

# **MTU\_ValueService** **Technical Documentation**

## **Engine Control System ECS-5**

**BR4000C22**

**ECU-4, EMU-1, FCB or SAM (optional)**

**Application: C&I**

**Application and Installation**

**E 532 319 / 02 E**



CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

# 1 Use

## 1.1 Introduction

The following brief information concerning Engine Control System ECS-5 is provided in this manual:

- Use, features and devices of Engine Control System ECS-5
- Exemplary configuration of ECS-5:
  - with fault code display A531  
or
  - with SAM
- Brief information about the devices of ECS-5  
(structure, function, installation location, connection, electrical interfaces and technical data)
- Brief information about optional service equipment  
(dialog software package, BDM, tools)
- Installation instructions  
(EMC concept, grounding concept, etc.)
- Overview of reference documentation

Refer to the descriptions of the individual devices for more detailed information.

## 1.2 Application

The “5th generation Engine Control System” ECS-5 regulates, controls and monitors the diesel engine. It is especially designed for use in vehicles with diesel-electric or diesel-hydraulic power transmission.

The versatile electrical interface of ECS-5 for controlling vehicles covers all the requirements for new and refitted equipment.

ECS-5 is used in conjunction with the following MTU engines:

- BR 4000 C22

Engine Monitoring Unit EMU 1 features:

- Up to 20 exhaust temperature inputs for NiCr-Ni sensors (housing reference temperature measuring on a printed circuit board of Engine Monitoring Unit EMU 1)
- Communication with ECS-5 devices and the superordinate system via CAN bus
- Self-monitoring and diagnosis
  - Transmission of fault messages via CAN to display units
- Online programming by downloading (dialog unit), transmission via CAN bus and programming adapter BDM
- CAN node address in a pluggable EEPROM
- Transmission of all measured values, warnings and alarms to the Monitoring and Control System via the CAN bus

Communication with other assemblies is effected via serial interfaces:

- 2 x CAN bus interface (redundant CAN bus) for communication with the following assemblies:
  - Other ECS-5 devices (ECU-4)
  - Superordinate Monitoring and Control Systems (e. g. Monitoring and Control System MCS)
  - Also used as a dialog interface
  - Download

### **Individual exhaust temperature measuring**

Engine Monitoring Unit EMU 1 must be able to detect the following in order to measure individual exhaust temperatures:

- How many cylinders does the engine actually have?
- How many cylinders are currently active (e.g. in case of cylinder cutout)?

For information about the wiring of the individual exhaust temperature sensors see appendix C.8.

### **Assignment of cylinder numbers**

Engine Monitoring Unit EMU 1 and Engine Control Unit ECU 4 use the same cylinder numbers. Communication is thus independent of engine type. Only cylinder numbers are assigned (1, 2, 3 ... 20).

If messages are output on alphanumeric display systems which use standard cylinder designations (A1 ... A10, B1 ... B10), the assignment of cylinder numbers used in ECS-5 (1, 2, 3 ... 20) to the standard cylinder designations (A1 ... A10, B1 ... B10) is made in the respective display unit.



### 3.2.6.3.2 Function

Display instrument for lube oil temperature.

### 3.2.6.3.3 Installation location

The lube oil temperature display instrument is designed for installation in the driver's console.

### 3.2.6.3.4 Connection technology

The electrical connection of the lube oil temperature display instrument is established via a 6.3 mm blade connector.

