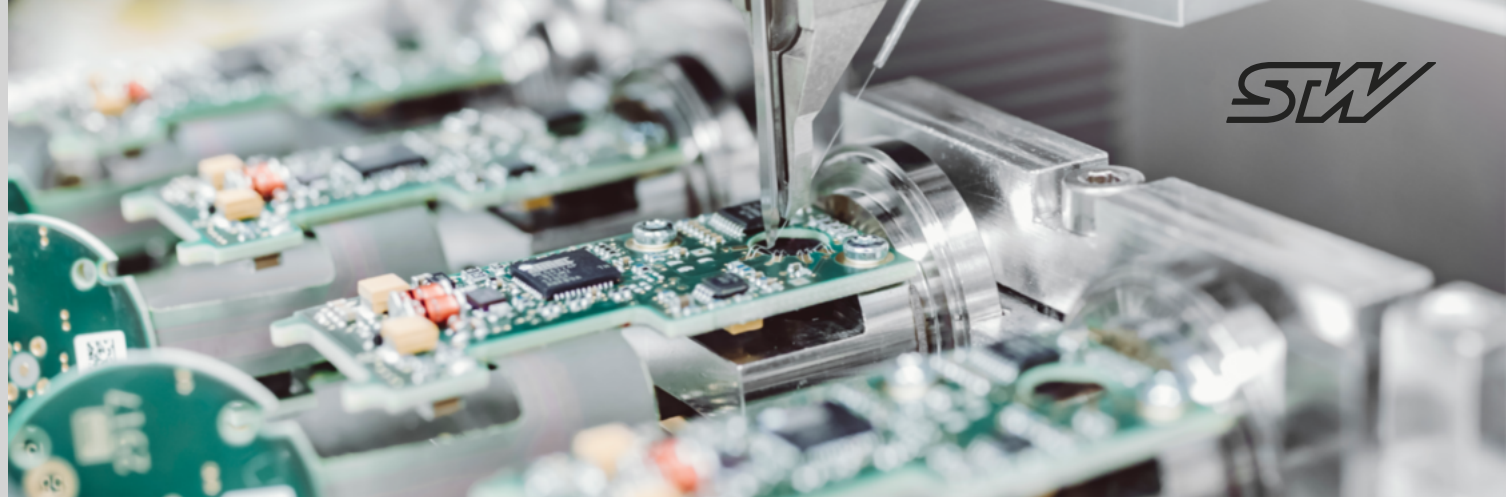




M01

Pressure sensors

KEY FEATURES

- Compact and robust design for use in harsh environments
- Designed for mobile hydraulics, alternative drives (H2, CNG, LPG) and industrial sectors
- Maximum flexibility through modular design, customization and individualization possible
- High media compatibility (with welded stainless steel measurement cell)
- Designed for OEM needs
- With ECE type approval
- UL Recognized

TECHNICAL DATA

- Pressure ranges from 0 ... 0.1 bar to 0 ... 7 bar (relative and absolute) with silicon measurement cell
- Pressure ranges from 0 ... 10 bar to 0 ... 2000 bar (relative) with welded stainless steel measurement cell
- Overload pressure at least twice the nominal pressure
- Media temperatures up to 150 °C / 302 °F
- Protection class IP67 and IPX9K
- CAN enabled: CANopen, SAE J1939, STW proprietary
- SENT variant: SAE J2716 APR2016 (Rev. 4) supported
- All common analog output signals available

ACCESSORIES

- Software package for CAN interface setting parameters

Sensor-Technik Wiedemann GmbH

Am Bärenwald 6
87600 Kaufbeuren
+49 8341 9505-0
info.stw@wiedemann-group.com
www.stw-mm.com

TECHNICAL DATA

Available Standard Pressure Ranges (Other Ranges Available) and Sensor Parameters

Component	Description/Value														
Pressure reference	Relative R (gauge G) / absolute A ¹⁾					Relative R (gauge G)									
Standard pressure range	0.3 bar	1 bar	3.4 bar	7 bar		5 bar ²⁾	10 bar	20 bar	50 bar	100 bar	250 bar	400 bar	800 bar	1200 bar	2000 bar ³⁾
Overload pressure (per DIN EN 60770-1)	0.6 bar	1.9 bar	6.9 bar	13.8 bar		20 bar	40 bar	40 bar	100 bar	200 bar	500 bar	800 bar	1000 bar	1600 bar	2200 bar
Bursting pressure (per DIN EN 60770-1)	0.7 bar	2 bar	7 bar	14 bar		70 bar	70 bar	70 bar	500 bar	1000 bar	2500 bar	4000 bar	> 4000 bar	> 4000 bar	> 4000 bar
Media temperature	-40 ... +85 °C / -40 ... +185 °F					-40 ... +150 °C / -40 ... +302 °F									
Operating and storage temperature	-40 ... +85 °C / -40 ... +185 °F					-40 ... +125 °C (-25 ... +85 °C at cable output) -40 ... +257 °F (-13 ... +185 °F at cable output)									
Material with medium contact	Stainless Steel AISI 316 Ti (EN 1.4571), Silicone Elastomer and NBR seal (For applications with non-aggressive gases and fluids or substances which do not react with above mentioned materials)					Stainless Steel AISI 630 (EN 1.4542), AISI 316 L (EN 1.4435) on request									
Overall accuracy at operating temperature	≤ 1.0 %FS (0 ... +85 °C) / (32 ... +185 °F) ≤ 2.5 %FS (-40 ... 0 °C) / (-40 ... +32 °F)					≤ 0.5 %FS (0 ... +105 °C) / (32 ... +221 °F) ≤ 1.5 %FS (-40 ... 0 °C and +105 ... +125 °C) / (-40 ... +32 °F and +221 ... +257 °F)									
Thereof linearity, pressure hysteresis and repeata- bility (Linearization with limit point setting)	< 0.25 %FS					< 0.25 %FS									
Long-term stability	< 0.2 %FS p.a.					< 0.2 %FS p.a.									

