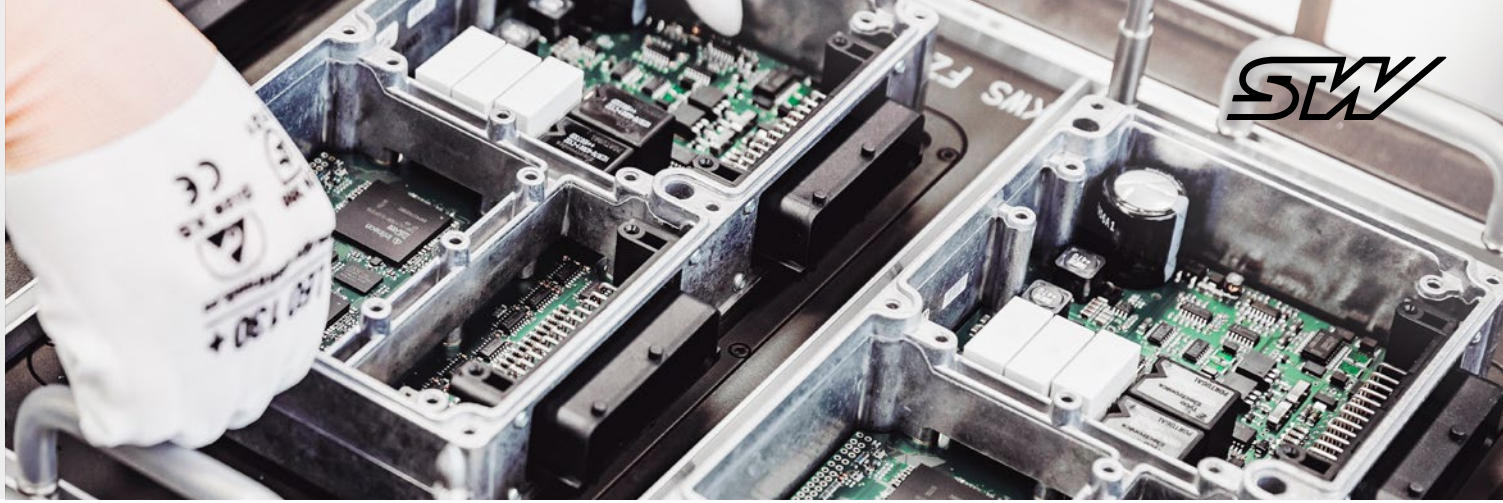


ESX-3XM

ESX Control Units

KEY FEATURES

- Control specially designed for use in harsh mobile applications
- Internally expandable with up to max. 3 expansion boards (standard variants or customer specific)
- Flexible programming in C, CODESYS V3.5 IEC61131 or Matlab
- Suitable for safety-related applications up to SIL 2 according to IEC 61508:2010 or PL d according to EN ISO 13849-1:2015

TECHNICAL DATA

- TriCore TC 1796 32 bit, 150 MHz
- 80 kB SRAM internal, 4 MB SRAM external
- 2 MB Flash internal, 4 MB Flash external
- 32 kB EEPROM
- 4 CAN interfaces and 1 RS232 interface (basic version without expansion boards)
- 15 inputs (basic version without expansion board)
- 8 outputs (basic version without expansion board)
- Expandable via expansion boards