### 3.2.6.3.5 Technical data

Housing design	Plastic housing
Dimensions ( $\varnothing \times D$ )	$\varnothing 62.5 \text{ mm} \times 106.0 \text{ mm}$
Installation position	$0^\circ - 90^\circ \nabla$
Installation opening	$\varnothing 52.0 \pm 0.2 \text{ mm}$
Installation depth	90 mm
Face	Black background RAL 9005, white print RAL 9010
Pointer	White (RAL 9010)
Degree of protection	IP 65 from the front
Illumination	Colour – red
Ambient temperature	$-25 \text{ }^\circ\text{C} \dots +70 \text{ }^\circ\text{C}$
Display range	$0 - 120 \text{ }^\circ\text{C}$
Display tolerance	$\pm 2.5 \%$
Signal input	0 VDC ... 8 VDC

## 4 Functions

### 4.1 Control functions

ECS-5 comprises the following control functions:

- Start sequence control (engine start)
- Stop control
- Speed setpoint switching with analog/frequency speed setting (configurable)
- Fixed speeds with fixed speed 1/fixed speed 2 speed setting (configurable)
- Alarm output via 0 VDC / 24 VDC transistor outputs
  - Red alarm
  - Yellow alarm
- Alarm reset
- "Engine running" signal output to control operating hours counter via 0 VDC / 24 VDC transistor output
- Starter control via 0 VDC / 24 VDC transistor output
- Control of the following display instruments via analog outputs:
  - Engine speed
  - Lube oil pressure
  - Coolant temperature
  - Lube oil temperature (option)
- Fan speed control
- Vehicle controller signal to set the maximum fan speed

### 4.3.4 Adjustable speed droop

Fig. 32 illustrates the principle engine governing range and the effects of adjustable speed droop (load-dependent adjustment of the set speed value).

Speed droop is also used in order to balance loading on coupled drives. The speed droop is set individually for each plant and can be modified using the dialog unit.

Speed droop is defined as the relative change in speed when the engine is unloaded. Speed droop is referenced to nominal speed (= maximum speed at maximum power output). Every point in the operating range is influenced by a change in loading.

$$\text{Speed droop} = \frac{\text{Maximum speed (zero load) } n_{Zero} - \text{Nominal speed } n_{nom}}{\text{Nominal speed } n_{nom}} \times 100 \%$$

