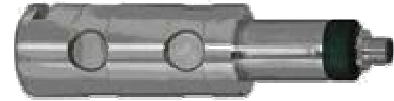


Load pin with thin-film sensor for OEM applications

Accuracy: 2% or 0,5%
Output signals: 4...20 mA; 2-wire,
0...10 VDC; 3-wire



Optional



for SIL3-Applications
with 2-channel PC control

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

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 0,5%, 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.

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: **SIL1...SIL4 (Safety Integrity Level)** – 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.

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

SIL-3 (Option)

- Security electronic
- SIL-3 approval with 2-channel PC control; accreditation: TÜV-Süd-Nr. 2005-08-11/tecsis

Measuring ranges

- 5 kN ... 200 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

SIL-3 (Option)

For theatre and stage design:

- Above-stage machinery
- Below-stage machinery
- Point hoists
- Bar hoists

Model: F5301, F53C1

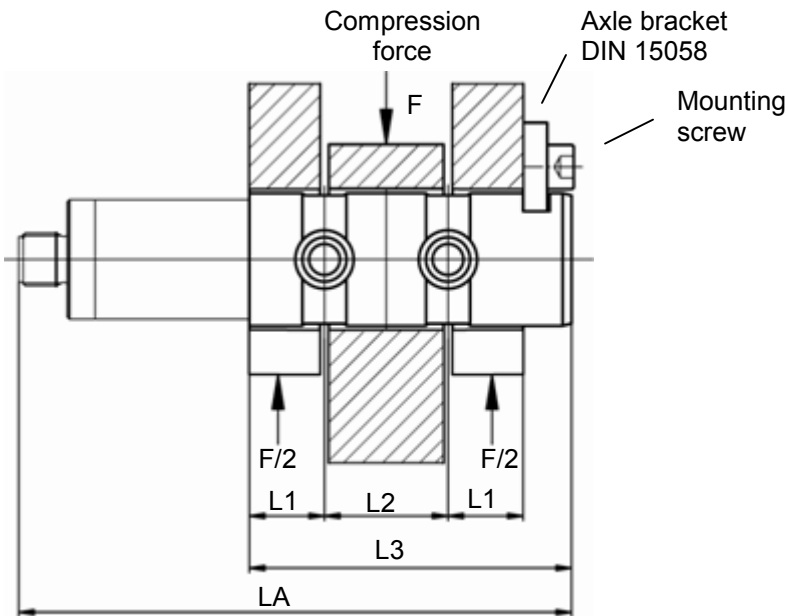
Technical data

| Model | F5301 | F53C1 SIL-3 (Option) |
|--|--|--|
| Nominal load F_{nom} | 5 / 10 / 20 / 30 / 50 / 100 / 200 kN | 5 / 10 / 20 / 30 / 50 kN |
| Limit load | 150 % F_{nom} | |
| Breaking load | > 300 % F_{nom} | |
| Accuracy | < 0.5 % C_n | |
| Combined error | $\leq \pm 0.5$ % of F.S. | |
| Hysteresis | < 0.2 % C_n of F.S. | |
| Cross sensitivity (Signal with 100% F_{nom} at 90°) | < 5 % | |
| Creep, 30 min. at F_{nom} | 0.1 % 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 - span - zero signal | 0.2 % F_{nom} / 10K 0.2 % F_{nom} / 10K | |
| 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 | $\leq (U_B - 6 \text{ V}) / 0.024 \text{ A}$ for current output > 10 k Ω for voltage output | |
| - Response time | $\leq 1 \text{ ms}$ (within 10 % ... 90 % F_{nom}) | $\leq 5 \text{ ms}$ (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 | $\leq \pm 0.1$ % of F.S. | |
| Stability per year | $\leq \pm 0.2$ % 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 \pm 0.2 mA resp. 3 \pm 0.2 V, others upon request |