¹⁾ Pressure range on request, not applicable for the SENT variant.

²⁾ Only applicable for the SENT variant.

³⁾ For common-rail applications.

TECHNICAL DATA

Available Outputs

Type	Component	Description/Value
CAN	Output protocol	STW-CAN, CANopen, SAE J1939
	Sampling Rate	1000 Samples/s (max.)
	Digital Filter	Averaging adjustable
	Electrical connection	M12 connector (plastic or stainless steel), DIN Bayonet (per DIN 72585), DT04-4P, cable output Other connectors on request
SENT	Output protocol	SENT according to SAE J2716 APR2016 (Rev. 4) https://www.sae.org/standards/content/j2716_201604
	Protocol configuration	Fast Channel Frame Format: H.4 with sensor type P/S/t (Pressure/Secure Sensor/Temperature in supplementary channel) Slow Channel Messages: "Enhanced Serial Format" with Diagnostic Error Codes, identification and supplementary information
	Electrical connection	5 V version: M12 connector (plastic), DIN bayonet (per DIN 72585), DT04-4P, DT04-3P, AMP-Superseal 1.5, cable output 8 ... 36 V version: DT04-3P, AMP Superseal 1.5 Other connectors on request
Analog	Output signal	4 ... 20 mA (2-wire technique), 0 ... 20 mA (3-wire technique), 4 ... 20 mA (3-wire technique), 0 ... 10 V, 0 ... 5 V, 1 ... 6 V, 10 ... 90 %VCC (ratiometric output) Other output signals on request
	Electrical connection	M12 connector (plastic or stainless steel), DIN bayonet (per DIN 72585); DT04-4P, DT04-3P, AMP Superseal 1.5, cable output Other connectors on request

TECHNICAL DATA

Mechanical Data

Component	Description/Value
Pressure connection	G 1/4", G 1/4" with manometer pin, 1/4" NPT, SAE04 (7/16-20UNF), SAE06 (9/16-18UNF), selected metrical pressure connectors, e.g. M14 x 1.5 and other pressure connectors on request, possible limitations of the pressure range. Pressure connections are available with a reduced diameter of the pressure channel to dampen pressure peaks.
Material housing	Stainless steel, AISI 304 (EN 1.4301)
Material connector	Glass-fiber reinforced plastic (PBT) or AISI 304 (EN 1.4301)
Installation torque	Max. 35 Nm
Protection class	IP67 and IPX9K (depends on the electrical connection)

Power Supply, Cable Connection

Parameter	Description
Voltage supply (DC)	U_{VCC} : 9 ... 36 V (for transmitter with 0...20 mA or 4 ... 20 mA current output or voltage output ≤ 6 V or CAN) U_{VCC} : 14 ... 36 V (for transmitter with 0 ... 10 V voltage output) U_{VCC} : 5 V $\pm$ 10 % (for transmitter with ratiometric output) U_{VCC} : 4.75 ... 5.25 V (for transmitter with SENT interface, version for 5 V sensor supply) U_{VCC} : 8 ... 36 V (for transmitter with SENT interface, version with integrated voltage regulator)
Electrical protection	Short circuit protected, signal on GND/VCC and inverse polarity protection (not at ratiometric output)
Maximum cable length	For CE conformity (EMC), the maximum overall cable length must not exceed 30 m

Functional safety

Standard	Description
EN ISO 13849-1:2015	PL b / Category B $MTTF_D = 949.9$ years (high) for M01 4 ... 20 mA (2-wire technique) $MTTF_D = 724.6$ years (high) for M01 CAN $MTTF_D = 1507.1$ years (high) for M01 SENT
SN 29500	$MTTF = 475.0$ years for M01 4 ... 20 mA (2-wire technique) $MTTF = 362.3$ years for M01 CAN $MTTF = 753.6$ years for M01 SENT

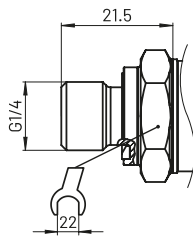
TECHNICAL DRAWINGS AND PIN ASSIGNMENTS

Available Standard Pressure Connections

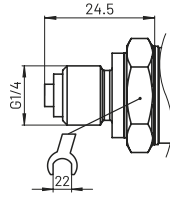
Connection

Drawing

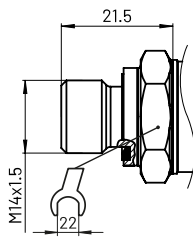
G1/4", DIN EN ISO 1179-2:2014-03 (formerly DIN 3869:1994-05)



