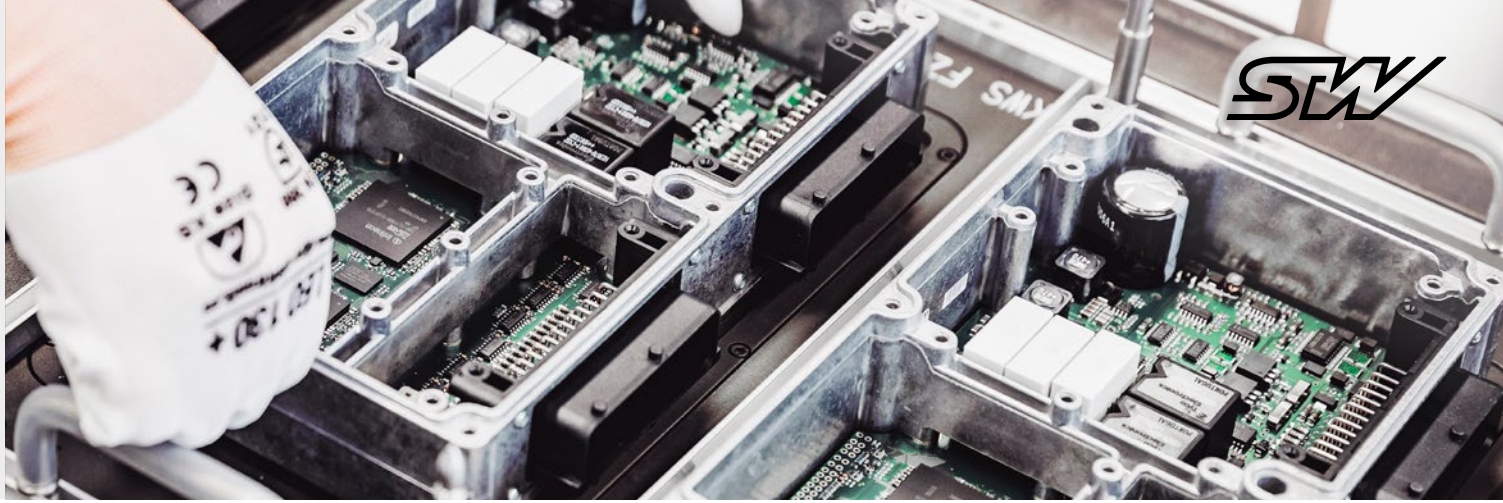

ESX-3CM

ESX control units

KEY FEATURES

- Control specially designed for use in harsh mobile applications
- Flexible programming in C, IEC 61131-3 (CODESYS V3.5 or logi.CAD 3) and Matlab
- Suitable for safety-related applications according to IEC 61508:2010 or according to EN ISO 13849-1:2015
  - CODESYS: SIL 1 / PL c
  - C: SIL 2 / PL d
  - logi.CAD 3: currently no safety release

TECHNICAL DATA

- TriCore TC 1798 32 bit, 300 MHz
- 288 kB SRAM internal, 8 MB SDRAM external
- 4 MB Flash internal
- 32 kB EEPROM
- 4 CAN interfaces (CAN 1 with wake-up function), 1 RS232 interface, 1 Ethernet interface
- 28 inputs (SENT support)
- 28 outputs

ACCESSORIES

- Debug Adapter
- Debugger
- Compiler
- ESX-Testbox Adapter
- StarterKit
- Component Deployment C, CODESYS V3.5, logi.CAD and Matlab
- Mating Plug
- Lifecycle Tool openSYDE

