting	Comment
Switching on Protection modules	ZKP No. of the Monitoring module minus 17	√	If settable with corresponding measured value
Limitation with delayed alarm	ZKP No. of the Monitoring module minus 16	√	If desired, see additional information
Override possible	ZKP No. of the Monitoring module minus 15	√	If desired
Delayed stop	ZKP No. of the Monitoring module minus 14	—	Not relevant
Alarm suppression with active stop signal	ZKP No. of the Monitoring module minus 13	√	With speed-dependent measured values
Alarm suppression with active self-test	ZKP No. of the Monitoring module minus 12	√	With sensors that have a self-test function
Alarm suppression via function	ZKP No. of the Monitoring module minus 11	—	
Alarm delay after start	ZKP No. of the Monitoring module minus 10	√	With speed-dependent measured values
Limitation of torque or speed	ZKP No. of the Monitoring module minus 7	—	With speed limitation
		√	With torque limitation
Absolute or relative limitation	ZKP No. of the Monitoring module minus 6	√	With absolute limit values

Use "Configuration parameters" (the characteristics of the Protection module)

The following "Configuration parameters" are required for the reduction function:

Designation	Parameter No.	Setting	Comment
Limit value as % of DBR/MCR value	ZKP No. of the Monitoring module minus 1	Make input if required	Only if torque limitation is set
P-parameter reduction	ZKP No. of the Monitoring module plus 2	Enter value 10	
I-parameter reduction	ZKP No. of the Monitoring module plus 3	Enter value 2	
Speed limitation ramp	ZKP No. of the Monitoring module plus 4	—	Not relevant
Minimum speed limit value with a limitation	ZKP No. of the Monitoring module plus 5	Input required	Only if speed limitation is set
Speed enable ramp	ZKP No. of the Monitoring module plus 6	Input required	Only if speed limitation is set; the specified speed is increased with this gradient.
Torque limitation ramp	ZKP No. of the Monitoring module plus 7	—	Not relevant
Minimum torque limit value with a limitation	ZKP No. of the Monitoring module plus 8	Input required	Only if torque limitation is set
Torque enable ramp	ZKP No. of the Monitoring module plus 9	Input required	Only if torque limitation is set; the specified torque is increased with this gradient.
Emergency stop delay	ZKP No. of the Monitoring module plus 10	—	Not relevant
Speed limit alarm	ZKP No. of the Monitoring module plus 11	—	Not relevant
Torque limit alarm	ZKP No. of the Monitoring module plus 12	—	Not relevant
Alarm ON delay	ZKP No. of the Monitoring module plus 13	Input required	Time specification for duration of the switch-on delay for the alarm
Alarm OFF delay	ZKP No. of the Monitoring module plus 14	Input required	Time specification for duration of the switch-off delay for the alarm
P-parameter scaling	ZKP No. of the Monitoring module plus 15	Enter value 10	
I-parameter scaling	ZKP No. of the Monitoring module plus 16	Enter value 200	

Stop function



T_{KM} Coolant temperature measured value
Hyst: Hysteresis value
PV_{Soll}: Specified value of process variables

$PV > PV_{Max}$: Limit value violation of process variables
PV_{Soll_min}: Minimum specified value of process variables, ZKP No. of the Monitoring module plus 8
AL: Alarm status

Δt AL ↓: Alarm ON delay: ZKP No. of the Monitoring module plus 13
Δt AL ↑: Alarm OFF delay: ZKP No. of the Monitoring module plus 14
Δt Stop: Stop delay time: ZKP No. of the Monitoring module plus 10

If the engine governor reaction in the event of a limit value violation is to be an automatic engine stop, this can be set as follows:

- Immediate engine stop after limit value violation
- Delayed engine stop after limit value violation; speed limitation should take place during a delay time
- Delayed engine stop after limit value violation; torque limitation should take place during a delay time

With an "immediate engine stop", an engine stop is tripped immediately after a limit value violation, a limitation along the limitation ramp (speed or torque) is started after the alarm delay, and the corresponding alarm is issued.

With a "delayed stop", in the event of a limit value violation the specified value (speed or torque, depending on setting) is limited to a fixed value and an alarm is issued.

A prerequisite is that the limit value violation lasts longer than the set delay time (Alarm ON delay). If the measured value returns to the permitted range within the delay time, the timer for the delay time (Alarm ON delay) is reset. It only starts again at 0 if there is another limit value violation. If the delay time (Alarm ON delay) has expired and the limit value violation still exists, the limitation ramp is started and an alarm is issued. If the limit value violation lasts long enough, the limitation ramp reaches a value that is not undershot ("Minimum torque limit value with a limitation" or "Minimum speed limit value with a limitation").

