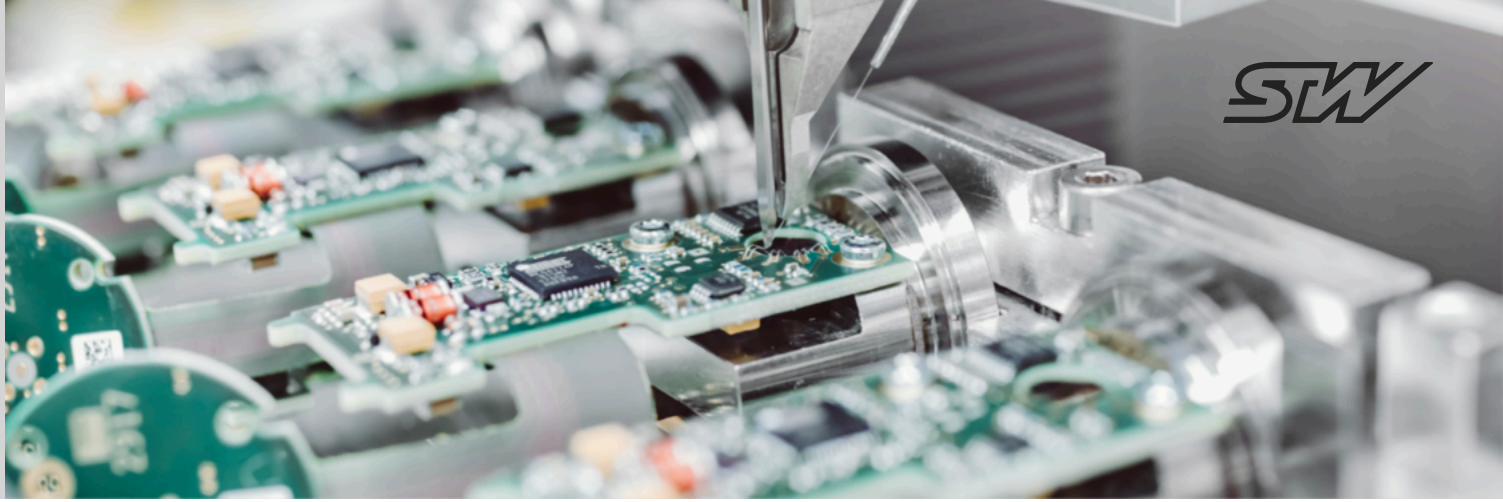

F01 Safety

Pressure switches

KEY FEATURES

- Safety pressure switch for applications that require a Performance Level PL d according to EN ISO 13849-1:2015
- Compact and robust design for use in harsh environments
- High media compatibility (with welded stainless steel measurement cell)
- Flexibility through modular design, customization and individualization possible
- Designed for OEM needs
- With ECE type approval

TECHNICAL DATA

- Pressure ranges from 0 ... 20 bar to 0 ... 1200 bar (relative)
- Operating temperature range -40 ... +85 °C / -40 ... +185 °F with media temperatures up to +125 °C / +257 °F
- Safe measurement of pressure, safe output of analog values and signals, safe detection of switching point, safe switching of outputs
- Available with two switching PNP outputs or one switching and one current output
- Protection class IP67

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TECHNICAL DATA

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

Component	**Description/Value**						
Pressure reference	Relative R (gauge G)						
Standard pressure range	20 bar	50 bar	100 bar	250 bar	400 bar	800 bar	1200 bar
Maximum allowable pressure	30 bar	75 bar	150 bar	425 bar	650 bar	1000 bar	1600 bar
Bursting pressure (per DIN EN 60770-1)	200 bar	500 bar	1000 bar	2500 bar	4000 bar	> 4000 bar	> 4000 bar
Media temperature	-40 ... +125 °C / -40 ... +257 °F						
Operating temperature	-40 ... +85 °C / -40 ... +185 °F						
Storage temperature	-40 ... +100 °C / -40 ... +212 °F						
Material with medium contact	Stainless Steel AISI 630 (EN 1.4542)						
Switch point accuracy under reference conditions (load 100 Ω, temperature in steady state, accuracy valid for SIG1)	≤ 1.0 %FS (0 ... +85 °C) / (+32 ... +185 °F) ≤ 1.5 %FS (-25 ... 0 °C) / (-13 ... +32 °F) ≤ 2.5 %FS (-40 ... −25 °C) / (-40 ... -13 °F)						
Thereof linearity, pressure hysteresis and repeatability (Linearization with limit point setting)	< 0.5 %FS						
Long-term stability	< 0.2 %FS p.a.						