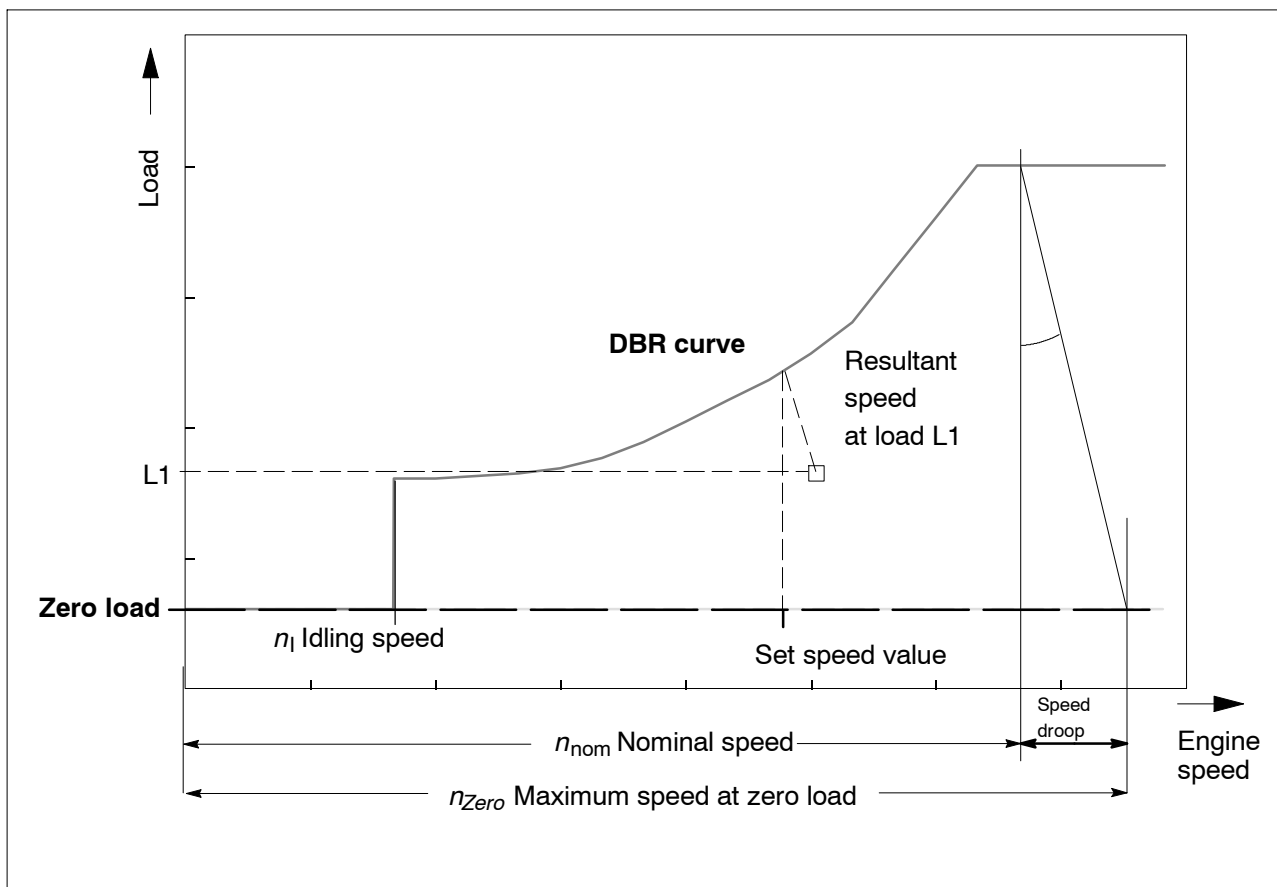


Fig. 32 : Graphic representation of the speed adjusting range and speed droop

## 5.4 Binary outputs

### 5.4.1 Priming Pump On (TAA1) - feedback indicator

The transistor output switches +24 VDC to indicate, that the priming pump is on..

### 5.4.2 Red alarm (TAA2)

The transistor output switches +24 VDC through when a red alarm is applied.

### 5.4.3 Yellow alarm (TAA3)

The transistor output switches +24 VDC through when a yellow alarm is applied.

### 5.4.4 $n > 300$ rpm (engine running) (TAA4)

The transistor output switches +24 VDC through to activate the operating hours counter when the diesel engine is running at a speed in excess of 300 rpm.

### 5.4.5 Starter on (TAA5)

The transistor output switches +24 VDC through to activate the starter.

### 5.4.6 Priming Pump ON (TAA6) - command

The transistor output switches +24 VDC to start the priming pump.

### 5.4.7 Priming Pump ON (TAM2)

The transistor output switches +24 VDC to start the priming pump.

## 5.5 Analog outputs

### 5.5.1 Engine (actual) speed UA1

A 0 VDC ... 10 VDC voltage (corresponding to 0 rpm ... 2000 rpm) which is proportional to the engine speed is applied to this analog output. A speed display instrument, for example, can be connected here.

### 5.5.2 Configurable voltage output UA2

Voltage output UA2 can be configured for the following output variants as an option:

- Engine load signal
- Lube oil temperature
- Fan speed
- Set injection quantity

### 5.5.3 Oil pressure (UA3)

A 0 VDC to 10 VDC voltage which is proportional to the lube oil pressure is applied to this analog output. This corresponds to a value of 0 bar to 10 bar. A display instrument may, for example, be connected here.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

