Compression force transducer with Thin-film sensor

Accuracy: 1 %
Output signal: 4...20 mA; 2-wire,
0...10 VDC; 3-wire

Optional ATEX/IECEX
II 2G Ex ib IIC T4/T3

Optional for SIL3-Applications
with 2-channel PC control

Description

In addition to our force transducer program with bonded foils, a new force transducer with a welded thin film sensor was developed. The usage of standardised sensors, which are welded into the measuring element, makes an automated manufacturing possible. Combined with an accuracy of 1%, the new compression force transducers are also of interest for OEM applications due to the attractive price- performance ratio.
Compression force transducers are often mounted directly in the forceflow. They are used for weight applications or overload measurement. Inside of machines they measure e.g. press, clamping or joining forces. Indirect mounted transducers can be used as torque supports for measurement of moments as well.
Different output signals are available: analogue standard output signals 4...20 mA, 0...10V or an mV/V output signal. These force transducers fulfil the regulations of EMC according to directive EN 61326.

ATEX/IECEX (Option)
Only equipment and protective systems with the corresponding certification and markings are to be put into operation in potentially explosive areas. Our force transducers with a thin-film measuring cell and integrated amplifier now have approval according to directive 94/9/EC in equipment group II (non-mining products), category 2G for zones 1 and 2 (gases). Other zones on request.

SIL-3 (Option)
In cooperation with the TÜV Süddeutschland a special security electronics has been developed for theatre and stage applications. It fulfils security standard SIL 3 with a 2-channel PC control in connection.
This international security standard for systems and processes is based on the standards IEC 61508 and 61511. The latter is used for ascertaining risk potentials of (engineering) systems. Depending on the potential existing risk a risk reduction has to be made. If automation components are used for that, they have to fulfil the demands of IEC 61508.
Both standards subdivide systems and risk reducing actions in four security steps: **SIL**1...SIL4 (**S**afety **I**ntegrity **L**evel) – from small up to very high risks. If persons are allowed to stay under hanging loads, e.g. in theatres, security level 3 (SIL 3) is valid.

UL-Certification (Option)
tecsis force transducers are also available with UL approval.

FM and CSA Approval submitted.

Features

- Thin film implant
  (instead of conventional bonded foil strain gauges)
- corrosion free stainless steel
- integrated amplifier
- small temperature drift
- high long term stability
- high shock and vibration resistance
- for dynamic or static measurements
- good repeatability
- easy to install

ATEX/IECEX (Option)
- for Zone 1 and 2
- II 2G Ex ib IIC T4/T3

SIL-3 (Option)
- Security electronic
- SIL-3 approval with
  2-channel PC control

Measuring range

- Compression forces 10 … 200 kN

Applications

- Torque support
- Automated manufacturing
- Plant engineering and machine building

ATEX/IECEX (Option)
- Mining
- Chemical and petrochemical industries
- Dedusting and filtration units

SIL-3 (Option)
For theatre and stage design:
- Above-stage machinery
- Below-stage machinery
- Point hoists
- Bar hoists

Model: F1301, F13C1

Technical data

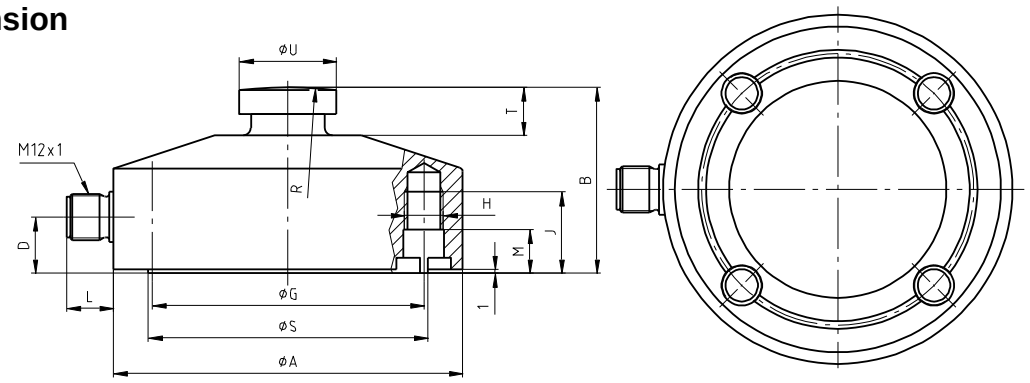
Model	**F1301**	**F13C1 ATEX/IECEX (Option)**	**F13C1 SIL-3 (Option)**
Nominal load F_{nom}	10 / 20 / 30 / 50 / 100 / 200 kN	10 / 20 / 30 / 50 / 100 / 200 kN	10 / 20 / 30 / 50 / 100 / 200[1)] kN
Combined error	< 1 % C_n		
Limit force	150 % F_{nom}		
Breaking force	> 300 % F_{nom}		
Hysteresis	≤± 0,2 % of F.S.C_n		
Cross sensitivity (Signal with 100% F_{nom} at 90°)	< 5% of F.S.		
Max. dynamic load	+70% F_{nom} acc. to DIN 50100 *		
Creep, 30 min. at F_{nom}	0,2 % of F.S. C_n		
Nominal deflection	see table		
Nominal temperature range	-20 … 80 °C		
Service temperature range	-40 … 80 °C		
Storage temperature	-40 … 80 °C		
Reference temperature	23 °C		
Temperature effect - span - zero	≤± 0,2 % of F.S. /10K ≤± 0,2 % of F.S. /10K		
Vibration resistance	20g, 100h, 50...150Hz (acc. to DIN EN 60068-2-6)		
Protection type (acc. to EN 60 529 / IEC 529)	IP 67		
Noise emission	acc. to EN 61326		
Noise immunity	acc. to EN 61326		
Insulation resistance	> 5 GΩ / 50 V		
Electrical protection	Reverse voltage, overvoltage and short-circuit-protection		
Analogue output - Output signal (output signal range: C_n) - Current consumption - Power requirement - Burden - Response time - Electrical connection	 4 … 20 mA, 2-wire or 0 ... 10 V, 3-wire Current output: Signal current Voltage output: approx. 8 mA 10 … 30 VDC for Current output 14 … 30 VDC for Voltage output ≤ (UB–6V) / 0,024 > 10 kΩ for Voltage output ≤ 1 ms (within 10 % … 90 % F_{nom}) Circular connector M12x1, 4-pin		4 … 16 mA – 2-wire; 0 ... 7 V – 3-wire ≤ 5 ms (within 10% … 90% F_{nom})
Relay power supply U_R Power consumption relay P_R Signal amplitude			Standard 24 V, max. 1.5 x UR, min. 0.8 x UR approx. 100 mW 4 ± 0.2 mA resp. 3 ± 0.2 V, others upon request
Material of measuring device	Stainless steel		
Weight	see table		
Certfication		⟨Ex⟩ II 2G Ex ib IIC T4/T3	TÜV: 2005-08-11/tecsis

