NOSHOK

Operating Manual

5301 Series
Load Pins

Safety note

Use for intended purpose

The force transducers in model series F5301 are intended for the measurement of static and dynamic tensile or compressive force. These devices have been constructed and tested in accordance with the safety regulations for electronic measuring equipment. Any other usage is deemed to be incorrect . The transducers can only be guaranteed to operate correctly and safely if the information in the operating instructions is complied with. The legal and safety regulations that apply to the respective application must also be observed during use (e.g. VDE 0100). This also applies to the use of accessories.
The transducer is not intended to be used a safety element. The correct and safe operation of this transducer depends on correct transportation and proper storage, installation and assembly and careful operation and maintenance.

General dangers if the safety instructions are not followed

Force transducers made by NOSHOK are manufactured in accordance with the latest state of technology and are safe during operation. However, the transducers can be the source of residual danger if they are used or operated improperly.
Any person who is entrusted to install, start up, maintain or repair a force transducer must have read and understood the operating instructions, particularly the technical safety instructions.

Residual dangers

The performance and scope of delivery of the transducer only cover a sub-area of force measuring technology. The technical safety aspects of force measuring technology must also be planned and implemented by the system planner / equipper / operator in such a way that residual dangers are minimised. The existing regulations must be complied with. Residual dangers associated with force measuring technology must be pointed out.

Maintenance

The force transducers in the F5301 model series are maintenance-free.
During welding work the transducer must be bypassed with a copper wire (min. 50 mm^2) so that welding current does not flow through the transducer and weld the force introduction points.

Ambient temperature

The temperature range of -20°C to +80°C that is specified in the data sheet applies with regard to deployment. The specified error limits are not guaranteed outside this temperature range.

Moisture and corrosion protection

Tropical climates and condensation are not a problem because the transducers comply with protection class IP 67 in accordance with EN 60529:1991+A1:2000 / IEC 529.

Deposits

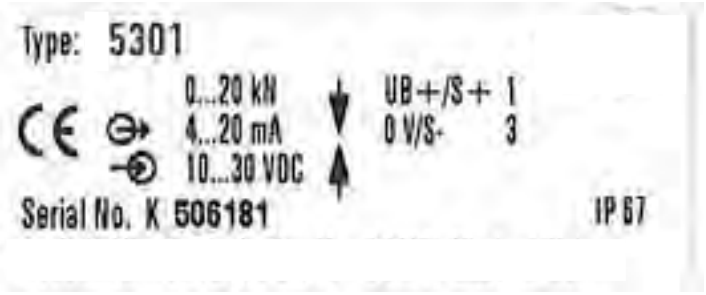
Dust, dirt and other object must not be allowed to form deposits in such a way that they create a force short-circuit to the measuring spring, which would falsify the measuring signal.

Precautions to take during assembly

- Force measuring equipment is extremely sensitive and must be handled carefully.
- Attention must be paid to the installation position and therefore the load direction when the force transducers are being installed.
- The transverse loads and side forces also include the relevant components of the measured variables, which may be introduced at an incline.
- Care must therefore be taken to keep the transducer free of lateral loads and torsion during assembly (e.g. when tightening the lock nuts).
- Overloading must be prevented at all times.
- The output signal (c=1-2mV/V, 4...20mA, 0…20mA, 0...10V) is noted on the name plate (Fig. 1). The connection assignments are also noted on the name plate and can also be found in the section entitled “Electrical connection”. The polarity must be correct at all times.

SEE NEXT PAGE FOR NAME PLATE DIAGRAM.

Fig. 1 Name plate



Type	Model
⊖→	Output
→⊕	Power Supply
S#	Serial Number
UB+	Pin assignment – power supply +
0V/S-	Pin assignment – power supply - / output -
S+	Pin assignment – output +
↕	Tension
↕	Compression

General Installation Guidelines

- The loads acting upon the force transducer must be as exact as possible in the load direction.
- Torsion and lateral force must be avoided. The transverse loads and side forces also include the relevant components of the measured variables, which may be introduced at an incline.
- Torsional moments, off-centre loads and lateral loads or side forces cause measuring errors and can permanently damage the transducers.
- The axle bracket grooves also serve as a reference for aligning the measuring axle.
- The DIN 15 058 axle bracket must be attached in such a way that the measuring axle is prevented from twisting in the bearing and does not have any axial play.
- The measuring axle may only be subjected to load if the correct type of bearing has been used. Loads occurring in other equipment may change the zero signal and result in permanent damage.
- The introduction of force in the centre must not wander and must be installed in such a way that axial shifts are prevented. However, force by-passing may not occur.