ACCESSORIES

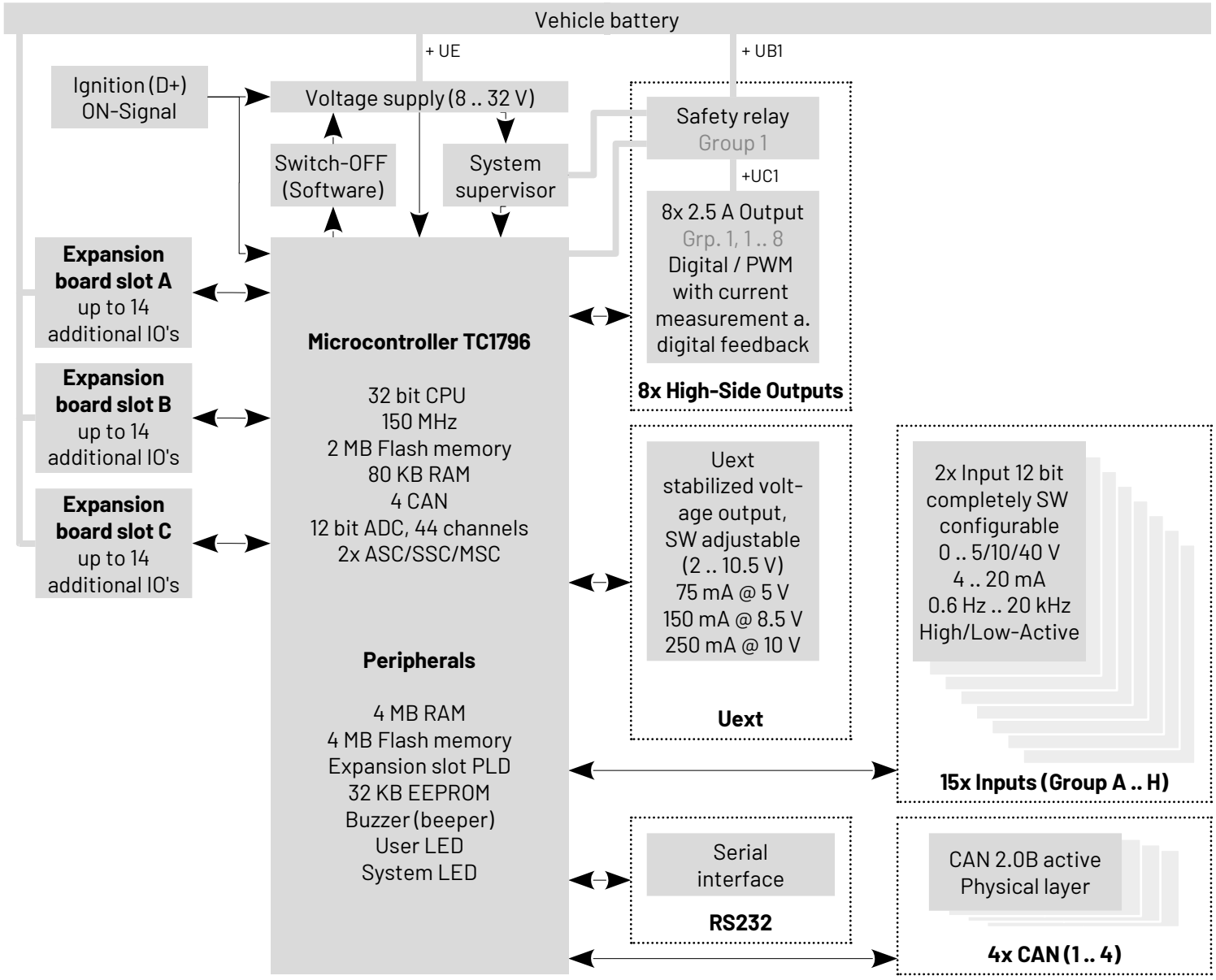
- Debug Adapter
- Debugger
- ESX Testbox adapter
- Component Deployment for C, CODESYS V3.5 and Matlab
- Mating plug

Sensor-Technik Wiedemann GmbH

Am Bärenwald 6
87600 Kaufbeuren

+49 8341 9505-0
info@sensor-technik.de
www.stw-mm.com

BLOCK DIAGRAM



TECHNICAL DATA

Processor and memory

Type	Properties	Features
TriCore TC 1796	32 bit	@150 MHz, separate system supervisor with programmable watchdog
SRAM		80 kB internal, 4 MB external
Flash		2 MB internal, 4 MB external
EEPROM		32 kB

Communication Interfaces

Type	Max. Quantity	Configuration
CAN	4	2.0 B, Full CAN, Low-/High-Speed up to 1 MBit/s
RS232	1	programmable baud rate up to 115 kBit/s
Expansion Possibilities	3 modules	for additional inputs and outputs or other functionalities

Inputs – Base configuration

Type	Max. Quantity	Configuration	Measurement	Options/Dependencies
Multi Function Inputs	15	Analog	4 mA ... 20 mA or 0 V ... 5 V / 10 V / 40 V	12 Bit, cut off frequency 100 Hz, short circuit protected, inbuilt diagnosis
	15	Digital	high / low active	short circuit protected, inbuilt diagnosis
	15	RPM/frequency	high / low active	cut off frequency 20 kHz, short circuit protected, inbuilt diagnosis
Incremental Inputs	3	Incremental encoder		(2 channels each) cut off frequency 20 kHz, short circuit protected

