Tension/compression force transducer
With thin-film technology and swivel head up to 45 kN
Model F2303

EAC

For further approvals
see page 3

Applications

- Machine building and plant construction
- Manufacturing automation
- Presses, lifting cylinders, welding guns, drives
- Chemistry and petrochemistry

Special features

- Measuring ranges 0 ... 10 kN to 0 ... 45 kN
  [0 ... 2,248 lbf to 0 ... 10,116 lbf]
- Corrosion-resistant stainless steel design
- Integrated amplifier
- High long-term stability, high shock and vibration resistance
- Good reproducibility, simple installation

Tension/compression force transducer, model F2303

Description

The tension/compression force transducer is designed for static and dynamic measurement tasks in the direct flux of force. It determine the tension and compression forces in a wide scope of applications.

Force transducers of this model are used for measuring axial forces on electric spindle presses, for monitoring overload protection in lifting cylinders and for measuring force on punches, presses and welding guns.

Appropriate technical and regional approvals are available as an option.

The force transducer is made of high-strength, corrosion resistant stainless steel 1.4542, which is particularly suitable for their application areas.

As output signals, the common active current and voltage outputs are available (4 … 20 mA, 0 … 10 V).
Also redundant output signals and CANopen® protocols are possible.

WIKA
Smart in sensing

Data sheets showing similar products:
Tension/compression force transducers; models F2301, F23C1, F23S1; see data sheet FO 51.17
Tension/compression force transducer, up to 200 kN; model F2304; see data sheet FO 51.47

Specifications in accordance with VDI/VDE/DKD 2638

Model	F2303
Rated force F_{nom} kN	10, 18, 20, 34, 45
Rated force F_{nom} lbf	2,248; 4,047; 4,496; 7,644; 10,116
Relative linearity error d_{lin} 1)	0.5 % F_{nom}
Relative reversibility error	< 0.1 % F_{nom}
Relative creep, 30 min. at F_{nom}	0.1 % F_{nom}
Temperature effect on	
Zero signal TK0	0.2 % F_{nom} / 10 K
Characteristic value TK_C	0.2 % F_{nom} / 10 K
Limit force F_L	150 % F_{nom}
Breaking force F_B	300 % F_{nom}
Permissible vibration loading F_{rb}	50 % F_{nom} (in accordance with DIN 50100)
Rated displacement (typical) s_{nom}	< 0.1 mm [< 0.004 in]
Material of the measuring body	■ Corrosion-resistant stainless steel 1.4542, ultrasound-tested 3,1 material ■ Version with 3,2 material available
Rated temperature range $B_{T, nom}$	-20 … +80 °C [-4 ... +176 °F]
Service temperature range $B_{T, G}$	-30 … +80 °C [-22 ... +176 °F]
Storage temperature range $B_{T, S}$	-40 … +85 °C [-40 ... +185 °F]
Electrical connection	Circular connector M12 x 1, 5-pin
Output signal (Rated characteristic value) C_{nom}	■ 4 … 20 mA 2-wire ■ 4 … 20 mA 3-wire ■ DC 0 … 10 V 3-wire ■ Optional redundant signal ■ CANopen® Protocol in accordance with CiA®301, device profile CiA®404, communication services LSS (CiA®305), configuration of the instrument address and baud rate Sync/Async, Node/Lifeguarding, heartbeat; zero and span ±10 % adjustable via entries in the object directory 2)
Current/power consumption	Current output: 4 … 20 mA, Signal current: 2-wire
Supply voltage UB	DC 10 ... 30 V for current output
Load	≤ (UB – 10 V) / 0.024 A for current output
Response time	< 1 ms (within 10 % to 90 % F_{nom}) 3)
Ingress protection (per EN/IEC 60529)	
Unplugged state	IP66, IP67
Plugged-in state	IP68, IP69, IP69K
Electrical protection	Reverse polarity protection, overvoltage and short-circuit resistance
Vibration resistance)	20 g, 100 h, 50 ... 150 Hz (per DIN EN 60068-2-6)
Immunity	■ Per DIN EN 61326-1/DIN EN 61326-2-3 ■ EMC-strengthened versions
Intended use	Indoor and outdoor use, typically at altitudes of up to 2,500 m [8,202.5 ft] above sea level.