### A.2.2.2 Binary output

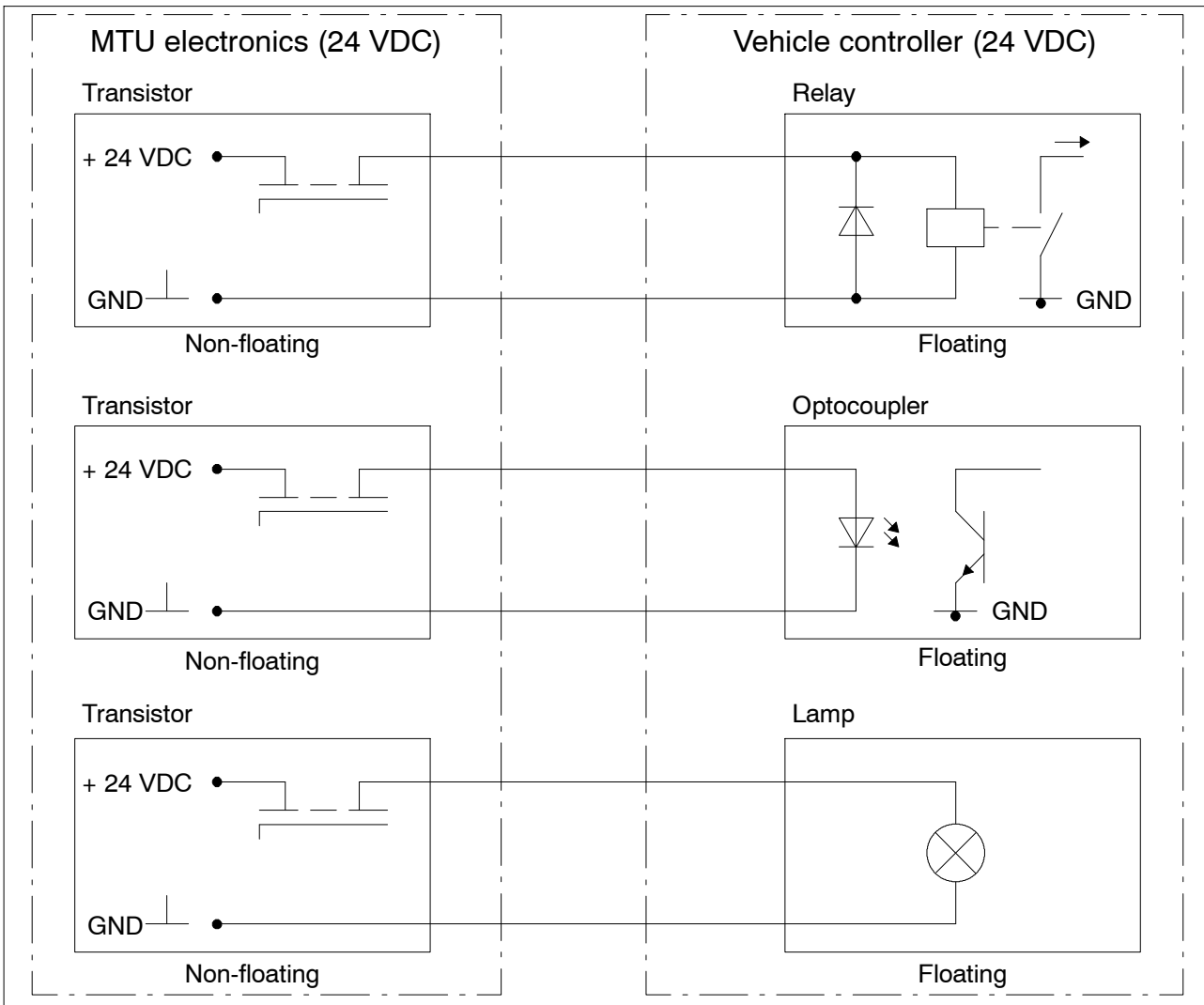


Fig. 41 : Binary output

### A.2.2.3 Analog inputs

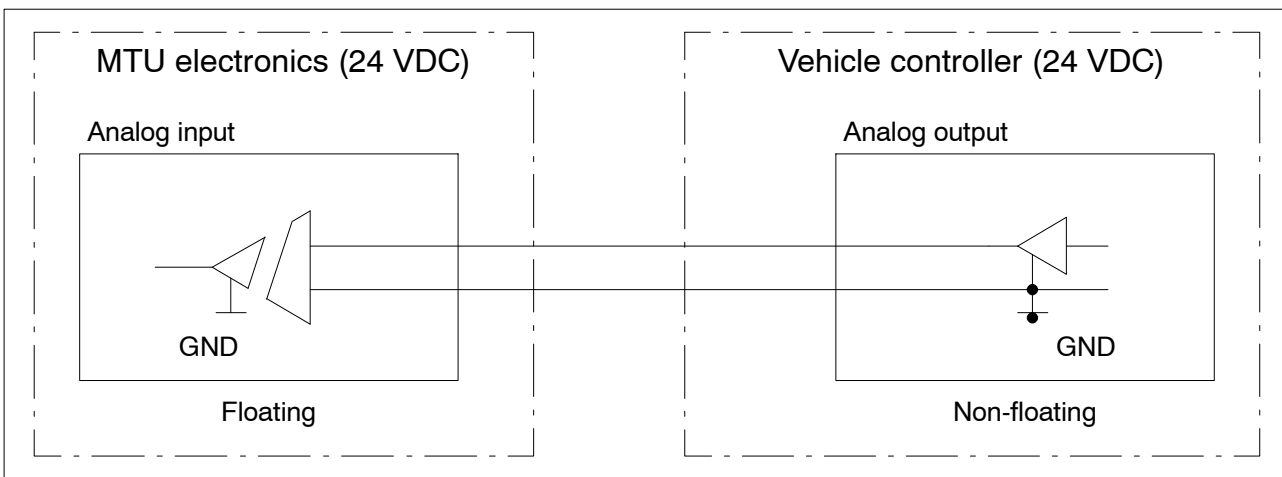


Fig. 42 : Analog inputs

Channel	Signal	Pin	Comments	Sensor	Pin
DME2	+IN	A	$U < -400 \text{ mV} = \text{low} / U > 400 \text{ mV} = \text{high}$		
DME2	-IN	U			
PDM1	OUT	K	24 V/3 A	Y44	A
PDM1	GND	L		Y44	B
TAM1	OUT	R	24 V/1.5 A		
TAM1	GND	j			
TAM2	OUT	h	24 V/1.5 A Relay Pump pre lube	KM2	86
TAM2	GND	i	Relay Pump pre lube	KM2	85

Channel	Signal	Pin	Comments	Injector Cylinder	Pin
TEH12	NiCr-Ni	T	T-Exhaust Single Cylinder B2	B4B2	Red
TEH12		U		B4B2	Green
TEH13	NiCr-Ni	R	T-Exhaust Single Cylinder B3	B4B3	Red
TEH13		S		B4B3	Green
TEH14	NiCr-Ni	N	T-Exhaust Single Cylinder B4	B4B4	Red
TEH14		P		B4B4	Green
TEH15	NiCr-Ni	e	T-Exhaust Single Cylinder B5	B4B5	Red
TEH15		M		B4B5	Green
TEH16	NiCr-Ni	g	T-Exhaust Single Cylinder B6	B4B6	Red
TEH16		f		B4B6	Green
TEH17	NiCr-Ni	i	T-Exhaust Single Cylinder B7	B4B7	Red
TEH17		h		B4B7	Green
TEH18	NiCr-Ni	X	T-Exhaust Single Cylinder B8	B4B8	Red
TEH18		j		B4B8	Green
TEH19	NiCr-Ni	s	T-Exhaust Single Cylinder B9	B4B9	Red
TEH19		k		B4B9	Green
TEH20	NiCr-Ni	q	T-Exhaust Single Cylinder B10	B4B10	Red
TEH20		r		B4B10	Green