Outputs – Base configuration

Type	Max. Quantity	Configuration	Range	Property	Features
Digital- / PWM-outputs with current measurement	16		2,5 A	high-side, 0 % ... 100 %	short circuit protected, built-in diagnosis
Voltage Output	1	independent, regulated voltage supplies	5 V ... 10 V		

Inputs/Outputs

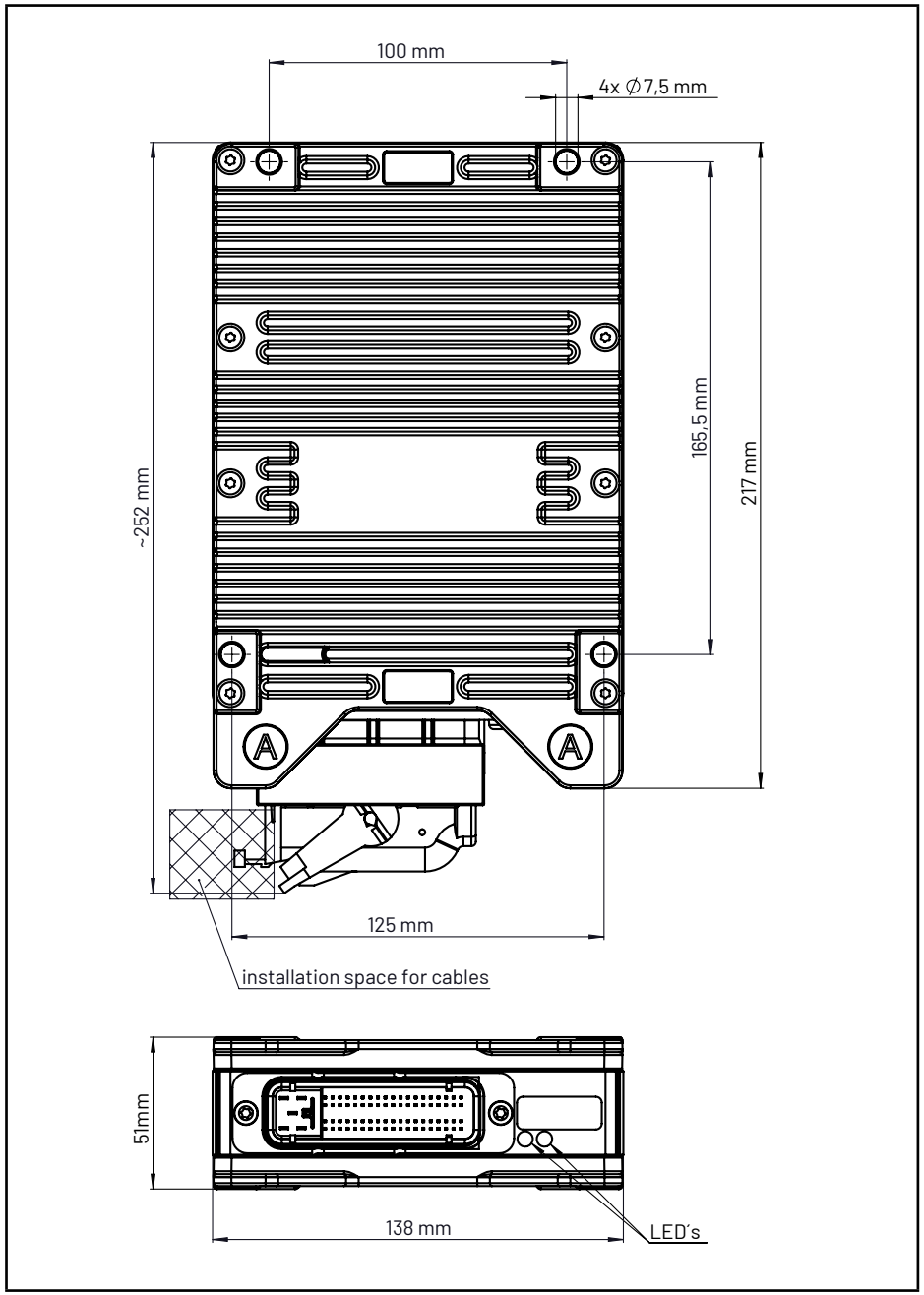
Type	Max. Quantity	Features
Expansion possibilities	3 modules	each serving up to 14 Inputs/Outputs, e.g. for digital or analogue I/Os PVG-outputs for Danfoss-Valves, inputs for encoders, motor bridges, communication interfaces or customer specific design