Sensor-Technik Wiedemann GmbH

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87600 Kaufbeuren

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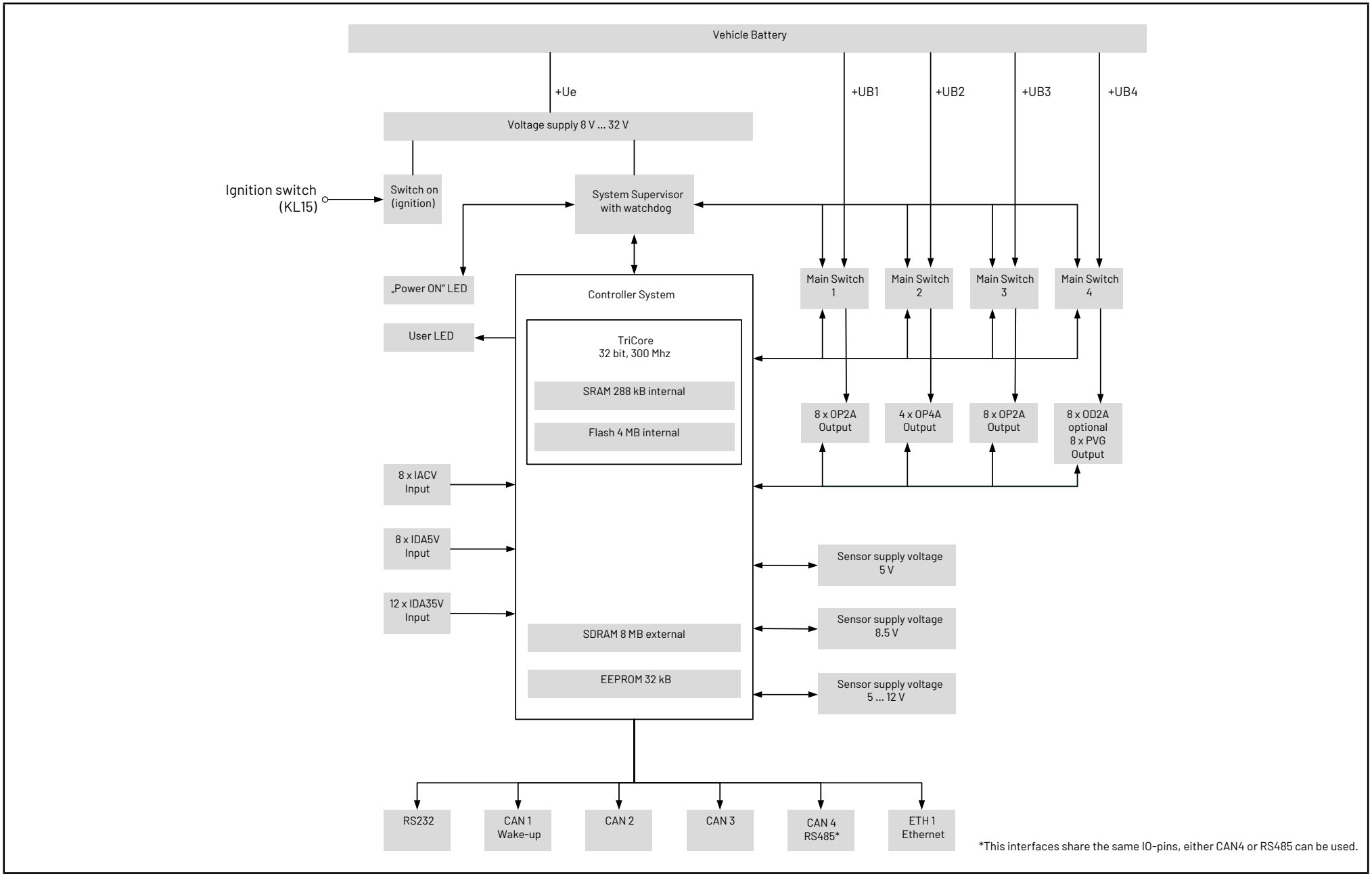
www.stw-mm.com

