Tension/compression force transducer
With thin-film technology up to 50 kN
Models F2304, F23C4

Applications

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

Special features

- Measuring ranges 0 ... 1 kN up to 0 ... 50 kN
- Corrosion-resistant stainless steel design
- Integrated amplifier
- High long-term stability, high shock and vibration resistance
- Good reproducibility, simple installation

Tension/compression force transducer, models F2304, F23C4

Description

Tension/compression force transducers are designed for static and dynamic measurement tasks in the direct flux of force. They determine the tension and compression forces in a wide scope of applications.

Force transducers of this series 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.

These force transducers are made of high-strength, corrosion resistant stainless steel 1.4542, which is particularly suitable for their application areas. The standard active current and voltage outputs are available as output signals (4 ... 20 mA/0 ... 10 V). Redundant output signals and CAN protocols are possible.

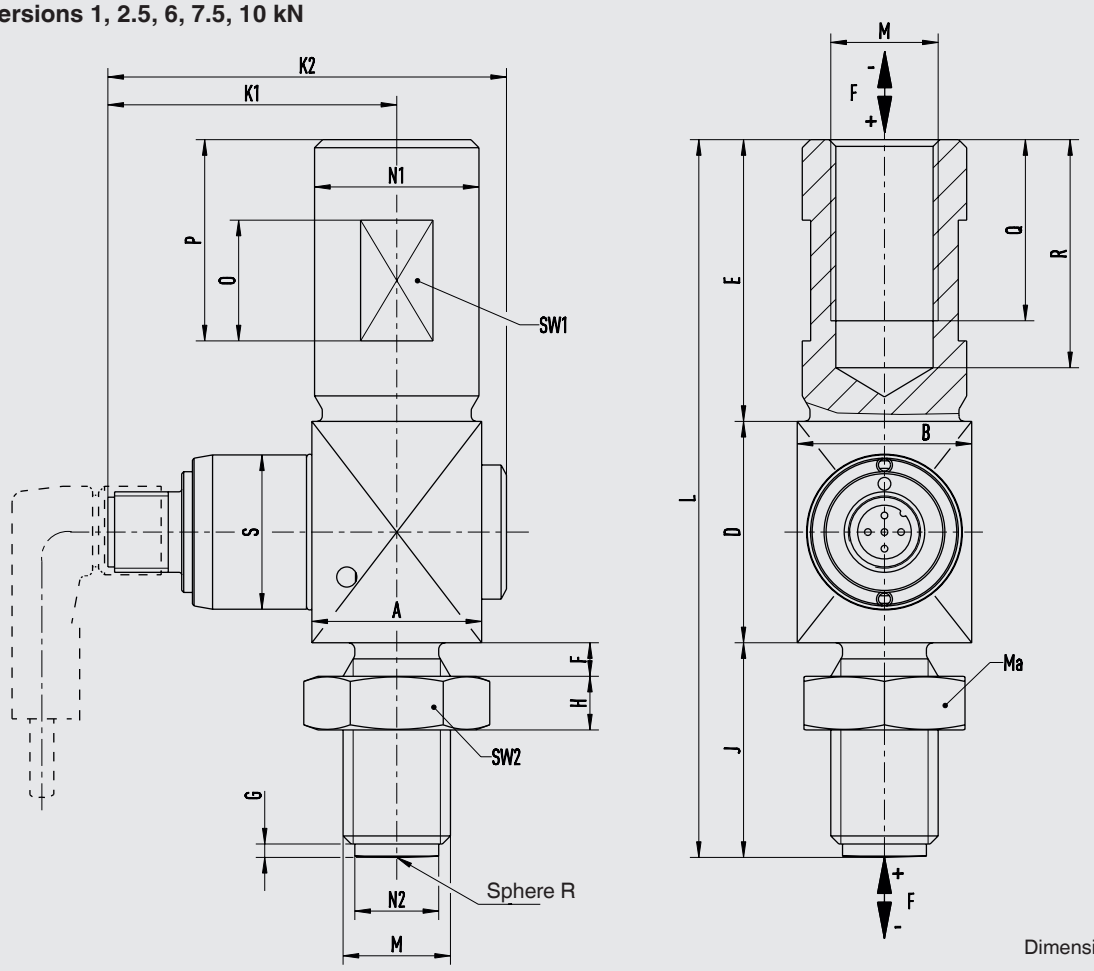
Specifications in accordance with VDI/VDE/DKD 2638