TECHNICAL DATA

System Data

Type	Property	Values
Supply Voltage	Direct Current (DC)	8 ... 32 V
Power Consumption	Without external load	< 350 mA at 12 V supply Voltage < 200 mA at 24 V supply Voltage
	Standby (ignition off)	< 1 mA
Temperature	Chassis Temperature	–40 °C ... +85 °C (–40 °F ... +185 °F)
Connector	Automotive Type (Tyco/ AMP)	81 Pins
Indicators	2 LED (dual color) Buzzer	2 x for system status
Housing	Die-cast aluminum	GORE-TEX® Membrane for pressure equalization
Dimensions		138 mm x 217 mm x 51 mm
Weight		Ca. 1.5 kg (3.3 lbs)
Degree of Protection	IP67 and IP69k	
Certificates and Compliance	Qualified to the applicable standards for automotive, agricultural and construction industries	
	CE	

TECHNICAL DRAWING

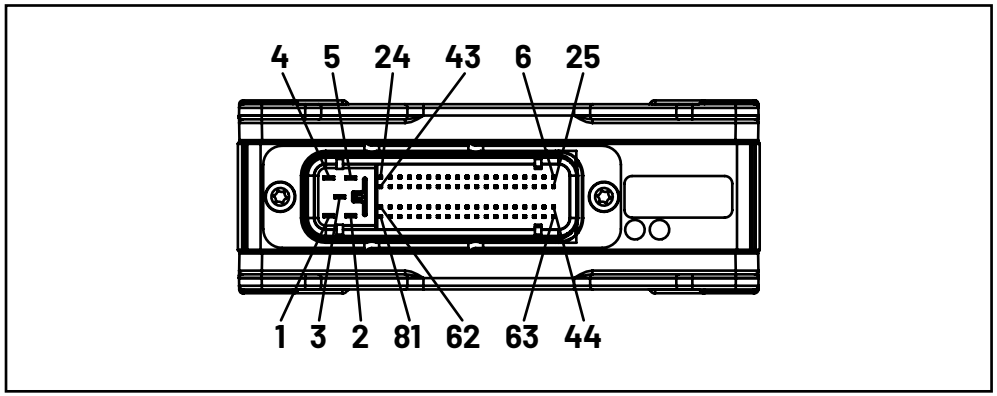


PIN ASSIGNMENT

Pin assignment 81 pin connector:

Pin	Description
1	Expansion slot C - IO pin 14
2	GND
3	Expansion slot A - IO pin 14
4	Expansion slot B - IO pin 14
5	UB: Power supply pin for outputs 1..8 (High-Side 2.5 A)
6	UE: Power supply electronic
7	Can bus 1 high
8	Can bus 3 high
9	Multi Funtion Input 14
10	Multi Funtion Input 10
11	Multi Funtion Input 6
12	Multi Funtion Input 2
13	Digital-/ PWM-Output 5
14	Digital-/ PWM-Output 6
15	Expansion slot A - IO pin 10
16	Expansion slot A - IO pin 6
17	Expansion slot A - IO pin 2
18	Expansion slot B - IO pin 11
19	Expansion slot B - IO pin 7
20	Expansion slot B - IO pin 3
21	Expansion slot C - IO pin 12
22	Expansion slot C - IO pin 8
23	Expansion slot C - IO pin 4
24	Expansion slot C - IO pin 13
25	Ignition (KL15)
26	CAN bus 1 low
27	CAN bus 3 low
28	Multi Funtion Input 15

Pin	Description
29	Multi Funtion Input 11
30	Multi Funtion Input 7
31	Multi Funtion Input 3
32	Digital-/ PWM-Output 1
33	Digital-/ PWM-Output 2
34	Expansion slot A - IO pin 11
35	Expansion slot A - IO pin 7
36	Expansion slot A - IO pin 3
37	Expansion slot B - IO pin 12
38	Expansion slot B - IO pin 8
39	Expansion slot B - IO pin 4
40	Expansion slot B - IO pin 13
41	Expansion slot C - IO pin 9
42	Expansion slot C - IO pin 5
43	Expansion slot C - IO pin 1
44	RS232 (Tx)
45	CAN bus 2 high
46	CAN bus 4 high
47	Analog GND
48	Multi Funtion Input 12
49	Multi Funtion Input 8
50	Multi Funtion Input 4
51	Digital-/ PWM-Output 3
52	Digital-/ PWM-Output 4
53	Expansion slot A - IO pin 12
54	Expansion slot A - IO pin 8
55	Expansion slot A - IO pin 4
56	Expansion slot A - IO pin 13
57	Expansion slot B - IO pin 9