If the measured value returns to the permitted range, the enable ramp is started and the limitation along this ramp is thus raised to the output value of the limitation. Following this, the limitation is canceled completely. Now the timer for delay time (Alarm OFF delay) is started. If the delay time (Alarm OFF delay) has expired and there is still no limit value violation, the alarm is reset.

When the set delay time (Alarm ON delay) has elapsed, the stop delay time (emergency stop delay) begins. If the limit value violation lasts longer than the stop delay time, an engine stop is tripped. The stop is tripped irrespective of the currently used target value (due to the ramp function) for limitation. If the measured value returns to the permitted range during the stop delay time, this does not influence the tripping of the engine stop.

If an override is pending and the corresponding parameter is set ("Override possible"), no limitation is carried out, or an existing limitation is canceled via the enable ramp. Likewise, an engine stop will not be carried out in this case. After cancelation of an override, the engine stop is only tripped after the stop delay time has elapsed (if it has not already expired in the meantime). The alarm is issued in spite of this.

Parameter setting for tripping a stop (the behavior of the Protection module)

In the drop-down selection window "Protection Mode" of the DiaSys®, set: "Security Shutdown"

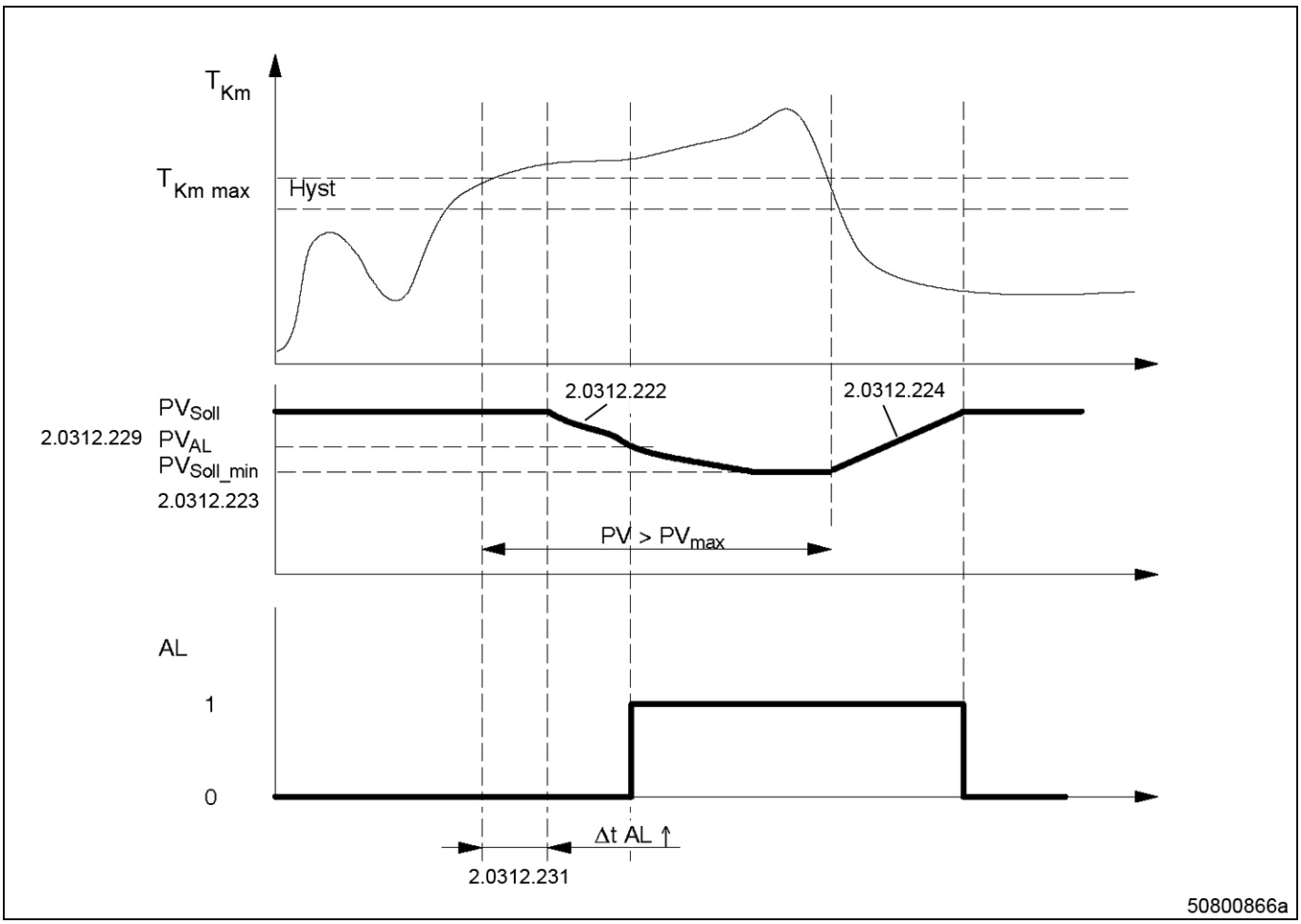
Designation	Parameter No.	Setting	Comment
Switching on Protection modules	ZKP No. of the Monitoring module minus 17	√	If settable with corresponding measured value
Limitation with delayed alarm	ZKP No. of the Monitoring module minus 16	√	Not relevant
Override possible	ZKP No. of the Monitoring module minus 15	√	If desired
Delayed stop	ZKP No. of the Monitoring module minus 14	—	If desired
Alarm suppression with active stop signal	ZKP No. of the Monitoring module minus 13	√	With speed-dependent measured values
Alarm suppression with active self-test	ZKP No. of the Monitoring module minus 12	√	With sensors that have a self-test function
Alarm suppression via function	ZKP No. of the Monitoring module minus 11	—	
Alarm delay after start	ZKP No. of the Monitoring module minus 10	√	With speed-dependent measured values
Limitation of torque or speed	ZKP No. of the Monitoring module minus 7	—	With speed limitation
		√	With torque limitation
Absolute or relative limitation	ZKP No. of the Monitoring module minus 6	√	With absolute limit values

