Shackle load cell with high accuracy class up to 3 t
Model F9221

Applications

- Measuring of tensile loads
- Measuring of wire ropes
- Chain hoists

Special features

- High accuracy 0.15 % of F.S.
- Ideal for retrofit applications, simple mounting
- Protection class IP67
- Unaffected with changing loading conditions
- High long-term stability, high shock and vibration resistance, Small temperateness

Load measuring shackle, model F9221

Description

The shackle load cell F9221 has been developed to measure the tension while lifting loads as well as forces working in riggings, wirings, tension ropes and similar objects.

This compact shackle load cell has been optimized for high accuracy. The high accuracy of 0.15 % of F.S. is caused by integrated force measurement elements in both shackle blades. The space-saving construction is another benefit of this novel shackle load cell. This allows to implement the shackle easily in already existing constructions or to use it in limited space.

Measuring range
- 0 … 30 kN
- Other ranges on request

ATEX / IECEX (optional)
- For Zone 1 and 2
- Ⓔx II 2G Ex ib IIC T4/T3

SIL 3 (optional)
In cooperation with TÜV SÜD, the safety electronics have been developed specifically for use in stage technology. They will meet the SIL 3 security standard when used in combination with a 2-channel computing system.

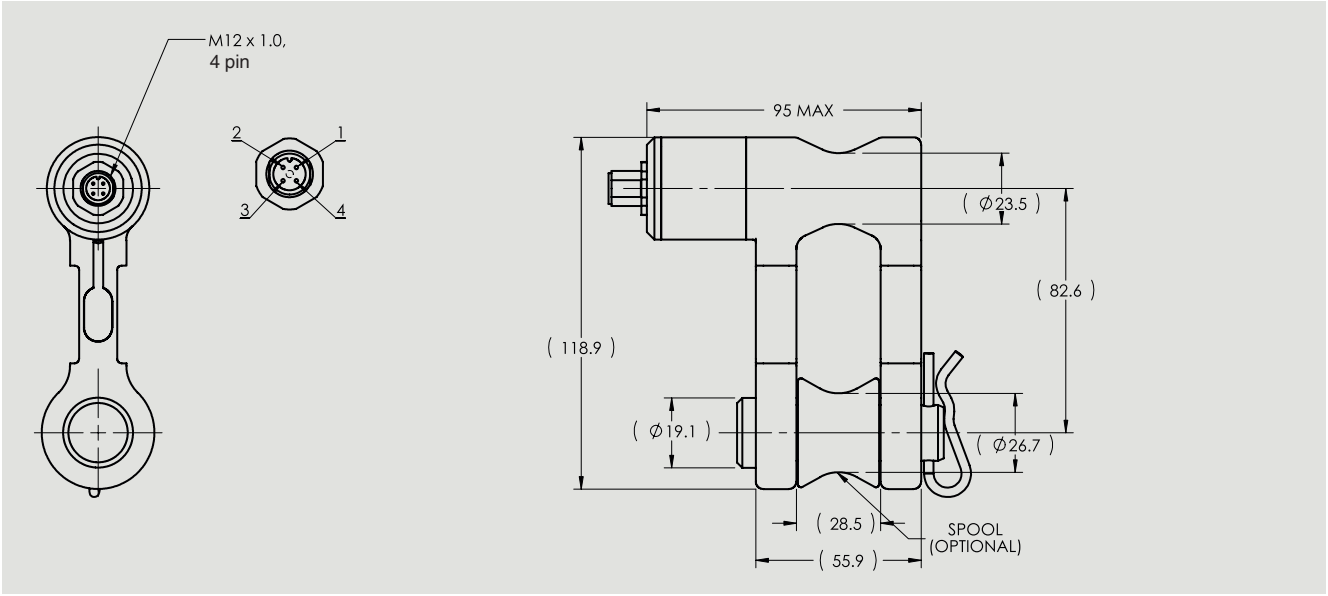
Application with SIL 3 (optional)
- Theatre and stage technology: fly system
- Theatrical rigging