Measuring element: stainless steel material
Other materials and geometries on request

*) for higher load please order higher load class
of F.S. = full scale

[1)] Elektronic in cable housing

Dimension



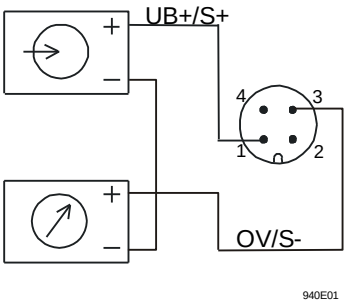
Nominal load	ØA -0.2	B	D	ØG	H	J	R	ØS-0.1	T	ØU -0,1	L	M	Nominal defelection mm	Weight g
10 kN	50	27	8.5	4.2	4xM5	13	60	43	10	17	19	4	< 0,05	~200
20 kN	90	48	14.5	70	4xM10	21	100	72	12.5	25	12	13	< 0,1	~1000
30 kN														
50 kN														
100 kN	115	60	14.5	90	4xM12	24	160	91.5	25	32	12	3	< 0,2	~1800
200 kN														

Electrical connection

F1301/F13C1 ATEX/IECEX (Option)

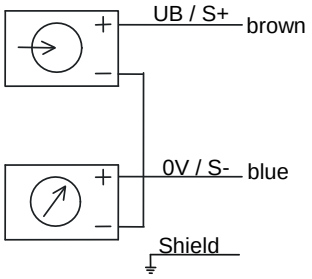
Analogue output 4..20mA (2-wire)

Circular connector M12x1, 4-pin



940E01

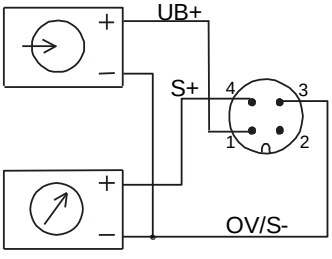
Cable output



940E03

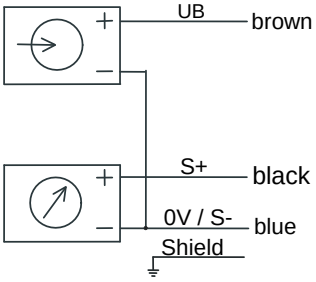
Analogue output 0...10V (3-wire)

Circular connector M12x1, 4-pin



940E04

Cable output



940E06

Pin configuration of connector M12x1 (4-pin) /
Open cable outlet of the tecsis standard connection cable (STL 288, black)

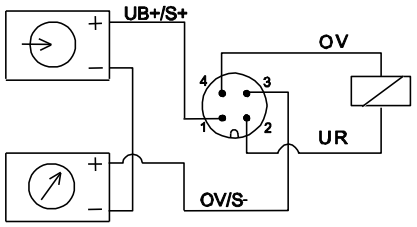
	4...20 mA (2 – wire)		0...10 VDC (3 – wire)	
	pin	**cable outlet**	**pin**	**cable outlet**
Supply: UB+	1	brown	1	brown
Supply: 0V	3	blue	3	blue
Signal: S+	1	brown	4	black
Signal: S-	3	blue	3	blue
⏚	thread M12x1	screen	thread M12x1	screen

	mV/V (4 – wire)	
	pin	**cable outlet**
Supply: UB+	1	brown
Supply: 0V	3	blue
Signal: S+	4	black
Signal: S-	2	white
⏚	thread M12x1	screen