Pin	Description
58	Expansion slot B - IO pin 5
59	Expansion slot B - IO pin 1
60	Expansion slot C - IO pin 10
61	Expansion slot C - IO pin 6
62	Expansion slot C - IO pin 2
63	RS232 (Rx)
64	CAN bus 2 low
65	CAN bus 4 low
66	Voltage Output 1
67	Multi Funtion Input 13
68	Multi Funtion Input 9
69	Multi Funtion Input 5
70	Multi Funtion Input 1
71	Digital-/ PWM-Output 7
72	Digital-/ PWM-Output 8
73	Expansion slot A - IO pin 9
74	Expansion slot A - IO pin 5
75	Expansion slot A - IO pin 1

Pin	Description
76	Expansion slot B - IO pin 10
77	Expansion slot B - IO pin 6
78	Expansion slot B - IO pin 2
79	Expansion slot C - IO pin 11
80	Expansion slot C - IO pin 7
81	Expansion slot C - IO pin 3

QUALIFICATION

Norm	Description
ISO/IEC 17050-1	Conformity
94/9/EC	Conformity (available on request, please contact your local sales representative)
KBA (Kraftfahrt-Bundesamt)	Certification 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
ISO13766	Earth-moving machinery - Electromagnetic compatibility
DIN EN 13309	Construction machinery - Electromagnetic compatibility of machines with internal power supply
DIN EN ISO 14982	Agricultural and forestry machines - Electromagnetic compatibility - Test methods and acceptance criteria
FCC, 47 CFR Part 15, Subpart B	Correspondence with FCC Docket 92-152 'Harmonisation of Rules for Digital Devices Incorporated International Standards' under terms of CISPR 22
RoHS	Restriction of Hazardous Substances

The ESX.3xm is manufactured in accordance to IPC standards.

DETAILED QUALIFICATIONS

EMC industrial (CE)

Electromagnetic compatibility (EMC) - Part 6-2: Generic standards: Immunity for industrial environments (CE mark) ESD (EN 61000-4-2) 330 Ω/ 150 pF, Contact: +/- 4 kV, Air: +/- 8 kV Radio frequency (EN 61000-4-3) 80 MHz-2700 MHz, 10 V/m, AM, horizontal + vertical Burst (EN 61000-4-4) Supply: +/- 2 kV; 5/50 ns; 5 kHz Signal: +/- 2 kV; 5/50 ns; 5 kHz Surge (EN 61000-4-5) Supply: +/- 0.5 kV; 1.2/50 µs Signal: +/- 1 kV; 1.2/50 µs Conducted disturbance (EN 61000-4-6) 0.15 MHz – 80MHz, 10V, 80% AM sine wave 1kHz	EN 61000-6-2:2006-03 (former EN 50082-2)
Electromagnetic compatibility (EMC) - part 6-3: Generic standards - emission standard for residential, commercial and light-industrial environments (CE-mark) Group 1 class A (with expansion boards, class B limits exceeded only at 48 MHz and 156 MHz) group 1 class B (without expansion boards)	EN 61000-6-3:2007

EMC automotive

Emission 150 kHz to 3 GHz, 1 m, 120 kHz bandwidth	2006/28/EG (Cispr25, DIN EN 55025)
Immunity Stripline: 150 kHz - 400 MHz 200 V/m, 80% AM sine wave 1kHz; absorber lined chamber: 200 MHz - 3 GHz, 200 V/m, AM	ISO 11452-5:2002-04 ISO 11452-2:2000-03
Road vehicles, electrical disturbance by conduction and coupling Voltage transient emissions	ISO7637-2:2004-09
Pulse 1 (24 V): -600 V, 50 Ω, 5000 pulses Pulse 1 (12 V): -300 V, 5000 pulses Pulse 2a (24 V): +50 V, 2 Ω, 5000 pulses Pulse 2b (24 V): +20 V, 10 pulses Pulse 2b (12 V): +10 V, 10 pules Pulse 3a (24 V): -200 V, 1 hr. Pulse 3b (24 V): +200 V, 1 hr. Pulse 4 (24 V): -16 V, 2 pulses Pulse 4 (12 V): -7 V, 2 pulses Pulse 5a: +70V, 100ms, 2 Ω, 2 pulses	DIN40839-1:1992-10
Road vehicles, electrical disturbance by conduction and coupling (data, signal), test level 4 Pulse a: -80 V, 1 hr. Pulse b: +80 V, 1 hr.	ISO 7637-3:2007
Electrostatic discharge, test level 4	ISO 10605:2008
Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices 0.15 MHz to 108 MHz	IEC / CISPR 25:2008 EN 55025:2008
Earth-moving machinery - electromagnetic compatibility	ISO 13766:2006
Construction machinery - electromagnetic compatibility of machines with internal power supply	DIN EN 13309:2010
Agricultural and forestry machines - electromagnetic compatibility	DIN EN 14982:2009