BLOCK DIAGRAM



TECHNICAL DATA

Processor and memory

Type	Properties	Features
TriCore TC1798	32 bit	@ 300 MHz
SRAM	288 kB internal	
SDRAM	8 MB external	Available space for customer application (non-safety): in C: 7,80 MB in CODESYS: 3,00 MB
Flash	4 MB internal	Available space for customer application (non-safety): in C: 3,75 MB in CODESYS: 2,00 MB
EEPROM	32 kB	Available space for customer application (non-safety): in C: 24 kB in CODESYS: 24 kB

Communication Interfaces

Type	Max. Quantity	Configuration
CAN	4	CAN 2.0 B, Low-/High-Speed max 1 Mbit/s CAN 1: Wake-up functionality CAN 4: CAN or configurable as RS 485, half-duplex, baud rate up to 115 kbit/s
RS 232	1	baud rate up to 115 kbit/s
Ethernet	1	Hardware-variant with additional connector. speed up to 100 Mbit/s

Inputs

Type	Max. Quantity	Configuration	Measurement	Options / Dependencies
Analog Input IACV	8	Voltage	0 ... 12 V	
		Current	4 ... 20 mA	
		Digital	Voltage	Cutoff frequency: 100 Hz
		Edge Evaluation	Events, rising/ falling edges	
Multi Function Input IDA5V	8	Analog Voltage	0 ... 5 V	e.g. PT1000, KTY
		Digital	Low-Active	Programmable pull-up resistor 1 kΩ to 5 V
			High-Active	External pull-down resistor required
		Frequency	0,6 Hz ... 20 kHz	
		Edge Evaluation	Events, rising/ falling edges	
		SENT Interface		

TECHNICAL DATA

Inputs

Type	Max. Quantity	Configuration	Measurement	Options / Dependencies
Multi Function Input IDA35V	12	Analog Voltage	0 ... 35 V	
		NAMUR sensors		
		Digital	Low-Active High-Active	Programmable pull-up (1 kΩ to 8,5 V) or pull-down resistors
		Frequency	0,6 Hz ... 20 kHz	A maximum of 8 Inputs can be used for the function "Average Frequency Measurement"
		Edge Evaluation	Events, rising/ falling edges	
		Incremental Input	Position or angle change	Pairs of 2 inputs can be connected to a maximum of 4 incremental encoder inputs

Outputs (All outputs are short circuit protected)

Type	Max. Quantity	Configuration	Range	Property	Features
Digital-/ PWM-Output OP4A	4	Digital PWM	0 ... 4 A	Current On / Off 0 ... 100 % max. 1000 Hz	High side switch Current control with 2 % accuracy Digital feedback Cut-off at overcurrent (> 7,5 A ±20 %) Several outputs in parallel circuit for up to 15 A Group 2 all outputs in summary max. 15 A

Outputs (All outputs are short circuit protected)