1) Relative linearity error is specified in accordance with Directive VDI/VDE/DKD 2638 chapter 3.2.6.
2) Protocol in accordance with CiA®301, device profile CiA®404, communication service LSS (CiA®305)
3) Other response times possible upon request.
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Approvals

Logo	Description	Region
CE	**EU declaration of conformity** EMC directive	European Union

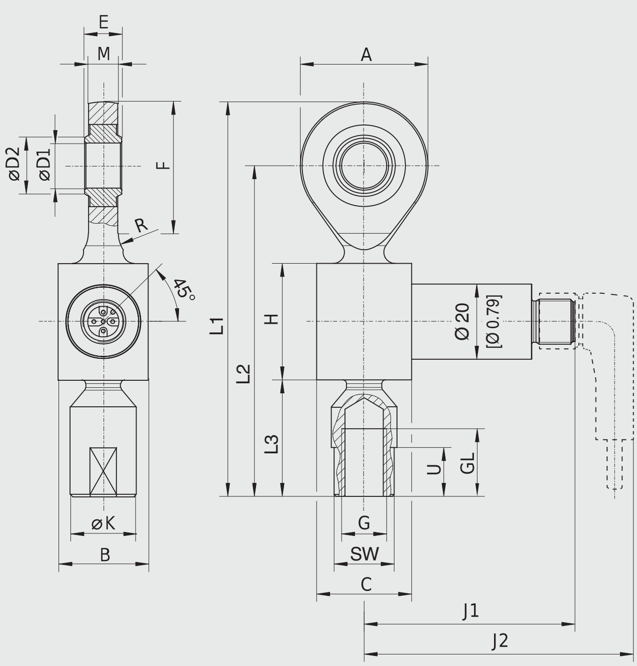
Optional approvals

Logo	Description	Region
EAC	**EAC** EMC directive	Eurasian Economic Community

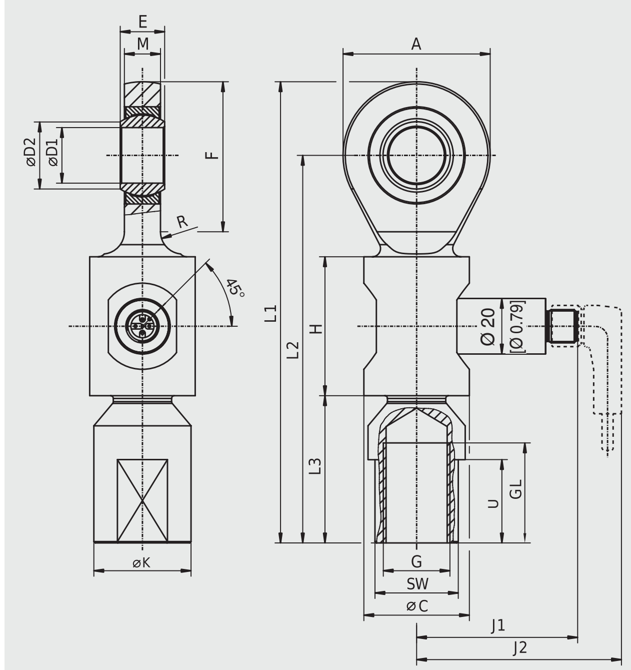
→ Approvals and certificates, see website

Dimensions in mm [in]

Version up to 30 kN [6,744 lbf], female thread



Version from 45 kN [10,116 lbf] male thread



Rated force in kN	Dimensions in mm													
	A	B	C	ØC	ØD1 -0.008	ØD2	E	F	G	GL	H	J1	J2	ØK
10	34	24	25.3	-	12-	14.9	10	35	M12	18	31	56	76	17.5
20	46	26	25.3	-	17	20.7	14	46	M20 x 1.5	30	35	56	76	31
30	46	27	26	-	17	20.7	14	46	M20 x 1.5	30	40	56.5	76.5	31
45	53	-	-	38	20	24.2	16	54	M24 x 2	36	50	58	78	35

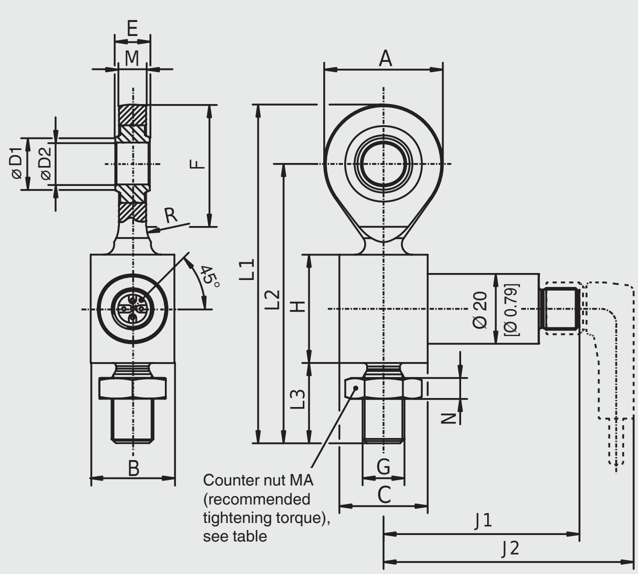
Rated force in kN	Dimensions in mm							Tightening torque MA (Nm)
	L1	L2	L3	M	U	SW	Rated displacement	
10	105	88	31	8	13	19	< 0.02	15
20	133	110	44	11	20	19	< 0.2	60
30	138	115	44	11	20	19	< 0.2	60
45	166	139.5	53	13	30	19	< 0.2	110

Rated force in lbf	Dimensions in inch													
	A	B	C	ØC	ØD1 -0.0003	ØD2	E	F	G	GL	H	J1	J2	ØK
2,248	1.34	0.94	1	-	0.47	0.587	0.39	1.38	M12	0.71	1.22	2.20	2.99	0.69
4,496	1.81	1.02	1	-	0.67	0.81	0.55	1.81	M20 x 1.5	1.18	1.38	2.20	2.99	1.22
6,744	1.81	1.06	1.02	-	0.67	0.81	0.55	1.81	M20 x 1.5	1.18	1.57	2.22	3.01	1.22
10,116	2.09	-	-	1.5	0.79	0.95	0.63	2.13	M24 x 2	1.42	1.97	2.28	3.07	1.38

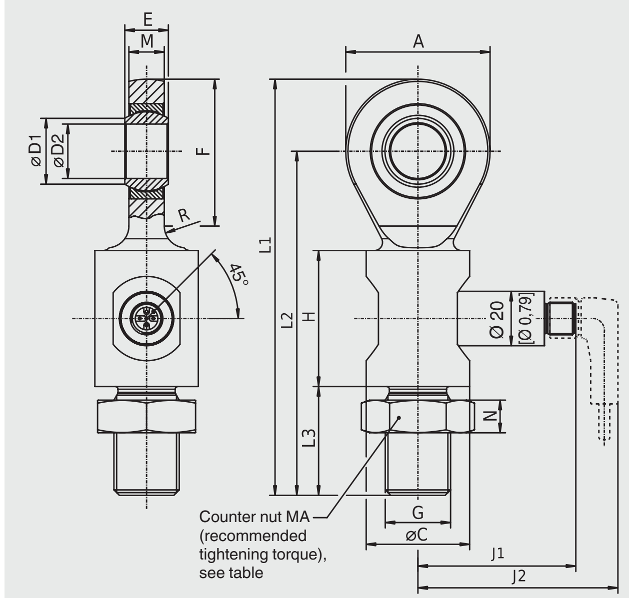
Rated force in lbf	Dimensions in inch							Tightening torque MA (Nm)
	L1	L2	L3	M	U	SW	Rated displacement	
2,248	4.13	3.46	1.22	0.31	0.51	0.75	< 0.0008	15
4,496	5.24	4.33	1.73	0.43	0.79	0.75	< 0.0079	60
6,744	5.43	4.53	1.73	0.43	0.79	0.75	< 0.0079	60
10,116	6.54	5.49	2.09	0.51	1.18	0.75	< 0.0079	110

Dimensions in mm [in]

Version up to 30 kN [6,744 lbf], male thread



Version from 45 kN [10,116 lbf], male thread



Rated force in kN	Dimensions in mm											
	A	B	C	ØC	ØD1 -0.008	ØD2	E	F	G	H	J1	J2
10	34	24	25.3	-	14.9	12	10	35	M12	31	56	76
20	46	26	25.3	-	20.7	17	14	46	M20 x 1.5	35	56	76
30	46	27	26	-	20.7	17	14	46	M20 x 1.5	44	56.5	76.5
45	53	-	-	38	24.2	20	16	54	M24 x 2	50	58	78

Rated force in kN	Dimensions in mm						Tightening torque MA (Nm)
	L1	L2	L3	M	N	Rated displacement	
10	97	80	23	8	6	< 0.02	15
20	123	100	34	11	10	< 0.2	60
30	132	109	34	11	10	< 0.2	60
45	153	126.5	40	13	12	< 0.2	110

Rated force in lbf	Dimensions in inch											
	A	B	C	ØC	ØD1 -0.0003	ØD2	E	F	G	H	J1	J2
2,248	1.34	0.94	1	-	0.47	0.587	0.39	1.38	M12	1.22	2.20	2.99
4,496	1.81	1.02	1	-	0.67	0.81	0.55	1.81	M20 x 1.5	1.38	2.20	2.99
6,744	1.81	1.06	1.02	-	0.67	0.81	0.55	1.81	M20 x 1.5	1.73	2.22	3.01
10,116	2.09	-	-	1.5	0.79	0.95	0.63	2.13	M24 x 2	1.97	2.28	3.07

Rated force in lbf	Dimensions in inch						Tightening torque MA (Nm)
	L1	L2	L3	M	N	Rated displacement	
2,248	3.82	3.15	0.91	0.31	0.24	< 0.0008	15
4,496	4.84	3.94	1.34	0.43	0.39	< 0.0079	60
6,744	5.20	4.29	1.34	0.43	0.39	< 0.0079	60
10,116	6.02	4.98	1.57	0.51	0.47	< 0.0079	110

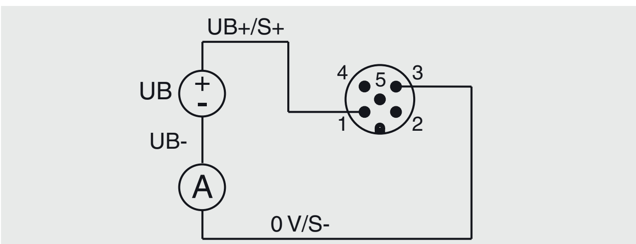
Pin assignment of analogue output

Abbreviations, definitions

Signal	Description
UB	Voltage source for sensor
UB+	Sensor-supply voltage (+)
UB-	Sensor-supply voltage (-)
UR	Voltage source for den signal jump
UR+	Signal jump-supply voltage (+)
UR-	Signal jump-supply voltage (-)
S+	Output signal (+)
S-	Output signal (-)
0V	0V-Potential

Signal	Description
Ⓐ	Ammeter
Ⓥ	Voltmeter
(±)	Voltage source
⌐	Switch
⏚	Shield [grounding]

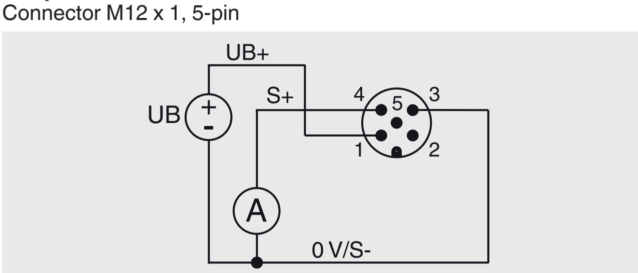
Output 4 ... 20 mA, 2-wire
Connector M12 x 1, 5-pin



Signal	4 ... 20 mA, 2-wire	Cable colour
UB+/S+	1	Brown
0V/S-	3	Black
Shield ⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

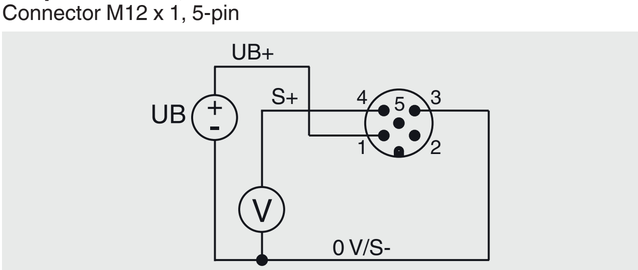
Output 4 ... 20 mA, 3-wire
Connector M12 x 1, 5-pin