Electrical tests

Safety of machinery – electrical equipment of machines	EN 60204-1:2008-01
Superimposed alternating voltage Slow decrease and increase of supply voltage Momentary drop in supply voltage Reset behavior at voltage drop Starting profile Supply voltage cranking, Level I, II, III, IV for code B devices without relevant functions to vehicle operation during cranking	ISO 16750-2:2010
Overvoltage 36 V for 1 hr. at +65 °C	ISO 16750-2
Reversed voltage - case 2 28 V: Duration: 1 Min.	ISO 16750-2
Open circuit tests - Single line interruption Interruption of each single Output for 10 s ± 1 s	ISO 16750-2
Open circuit tests - Multiple line interruption Supply voltage completely removed from DUT for 10 s ± 1s	ISO 16750-2
Short circuits - signal lines Connect every In- and Output to Usmax and GND for 1 minute	ISO 16750-2
Short circuit - supply lines To load circuits duration: 5 minutes	ISO 16750-2

Climatic and mechanical tests

IP Protection classes IP 67, IP 69K	EN 60529:2000-09, DIN 40050-9:1993-05
Environmental testing: Cold (storage and operational) 24 hrs. at -40 °C	ISO16750-4:2006 (IEC 60068-2-1:1995-03)
Environmental testing: Dry heat (storage and operational) +85 °C, storage: 48 hrs., operation: 96 hrs.	ISO16750-4:2006 (IEC 60068-2-2/A2 1995-01
Environmental testing: Damp heat steady state 21 days with 40 °C and 93% r. h.	ISO16750-4:2006 (IEC 60068-2-78:2002-09)
Environmental testing: Change of temperature Na From -40 °C to +85 °C, 100 cycles, dwell time 1hr., temp. change rate ≤ 30 s	ISO16750-4:2006 (IEC 60068-2-14:2000-08)
PSD random vibration with temperature superimposition (Test VII) 10 Hz-2000 Hz, 32 hrs. for each plane	ISO 16750-3:2007-08
Environmental testing: Change of temperature Nb From -40 °C to +85 °C, 30 cycles	ISO16750-4:2006 (IEC 60068-2-14:2000-08)
Environmental testing: Shock 50 g/11ms, sine wave, 10 shocks/axis	ISO16750-3:2007 (IEC 60068-2-27:1995-03)
Environmental testing: Bump Bump, 30 g/6ms, sine wave, 1000 shocks/axis	DIN EN 60068-2-27
Environmental testing: Damp heat cyclic From +25 °C to 65 °C with 93% r. h. 10 cycles (each cycle 24 hrs.), five cycles with freeze phase (-10 °C)	ISO16750-4:2006 (IEC 60068-2-38-Z/AD:2000-02)
Environmental testing: Free fall 1 m free fall on steel plate, 6 axis	ISO16750-3:2006
Paints and varnishes - Determination of resistance to humidity 8 hrs. / 16 hrs. cyclic, 4 days	EN ISO 6270-2:2007-10
Sodium chloride 5% NaCl, Level 5, test duration 28 days	ISO16750-4:2006 (IEC 60068-2-52:2000-02)

Climatic and mechanical tests

Road vehicles - Environmental conditions and testing for electrical and electronic equipment: Chemical loads	ISO 16750-5:2003-12
Flowing mixed gas corrosion test Sulfur dioxide SO2, Hydrogen sulfide H2S, Nitrous oxide NO2,Chlorine Cl2	ISO16750-4:2006 (IEC 60068-2-60:1995-12)
Vibration sinusoidal 10 Hz...2000 Hz, 1 oct/min, 5 g, 10 cycles, bidirectional	DIN EN 60068-2-6
Temperature step test Starting from 20 °C to TMIN, then to TMAX, in 5 °C steps; duration: 16 hrs (-40 °C to +85 °C)	ISO 167500-4
Life test (Weibull) 54 days at 105 °C in operation	ISO 16750-1 Annex B