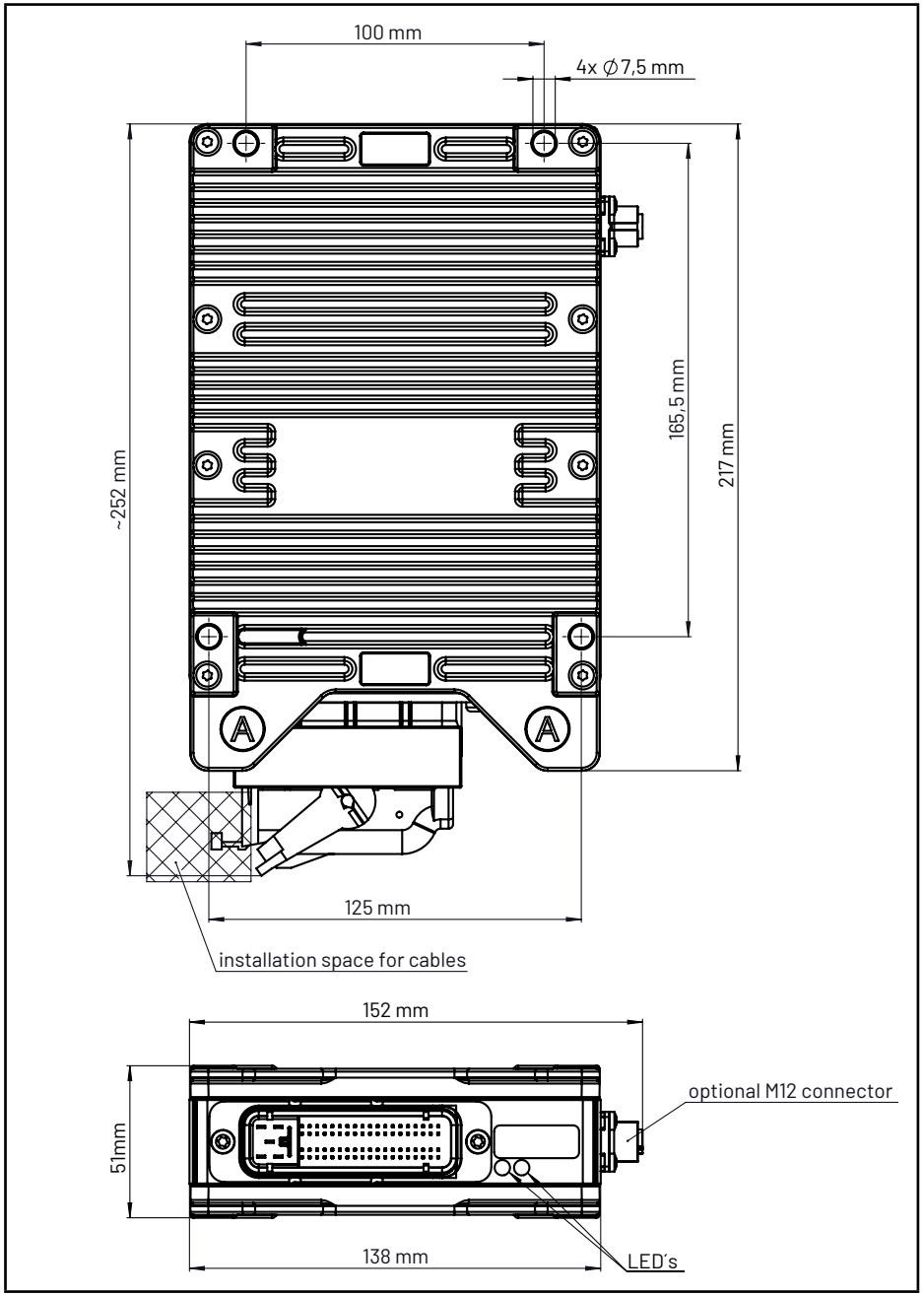
Type	Max. Quantity	Configuration	Range	Property	Features
Digital-/ PWM- Output OP2A	16	Digital PWM	0 ... 2,5 A	Current On / Off 0 ... 100 % max. 1000 Hz	High side switch Current control with 2 % accuracy Digital Feedback Cut-off at overcurrent (> 4,6 A ±20 %) Several outputs in parallel circuit for up to 15 A Group 1 8 outputs Group 3 8 outputs all outputs per group in summary max. 15 A
Digital-/ PWM- Output OD2A	8	Digital PWM	0 ... 2,5 A	Current On / Off 0 ... 100 % max. 1000 Hz	High side switch Voltage measurement with ±3 % accuracy Current detection Group 4 all outputs per group in summary max. 15 A
optional PVG		PVG	160 Hz ... 20 kHz		Voltage feedback, digital feedback
Sensor supply UExt	3	Programmable	5 ... 12 V	100 ... 250 mA	
		Fixed Voltage	8,5 V	Max. Current 250 mA	
		Fixed Voltage	5 V		