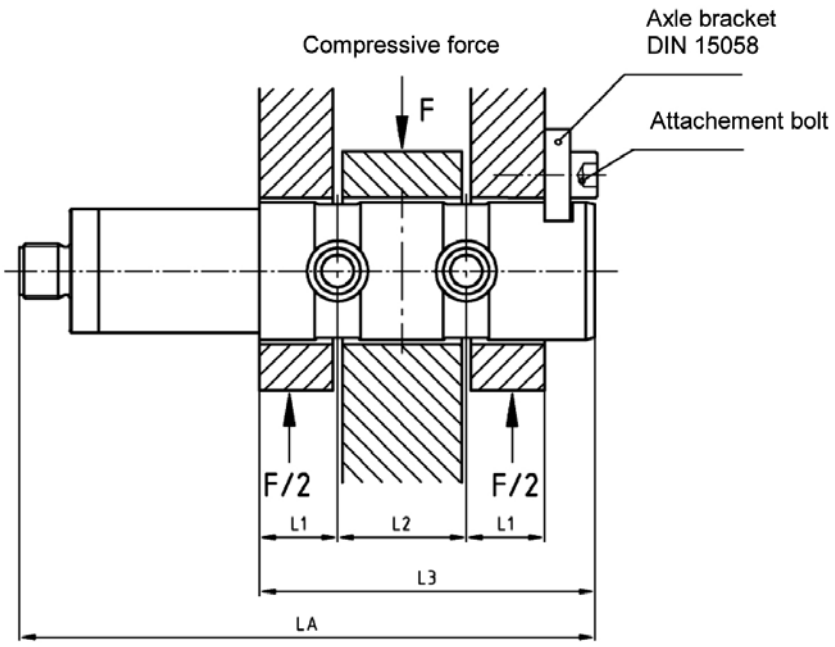


Fig. 2 Installation situation of a load pin

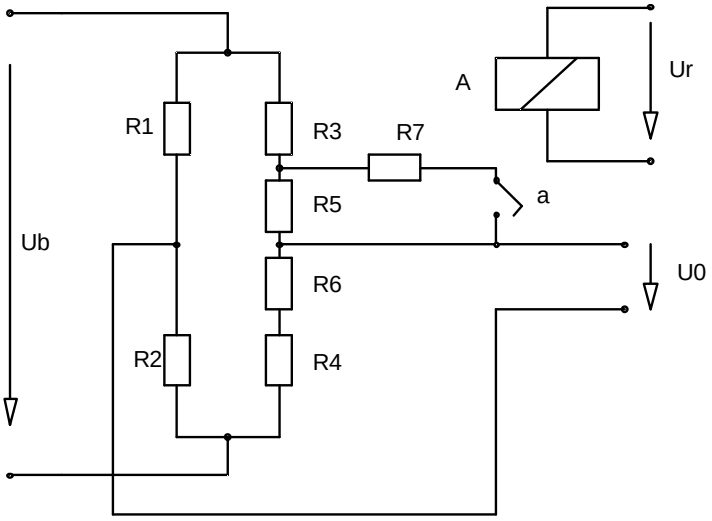
Please note the following:

- Always use shielded, low-capacity measuring cables (all NOSHOK cables meet these requirements, see chapter 10.1).
- Do not route the measuring cable parallel to high-voltage current and control cables.
- Avoid leakage fields from transformers, motors and contactors.
- The transducer, the amplifier and the display unit must not have multiple grounds. Attach all equipment to the same protective conductor.