Use "Configuration parameters" (the characteristics of the Protection module)

The following "Configuration parameters" are required for the reduction function:

Designation	Parameter No.	Setting	Comment
Limit value as % of DBR/MCR value	ZKP No. of the Monitoring module minus 1	Make input if required	Only if torque limitation is set
P-parameter reduction	ZKP No. of the Monitoring module plus 2	—	Not relevant
I-parameter reduction	ZKP No. of the Monitoring module plus 3	—	Not relevant
Speed limitation ramp	ZKP No. of the Monitoring module plus 4	—	Only if automatic stop with speed limitation is set
Minimum speed limit value with a limitation	ZKP No. of the Monitoring module plus 5	Input required	Only if speed limitation is set
Speed enable ramp	ZKP No. of the Monitoring module plus 6	Input required	Only if automatic stop with speed limitation is set; the specified speed is increased with this gradient.
Torque limitation ramp	ZKP No. of the Monitoring module plus 7	Input required	Only if automatic stop with torque limitation is set
Minimum torque limit value with a limitation	ZKP No. of the Monitoring module plus 8	Input required	Only if automatic stop with torque limitation is set
Torque enable ramp	ZKP No. of the Monitoring module plus 9	Input required	Only if automatic stop with torque limitation is set; the specified torque is increased with this gradient.
Emergency stop delay	ZKP No. of the Monitoring module plus 10	—	Delay time for automatic stop
Speed limit alarm	ZKP No. of the Monitoring module plus 11	—	Not relevant
Torque limit alarm	ZKP No. of the Monitoring module plus 12	—	Not relevant
Alarm ON delay	ZKP No. of the Monitoring module plus 13	Input required	Time specification for duration of the switch-on delay for the alarm
Alarm OFF delay	ZKP No. of the Monitoring module plus 14	Input required	Time specification for duration of the switch-off delay for the alarm
P-parameter scaling	ZKP No. of the Monitoring module plus 15	—	Not relevant
I-parameter scaling	ZKP No. of the Monitoring module plus 16	—	Not relevant

Limitation with delayed alarm



T_{KM} Coolant temperature measured value
Hyst: Hysteresis value
PV_{Soll}: Specified value of process variables

$PV > PV_{Max}$: Limit value violation of process variables
PV_{Soll_min}: Minimum specified value of process variables, ZKP No. of the Monitoring module plus 8

PV_{AL}: Limit value of process variables for alarm tripping
AL: Alarm status
Δt AL ↓: Alarm ON delay: ZKP No. of the Monitoring module plus 13

If a "Limitation with delayed alarm" is set, the alarm is only issued following a limit value violation if:

- the set delay time (Alarm ON delay) has expired (ZKP No. of the Monitoring module plus 10)
- and the limit value for the alarm has been violated:
  - Speed limit alarm: ZKP No. of the Monitoring module plus 11
  - Torque limit alarm: ZKP No. of the Monitoring module plus 12

This function can operate either with a limitation or a reduction.

5.8 Index