PDO- Analog measuring values: NODE-ID + 1, Transmit PDO 1; COB-Id 195***													
			Byte Bit-No	PDO Bit-No	Obj- Bit-No	PV-Name	ECU Error Code	Note					
P-Charge Air	P-Charge Air	Byte 8	0	0	24	Resolution: 0,01 mbar (signed) Range: -4,5 - +4,5 bar  For value calculation byte sequence must be as follows: Byte: 8 7 6 5 Example: 1,6 bar = 160000 digit = 0x21700h	00						
			1	1	25								
			2	2	26								
			3	3	27								
			4	4	28								
			5	5	29								
			6	6	30								
		7	7	31									
				Byte 7	0		8		16	02			
		1	9		17								
		2	10		18								
		3	11		19								
		4	12		20								
		5	13		21								
		6	14		22								
		7	15	23									
				Byte 6	0		16		8	17			
		1	17		9								
		2	18		10								
		3	19		11								
		4	20		12								
		5	21		13								
		6	22		14								
		7	23	15									
				Byte 5	0		24		0	00			
		1	25		1								
		2	26		2								
		3	27		3								
4	28	4											
5	29	5											
6	30	6											
7	31	7											
P-Lube Oil	PV110026	Byte 4	0	32	24	Resolution: 0,01 mbar (signed) Range: -10bar - +10 bar  For value calculation byte sequence must be as follows: Byte: 4 3 2 1 Example: 4,0 bar = 400000 digit = 0x61A80h	00						
			1	33	25								
			2	34	26								
			3	35	27								
			4	36	28								
			5	37	29								
			6	38	30								
		7	39	31									
				Byte 3	0		40		16	06			
		1	41		17								
		2	42		18								
		3	43		19								
		4	44		20								
		5	45		21								
		6	46		22								
		7	47	23									
				Byte 2	0		48		8	1A			
		1	49		9								
		2	50		10								
		3	51		11								
		4	52		12								
		5	53		13								
		6	54		14								
		7	55	15									
				Byte 1	0		56		0	80			
		1	57		1								
		2	58		2								
		3	59		3								
4	60	4											
5	61	5											
6	62	6											
7	63	7											

PDO- Analog measuring values: NODE-ID + 3, Transmit PDO 3; COB-Id 397***							
		Byte Bit-No	PDO Bit-No	Obj- Bit-No	PV-Name	ECU Error Code	Note
Daily Fuel Consumption	PV 110120	<b>Byte 8</b>			Dimension: l Resolution: 0,1 ltr (signed) Range: -10 000 000 l bis 10 000 000 l  For value calculation byte sequence must be as follows: Byte: 8 7 6 5 Example: 900 l = 9000 digit = 0x2328h		
		0	0	24			
		1	1	25			
		2	2	26			
		3	3	27			
		4	4	28			
		5	5	29			
		6	6	30			
		7	7	31			
		<b>Byte 7</b>					
		0	8	16			
		1	9	17			
		2	10	18			
		3	11	19			
		4	12	20			
		5	13	21			
		6	14	22			
		7	15	23			
		<b>Byte 6</b>					
		0	16	8			
		1	17	9			
		2	18	10			
		3	19	11			
		4	20	12			
		5	21	13			
		6	22	14			
		7	23	15			
		<b>Byte 5</b>					
		0	24	0			
		1	25	1			
		2	26	2			
		3	27	3			
		4	28	4			
		5	29	5			
		6	30	6			
7	31	7					
Actual Fuel Consumption	PV 110119	<b>Byte 4</b>			Dimension: l/h Resolution: 0,001 l/h (signed) Range: -1000 l/h bis 1000 l/h  For value calculation byte sequence must be as follows: Byte: 4 3 2 1 Example: 90 l/h = 90000 digit = 0x15F90h		
		0	32	24			
		1	33	25			
		2	34	26			
		3	35	27			
		4	36	28			
		5	37	29			
		6	38	30			
		7	39	31			
		<b>Byte 3</b>					
		0	40	16			
		1	41	17			
		2	42	18			
		3	43	19			
		4	44	20			
		5	45	21			
		6	46	22			
		7	47	23			
		<b>Byte 2</b>					
		0	48	8			
		1	49	9			
		2	50	10			
		3	51	11			
		4	52	12			
		5	53	13			
		6	54	14			
		7	55	15			
		<b>Byte 1</b>					
		0	56	0			
		1	57	1			
		2	58	2			
		3	59	3			
		4	60	4			
		5	61	5			
		6	62	6			
7	63	7					