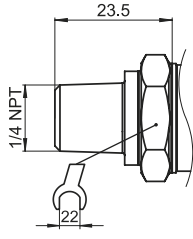
G1/4" according to DIN EN 837-1:1997-02 (formerly DIN 16288)



M14 x 1.5, DIN EN ISO 9974-2:2000-09



1/4" NPT per „Nominal width for US-standard bevelled pipe thread NPT“

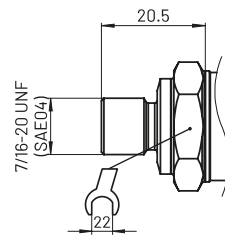


Available Standard Pressure Connections

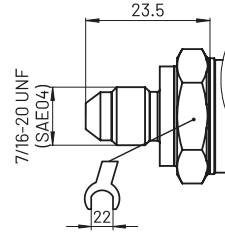
Connection

Drawing

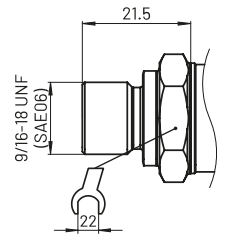
SAE04 (7/16-20UNF) - O-Ring



SAE04 (7/16-20UNF) - Cone



SAE06 (9/16-18UNF) - O-Ring



TECHNICAL DRAWINGS AND PIN ASSIGNMENTS

Available Electrical Connections, Protection Class

Connection Circular plug-in connector M12x1, 5-pole, IP67 applicable for CAN, SENT and analog Version

Drawing

PBT-GF30
L = 30.8
L = 24.4 ratiometric and SENT

Pins

Pin Assignment

Pin	2-wire technique	3-wire technique	CAN
1	VCC	VCC	PE, housing
2	-	-	VCC
3	SIG	GND	GND
4	-	SIG	CAN_H
5	-	-	CAN_L

Do not connect the pins marked with „-“!

Connection Circular plug-in connector M12x1, 5-pole, IP67 applicable for CAN and analog Version

Drawing

stainless steel

Pins

Pin Assignment

Pin	2-wire technique	3-wire technique	CAN
1	VCC	VCC	PE, housing
2	-	-	VCC
3	SIG	GND	GND
4	-	SIG	CAN_H
5	-	-	CAN_L

Do not connect the pins marked with „-“!

Connection Bayonet connector DIN 72585, 4-pole, IP67 applicable for CAN, SENT and analog Version

Drawing

L = 35.6
L = 29.2 ratiometric and SENT

Pins

Pin Assignment

Pin	2-wire technique	3-wire technique	CAN
1	VCC	VCC	VCC
2	SIG	GND	GND
3	-	SIG	CAN_H
4	-	-	CAN_L

Do not connect the pins marked with „-“!

Connection Connector DT04-4P, 4-pole, IP67 applicable for CAN, SENT and analog Version

Drawing

L = 43.7
L = 37.3 ratiometric and SENT

Pins

Pin Assignment

Pin	2-wire technique	3-wire technique	CAN
1	VCC	VCC	CAN_L
2	SIG	GND	VCC
3	-	SIG	GND
4	-	-	CAN_H

Do not connect the pins marked with „-“!

Available Electrical Connections, Protection Class

Connection Cable output IP67/IPX9K (Oil-resistant cable on request) applicable for CAN, SENT and analog Version

Drawing

L = 55.5
L = 49.1 ratiometric and SENT

Pins

Pin Assignment

Litz wire	2-wire technique	3-wire technique	CAN
brown	VCC	VCC	PE, housing
white	-	-	VCC
blue	SIG	GND	GND
black	-	SIG	CAN_H
grey	-	-	CAN_L

Do not connect the litz wires marked with „-“!

Connection Connector for AMP Superseal 1,5 3-pole, IP67 applicable for SENT and analog

Drawing

L = 38.2
L = 31.8 ratiometric and SENT version

Pins

Pin Assignment

Pin	2-wire technique	3-wire technique
1	SIG	GND
2	-	SIG
3	VCC	VCC

Do not connect the pins marked with „-“!

Connection Connector DT04-3P 3-pole, IP67 applicable for SENT and analog

Drawing

L = 42.7
L = 36.3 ratiometric and SENT version

Pins

Pin Assignment

Pin	2-wire technique	3-wire technique
A	VCC	VCC
B	-	SIG
C	SIG	GND

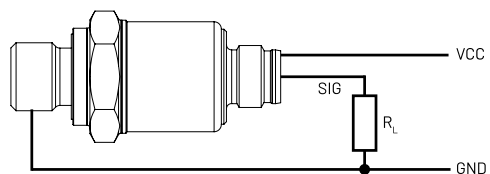
Do not connect the pins marked with „-“!

STW standard pin assignments are shown, other pin assignments on request. The actual pin assignment is shown on the product label.
Pin assignments for 3-wire technique are also applicable for versions with SENT interface.