Model	F2304	F23C4 ATEX/IECEx EX ib [1]
Rated force F_{nom} kN	1, 2.5, 7.5, 10, 20, 25	50
Relative linearity error d_{lin} [2]	±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 TK_0 ■ Characteristic value TK_C	 0.4 % F_{nom} / 10 K 0.4 % 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	
Material of the measuring body	Corrosion-resistant stainless steel, ultrasound-tested 3.1 material (optionally 3.2)	
Rated temperature range $B_{T, nom}$	-20 … +80 °C	
Service temperature range $B_{T, G}$	-30 … +80 °C	Ex II 2G Ex ib IICT4 Gb -25 °C < T_{amb} < +85 °C Ex II 2G Ex ib IIC T3 Gb -25 °C < T_{amb} < +100 °C Ex I M2 Ex ib I Mb -25 °C < T_{amb} < +85 °C Ex II 2G Ex ib IIC T4 Gb -40 °C < T_{amb} < +85 °C Ex I M2 Ex ib I Mb (only available with cable connection)
Storage temperature range $B_{T, S}$	-40 … +85 °C	
Electrical connection	Circular connector M12 x 1, 4-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 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 [3]	4 … 20 mA, 2-wire
Current/power consumption	Current output 4 … 20 mA 2-wire: Signal current	
Power supply	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}) [4]	
Ingress protection (per EN/IEC 60529)	IP67	
Vibration resistance (to DIN EN 60068-2-6)	20 g, 100 h, 50 ... 150 Hz	
Wiring protection	Reverse polarity, overvoltage and short-circuit resistance	
Interference emission	DIN EN 55011	
Immunity	per DIN EN 61326-1/DIN EN 61326-2-3 (optionally EMC-protected versions)	
Options	Certificates, strength verifications, 3D-/CAD files (STEP, IGES) on request	
Certificates (optional)	**ATEX:** per EN 60079-0:2012 and EN 60079-11:2012 (Ex ib) **IECEx:** per IEC 60079-0:2011 (Ed.6) and IEC 60079-11:2011 (Ed. 6) (Ex ib)	

1) The force transducers with ignition protection type “ib” should only be powered using galvanically isolated repeater power supplies. Suitable repeater power supplies can be offered as an option e.g. EZE08X030003. 2) Relative linearity error is specified in acc. with Directive VDI/VDE/DKD 2638 Chap. 3.2.6. 3) Protocol in accordance with CiA 301, device profile 404, communication service LSS (CiA 305). 4) Other response times possible upon request. CANopen® and CiA® are registered community trademarks of CAN in Automation e. V.