Construction: stainless steel (17-4 PH) material

*) for higher load please order higher load class

Example of installation: load pin with surrounding parts



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

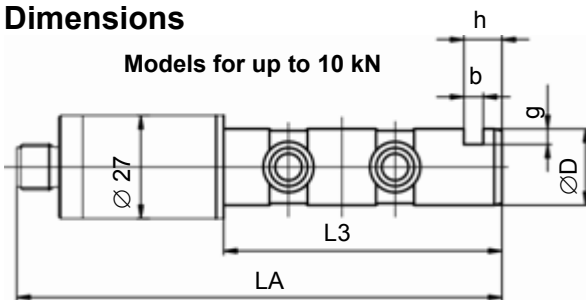
| Measuring range [kN] | Dimensions in mm | | | | | | | | | | | | | | Nominal deflection mm | Weight g |
|----------------------|------------------|-----------|---------|------|----|-------|----|----|-----|-----|----|----|-----|----|-----------------------|----------|
| | ØD (f9)** | Ana-logue | CAN *** | 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 | 40 | 150 | 165 | 22,5 | 40 | 97,5 | 25 | 6 | 80 | 50 | 11 | 26 | 6,5 | 12 | < 0,1 | 950 |
| 100 | 50 | 165 | 180 | 23 | 50 | 112,5 | 30 | 8 | 100 | 70 | 13 | 33 | 7 | 16 | | 1750 |
| 200 | 70 | 213 | 230 | 35 | 70 | 160,5 | 40 | 10 | 140 | 100 | 17 | 45 | 10 | 20 | | 4700 |

** other load pin-Ø on demand

*** case diameter 40 mm

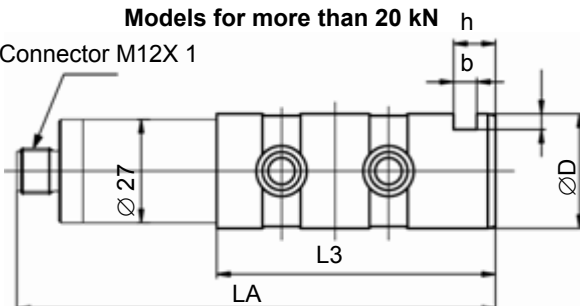
Dimensions

Models for up to 10 kN

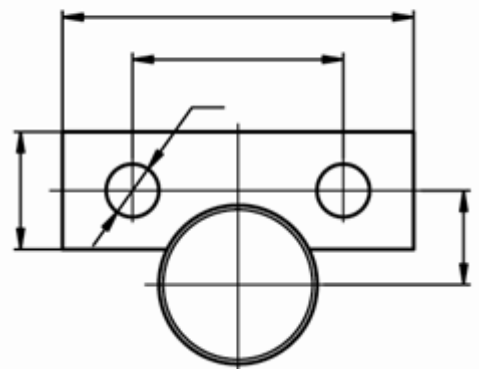


Models for more than 20 kN

Connector M12X 1



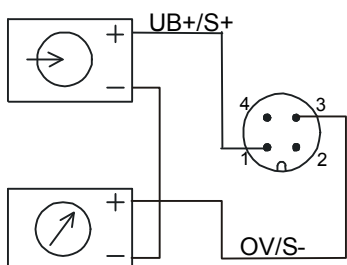
Axle bracket acc. to DIN 15 058
(to be ordered separately)



Electrical connection

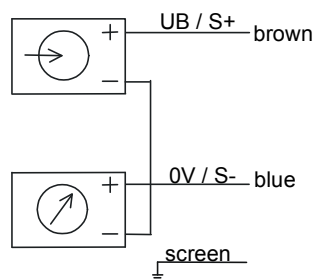
Output signal 4..20mA (2-wire)

Circular connector M12x1, 4-pin



940E01

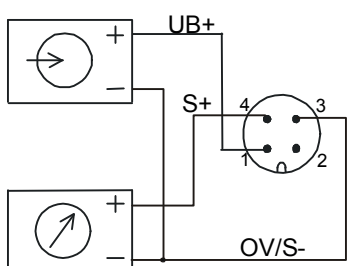
Cable outlet



940E03

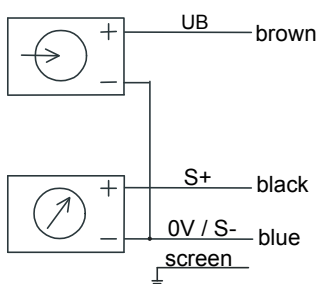
Output signal 0...10V (3-wire)