SIL-3 Elektronic

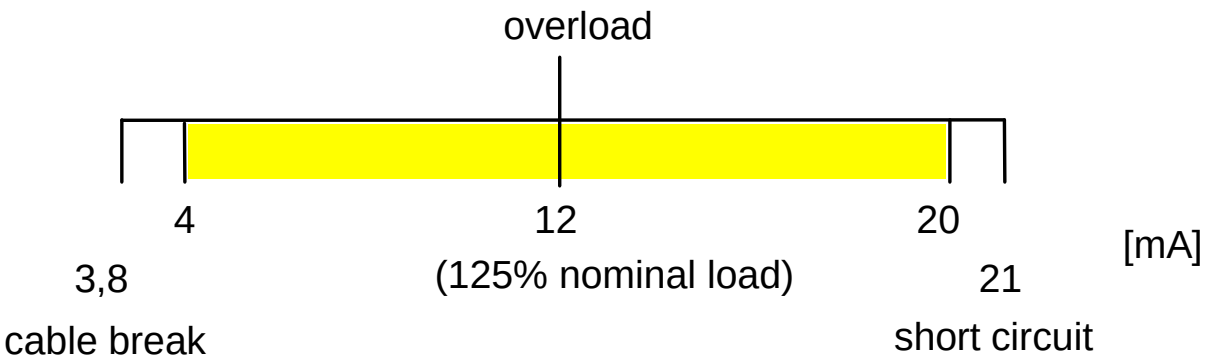
Amplifier-Electronics 4...20mA or 0...10V
for SIL-3 applications with 2-channel PC control

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.



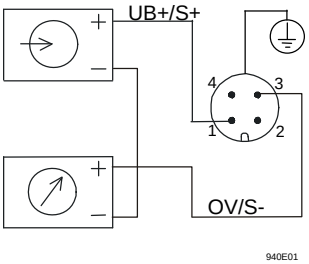
The connection of resistor R7 will always result in a defined unbalancing of the zero point (diagonal voltage) of the Wheatstone Bridge.
An external independent control unit activates relay A which changes the output by a certain value. Because of security reasons the control unit has to be a 2-channel 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.:

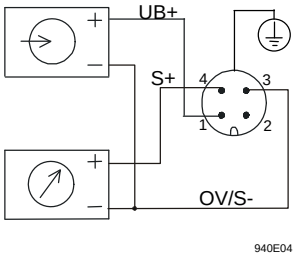


With activating the check relay a fixed signal jump of 8 mA will exceed the overload limit in every working condition. The measurement's upper limit of 20 mA however will never be reached. This makes the checking of the signal jump possible.