TECHNICAL DATA

System Data

Type	Property	Values
Supply Voltage	Direct Current (DC)	8 ... 32 V
Power Consumption	Without external load	< 400 mA at 12 V supply Voltage < 240 mA at 24 V supply Voltage
	Standby (ignition off)	< 1 mA
	Maximum load current	60 A
Temperature	Chassis Temperature	–40 °C ... +85 °C –40 °F ... +185 °F
Connector	Automotive Type (Tyco / AMP): Ethernet-Variant:	81 Pins 4-pin M12 sleeve with D-Code
Indicators	2 LED	1 x for system status and 1 x freely programmable
Housing	Die-cast aluminum	GORE-TEX® Membrane for pressure equalization
Dimensions	Standard Variant Variant with Ethernet-connector	217 mm x 138 mm x 51 mm 217 mm x 152,5 mm x 51 mm
Weight		Ca. 1.3 kg (2.9 lbs)
Degree of Protection	Variant without Ethernet connector	IP6k7, IP6k9k (IP6k9k is not available for the Ethernet variant)
	Variant with Ethernet Connector	IP6k7
Certificates and Compliance	Qualified to the applicable standards for automotive, agricultural and construction industries	
	CE	
	RoHS	
	E1: All Vehicle types with a 12 V resp. 24 V – electrical wiring and battery (–) at the body.	

TECHNICAL DRAWING

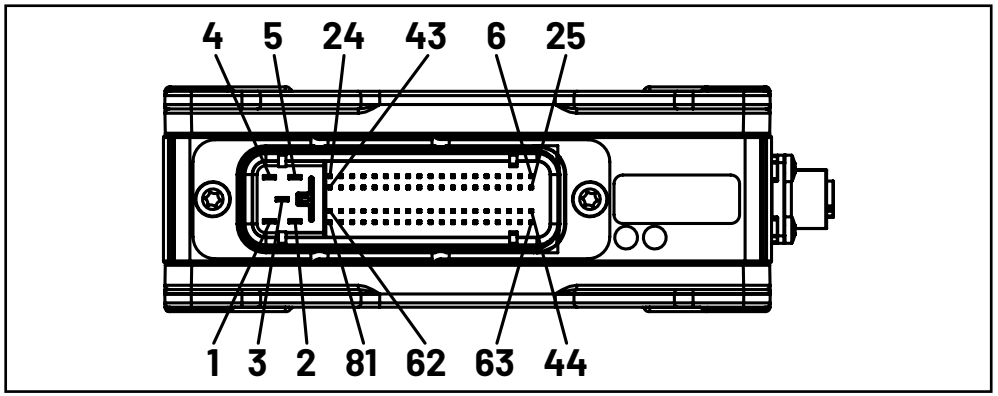


PIN ASSIGNMENT

Pin Assignment 81 Pin Connector:

Pin	Description
1	UB: Power supply for the digital outputs of type OD2A
2	GND
3	UB: Power supply of the PWM outputs of type OP4A
4	UB: Power supply of the PWM outputs of type OP2A
5	UB: Power supply of the PWM outputs of type OP2A
6	UE: Power supply Electronic
7	CAN bus 1 high
8	Can bus 3 high
9	Analog Input IACV_2
10	Multi Function Input IDA35V_10
11	Multi Function Input IDA35V_6
12	Multi Function Input IDA35V_2
13	Digital-/ PWM-Output OP2A_5
14	Digital-/ PWM-Output OP2A_6
15	CAN bus 1 high
16	Analog Input IACV_5
17	Digital-/ PWM-Output OP4A_2
18	Multi Function Input IDA5V
19	Digital-/ PWM-Output OP2A_15
20	Digital-/ PWM-Output OP2A_11
21	Multi Function Input IDA5V
22	Digital-/ PWM-Output OD2A_8
23	Digital-/ PWM-Output OD2A_4
24	Sensor supply UExt
25	Ignition (KL15)