PDO- Analog measuring values: NODE-ID + 6, Transmit PDO 1; COB-Id 19A***								
		Byte Bit-No	PDO Bit-No	Obj- Bit-No	PV-Name	ECU Error Code	Note	
T-Exhaust Temperature A10	PV112210	<b>Byte 8</b>			Resolution: 0,01 °C (signed) Range: - 40 °C bis + 1000 °C  For value calculation byte sequence must be as follows: Byte: 4 3 2 1 Example:45°C = 4500 digit = 0x1194h	00		
		0	0	24				
		1	1	25				
		2	2	26				
		3	3	27				
		4	4	28				
		5	5	29				
		6	6	30				
		7	7	31				
		<b>Byte 7</b>						
		0	8	16				
		1	9	17				
		2	10	18				
		3	11	19				
		4	12	20				
		5	13	21				
		6	14	22				
		7	15	23				
		<b>Byte 6</b>						
		0	16	8				
		1	17	9				
		2	18	10				
		3	19	11				
		4	20	12				
		5	21	13				
		6	22	14				
		7	23	15				
		<b>Byte 5</b>						
0	24	0						
1	25	1						
2	26	2						
3	27	3						
4	28	4						
5	29	5						
6	30	6						
7	31	7						
T-Exhaust Temperature A9	PV 112209	<b>Byte 4</b>			Resolution: 0,01 °C (signed) Range: - 40 °C bis + 1000 °C  For value calculation byte sequence must be as follows: Byte: 4 3 2 1 Example:45°C = 4500 digit = 0x1194h	00		
		0	32	24				
		1	33	25				
		2	34	26				
		3	35	27				
		4	36	28				
		5	37	29				
		6	38	30				
		7	39	31				
		<b>Byte 3</b>						
		0	40	16				
		1	41	17				
		2	42	18				
		3	43	19				
		4	44	20				
		5	45	21				
		6	46	22				
		7	47	23				
		<b>Byte 2</b>						
		0	48	8				
		1	49	9				
		2	50	10				
		3	51	11				
		4	52	12				
		5	53	13				
		6	54	14				
		7	55	15				
		<b>Byte 1</b>						
0	56	0						
1	57	1						
2	58	2						
3	59	3						
4	60	4						
5	61	5						
6	62	6						
7	63	7						

PDO- Analog demands: NODE-ID + 0, Receive PDO 3; COB-Id 414***								
			Byte Bit-No	PDO Bit-No	Obj- Bit-No	PV-Name	ECU Error Code	Note
dummy 6	PV009288	Byte 8	0	0	24		00	
			1	1	25			
			2	2	26			
			3	3	27			
			4	4	28			
			5	5	29			
			6	6	30			
		Byte 7	0	8	16			
			1	9	17			
			2	10	18			
			3	11	19			
			4	12	20			
			5	13	21			
			6	14	22			
		Byte 6	7	15	23			
			0	16	8			
			1	17	9			
			2	18	10			
			3	19	11			
			4	20	12			
			5	21	13			
		Byte 5	6	22	14			
			7	23	15			
			0	24	0			
			1	25	1			
			2	26	2			
			3	27	3			
			4	28	4			
		Byte 4	5	29	5			
			6	30	6			
			7	31	7			
			0	32	24			
			1	33	25			
			2	34	26			
			3	35	27			
Byte 3	4	36	28					
	5	37	29					
	6	38	30					
	7	39	31					
	0	40	16					
	1	41	17					
	2	42	18					
Byte 2	3	43	19					
	4	44	20					
	5	45	21					
	6	46	22					
	7	47	23					
	0	48	8					
	1	49	9					
Byte 1	2	50	10					
	3	51	11					
	4	52	12					
	5	53	13					
	6	54	14					
	7	55	15					
	0	56	0					
Byte 1	1	57	1					
	2	58	2					
	3	59	3					
	4	60	4					
	5	61	5					
	6	62	6					
	7	63	7					