Dimensions

F2304 Versions 1, 2.5, 6, 7.5, 10 kN



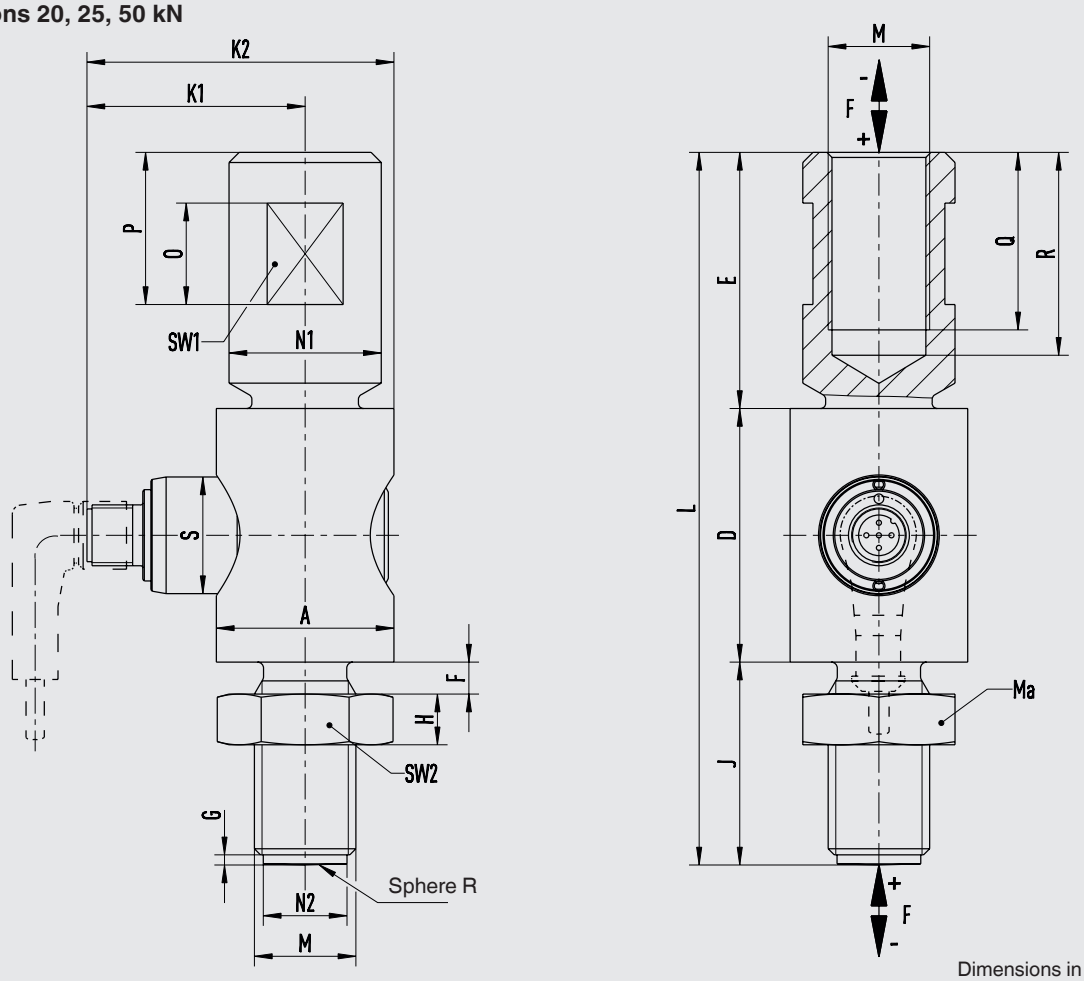
Dimensions in mm.

Rated force in kN	A	B	D	E	F	G	H	J	K1	K2	L
1	25.3	22	24	32	3.2	1.5	5	22	43	60	78
2.5	25.3	22	24	33	4.3	1.5	6	24	43	60	81
6	25.3	22	33	35	5	2	8	32	43	60	100
7.5, 10	25.3	26	33	42	5	2	8	32	43	60	107

Rated force in kN	M	O	P	Q	R	S	SW1	SW2	$ØN1_{0.1}$	$ØN2_{0.1}$	Sphere R	MA (Nm)	Rated displacement
1	M10 x 1.25	14	23	21	25	21.5	13	17	14	7.6	60	60	< 0.5
2.5	M12 x 1.25	14	23	22	26	21.5	15	19	16	9.4	60	60	< 0.5
6	M16 x 1.5	18	23	23	28	21.5	22	24	24.5	12.5	100	60	< 0.5
7.5, 10	M16 x 1.5	18	30	27	34	21.5	22	24	24.5	12.5	100	60	< 0.5