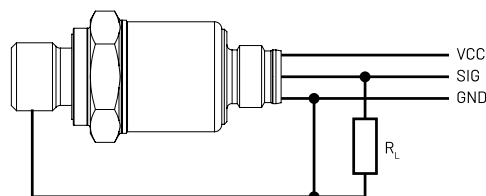
TERMINAL LAYOUTS

Recommended terminal layout

2-wire technique



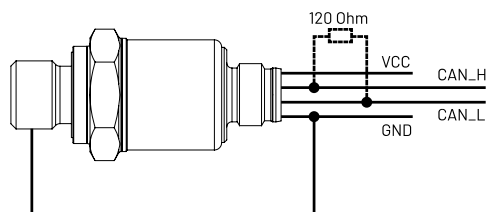
3-wire technique



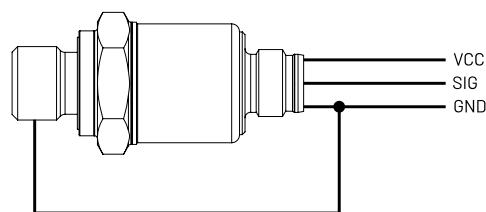
Current output load $R_L \leq (U_{VCC} - 9\text{ V}) / 0.02\text{ A}$ for $U_{VCC} \geq 24\text{ V}$
 additionally $R_L \geq (U_{VCC} - 24\text{ V}) / 0.048\text{ A}$

Voltage output load: $R_L \geq 10\text{ k}\Omega$

CAN



SENT



QUALIFICATION

Compliance Information

Standard

ISO/IEC 17050-1

UL recognized

KBA (Kraftfahrt-
Bundesamt)

Description



Conformity



UL File Number E317934



Certification

According UN ECE Regulation No. 10

DETAILED QUALIFICATION

EMC industrial (CE)

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
DIN EN 61000-6-3:2007 + A1:2011 DIN EN 55011:2007 + A2:2007	Emissions - Residential, commercial and light-industrial environments	Conducted emission 150 kHz to 30 MHz; Radiated emission 30 MHz to 1000 MHz, 10 m	Yes	Yes	Yes	—	—	—
DIN EN 61000-6-4:2007 DIN EN 55011:2007 + A2:2007	Emissions - Residential, commercial and light-industrial environments	Conducted emission 150 kHz to 30 MHz; Radiated emission 30 MHz to 1000 MHz, 10 m	—	—	—	Yes	—	—
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 55016-2-1:2014 + A1:2017	Emissions - Electrical equipment for measurement, control and laboratory use ^{TMC)}	150 kHz to 30 MHz conducted emission	—	—	—	—	Yes	Yes
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 55016-2-3:2017	Emissions - Electrical equipment for measurement, control and laboratory use ^{TMC)}	30 MHz to 1000 MHz radiated emission, 10 m	—	—	—	—	Yes	Yes
DIN EN 61000-6-2:2005 DIN EN 61000-4-2:1998 + A2:2001	Immunity - Industrial environments - Electrostatic discharge immunity test	330 Ω / 150 pF Contact discharge ± 2 , ± 4 kV Air discharge ± 2 , ± 4 , ± 8 kV	Yes	Yes	Yes	Yes	—	—
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-2:2009	Immunity - Electrical equipment for measurement, control and laboratory use - Electrostatic discharge immunity test ^{TMC)}	330 Ω / 150 pF Contact discharge ± 4 kV Air discharge ± 8 kV	—	—	—	—	Yes	Yes
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-2:2009	Immunity - Electrical equipment for measurement, control and laboratory use - Electrostatic discharge immunity test ^{SMC)}	330 Ω / 150 pF Contact discharge ± 4 kV Air discharge ± 8 kV	Yes	Yes	Yes	Yes	—	—
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-3:2006 + A1:2008 + A2:2010	Immunity - Electrical equipment for measurement, control and laboratory use - Radiated, radio-frequency, electromagnetic field immunity test ^{TMC)}	80 MHz to 1.0 GHz -> 10 V/m 1.4 GHz to 2 GHz -> 3 V/m 2 GHz to 2.7 GHz -> 1 V/m	—	—	—	—	Yes	Yes

DETAILED QUALIFICATION

EMC industrial (CE)