F13C1 SIL-3 (Option)

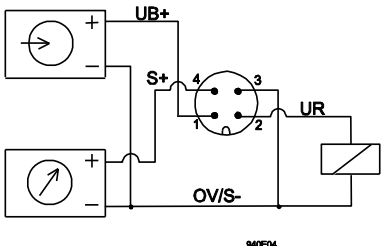
Output signal 4..20mA (2-wire)

Circular connector M12x1, 4-pin



Output signal 0...10V (3-wire)

Circular connector M12x1, 4-pin



Pin configuration M12x1 (4-pin) /
Open cable outlet of the tecsis standard connection cable (STL 288, black)

	4...20 mA (2 – wire)		0...10 VDC (3 – wire)	
	Pin	**Cable outlet**	**Pin**	**Cable outlet**
Supply: (UB+)	1	brown	1	brown
Supply: (0V)	3	blue	3	blue
Supply Relay: (UR)	2	white	2	white
Supply Relay: (0V)	4	black	3	blue
Signal: (+)	1	brown	4	black
Signal: (-)	3	blue	3	blue
⏚	thread M12x1	screen	thread M12x1	screen

Brief description SIL-3

Amplifier-Electronics 4...20mA or 0...10V
for SIL-3 applications with 2-channel PC control
(Certified by TÜV Süddeutschland, Germany)

Certificate-no.: 2005-08-11/tecsis

Force Transducers, which are based on strain gauges, are working with four variable resistors (R1...R4) connected to a Wheatstone Bridge. Caused by deformation of the body the respective opposite resistors are lengthened or compressed in the same way. This results in an unbalanced bridge and a diagonal voltage U_0.

This well proven design has been amended by an additional resistor R7 in order to monitor the condition of the amplifier unit and signal path. This resistor is connected as a shunt to resistor R5 by a relay contact (a) as soon as an excitation voltage U_r appears at relay A.

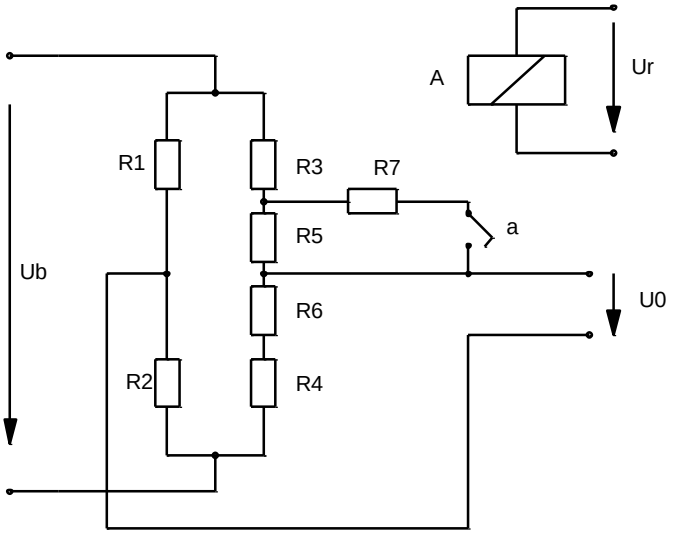
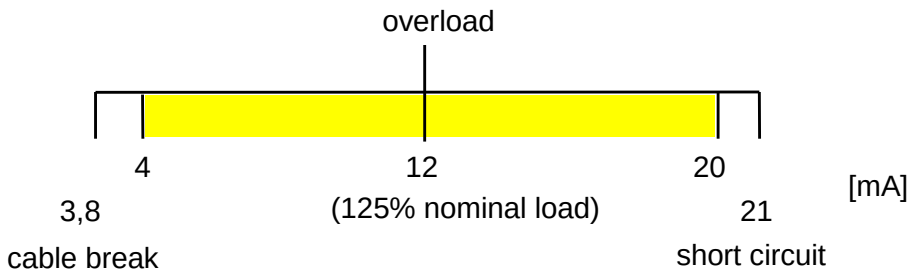


Fig.

The connection of resistor R7 will always result in a defined unbalancing of the zero point (diagonal voltage) of the Wheatstone Bridge.
An external independent control unit activates relay A which changes the output by a certain value. Because of security reasons the control unit has to be a 2-channel one. When the expected change of the output signal is detected it can be assumed that the whole signal path (Wheatstone Bridge – amplifier – output) works well. If it does not appear it can be concluded that there is a defect in the signal path.

The standard adjustment of force transducers with current output for overload control is e.g.:



With activating the check relay a fixed signal jump of 8 mA will exceed the overload limit in every working condition. The measurement's upper limit of 20 mA however will never be reached. This makes the checking of the signal jump possible.

Subject of technical changes