Dimensions

F2304 Versions 20, 25, 50 kN



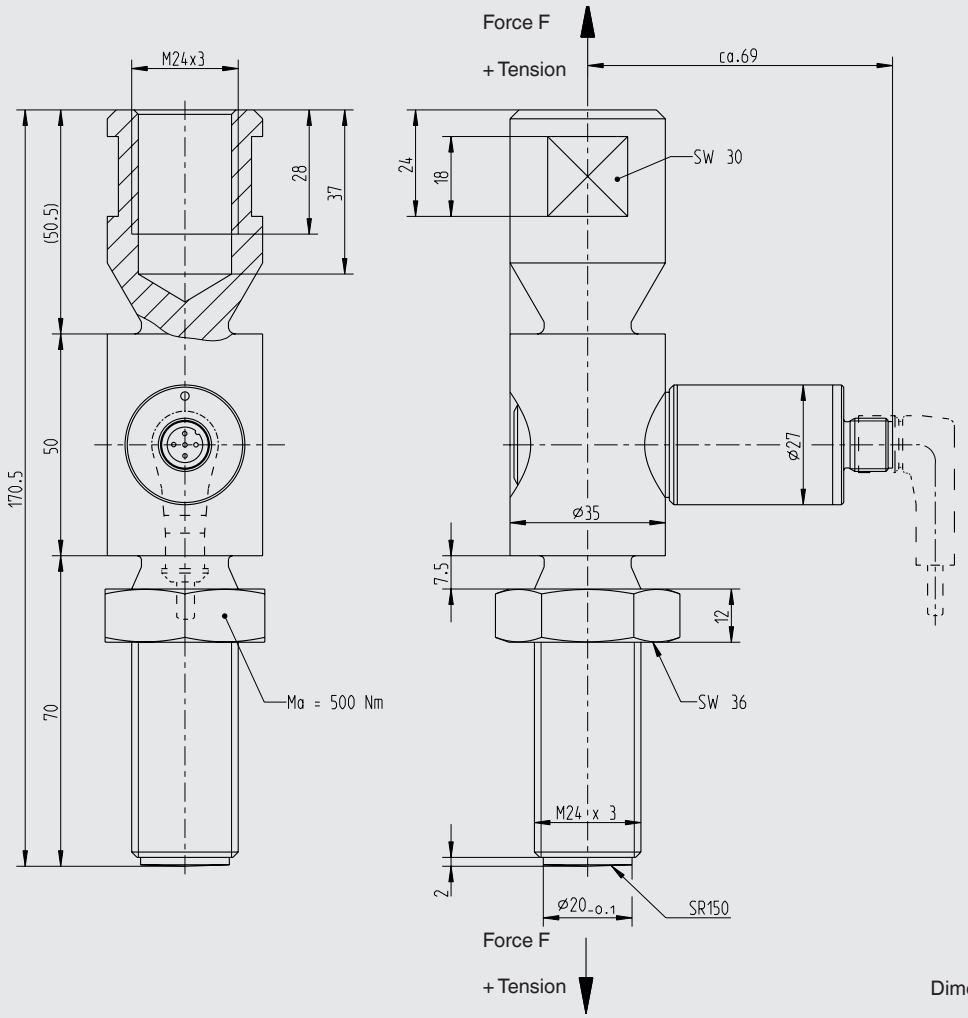
Dimensions in mm.

Rated force in kN	ØA	D	E	F	G	H	J	K1	K2	L
20, 25	35	50	50.5	6.3	2	10	40	43	60.5	140.5
50	35	50	50.5	5	2	12	70	43	57	170.5

Rated force in kN	M	O	P	Q	R	ØS	SW1	SW2	ØS	$ØN1_{0.1}$	$ØN2_{0.1}$	Sphere R	MA (Nm)	Rated displacement
20, 25	M20 x 1.5	20	30	35	40	23	26	30	23	30	16.5	150	356	< 0.5
50	M24 x 3	20	30	28	37	23	30	35	23	35	20	150	500	< 0.5

Dimensions

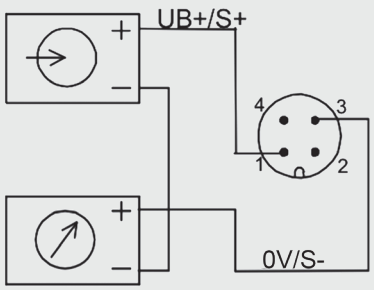
F23C4 50 kN



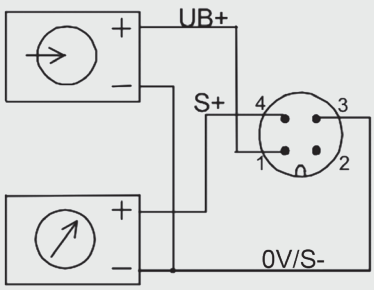
Dimensions in mm.

Pin assignment analogue output

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



Output 0 ... 10 V, 4 ... 20 mA, 3-wire
Circular connector M12 x 1, 4-pin



Circular connector M12 x 1, 4-pin			
	4 … 20 mA 2-wire	4 … 20 mA 3-wire	0 … 10 V 3-wire
Supply UB+	1	1	1
Supply 0V/UB-	3	3	3
Signal S+	1	4	4
Signal S-	3	3	3
Screen ⏚	Case	Case	Case

Cable outlet		
Cable colour	**2-wire**	**3-wire**
Brown	UB+/S+	UB+
White	-	-
Blue	0V/S-	0V/S-
Black	-	S+