Signal	4 ... 20 mA, 3-wire	Cable colour
UB+	1	Brown
S+	4	Black
0V/S-	3	Blue
Shield ⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Output 0 ... 10 V, 3-wire
Connector M12 x 1, 5-pin

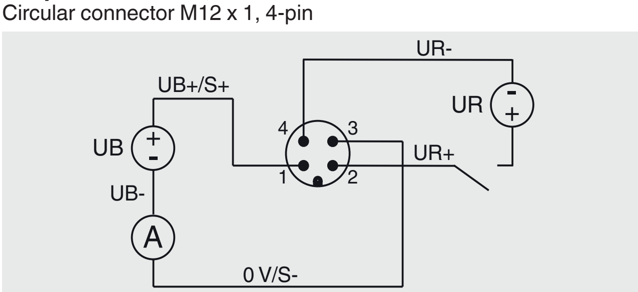


Signal	0 ... 10 V, 3-wire	Cable colour
UB+	1	Brown
S+	4	Black
0V/S-	3	Blue
Shield ⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Pin assignment with signal jump

Output 4 ... 20 mA, 2-wire
Circular connector M12 x 1, 4-pin

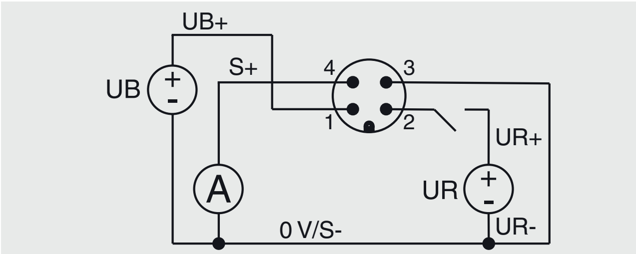


Signal	4 ... 20 mA, 2-wire	Cable colour
UB+/S+	1	Brown
0V/S-	3	Blue
UR+	2	White
UR-	4	Black
Shield ⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Pin assignment with signal jump

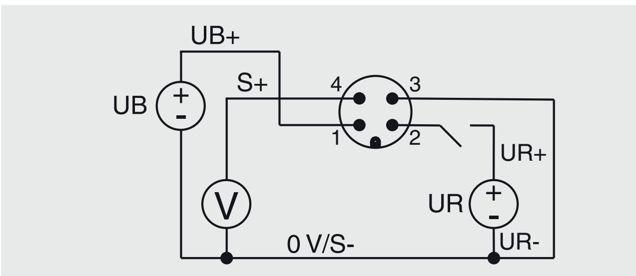
Output 4 ... 20 mA, 3-wire
Circular connector M12 x 1, 4-pin



Signal	4 ... 20 mA, 3-wire	Cable colour
UB+	1	Brown
0V/S-	3	Blue
UR+	2	White
UR-	3	Blue
S+	4	Black
Shield ⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Output 0 ... 10 V, 3-wire
Circular connector M12 x 1, 4-pin



Signal	0 ... 10 V, 3-wire	Cable colour
UB+	1	Brown
0V/S-	3	Blue
UR+	2	White
UR-	3	Blue
S+	4	Black
Shield ⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

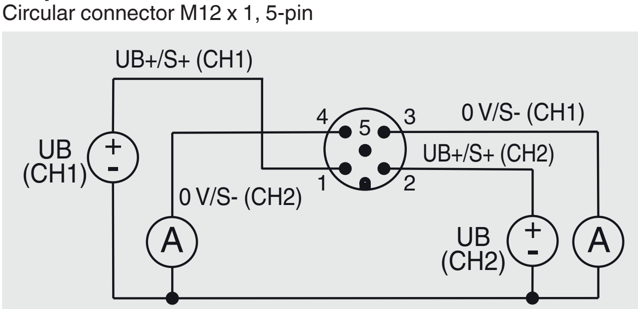
Pin assignment redundant with 1 x connector

Abbreviations, definitions

Signal	Description
UB	Voltage source for the sensor
UB+	Sensor voltage supply (+)
UB-	Sensor voltage supply (-)
S+	Output signal (+)
S-	Output signal (-)
CH1	Channel 1
CH2	Channel 2
CH1+2	Channel 1 and channel 2
0V	0V potential

Signal	Description
Ⓐ	Ammeter
Ⓥ	Voltmeter
±	Voltage source
⌐	Switch
⏚	Shield [ground]