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
		3 m, horizontal and vertical AM 80 %, 1 kHz						
DIN EN 61000-6-2:2005 DIN EN 61000-4-3:1998 + A2:2001	Immunity - Industrial environments - Radiated, radio-frequency, electro-magnetic field immunity test	80 MHz to 2.7 GHz -> 10 V/m 3 m, horizontal and vertical AM 80 %, 1 kHz	Yes	Yes	Yes	Yes	—	—
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-3: 2011-04	Immunity - Electrical equipment for measurement, control and laboratory use - Radiated, radio-frequency, electromagnetic field immunity test ^{SMC}	80 MHz to 2.7 GHz -> 10 V/m 2.7 GHz to 6 GHz -> 3 V/m 3 m, horizontal and vertical AM 80 %, 1 kHz	Yes	Yes	Yes	Yes		
DIN EN 61000-6-2:2005 DIN EN 61000-4-4:2001 + A2:2001	Immunity - Industrial environments - Electrical fast transient / burst immunity test	Supply lines ± 2 kV data lines ± 1 kV waveform: 5/50 ns tr/th repetition frequency 5 kHz	Yes	Yes	Yes	Yes	—	—
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-4:2012	Immunity - Electrical equipment for measurement, control and laboratory use - Electrical fast transient / burst immunity test ^{TMC}	Supply lines ± 2 kV data lines ± 1 kV waveform: 5/50 ns tr/th repetition frequency 5 kHz	—	—	—	—	Yes	Yes
DIN EN 61000-6-2:2005 DIN EN 61000-4-5:2001	Immunity - Industrial environments - Surge immunity test	Supply lines (symmetrical) ± 0.5 kV Supply lines (asymmetrical) ± 0.5 kV	Yes	Yes	—	Yes	—	—
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-5:2014 + A1:2017	Immunity - Electrical equipment for measurement, control and laboratory use - Surge immunity test ^{TMC}	Supply lines (symmetrical) ± 0.5 , ± 1 kV Supply lines (asymmetrical) ± 0.5 , ± 1 , ± 2 kV	—	—	—	—	Yes	—
DIN EN 61000-6-2:2005 DIN EN 61000-4-6:2001	Immunity - Industrial environments - Immunity to conducted disturbances, induced by radio-frequency fields	150 kHz to 80 MHz, 10 V 80% AM, sine at 1 kHz	Yes	Yes	Yes	Yes	—	—

DETAILED QUALIFICATION

EMC industrial (CE)

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-6: 2012-11	Immunity - Electrical equipment for measurement, control and laboratory use - Immunity to conducted disturbances, induced by radio-frequency fields ^{TMC)}	150 kHz to 80 MHz, 3V 80% AM, sine at 1 kHz	—	—	—	—	Yes	Yes
DIN EN 61326-1:2013-07 DIN EN 61326-2-3:2013-07 DIN EN 61000-4-6: 2014-08	Immunity - Electrical equipment for measurement, control and laboratory use - Immunity to conducted disturbances, induced by radio-frequency fields ^{SMC)}	150 kHz to 80 MHz, 10 V 80% AM, sine at 1 kHz	Yes	Yes	Yes	Yes	—	—

SMC) applicable only for Silicon based Measurement Cell.

TMC) applicable only for Thin-film based Measurement Cell.

DETAILED QUALIFICATION

FCC, 47 CFR Part15, Subpart B

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
FCC 47 CFR Part15 Subpart B: 2007, Class A	Emissions - Conducted emission from power port	Frequency: 150 kHz - 30 MHz	—	—	—	Yes	—	—
FCC 47 CFR Part15 Subpart B: 2007, Class A	Emissions - Radiated emission	Frequency: 30 MHz - 1 GHz	—	—	—	Yes	—	—
FCC 47 CFR Part15 Subpart B: Class B	Emissions - Conducted emission from power port	Frequency: 150 kHz - 30 MHz	Yes	Yes	Yes	—	—	—
FCC 47 CFR Part15 Subpart B: Class B	Emissions - Radiated emission	Frequency: 30 MHz - 1 GHz	Yes	Yes	Yes	—	—	—
FCC Part15 class B: 2017 ANSI C63.4: 2014	Emissions - Conducted emission from power port ^{TMC)}	Frequency: 150 kHz - 30 MHz	—	—	—	—	Yes	Yes
FCC Part15 class B: 2017 ANSI C63.4: 2014	Emissions - Radiated emission ^{TMC)}	Frequency: 30 MHz - 1 GHz, 10 m	—	—	—	—	Yes	Yes
SMC) applicable only for Silicon based Measurement Cell.								
TMC) applicable only for Thin-film based Measurement Cell.								

DETAILED QUALIFICATION

EMC automotive

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
UN ECE R10 DIN EN 55025:2003-11, IEC/CISPR 25:2002	Emissions - Radiated emissions from components - ALSE method	150 kHz to 3 GHz, 1 m	Yes	Yes	Yes	Yes	—	—
UN ECE R10 DIN EN 55025:2003-11, IEC/CISPR 25:2002	Emissions - Radiated emissions from components - ALSE method TM	30 MHz to 1 GHz	—	—	—	—	Yes	Yes
IEC/CISPR 25:2002, DIN EN 55025:2003-11	Emissions - Conducted emission - voltage probe method TM	150 kHz - 108 MHz	Yes	Yes	Yes	Yes	—	—
IEC/CISPR 25:2002, DIN EN 55025:2003-11	Emissions - Conducted emission - current probe method TM	150 kHz - 108 MHz	Yes	Yes	Yes	Yes	—	—
UN ECE R10 ISO 11452-2:2004, ISO 11452-5:2002-04	Immunity - For components to electromagnetic Energy TM	ALSE - 400 MHz - 2000 MHz, 100 V/m Stripline - 0.01 MHz - 400 MHz, 200 V/m	—	—	Yes	—	—	—
UN ECE R10 ISO 11452-2:2004, ISO 11452-5:2002-04	Immunity - For components to electromagnetic Energy TM	ALSE - 400 MHz - 2000 MHz, 50 V/m Stripline - 0.01 MHz - 400 MHz, 200 V/m	Yes	Yes	—	—	—	—
UN ECE R10 ISO 11452-2:2004, ISO 11452-5:2002-04	Immunity - For components to electromagnetic Energy TM	ALSE - 400 MHz - 2000 MHz, 200 V/m Stripline - 0.01 MHz - 400 MHz, 200 V/m	—	—	—	Yes	—	—
UN ECE R10 ISO 11452-2:2000-03, ISO 11452-5:2002-04	Immunity - For components to electromagnetic Energy TM	ALSE - 1 GHz - 2 GHz, 30 V/m Stripline - 20 MHz - 1 GHz, 60 V/m	—	—	—	—	Yes	Yes
UN ECE R10 ISO 11452-2:2004,	Immunity - For components to electromagnetic Energy SM	ALSE - 200 MHz - 2000 MHz, 50 V/m BCI - 1 MHz - 400 MHz, 100 mA	Yes	Yes	Yes	Yes	—	—