Pin	Description
26	CAN bus 1 low
27	CAN bus 3 low
28	Analog Input IACV_3
29	Multi Function Input IDA35V_11
30	Multi Function Input IDA35V_7
31	Multi Function Input IDA35V_3
32	Digital-/ PWM-Output OP2A_1
33	Digital-/ PWM-Output OP2A_2
34	CAN bus 1 low
35	Analog Input IACV_6
36	Digital-/ PWM-Output OP4A_3
37	Multi Function Input IDA5V
38	Digital-/ PWM-Output OP2A_16
39	Digital-/ PWM-Output OP2A_12
40	Analog gND
41	Multi Function Input IDA5V
42	Digital-/ PWM-Output OD2A_5
43	Digital-/ PWM-Output OD2A_1
44	RS 232 (Tx)
45	CAN bus 2 high
46	CAN bus 4 high
47	Analog gND
48	Multi Function Input IDA35V_12
49	Multi Function Input IDA35V_8
50	Multi Function Input IDA35V_4
51	Digital-/ PWM-Output OP2A_3
52	Digital-/ PWM-Output OP2A_4
53	Sensor supply UExt
54	Analog Input IACV_7



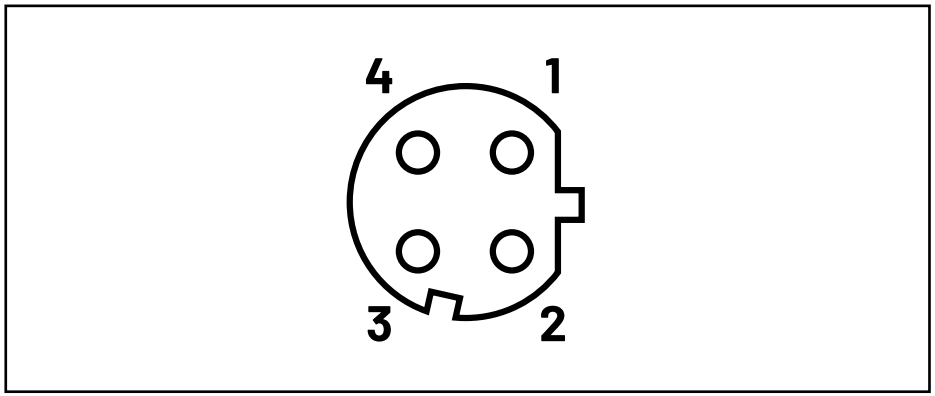
Pin	Description
55	Digital-/ PWM-Output OP4A_4
56	Analog gND
57	Multi Function Input IDA5V
58	Digital-/ PWM-Output OP2A_13
59	Digital-/ PWM-Output OP2A_9
60	Multi Function Input IDA5V
61	Digital-/ PWM-Output OD2A_6
62	Digital-/ PWM-Output OD2A_2
63	RS 232 (Rx)
64	CAN bus 2 low
65	CAN bus 4 low
66	Sensor supply UExt
67	Analog Input IACV_1
68	Multi Function Input IDA35V_9
69	Multi Function Input IDA35V_5
70	Multi Function Input IDA35V_1
71	Digital-/ PWM-Output OP2A_7
72	Digital-/ PWM-Output OP2A_8
73	Analog Input IACV_8
74	Analog Input IACV_4

Pin	Description
75	Digital-/ PWM-Output OP4A_1
76	Multi Function Input IDA5V
77	Digital-/ PWM-Output OP2A_14
78	Digital-/ PWM-Output OP2A_10
79	Multi Function Input IDA5V
80	Digital-/ PWM-Output OD2A_7
81	Digital-/ PWM-Output OD2A_3

PIN ASSIGNMENT

Pin Assignment Ethernet Connector:

Pin	Description
1	Ethernet 1 (Tx+)
2	Ethernet 1 (Rx+)
3	Ethernet 1 (Tx-)
4	Ethernet 1 (Rx-)