Output 4 ... 20 mA, 2-wire
Circular connector M12 x 1, 5-pin

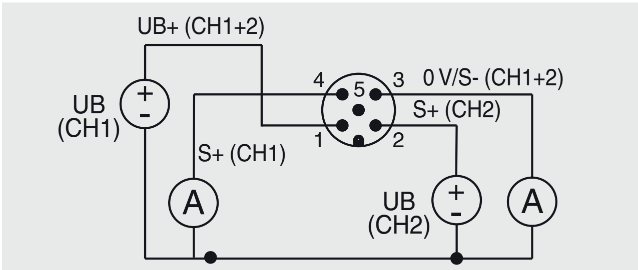


Signal	4 ... 20 mA, 2-wire	Cable colour
UB+/S+ (CH1)	1	Brown
UB+/S+ (CH2)	2	White
0V/S- (CH1)	3	Blue
0V/S- (CH2)	4	Black
Shield ⏚	Case / Connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Pin assignment redundant with 1 x connector

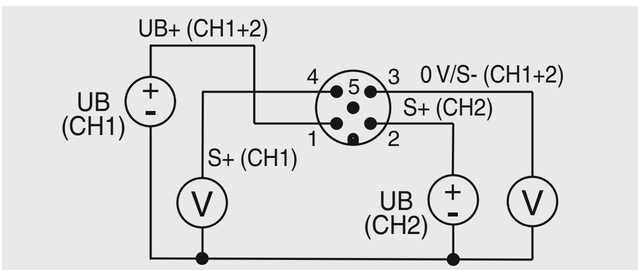
Output 4 ... 20 mA, 3-wire
Circular connector M12 x 1, 5-pin



Signal	4 ... 20 mA, 3-wire	Cable colour
UB+ (CH1+2)	1	Brown
0V/S- (CH1+2)	3	Blue
S+ (CH1)	4	Black
S+ (CH2)	2	White
Shield⏚	Case / connector	-

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Output 0 ... 10 V, 3-wire
Circular connector M12 x 1, 5-pin



Signal	0 ... 10 V, 3-wire	Cable colour
UB+ (CH1+2)	1	Brown
0V/S- (CH1+2)	3	Blue
S+ (CH1)	4	Black
S+ (CH2)	2	White
Shield⏚	Case / connector	-

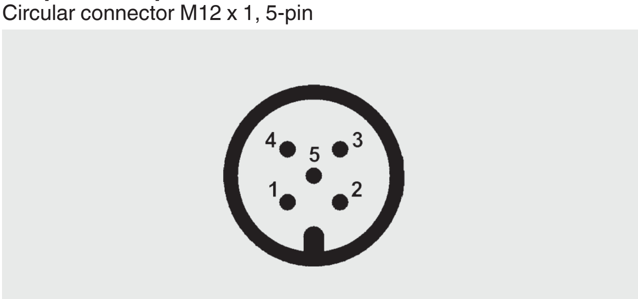
Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Pin assignment for CANopen® in according to CiA®303-1

Abbreviations, definitions

Signal	Description
CAN-SHLD, Shield ⏚	Shield
CAN-V+	External positive voltage supply for the supply of the sensor
CAN-GND	External 0V Potential for the supply of the sensor
CAN-High	CAN_H Bus line (dominant high)
CAN-Low	CAN_L Bus line (dominant low)

Output CANopen®
Circular connector M12 x 1, 5-pin

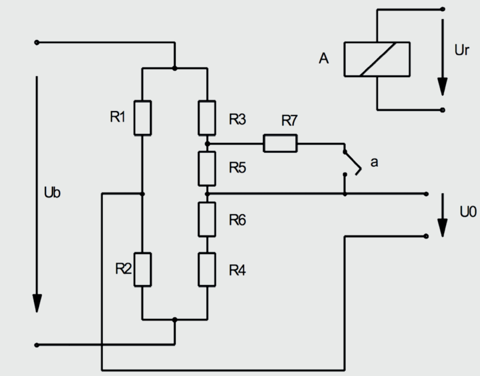


Signal	Pin	Cable colour
CAN-SHLD, shield ⏚	1 / case / connector	Brown
CAN-V+	2	Blue
CAN-GND	3	White
CAN-High	4	Blue
CAN-Low	5	Black

Cable colours are only valid when using the standard WIKA cable, e.g. order number: 14259454

Short description of the signal jump electronics

Amplifier 4 ... 20 mA or 0 ... 10 V for signal jump applications with 2-channel computer control.