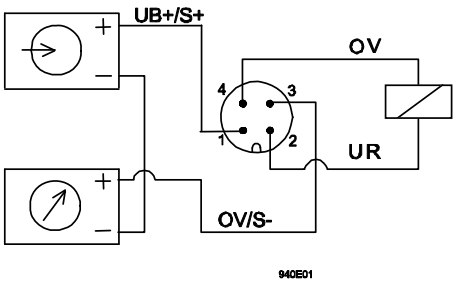
Round connector
M12x1, 4-pin



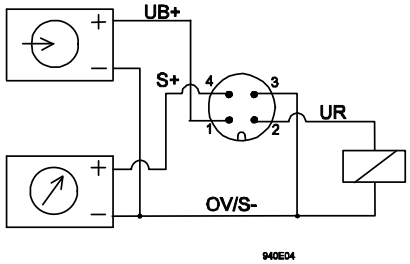
Round connector
M12x1, 4-pin



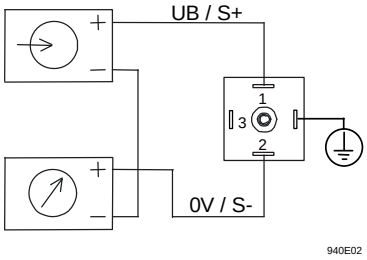
SIL-3



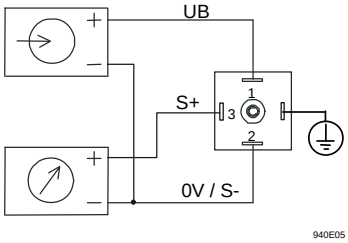
SIL-3



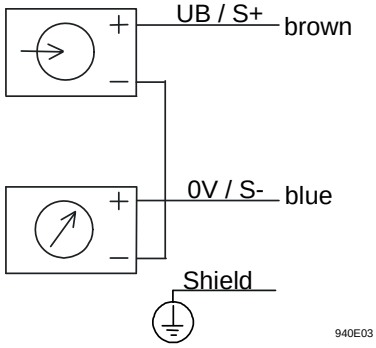
Mini-Hirschmann connector G4a1MMT



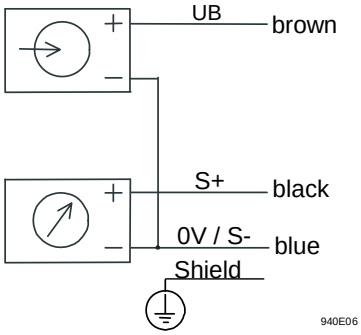
Mini-Hirschmann connector G4a1MMT



Cable output



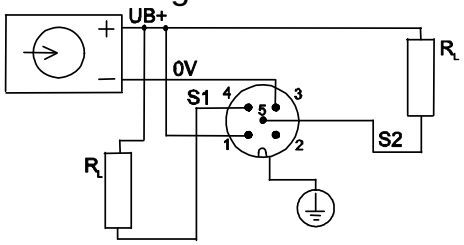
Cable output



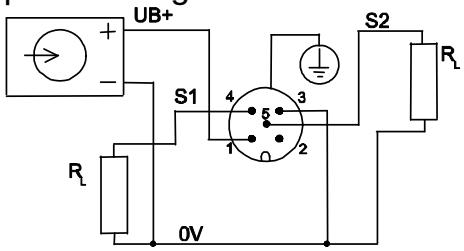
	mV/V Output (4 – wire)	0…20mA (3 – wire)	4…20 mA (2 – wire)	0…10 VDC (3 – wire)	Colour coding cable
Power supply: UB+	1	1	1	1	brown
Power supply: 0V/UB-/S-	3	3	3	3	blue
Supply Relay: (UR)			2	2	withe
Supply Relay: (0V)			4	3	black / blue
Signal: S+	4	4	-	4	black
Signal: S–	2	-	-	-	white
Schirm ⏚	housing	housing	housing	housing	Schirm ⏚

Switch: 2 switching outputs

n- switching



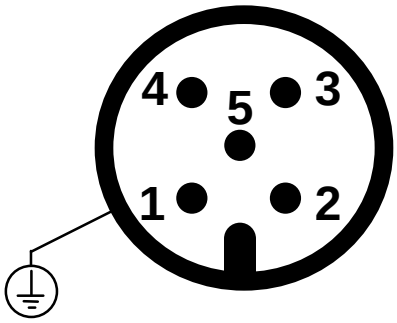
p- switching



Power supply: UB+	1
Power supply: 0V	3
Switching output: S1	4
Switching output: S2	5
Shield ⏚	Housing

CANopen

Round connector
M12x1, 5-polig



Shield ⏚	1
UB+ (CAN V+)	2
UB- (CAN GND)	3
Bus-Signal CAN-High	4
Bus-Signal CAN-Low	5

Technical data

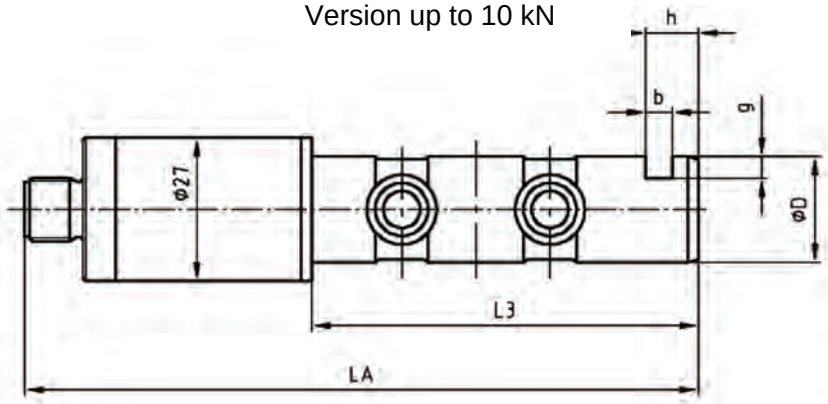
Model	5301	5301 (SIL-3)
Nominal force F_{nom}	5 / 10 / 20 / 30 / 50 / 100 / 200 kN	5 / 10 / 20 / 30 / 50 kN
Force limit	150 % F_{nom}	
Breaking limit	> 300 % F_{nom}	
Accuracy	< 2 % of F.S. and < 0,5 % of F.S.	< 0,5 % of F.S.
Relative backlash width (Hysteresis)	< 0,5 % of F.S. and <0,2 % of F.S.	< 0,5 % of F.S.
Creeping, 30 min. at F_{nom}	0,1 % of F.S.	
Nominal temperature range	-4 ... 176 °F (-20 … 80 °C)	
Storage temperature	-40 ... 212 °F (-40 … 100 °C)	
Temperature influence - Meas.range - Null signal	0,1 % / 10K 0,1 % / 10K	
Transverse force action (signal at 100% nominal load under 90°)	< 5 %	
Vibration resistance	20g, 100h, 50...150Hz acc. to DIN EN 60068-2-6	
Protection class	IP 67 acc. to EN 60 529 / IEC 529	
Interfering emission	acc. to EN 61326	
Interference immunity	acc. to 61326	
Electrical protection class	Reverse polarity, overvoltage and short circuit protection	
Analogue outputs		
Output signal	4 … 20 mA – 2-wire or 0 … 10 VDC – 3-wire	4 … 16 mA - 2-L 0 … 7 V - 3-L
Power consumption	Current output: 4 … 20 mA: Signal current Voltage output:: ca. 8 mA	
Auxiliary power	10 ... 30 VDC for output 4...20 mA 14 ... 30 VDC for output 0 ... 10 V	
Burden	≤ (UB–10 V)/0,02 A for output 4...20 mA > 10 kOhm for output 0 ... 10 V	
Adjusting time	≤ 1 ms (within 10 % up to 90 % of F.S.)	
Electrical connection	Round connector M12x1, 4-pin	5-pin