DETAILED QUALIFICATION

EMC automotive

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
ISO 11452-4:2011-12, ISO 11452-5:2002-04		Stripline - 20 MHz - 1000 MHz, 60 V/m						
ISO 7637-2:2004	Emissions - Voltage transient emissions ^{TMC}	12 V: +75/-100 V	—	—	—	—	Yes	—
ISO 7637-2:2004	Emissions - Voltage transient emissions	24 V: +150/-450 V	Yes	Yes	Yes	Yes	Yes	—
UN ECE R10 ISO 7637-2:2004-09	Immunity - Electrical transient conduction along supply lines only (12V and 24V System) - Level 4	Pulse 1 (24 V) -600 V, 5000 pulses Pulse 1 (12 V) -100 V, 5000 pulses Pulse 2a (24 V) +50 V, 5000 pulses Pulse 2b (24 V), +20 V, 10 pulses Pulse 3a (24 V), -200 V, 1 h Pulse 3b (24 V), +200 V, 1 h Pulse 4 (24 V), -16 V, 2 pulses	—	—	—	Yes	—	—
UN ECE R10 ISO 7637-2:2004-09	Immunity - Electrical transient conduction along supply lines only (24V System) - Level 4	Pulse 1 (24 V) -600 V, 5000 pulses Pulse 2a (24 V) +50 V, 5000 pulses Pulse 2b (24 V), +20 V, 10 pulses Pulse 3a (24 V), -200 V, 1 h Pulse 3b (24 V), +200 V, 1 h Pulse 4 (24 V), -16 V, 2 pulses	Yes	Yes	—	—	—	—
UN ECE R10 ISO 7637-2:2004-09	Immunity - Electrical transient conduction along supply lines only (12V and 24V System) - Level 3 ^{TMC}	Pulse 1 (24 V) -450 V, 5000 pulses Pulse 2a (24 V) +37 V, 5000 pulses Pulse 2a (12 V) +37 V, 5000 pulses Pulse 2b (24 V), +20 V, 10 pulses Pulse 2b (12 V), +10 V, 10 pulses Pulse 3a (24 V), -150 V, 1 h Pulse 3b (24 V), +150 V, 1 h Pulse 4 (24 V), -12 V, 1 pulse Pulse 4 (12 V), -6 V, 1 pulse	—	—	—	—	Yes	—
ISO 16750-2:2012-11	Immunity - Environmental conditions and testing for electrical and elec-	Load Dump - Test B 48 V, 100 ms, 8 Ω, 5 pulses	—	—	—	Yes	—	—

DETAILED QUALIFICATION

EMC automotive

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
	tronic equipment – Part 2: Electrical loads ^{TMC)}							
ISO 7637-3:1999	Immunity - Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines (24V System) - Level 4 ^{TMC)}	CCC Pulse 3a: -200 V, 1 h Pulse 3b: +200 V, 1 h	Yes	Yes	—	—	—	—
ISO 7637-3:1999	Immunity - Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines (24V System) - Level 4 ^{TMC)}	CCC Pulse 3a: -80 V, 1 h Pulse 3b: +80 V, 1 h	—	—	Yes	Yes	—	—
ISO 10605:2001-12	Immunity - ESD component test method -Powered-up test ^{TMC)}	2 kΩ/330 pF Contact discharge: ±8 kV Air discharge: ±15 kV	—	—	Yes	Yes	—	—
ISO 10605:2001-12	Immunity - ESD component test method -Powered-up test ^{TMC)}	2 kΩ/150 pF Contact discharge: ±8 kV Air discharge: ±15 kV	Yes	Yes	Yes	Yes	—	—
ISO 10605:2001-12	Immunity - ESD component test method -Powered-up test ^{SMC)}	2 kΩ/330 pF Contact discharge: ±8 kV Air discharge: ±15 kV	Yes	Yes	Yes	Yes	—	—
ISO 10605:2001-12	Immunity - ESD component test method - Packaging and Handling test (unpowered test) ^{TMC)}	2 kΩ/150 pF Contact discharge: ±8 kV	—	—	Yes	Yes	—	—
ISO 10605:2001-12	Immunity - ESD component test method - Packaging and Handling test (unpowered test) ^{TMC)}	2 kΩ/330 pF Contact discharge: ±6, ±8 kV	Yes	Yes	Yes	Yes	—	—
SMC)	applicable only for Silicon based Measurement Cell.							
TMC)	applicable only for Thin-film based Measurement Cell.							