Available Outputs

Type	**Component**	**Description/Value**
Analog	Output signal	Option 1: 2 x PNP Option 2: 1 x PNP and 1 x current output (4 ... 20 mA)
	Electrical connection	M12 connector (with stainless steel thread)

TECHNICAL DATA

Mechanical Data

Component	Description/Value
Pressure connection	G 1/4", other pressure connectors like 1/4" NPT, SAE04 (7/16-20UNF), SAE06 (9/16-18UNF), M10, M12, M14, M16 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	Stainless steel AISI 304 (EN 1.4301)
Weight	F01 (wrench-size 19) with G 1/4" and M12 x 1 stainless steel: approx. 120 g
Installation torque	Max. 35 Nm
Protection class	IP67

Power Supply, Cable Connection

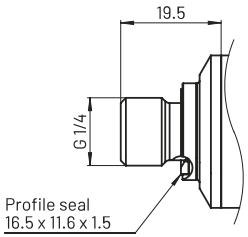
Parameter	Description
Voltage supply (DC)	U_{VCC}: 8 ... 36 V
Electrical protection	Short circuit protected, signal on GND/VCC and inverse polarity protection
Maximum cable length	For CE conformity (EMC), the maximum overall cable length must not exceed 30 m

Functional safety

Standard	Variant with two switching outputs	Variant with switching and current output
EN ISO 13849-1:2015	PL d / Category 2 $MTTF_D$ = 250.6 years DC_{avg} = 76.6 % CCF 70 points	PL d / Category 2 $MTTF_D$ = 244.6 years DC_{avg} = 77.1 % CCF 70 points
SN 29500	MTTF = 166 years	MTTF = 160 years

TECHNICAL DRAWINGS AND PIN ASSIGNMENTS

Available Standard Pressure Connections

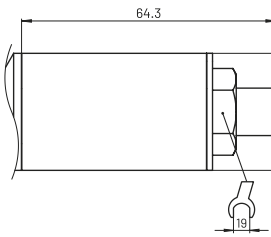
Connection	Drawing
G1/4", DIN EN ISO 1179-2:2014-03 (formerly DIN 3869:1994-05)	

Available Electrical Connections, Protection Class

Connection

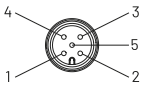
Circular plug-in connector M12x1, 5-pole, IP67

Drawing



stainless steel

Pins



Pin Assignment

Pin	Option 1	Option 2
1	VCC	VCC
2	OUT2	SIG
3	GND	GND
4	OUT1	OUT
5	-	-

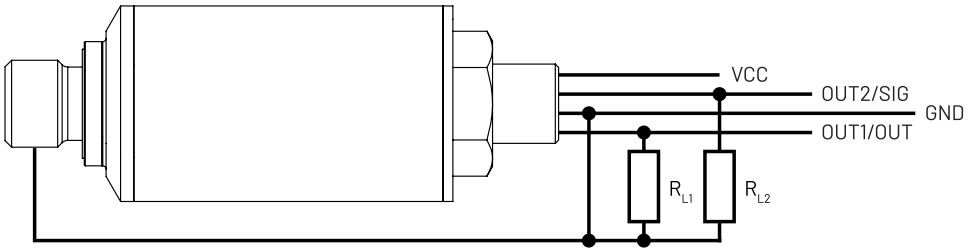
SIG: 4 ... 20 mA current output
OUT: switching output
Do not connect the pins marked with „-"!

STW standard pin assignments are shown, other pin assignments on request. The actual pin assignment is shown on the product label.