CANOpen **Measuring element made from stainless steel**

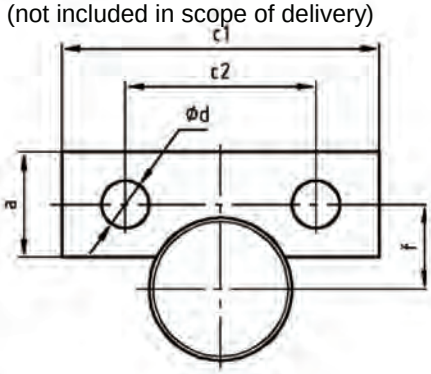
Output signal	CANopen protocol in acc.with CiA DS-301 V.402, Device profile DS-404 V. 1.2
Reproducibility	≤ ± 0.05 % of setting
Stability per year	≤ ± 0.2 % of setting under reference conditions
Electrical connection	Round connector M12 x 1 - 5-pin.
Auxiliary power	10 ... 30 VDC
Power consumption	< 0.5W (with galvanic separation <0.7W)
Communication services	LSS (CiA DSP 305, Version 1.1.1) Services Configuration of device address and baud rate Sync/Async, Node/Lifeguarding, Heartbeat
Filters	Individually programmable filters for specific removal of resonance frequencies, for example
Adjustment	Zero point and measuring range ±10% by making entries in object directory
Adjustment time	1.5 ms (baud rate ≥ 125K) within 10 % up to 90 % of setting.
Measuring frequency	Internal 1000 Hz (adjustable up to approx. 4 Hz)

Load pin, dimensions

Version up to 10 kN

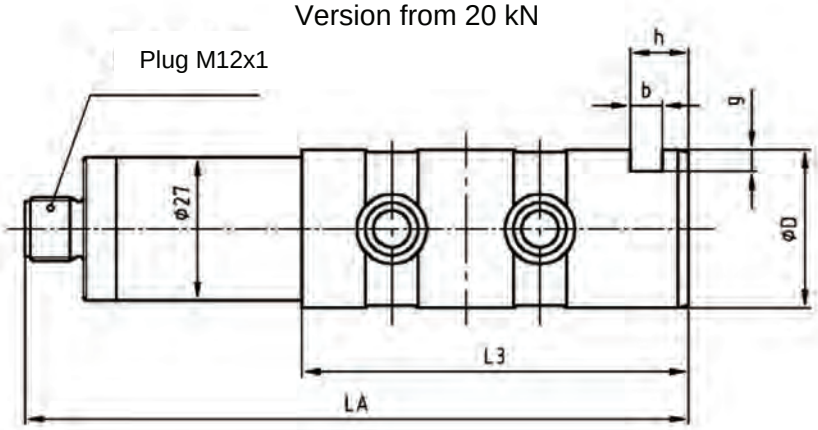


Axle bracket in acc.with DIN 15 058
(not included in scope of delivery)



Version from 20 kN

Plug M12x1



For two-sided measuring axle mounting the following applies:
Bolt/Hole Mating Tolerances: H9/f9

Measuring range [kN]	Dimensions in mm														Nominal deflection mm	Weight g
	ØD (f9) **	LA Ana-logue	LA 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		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	< 0,05	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		950
100	50	165	180	23	50	112,5	30	8	100	70	13	33	7	16	< 0,1	1750
200	70	213	230	35	70	160,5	40	10	140	100	17	45	10	20		4700

** Other bolt diameters available on request, drill hole tolerance H9

*** Case diameter 40 mm

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