QUALIFICATION

Norm	Description
ISO/IEC 17050-1	CE Conformity
KBA (Kraftfahrt-Bundesamt)	Certification E 1 This approved device can be used on any Vehicle type with the following restrictions: All Vehicle types with a 12 V respectively 24 V - electrical wiring and battery(-) at the body
RoHS	Restriction of hazardous substances

DETAILED QUALIFICATIONS

EMC industrial (CE)	
Emission	DIN EN 61000-6-3
Electrostatic Discharge (ESD) direct	DIN EN 61000-4-2:2009-12
Electrostatic Discharge (ESD) indirect hCP	DIN EN 61000-4-2:2009-12
Electrostatic Discharge (ESD) indirect VCP	DIN EN 61000-4-2:2009-12
Limits and methods of measurement of radio disturbance; characteristics for the protection of receivers used on board Vehicles	DIN EN 61000-6-2:2006-03
Burst	DIN EN 61000-4-4:2013-04
Surge	DIN EN 61000-4-5:2007-06
Immunity	DIN EN 61000-4-6:2014

EMC automotive	
Emission	IEC/CISPR25:2008/ECE R10
Immunity	ISO 11452-2:2004-11
Immunity	ISO 11452-4:2011-12
Immunity	ISO 11452-5:2002-04
Emission 12 V: (pos) + 100 V, (neg) - 150 V	ISO 7637-2:2nd edition 2004+AMD1:2008
Emission 24 V: (pos) + 200 V, (neg) - 600 V	ISO 7637-2: 2nd edition 2004+AMD1:2008

DETAILED QUALIFICATIONS

EMC automotive

Road Vehicles, electrical disturbance by conduction and coupling Pulse 1 (12 V): - 100 V, 2 ms, 2 Ω, 5000 pulses Pulse 1 (24 V): - 600 V, 1 ms, 50 Ω, 5000 pulses Pulse 2a (12 V): + 50 V, 0.05 ms, 2 Ω, 5000 pulses Pulse 2a (24 V): + 50 V, 0.05 ms, 2 Ω, 5000 pulses Pulse 2b (12 V): + 10 V, 1 s, 10 pulses Pulse 2b (24 V): + 20 V, 1 s, 10 pulses Pulse 3a (12 V): - 150 V, 150 ns, 50 Ω, 1 h Pulse 3a (24 V): - 200 V, 150 ns, 50 Ω, 1 h Pulse 3b (12 V): + 100 V, 150 ns, 50 Ω, 1 h Pulse 3b (24 V): + 200 V, 150 ns, 50 Ω, 1 h Pulse 4 (12 V): - 7 V, 1 pulse Pulse 4 (24 V): - 16 V, 1 pulse Pulse a (12 V): - 60 V, 10 min Pulse a (24 V): - 80 V, 10 min Pulse b (12 V): + 40 V, 10 min Pulse b (24 V): + 80 V, 10 min	ISO 7637-2: 2nd edition 2004+AMD1:2008
Emission	IEC/CISPR25:2008
Electrostatic Discharge (ESD) 330 Ω / 330 pF, contact: +/- 2 kV, +/- 4 kV, +/- 6 kV, +/- 8 kV 330 Ω / 150 pF +/- 6 kV, +/- 8 kV, +/- 15 kV, +/- 25 kV	ISO 10605:2008-07