TERMINAL LAYOUTS

Recommended terminal layout

Option 1/Option 2



QUALIFICATION

Compliance Information

Standard	Description
ISO/IEC 17050-1	Conformity
KBA (Kraftfahrt-Bundesamt)	Certification According UN ECE Regulation No. 10

DETAILED QUALIFICATION

EMC industrial (CE)

Standard	Test Description	Test Parameter
DIN EN 61000-6-3:2007 + A1:2011 CISPR 16-2-3:2006	Emissions - Residential, commercial and light-industrial environments	Radiated emission 30 MHz to 1000 MHz, 3 m
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 ±8 kV Air discharge ±15 kV
DIN EN 61000-6-2:2005 DIN EN 61000-4-3:2002 + A1:2002	Immunity - Industrial environments - Radiated, radio-frequency, electromagnetic field immunity test	80 MHz to 2.7 GHz → 10 V/m 3 m, horizontal and vertical AM 80 %, 1 kHz
DIN EN 61000-6-2:2005 DIN EN 61000-4-4:2004	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
DIN EN 61000-6-2:2005 DIN EN 61000-4-5:1995 + A1:2001	Immunity - Industrial environments - Surge immunity test	Supply lines (symmetrical) ±0.5 kV Supply lines (asymmetrical) ±0.5 kV
DIN EN 61000-6-2:2005 DIN EN 61000-4-6:2002	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 Coupling only on signal lines

DETAILED QUALIFICATION

EMC automotive

Standard	Test Description	Test Parameter
UN ECE R10 DIN EN 55025:2003-11, IEC/CISPR 25:2002	Emissions - Radiated emissions from components - ALSE method	30 MHz to 1 GHz
UN ECE R10 ISO 11452-2:2004, ISO 11452-5:2002-04	Immunity - For components to electromagnetic Energy	ALSE - 400 MHz - 2000 MHz, 30 V/m Stripline - 20 MHz - 400 MHz, 200 V/m
ISO 7637-2:2004	Emissions - Voltage transient emissions	24 V: +150/-450 V
UN ECE R10 ISO 7637-2:2004-09	Immunity - Electrical transient conduction along supply lines only (12V and 24V System) - Level 3	Pulse 1 (24 V) -450 V, 5000 pulses Pulse 2a (24 V) +37 V, 5000 pulses Pulse 2b (24 V), +20 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, 10 pulses Pulse 4 (12 V), -6 V, 10 pulses
ISO 7637-3:2007-07	Immunity - Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines (24V System) - Level 4	CCC Pulse 3a: -80 V, 1 h Pulse 3b: +80 V, 1 h
ISO 10605:2008-07	Immunity - ESD component test method -Powered-up test	2 kΩ/330 pF Direct contact discharge: ±4, ±8 kV Indirect contact discharge, HCP: ±4, ±8 kV
ISO 10605:2008-07	Immunity - ESD component test method - Packaging and Handling test (unpowered test)	2 kΩ/150 pF Contact discharge: ±2, ±4, ±8 kV

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter
DIN EN 60068-2-1:2007-03	Tests at constant temperature: Low temperature - operation	-40 °C for 96 h
DIN EN 60068-2-2:2007-07	Tests at constant temperature: High temperature - operation	+85 °C for 96 h
ISO 16750-4:2010-10 IEC 60068-2-14:2009-01	Temperature cycling test - Rapid change of Temperature	100 cycles, -40 °C to +125 °C Transfer time ≤ 30 s Dwell time: 40 min. In operation
ISO 16750-4:2010-10 IEC 60068-2-14:2009-01	Temperature cycling test - specified change rate of Temperature	30 cycles, -40 °C to 125 °C Duration per cycle: 8 h In operation
ISO 16750-4:2010-10	Ice water shock test - Submersion test	number of cycles: 10 h olding time(th) at Tmax +85 °C: 1 h water temperature: 0 °C to +4 °C immersion time: 5 min. In operation
DIN EN 60068-2-52:2000-02	Salt spray test - cyclic	5% NaCl, 4 cycles á 24 h, +35 °C
ISO 16750-4:2010 IEC 60068-2-38:2009-01	Humid heat - Test 2: Composite temperature / humidity cyclic test	Test Z/AD 10 cycles á 24 h, upper temperature +65 °C lower temperature +25/-10 °C 96% relative humidity In operation when the maximum cycle temperature is reached;
ISO 16750-4:2010 LV 124-2:2009-11	Humid heat - Test 3: Dewing test	Lower temperature: +25 °C Upper temperature: +80 °C 5 cycles and 98% relative humidity Duration per cycle: 300 min. In operation