Technical data in accordance with VDI/VDE/DKD 2638

Model	F9221	F92C1SIL-3 (optional)
Rated force F_{nom}	30 kN	
Relative linearity error d_{lin}	±0.15 % of F.S.	±0.5 % of F.S.
Force limit F_L	150 % F_{nom}	
Breaking force F_B	> 300 % F_{nom}	
Rated temperature range $B_{T, nom}$	+15 ... 70 °C	
Operating temperature range $B_{T, G}$	-45 ... +120 °C	-20 ... +80 °C
Temperature effect on ■ characteristic value TK_c ■ zero signal TK_0	 ≤ ±0.1 % of actual value/10K ≤ ±0.1 % of F.S./10K	 ≤ ±0.2 % of actual value/10K ≤ ±0.2 % of F.S. /10K
Protection type	IP67 in accordance with EN/IEC 60529	
Noise emission	In accordance with DIN EN 55011	
Noise immunity	In accordance with DIN EN 61326-1 /DIN EN 61326-2-3	
Insulation resistance R_{is}	> 5 x 10^9 Ω/50 V	> 5 GΩ/50 V
Electrical protection	Reverse current protection, overvoltage-and short-circuit protection	
Analogue output ■ Output signal (characteristic value) C	4 … 20 mA 3-wire	4 … 16 mA, 3-wire system signal shift 4 mA ± 0.2 mA, others on request, via inline amplifier
■ Supply voltage	DC 12 … 40 V	DC 10 … 30 V, supply unit SIL 3 relay DC 24 V (+50 %/-20 %), power consumption approx. 100 mW
■ Relative deviation of zero signal	±2 % F.S.	-
■ Electrical connection	Connector M12 x 1, 4-pin	
Certifications / Approvals	-	TÜV Süd, Certificate-Nr. Z-IS-ATA3-MAN 6000219499 in accordance with EN 62061:2005
Material	Stainless steel (force transducers and amplifier housing)	

F.S. = Fullscale output

Dimensions in mm



Electrical connection

Analogue output 4 ... 20 mA, 3-wire
PIN configuration M12 x 1, 4-pin/open cable outlet of the tecsis standard connection cable (STL 288, black)

Analogue output	S 4 ... 20 mA, 3-wire	
Electrical connection	**Pin**	**Cable outlet**
Supply: UB+	2	White
Supply: 0V	3	Blue
Signal: S+	4	Black
Signal: S-	3	Blue
Shielding ⏚	Thread M12 x 1	Shield

Analogue output with SIL 3 (optional)
PIN configuration M12 x 1, 4-pin/inline amplifier with 4 … 20 mA, 3-wire or 0 ... 10 V, 3-wire, open cable outlet of the tecsis standard connection cable (STL 288, black)

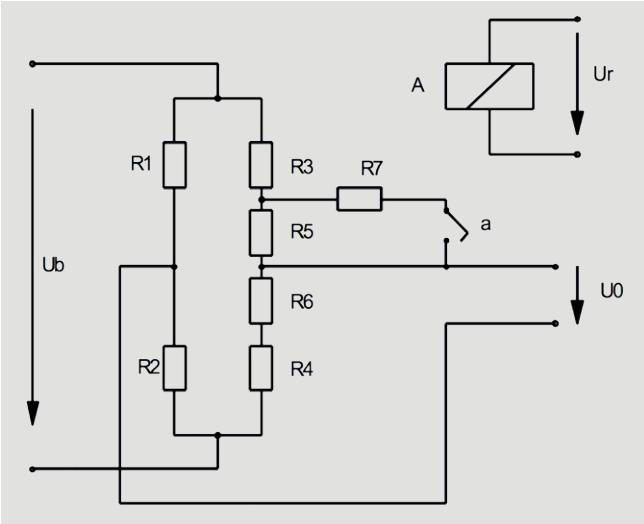
Analogue output	SIL 3 4 … 20 mA or 0 … 10 V, 3-wire	
Electrical connection	**Pin**	**Cable outlet**
Supply: UB+	1	Brown
Supply: 0V	3	Blue
Supply Relais: UR	2	White
Supply Relais: 0V	3	Blue
Signal: S+	4	Black
Signal: S-	3	Blue
Shielding ⏚	Thread M12 x 1	Shield

Brief description SIL 3

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

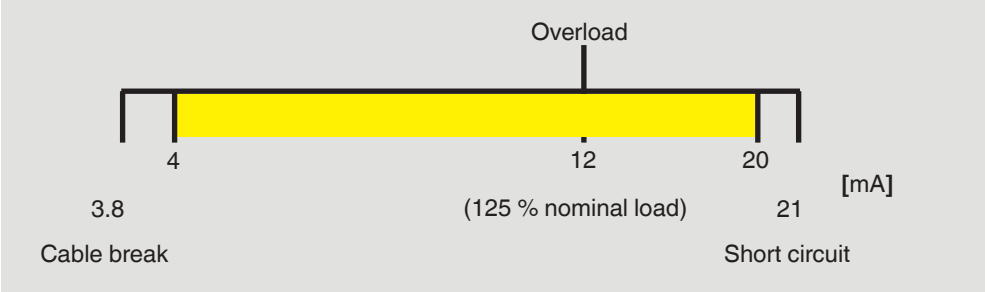
Force Transducers, which are based on strain gauges, are working with four variable resistors (R1 ... R4) connected to a Wheatstone Bridge. Caused by deformation of the body the respective opposite resistors are lengthened or compressed in the same way. This results in an unbalanced bridge and a diagonal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

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