Circular connector M12x1, 4-pin



940E04

Cable outlet



940E06

Pin configuration of connector M12x1 (4-pin) /

Open cable outlet of the tectis standard connection cable (STL 288, black)

| Analogue output Electrical 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

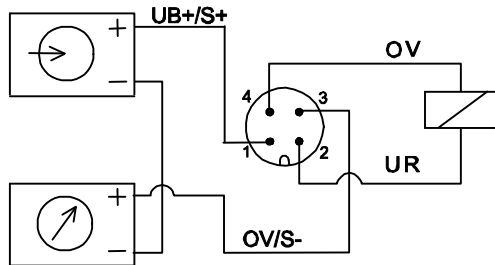
M12x1 (5-pin)

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

SIL-3 (Option)

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

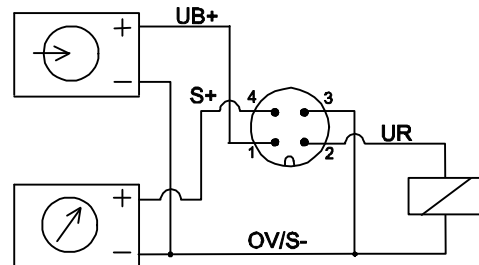
Circular connector M12x1, 4-pin



940E01

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

Circular connector M12x1, 4-pin



940E04

Pin configuration of connector M12x1 (4-pin) /

Open cable outlet of the tecs standard connection cable (STL 288, black)

| Analogue output Electrical 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)



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.

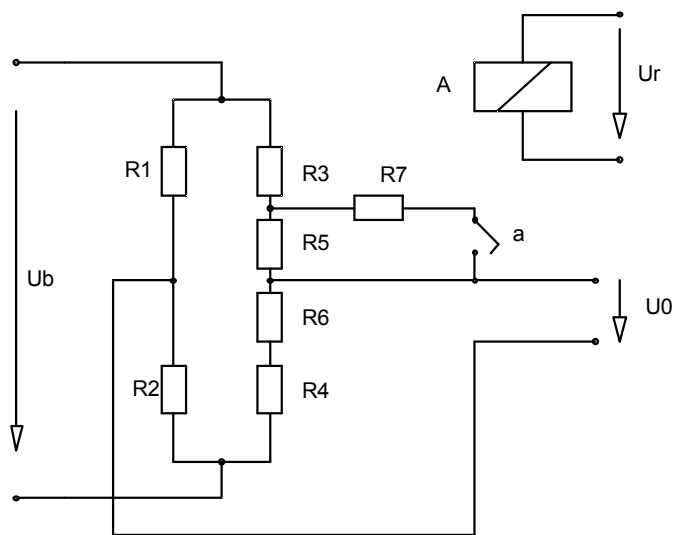
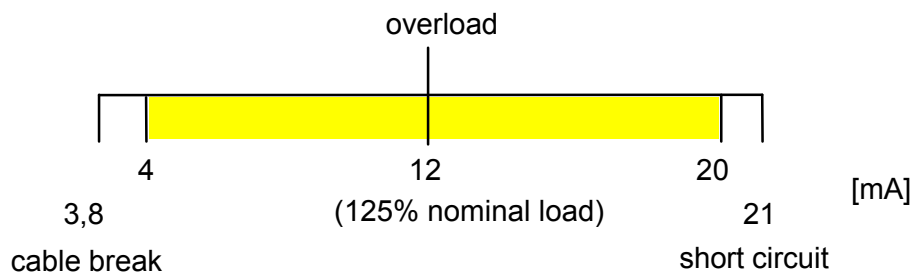


Fig.

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