DETAILED QUALIFICATION

Climatic and mechanical tests

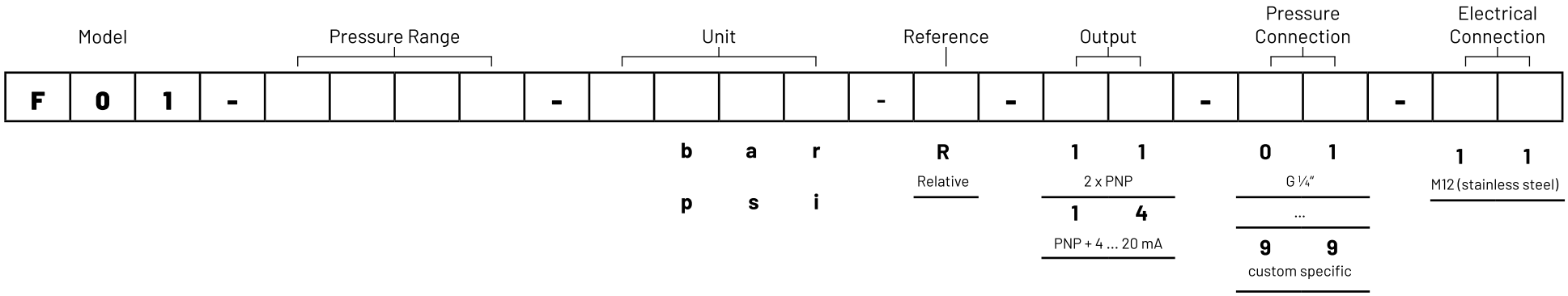
Standard	Test Description	Test Parameter
DIN EN 60068-2-78:2002-09	Damp heat, steady-state test	+40 °C and 96% relative humidity Not in operation for 20 days 23 h In operation for the last hour Duration: 21 days
ISO 16750-4:2010-04 IEC 60068-2-60	Corrosion test with flow of mixed gas	Test Ke, Method 4 Duration: 10 days SO_2 , H_2S , NO_2 , Cl_2
ISO 16750-1	Life-time Temperature cycling test - Rapid change of Temperature (Weibull)	Test duration: 30 days Min. temperature: -40 °C Max. temperature: +125 °C Holding time: 60 min. Cycles: 355
DIN EN 60068-2-6:2007-12 DIN EN 60068-2-14:2009-01	Vibration (sinusoidal) with temperature superimposition	5 - 2000 hz, 1 oct/min., 20 g 6 h/axis, 3 axes Temperature superimposition: -40 °C to +85 °C, 6 cycles (3 x 2 h) Dwell time = 1 h
ISO 16750-3:2012-12 Test VII IEC 60068-2-64:2008-04	Vibration (random) with temperature superimposition	5 - 2000 hz, 32 h/axis, 3 axes, random vibration Temperature superimposition: -40 °C to +85 °C, 4 cycles
DIN EN 60068-2-27:2008-02	Mechanical shock	Acceleration: 50 g, half sine Time: 11 ms 3 Shocks/direction
DIN EN 60068-2-27:2008-02	Mechanical shock	Acceleration: 500 g, half sine Time: 1 - 2 ms 6 Shocks/direction
DIN EN 60068-2-27:2008-02	Bump	Acceleration: 30 g, half sine Time: 6 ms 1000 Shocks/direction

DETAILED QUALIFICATION

Climatic and mechanical tests

Standard	Test Description	Test Parameter
ISO 16750-3: 2012 DIN EN 60068-2-31:2009-04	Free fall	3 devices, 2 falls every device on the opposite side of the housing drop height: 1 m to concrete ground or steel plate
DIN EN 60068-2-6:2007-12	Resonance search	5 – 2000 hz, 1 oct/min, 3 axes
SAE J 1211 part 4.4:1978-11	Immersion and splash	Agents: gasoline, diesel, de-greaser, anti-freezing agent After test: drying at +125 °C, 48 h
ISO 16750-5:2010-10	Chemical resistance	Agents: brake fluid, anti-freeze fluid, protective lacquer remover, cold cleaning agent and denatured alcohol Application method: brushing After test: drying at +70 °C, 48 h
ISO 16750-5:2003-12	Chemical resistance	Agents: Diesel fuel, brake fluid, anti-freeze fluid, engine oil, cold cleaning agent, transmission fluid, After test: drying at +85 °C, 48 h Agents: protective lacquer remover, denatured alcohol After test: drying at +25 °C, 48 h
DIN EN 60529:1991	IP Protection grade	IP67

ORDER CODES



Minimum order quantity and shipment lot sizes may apply.