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
ISO 16750-4:2010-04	Tests at constant temperature: Low temperature - operation ^{TMC}	-40 °C for 24 h	—	—	—	—	Yes	Yes
DIN EN 60068-2-1:1995-03	Tests at constant temperature: Low temperature - operation	-40 °C for 96 h	Yes	Yes	Yes	Yes	—	—
DIN EN 60068-2-2/A2 :1995-01	Tests at constant temperature: High temperature - operation	+125 °C for 96 h	Yes	Yes	Yes	Yes	—	—
ISO 16750-4:2010-04	Tests at constant temperature: High temperature - operation ^{TMC}	+125 °C for 96 h	—	—	—	—	Yes	Yes
DIN EN 60068-2-2/A2 :1995-01	Tests at constant temperature: High Temperature endurance test ^{TMC}	+70 °C for 500 h	Yes	Yes	Yes	—	—	—
DIN EN 60068-2-14:2000-08	Temperature cycling test - Rapid change of Temperature	10 cycles, -40 °C to +125 °C Transfer time < 30 s Dwell time: 60 min. In operation	Yes	Yes	Yes	Yes	—	—
DIN EN 60068-2-14:2000-08	Temperature cycling test - specified change rate of Temperature	10 cycles, -40 °C to 125 °C Temp. Change rate: 3K/min. Dwell time: 60 min. In operation	Yes	Yes	Yes	Yes	Yes	Yes
ISO 16750-4:2010-04	Ice water shock test - Submersion test	number of cycles: 10 holding time(th) at Tmax +125 °C: 1 h water temperature: 0 °C to +4 °C immersion time: 5 min. In operation	Yes	Yes	Yes	Yes	Yes	Yes
DIN EN 60068-2-52:2000-02	Salt spray test - cyclic ^{TMC}	5% NaCl, 4 cycles á 24 h, +35 °C	Yes	Yes	Yes	Yes	—	—

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
DIN EN 60068-2-30:2000-02, DIN 50016:1962-12	Humid heat - Damp heat cyclic test ^{TMC)}	+25 °C to +55 °C and 96% relative humidity 6 cycles á 24 h	Yes	Yes	Yes	Yes	—	—
DIN EN 60068-2-78:2002-09	Damp heat, steady-state test	+40 °C and 96% relative humidity Not in operation for 20 days 23 h In operation for the last hour Duration: 21 days	Yes	Yes	Yes	Yes	—	—
ISO 16750-4:2010-04 IEC 60068-2-60	Corrosion test with flow of mixed gas ^{TMC)}	Test Ke, Method 4 Duration: 10 days SO ₂ , H ₂ S, NO ₂ , Cl ₂	Yes	Yes	Yes	Yes	Yes	Yes
DIN EN ISO 6270-2:2005	Condensation water atmospheres ^{TMC)}	4 cycles, 96 h	Yes	Yes	Yes	Yes	—	—
DIN EN 60068-2-14 Na:2000-08	Life-time Temperature cycling test - Rapid change of Temperature (Weibull) ^{TMC)}	Test duration: 9 days Min. temperature: -50 °C Max. temperature: +125 °C Holding time: 30 min. Cycles: 216	Yes	Yes	Yes	Yes	—	—
ISO 16750-1:2018 Annex B	Life-time Temperature cycling test - Rapid change of Temperature (Weibull) ^{SMC)}	Test duration: 12 days Min. temperature: -50 °C Max. temperature: +125 °C Holding time: 30 min. Cycles: 268 Not in operation	Yes	Yes	Yes	Yes	—	—
DIN EN 60068-2-6: 2008-10	Vibration (sinusoidal) ^{TMC)}	10 Hz - 2000 Hz - 10 Hz, 1 oct/min., 5 g 10 cycles, bidirectional	—	—	—	—	Yes	Yes
DIN EN 60068-2-6:1996-05	Vibration (sinusoidal) ^{TMC)}	5 Hz - 2000 Hz - 5 Hz, 1 oct/min., 20 g 5 h /axis, 3 axes	—	—	—	Yes	—	—

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
DIN EN 60068-2-6:2008 DIN EN 60068-2-14:2009	Vibration (sinusoidal) with temperature superimposition ^{TMC)}	5 - 2000 - 5 Hz, 1 oct/min., 20 g 5 h/axis, 3 axes Test Nb, Temperature superimposition: -40 °C to +125 °C, 3 K/min. Duration time= 15 min., Change= 60 min. 2 Temp. cycles/axis	—	—	—	—	Yes	Yes
ISO 16750-3:2012 Test VI IEC 60068-2-80	Vibration (sinusoidal & random) with temperature superimposition ^{TMC)}	94 h/axis, 3 axes, mixed mode vibration (sine and random) Temperature superimposition: -40 °C to +125 °C	Yes	Yes	—	Yes	—	—
DIN EN 60068-2-6:2008 DIN EN 60068-2-14:2010	Vibration (sinusoidal) with temperature superimposition ^{SMC)}	5 - 2000 - 5 Hz, 1 oct/min., 20 g 5 h/axis, 3 axes Test Nb, Temperature superimposition: -40 °C to +85 °C, 3 K/min. Duration time= 15 min., Change= 60 min. 2 Temp. cycles/axis	Yes	Yes	Yes	Yes	—	—
ISO 16750-3:2012 Test VII	Vibration (random) with temperature superimposition ^{SMC)}	10 - 2000 Hz, 32 h/axis, 3 axes, random vibration Temperature superimposition: -40 °C to +85 °C, 4 cycles	Yes	Yes	Yes	Yes	—	—
DIN EN 60068-2-27:1995-03	Mechanical shock ^{TMC)}	Acceleration: 50 g, half sine Time: 11 ms 3 Shocks/direction, 6 directions	Yes	Yes	—	Yes	—	—