Only when using the standard cable, e.g. EZE53X011016

Pin assignment ATEX/IECEx

Circular connector M12 x 1, 4-pin	
	ATEX Ex ib 4…20 mA 2-wire
Supply UB+	1
Supply 0V/UB-	3
Signal S+	1
Signal S-	3
Screen ⏚	Case

Cable outlet	
Cable colour	**2-wire**
Brown	UB+/S+
White	-
Blue	0V/S-
Black	-

Only when using the standard cable, e.g. EZE53X011016

Pin assignment signal jump version in accordance with EN 62061:2005

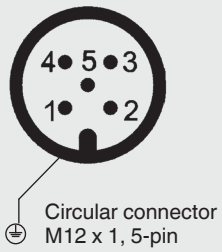
Circular connector M12 x 1, 4-pin			
	4…20 mA 2-wire	**4…20 mA 3-wire**	**0…10 V 3-wire**
Supply UB+	1	1	1
Supply 0V/UB-	3	3	3
Relay UR+	2	2	2
Relay UR-	4	3	3
Signal S+	1	4	4
Signal S-	3	3	3
Screen ⏚	Case	Case	Case

Cable outlet		
Cable colour	**2-wire**	**3-wire**
Brown	UB+/S+	UB+
White	UR+	UR+
Blue	0V/S-	0V/S-/UR-
Black	UR-	S+

Only when using the standard cable, e.g. EZE53X011016

Pin assignment CANopen®

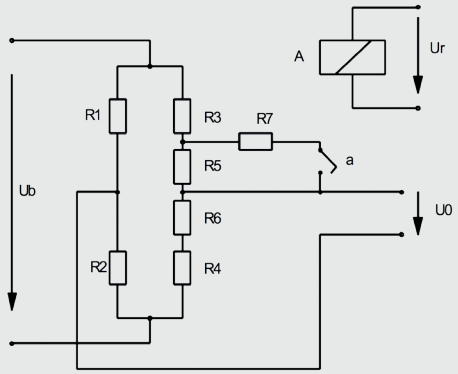
Circular connector M12 x 1, 5-pin	
Screen ⏚	1
Supply UB+ (CAN V+)	2
Supply UB- (CAN GND)	3
Bus-Signal CAN-High	4
Bus-Signal CAN-Low	5



Connect the cable shield to the force transducer housing. In the case of accessory cables, the cable shield must be connected with the knurled nut and thus connected to the housing of the force transducer. When extending, only shielded and low capacitance cables should be used. The permitted maximum and minimum lengths of the cable are specified in ISO 11898-2. A high-quality connection of the shielding must also be ensured.

Short description of signal jump electronics

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



Circuit diagram of signal jump electronics

These force transducers 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 U0.

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.

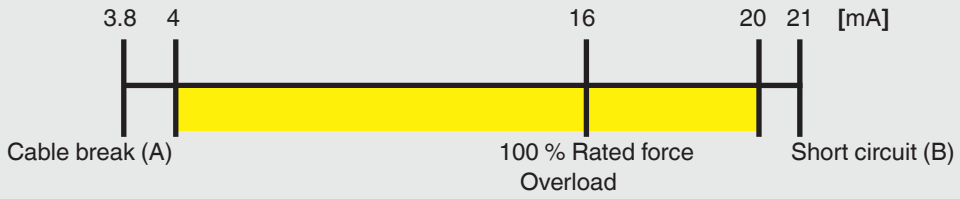
Compliance with functional safety

An external safety controller independently of the force transducer must monitor the safe functioning of the force transducer. The function test with a signal jump of 4 mA / 2 V is generated at a 24-hour interval. The safety controller activates relay A and thus defines the output signal of the force transducer.

If the expected change in the output signal occurs, it can be assumed that the entire signal path of the Wheatstone bridge via the amplifier to the output functions correctly.

If it does not occur, an error in this signal path can be concluded. Furthermore, the measuring signal is to be checked by the safety controller for the Min- (A) and Max- (B) signal values in order to detect a possibly arising line break or short circuit.

The standard adjustment of force transducers with current output 4 ... 20 mA for overload control is e.g.:



Signal of signal jump electronics

With a fixed signal level of, for example, 4 mA, the testing cycle can be triggered in every operating status upon activation of the check relais. The measurement's upper limit of 20 mA will not be reached. This enables a check of the signal level.

WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. +49 9372 132-0
Fax +49 9372 132-406
info@wika.de
www.wika.de