Circuit diagram of the signal jump electronics

With these force transducers, four variable resistors (R1 ... R4) are connected together to form a Wheatstone bridge. When the measuring body deforms, the opposing resistors are stretched or compressed in the same way. This leads to a detuning of the bridge and a diagonal voltage U0.

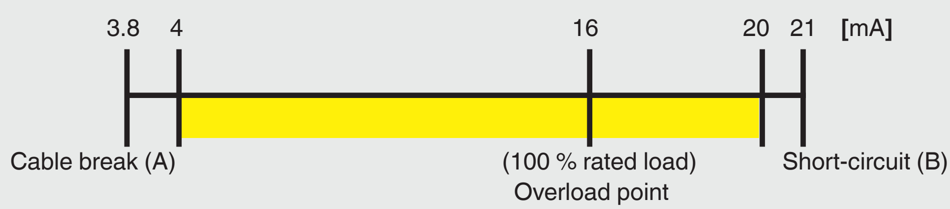
The test resistor R7 is now important in connection with checking the subsequent amplifier circuit and the subsequent signal paths. This is switched parallel to the resistor R5 via the relay contact (a) as soon as the excitation voltage Ur of the relay A is present. The connection of the resistor R7 causes a defined, always constant, detuning of the zero point (diagonal voltage) of the Wheatstone bridge.

An external controller that is independent of the force transducer must monitor the safe functioning of the force transducer. The functional test with a signal jump of 4 mA / 2 V is executed at an interval of 24 hours. The controller activates the relay A, thus changing the output signal of the force transducer in a defined manner.

If the expected change in the output signal occurs, it can be assumed that the entire signal path from the Wheatstone bridge per the amplifier through to the output is functioning correctly. If no signal change occurs, then it can be concluded that there is an error in the signal path.

Furthermore, the measuring signal should be checked by the controller for min. (A) and max. (B) signal values in order to detect any cable breaks or short circuits that may occur.

The default setting of the force transducers with a current output of 4 ... 20 mA for overload detection is, for example:



Signals of the signal jump electronics

With a fixed signal jump of, for example, 4 mA, the test cycle can then be triggered, in any operating state, by activating the test relay. The upper measuring range limit of 20 mA will never be reached and thus the checking of the signal jump is enabled.

Accessories

Connectors model EZE53 with moulded cable					
Model	**Description**	**Temperature range**	**Cable diameter**	**Cable length**	**Order number**
	Straight version, cut to length, 4-pin, PUR cable, UL listed, IP67	-20 ... +80 °C [-4 ... +176 °F]	4.75 mm ... 5.7 mm [0.18 in ... 0.22 in]	2 m [6.6 ft]	14259451
				5 m [16.4 ft]	14259453
				10 m [32.8 ft]	14259454
	Straight version, cut to length, 5-pin, PUR cable, UL listed, IP67	-20 ... +80 °C [-4 ... +176 °F]	4.75 mm ... 5.7 mm [0.18 in ... 0.22 in]	2 m [6.6 ft]	14259458
				5 m [16.4 ft]	79100672
				10 m [32.8 ft]	14259472
	Angled version, cut to length, 4-pin, PUR cable, UL listed, IP67	-20 ... +80 °C [-4 ... +176 °F]	5.05 mm ... 6 mm [0.2 in ... 0.24 in]	2 m [6.6 ft]	14259452
				5 m [16.4 ft]	14293481
				10 m [32.8 ft]	14259455
	Angled version, cut to length, 5-pin, PUR cable, UL listed, IP67	-20 ... +80 °C [-4 ... +176 °F]	5.05 mm ... 6 mm [0.2 in ... 0.24 in]	2 m [6.6 ft]	79101493
				5 m [16.4 ft]	79100686
				10 m [32.8 ft]	On request

Further cable lengths and cable types are available on request.

→ WIKA accessories can be found online at www.wika.com.

Ordering information

Model / Rated force / Relative linearity error / Temperature range / Output signal / Electrical connection / Approvals, certificates / Pin assignment / Accessories

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