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
DIN EN 60068-2-27:2009	Mechanical shock ^{TMC)}	Acceleration: 50 g, half sine Time: 11 ms 3 Shocks/direction, 6 directions	—	—	—	—	Yes	Yes
DIN EN 60068-2-27:1995-03	Mechanical shock ^{TMC)}	Acceleration: 500 g, half sine Time: 1 – 2 ms 3 Shocks/direction, 6 directions	Yes	Yes	—	Yes	—	—
DIN EN 60068-2-29:1995-03	Bump	Acceleration: 30 g, half sine Time: 6 ms 500 Shocks/direction, 6 directions	Yes	Yes	—	Yes	—	—
DIN EN 60068-2-27:2009	Bump ^{TMC)}	Acceleration: 30 g, half sine Time: 6 ms 500 Shocks/direction, 6 directions	—	—	—	—	Yes	Yes
ISO 16750-3: 2012 DIN EN 60068-2-31: 2009-04	Free fall ^{TMC)}	3 devices, 2 falls every device on the opposite side of the housing drop height: 1 m to concrete ground or steel plate	—	—	—	—	Yes	Yes
DIN EN 60068-2-32:1995-03	Free fall ^{TMC)}	1 device, 6 falls each side of the housing drop height: 1 m on iron plate	Yes	Yes	—	Yes	—	—
ISO 16750-3: 2012 IEC 60068-2-31: 2008	Free fall ^{SMC)}	3 devices, 2 falls every device on the opposite side of the housing drop height: 1 m to concrete ground or steel plate	Yes	Yes	Yes	Yes	—	—
SAE J 1211 part 4.4:1978-11	Immersion and splash ^{TMC)}	Agents: gasoline, diesel, degreaser, anti-freezing agent After test: drying at +125 °C, 48 h	Yes	Yes	Yes	Yes	Yes	Yes

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter	Analog Voltage	Analog Current	Analog Ratio-metric	CAN	SENT 8 ... 36 V	SENT 5 V
ISO 16750-5:2010	Chemical resistance	Agents: diesel, motor oil, hydraulic oil, gear oil, bio-diesel, E10, urea "Caelo" After test: drying at +70 °C, 48 h	Yes	Yes	Yes	Yes	Yes	Yes
DIN EN 60529:1991	IP Protection grade	IP67 (depending on connector type)	Yes	Yes	Yes	Yes	Yes	Yes
DIN 40050-9:1993-05	IP Protection grade	IPX9K (depending on connector type)	Yes	Yes	Yes	Yes	Yes	Yes
SMC)	applicable only for Silicon based Measurement Cell.							
TMC)	applicable only for Thin-film based Measurement Cell.							

ORDER CODES

Model				Pressure Range				Unit				Reference		Output		Pressure Connection		Electrical Connection	
	M	0	1	-				-				-	-			-			
								b a r				R		0 1		0 1		0 1	
								p s i				Relative		4 ... 20 mA (2-wire technique)		G $\frac{1}{4}$ "		M12 (plastic)	
												A		0 2		0 8		0 4	
												Absolute (≤ 7 bar)		0 ... 20 mA (3-wire technique)		G $\frac{1}{4}$ " with manometer		Bayonet connector (DIN 72585)	
														1 1		0 4		0 5	
														4 ... 20 mA (3-wire technique)		$\frac{1}{4}$ " NPT		AMP Superseal 1.5	
														0 3		0 9		0 6	
														0 ... 10 V		SAE04 ($\frac{7}{16}$ -20UNF) - Cone		Cable (2.5 m)	
														0 4		1 0		0 7	
														0 ... 5 V		SAE04 ($\frac{7}{16}$ -20UNF) - O-Ring		Cable (5 m)	
														0 5		1 1		0 9	
														1 ... 6 V		SAE06 ($\frac{9}{16}$ -18UNF) - O-Ring		DT04-4P	
														0 6		...		1 0	
														10 ... 90 % VCC		Customer specific		DT04-3P	
														0 8				1 1	
														CANopen				M12 (stainless steel)	
														0 9				...	
														SAE J1939				9 9	
														1 0				Customer specific	
														STW-CAN					
														1 2					
														SENT SAE J2716 5 V					
														1 3					
														SENT SAE J2716 8 ... 36 V					
														...					
														9 9					
														Customer specific					

Minimum order quantity and shipment lot sizes may apply.