Electrical tests

Overvoltage 12 V: 60 min, Voltage supply = 18 V, T = 65 °C / 149 °F, 1 Cycle 24 V: 60 min, Voltage supply = 18 V, T = 65 °C/ 149 °F, 1 Cycle	ISO 16750-2: 2012-11
Superimposed alternating Voltage 12 V: severity 4: Upp = 2 V, 10 min 24 V: severity 2: Upp = 4 V, 10 min	ISO 16750-2: 2012-11
Slow decrease and increase of supply Voltage	ISO 16750-2: 2012-11
Momentary drop in supply Voltage 12 V: single Voltage drop to 4.5 V 24 V: single Voltage drop to 9 V	ISO 16750-2: 2012-11
Reset behavior at Voltage drop 12 V: Voltage drops in 5 % steps until 0 V, drop duration 10 s 24 V: Voltage drops in 5 % steps until 0 V, drop duration 10 s	ISO 16750-2: 2012-11
Starting profile switch-on hysteresis 12 V: Testlevel 4 24 V: Testlevel 3	ISO 16750-2: 2012-11
Load Dump 12 V Impulse a: Usmax = 70 V, 10 Pulses 12 V Impulse b: Usmax = 70 V, 5 Pulses 24 V Impulse a: Usmax = 70 V, 10 Pulses 24 V Impulse b: Usmax = 70 V, 5 Pulses	ISO 16750-2: 2012-11
Reversed Voltage case 2: Duration 1 min.	ISO 16750-2: 2012-11
Ground reference and supply offset	ISO 16750-2: 2012-11
Open circuit test - single line interruption	ISO 16750-2: 2012-11
Open circuit test - Multiple line interruption	ISO 16750-2: 2012-11
Short circuits - signal lines	ISO 16750-2: 2012-11
Short circuits - load lines	ISO 16750-2: 2012-11

DETAILED QUALIFICATIONS

Climatic and mechanical tests	
Resonance search	DIN EN 60068-2-64: 2009-04 ISO 16750-3: 2012-12
Shock (50 g / 6 ms, halfsine wave, 10 shocks / axis)	DIN EN 60068-2-27: 2010-02 ISO 16750-3: 2012-12
Free fall	DIN EN 60068-2-31: 2009-04 ISO 16750-3: 2012-12
Vibration (sinusoidal)	DIN EN 60068-2-6: 2008-10 ISO 16750-3: 2012-12
Shock (Pulse shape: half-sine Control strategy: single channel; Acceleration: 50 g; Pulse duration: 11 ms Number of tested axes: 3; Number of shocks: 3 positive, 3 negative per axis	DIN EN 60068-2-27: 2010-02 ISO 16750-3: 2012-12
Bump	DIN EN 60068-2-27: 2010-02
Low temperature, storage	DIN EN 60068-2-1: 2008-01 ISO 16750-4: 2010-04
High temperature, storage	DIN EN 60068-2-2: 2008-05 ISO 16750-4: 2010-04
Temperature step test	ISO 16750-4: 2010-04
Rapid change of temperature	DIN EN 60068-2-14: 2010-04 ISO 16750-4: 2010-04
Temperature cycle with specified change rate	DIN EN 60068-2-14: 2010-04 ISO 16750-4: 2010-04
Salt spray corrosion test	DIN EN 60068-2-52: 1996-10 ISO 16750-4: 2010-04
Salt spray, leakage and function test	DIN EN 60068-2-11: 2000-02 ISO 16750-4: 2010-04
Damp heat, steady state Tmax: + 65 °C/ 149 °F; Tmin: - 10 °C/ 14 °F; Duration: 240 h (10 cycles a 24 h)	DIN EN 60068-2-38: 2010-06

Climatic and mechanical tests	
Damp heat, steady state Tmax: 40 °C/ 104°F; Relative humidity: 85 % RH; Duration: 21 days	DIN EN 60068-2-78: 2014-02 ISO 16750-4: 2010-04
Dewing test	DIN EN 60068-2-30: 2006-06 ISO 16750-4: 2010-04
Corrosion test with flow of mixed gas	DIN EN 60068-2-60: 1996-09 ISO 16750-4: 2010-04
IP Protection classes IP6KX and IPX5	ISO 20653: 2013-02
Chemical resistance	ISO 16750-5: 2010-04
Life test (Weibull)	DIN EN 60068-2-14: 2010-04