No.	Designation	Description	Information/Remarks
EC 212	SD P-COOLANT	Sensor defect (coolant pressure)	Check for short circuit or broken cable, sensor and cables to B16
EC 213	SD P-COOLANT INTERC.	Sensor defect (coolant pressure intercooler)	Check for short circuit or broken cable, sensor and cables to B43
EC 214	SD P-CRANKCASE	Sensor defect, short circuit or broken cable => limit monitoring inactive	Check cables and sensor to B50
EC 215	SD P-RAIL FUEL	Sensor defect (rail pressure) => High-pressure controller emergency operation	Check for short circuit or broken cable, sensor and cables to B48
EC 216	SD T-LUBE OIL	Sensor defect (lube oil temperature)	Check for short circuit or broken cable, sensor and cables to B7
EC 219	SD T-INTAKE AIR	Sensor defect (intake air temperature)	Check for short circuit or broken cable, sensor and cables to B3
EC 220	SD COOLANT LEVEL	Sensor defect (coolant niveau)	Check for short circuit or broken cable, sensor and cables to F33, Niveau sensor check works in defined intervals (typ. 1 hour, MP 63.00)
EC 221	SD P-OILFILTER DIFF.	Not used, only switch	
EC 226	SD WATER IN FUEL LEV	Sensor defect (water in fuel filter )	Check for short circuit or broken cable, sensor and cables to F57, Niveau sensor check works in defined intervals (typ. 1 hour, MP 63.00)
EC 229	SD ENG.SPEED SENSORS	Sensor defect crankshaft speed u n d sensor defect camshaft speed ()	see comments on the alarms 230 and 231
EC 230	SD CRANKSHAFT SPEED	Sensor defect (crankshaft speed)	Check for short circuit or broken cable, sensor and cables to B13
EC 231	SD CAMSHAFT SPEED	Sensor defect (camshaft speed)	Check for short circuit or broken cable, sensor and cables to B1
EC 232	SD ETC SPEED 1	Sensor defect (basic charger speed)	Check for short circuit or broken cable, sensor and cables to B44 or charger blocked
EC 240	SD P-FUEL	Sensor defect (fuel pressure)	Check for short circuit or broken cable, sensor and cables to B34
EC 245	SD POWER SUPPLY	Internal ECU error	Electronic defect
EC 246	SD T-ELECTRONIC	Internal ECU error	Electronic defect
EC 250	SD CAN SPEED DEMAND	Sensor defect CAN (Speed Demand) => no setpoint speed signal. Depending on the setting of MP 180.14, the setpoint speed either goes to a failure value (MP 180.05) or remains at the actual speed	

<b>No.</b>	<b>Designation</b>	<b>Description</b>	<b>Information/Remarks</b>
AL 331441	MD CANopen Reset Trip Fuel C.	Missing Data for CANopen Signal Reset Trip Fuel Consumption	Electronic service
AL 331446	MD CANopen Alternate Minimum V	Missing Data for CANopen Signal Alternate Minimum VSG	Electronic service
AL 331457	MD CANopen Ext.Power Curve Lim	Missing Data for CANopen Signal Ext.Power Curve Limitation Active	Electronic service
AL 331469	MD CANopen Force Max. Fan Speed	Missing Data for CANopen Signal Force Max. Fan Speed	Electronic service
AL 500995	AL CCB J1939 Error	Common Error on J1939 CAN-Bus	Electronic service
AL 500996	AL CCB CANopen Error	Common Error on CANopen CAN-Bus	Electronic service
AL 500997	AL CCB Error	Common Error on CCB2 Gateway Card	Electronic service

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: [www.heydownloads.com](http://www.heydownloads.com) by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL