

Load pin with thin-film sensor for OEM applications

Accuracy: 2% or 1%
Output signals: 4...20 mA; 2-wire,
0...10 VDC; 3-wire
CANopen®

Optional ATEX/IECEX
Ex 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 2% or 1%, the load pins are also of interest for OEM applications due to the attractive price- performance ratio.

Thin film sensors, produced by very modern manufacturing technology, have all advantages of the conventional bonded foil strain gauges, but without having their substantial disadvantages (temperature drifts of the glue and creeping).

Load pins are suited to mounting in deviation rolls, fork heads and rolling bearings. Due to their structural shape load pins fit into the constructions directly replacing on existing bolt.

Different output signals are available: analogue standard-output signals (4...20 mA, 0...10V) or CANopen®-fieldbus. Load pins 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.

UL-Certification (Option)

tecsis force transducers are also available with UL approval.

Features

- thin film implants (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
- Ex II 2G Ex ib IIC T4/T3

SIL-3 (Option)

- Security electronic
- SIL-3 approval with 2-channel PC control; Certification: TÜV-Süd- No. Z-IS-ATA3-MAN 6000219499 acc. to EN 62061:2005

Measuring ranges

- 5 kN ... 70 kN

Applications

- shear bolt in deviation rolls and mountings on rolling bearings
- industrial weighing
- automation of the manufacturing process
- measuring of tensions in cables
- machine and plant construction

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

Technical data

Model	F5301	F53C1 ATEX/IECEx ¹⁾ (Option)	F53C1 SIL-3 (Option)
Nominal load F_{nom}	5 / 10 / 20 / 30 / 50 / 70 kN ²⁾	5 / 10 / 20 / 30 / 70 kN ²⁾	5 / 10 / 20 / 30 / 70 kN ²⁾
Limit load	150 % F_{nom}		
Breaking load	> 300 % F_{nom}		
Non-linearity	2.0 or 1.0 % of F.S.		
Cross sensitivity (Signal with 100% F_{nom} at 90°)	± 5 %		
Hysteresis	<0.2 % C_n of F.S.		
Max. dynamic load	± 80% F_{nom} acc. to DIN 50100		
Nominal deflection	see table		
Nominal temperature range	-20 ... +80°C		
Service temperature range	-40 ... +80°C		
Storage temperature	-40 ... +85 °C		
Temperature effect	0.2 % F_{nom} / 10K		
- span	0.2 % F_{nom} / 10K		
- zero signal			
Vibration resistance	20g, 100h, 50...150 Hz 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		
Analogue output			
- Output signal	4 ... 20 mA; 2-wire 0 ... 10 V DC; 3-wire	4 ... 16 mA - 2-wire; 0 ... 7 V - 3-wire	
- Current consumption	Current output 4 ... 20 mA: signal current; Voltage output approx. 8 mA	Current output: signal current; Voltage output approx. 8 mA	
- Power requirement	10 ... 30 V DC for current output 14 ... 30 V DC for voltage output		
- Burden	≤ (UB–6 V)/ 0.024 A for current output > 10 kΩ for voltage output		
- Response time	≤ 1 ms (within 10 % ... 90 % F_{nom})	≤ 5 ms (within 10 %-90 % F_{nom})	
Electrical connection	Circular connector M 12x1, 4-pin		
Material of measuring device	stainless steel		
Weight	see table		
CANopen[®] – data not shown separately correspond to the product with analogue output			
Output signal	CANopen [®] protocol acc. to CiA DS-301, Device profile DS-404 Communication services: LSS (CiA DSP 305) Services: Configuration of device address and baud rate; sync/async; node/lifeguarding, heartbeat		
Repeatability	≤± 0.1% of F.S.		
Stability per year	≤± 0.2% of F.S. at reference conditions		
Power requirement	12 ... 30 V DC		
Power consumption	< 1 W (with galvanic isolation)		
Adjustment	Zero point and span to ±10% by entries into object directory		
Response time	1 ms (baud rate ³ 125K) within 10... 90% of C_n F.S.		
Electrical connection	Circular connector M12 x 1 - 5-pin		
Relay power supply U_R			Standard 24 V, max. 1.5 x U_R , min. 0.8 x U_R
Power consumption relay P_R			approx. 100 mW
Signal amplitude			4 ± 0.2 mA resp. 3 ± 0.2 V, others upon request
Certification		 II 2G Ex ib IIC T4/T3	Certification: TÜV-Süd- No. Z-IS-ATA3-MAN 6000219499 acc. to EN 62061:2005

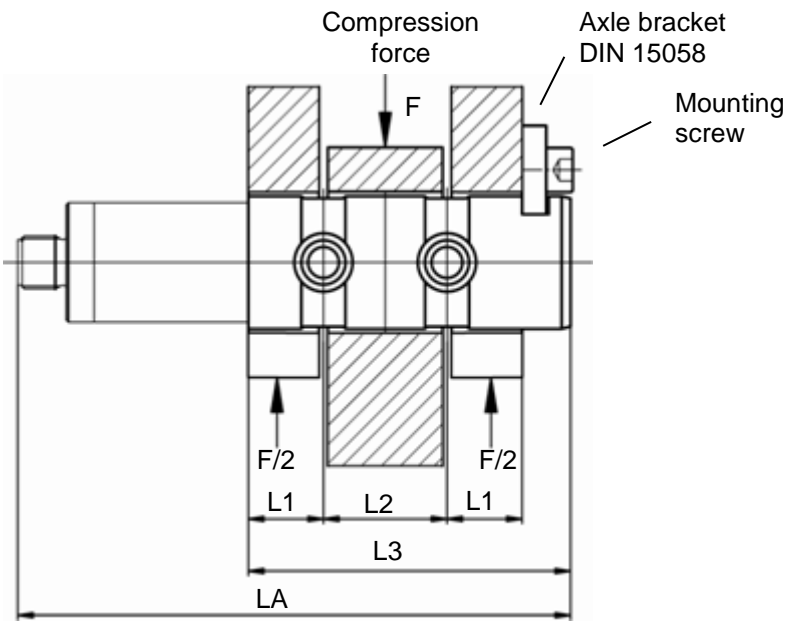
Construction: stainless steel material

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¹⁾ The force transducers with ignition protection type "ib" must only be supplied using galvanically-isolated power supplies. Suitable supply isolators are also optionally available: EZE08X030003 (1-channel) und EZE08X03000x (2-channel).

²⁾ For higher nominal load see model F5308/F53C8

Example of installation: load pin with surrounding parts



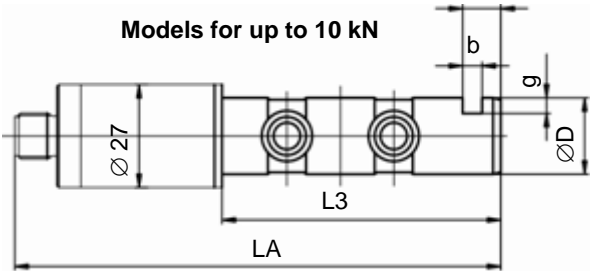
Arrangement of bearings at two ends: Tolerance of bearing-/ bolt pair H9/ f9

Measuring range [kN]	Dimensions in mm														Nominal deflection mm	Weight g
	ØD (f9) ¹⁾	LA	Ana- logue	CAN ²⁾	L1	L2	L3	a	b	c1	c2	Ød	f	g	h	
5	20	105	120	10	20	50.5	20	5	60	36	9	16	4.0	10	< 0.05	230
10	25	115	130	12.5	25	60.5	20	5	60	36	9	18	4.5	10		300
20	30	125	140	15	30	72.5	25	6	80	50	11	22	5.5	12		430
30	35	135	150	17.5	35	82.5	25	6	80	50	11	24	6	12		630
50/70	40	150	165	22.5	40	97.5	25	6	80	50	11	26	6.5	12		950

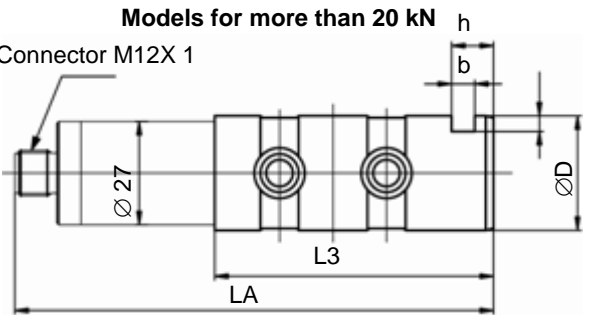
¹⁾ other load pin-Ø on demand

²⁾ case diameter 40 mm

Dimensions



Axle bracket acc. to DIN 15 058
(to be ordered separately)

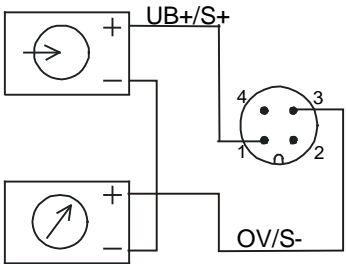


Electrical connection

F5301/F53C1 ATEX/IECEX (Option)

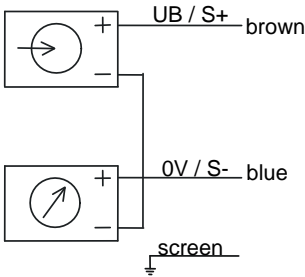
Output signal 4..20mA (2-wire)

Circular connector M12x1, 4-pin



940E01

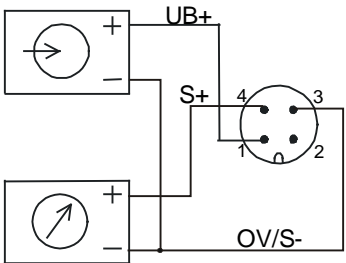
Cable outlet



940E03

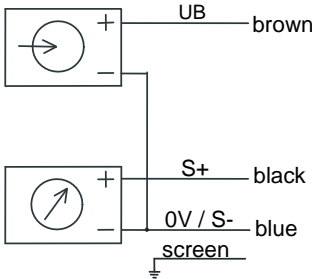
Output signal 0...10V (3-wire)

Circular connector M12x1, 4-pin



940E04

Cable outlet



940E06

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

Analogue output Electrial connection	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

CANopen®

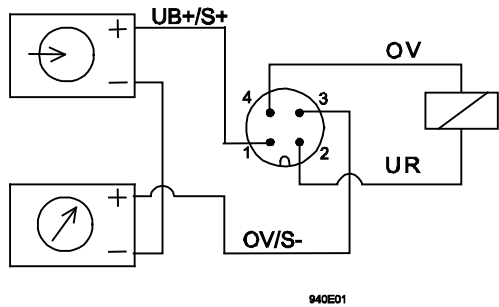
Connexion plug arrangement M12x1
(5-pin)

CANopen®	Pin
UB+ (CAN V+)	2
UB- (CAN GND)	3
Bus signal CAN-High	4
Bus signal CAN-Low	5
Screen	1

F53C1 SIL-3 (Option)

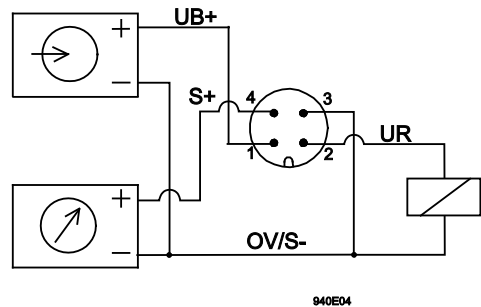
Analogue output 4..20mA (2-wire)

Circular connector M12x1, 4-pin



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

Circular connector M12x1, 4-pin



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

Analogue output Electrial connection	4...20 mA (2 – wire)		0...10 VDC (3 – wire)	
	pin	cable outlet	pin	cable outlet
Supply: (UB+)	1	brown	1	brown
Supply: (OV)	3	blue	3	blue
Supply Relay: (UR)	2	white	2	white
Supply Relay: (OV)	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)



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 .

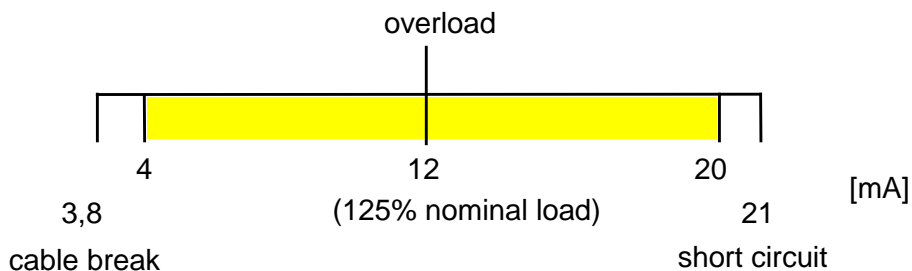
This well proven design has been amended by an additional resistor R7 in order to monitor the condition of the amplifier unit and signal path. This resistor is connected as a shunt to resistor R5 by a relay contact (a) as soon as an excitation voltage U_r appears at relay A.

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