

# Tension/compression force transducer

## With thin-film technology up to 500 kN

### Models F2301 standard, F23C1 ATEX, F23S1 safety version

WIKA data sheet FO 51.17



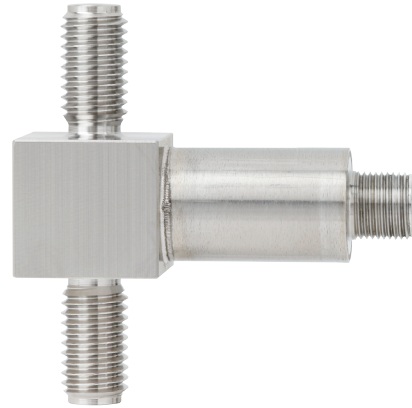
For further approvals  
see page 4

#### Applications

- Industrial weighing technology
- Machine building and plant construction, manufacturing automation
- Chemical and petrochemical industries
- Crane systems and hoists

#### Special features

- Measuring ranges 0 ... 1 kN to 0 ... 500 kN  
[0 ... 224.8 lbf to 0 ... 112,404 lbf]
- Corrosion-resistant stainless steel design
- Integrated amplifier
- High long-term stability, high shock and vibration resistance
- Good reproducibility, easy installation



Tension/compression force transducer, model F2301

Standard  
articles



#### Description

The tension/compression force transducers are suitable for static and dynamic measuring requirements in the direct force flow. They serve for determining tension and/or compression forces in diverse application areas.

These force transducers are very often used in linear drives as well as in the areas of special machine construction and laboratory technology. The force transducers are also perfectly suited for hoists and crane systems.

The corresponding technical and regional approvals of these force transducers are, of course, available as options.

The force transducers are made of high-strength, corrosion resistant stainless steel 1.4542, whose properties are particularly suitable for the transducer's application area.

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.

The tension/compression force transducers can be integrated into a certified WIKA overload protection with model ELMS1 (DIN EN ISO 13849-1 with PL d/Cat. 3).

## Specifications per VDI/VDE/DKD 2638

Model	F2301 and F23C1 UL approval	F23S1
<b>Rated force <math>F_{nom}</math> kN</b>	1, 2, 3, 5, 10, 20, 30, 50, 100, 200, 300, 500	3, 5, 10, 20, 30, 50, 100
<b>Rated force <math>F_{nom}</math> lbf</b>	225; 450; 674; 1,124; 2,248; 4,496; 6,744; 11,240; 22,481; 44,962; 67,443; 112,404	674; 1,124; 2,248; 4,496; 6,744; 11,240; 22,481
<b>Relative linearity error <math>d_{lin}^{1)}</math></b>	$\pm 0.5 \% F_{nom}$	
<b>Relative reversibility error <math>v</math></b>	$< 0.1 \% F_{nom}$	
<b>Temperature effect on</b>		
the characteristic value $TK_C$	$0.2 \% F_{nom} / 10 \text{ K}$	$0.4 \% F_{nom} / 10 \text{ K}$
the zero signal $TK_0$	$0.2 \% F_{nom} / 10 \text{ K}$	$0.4 \% F_{nom} / 10 \text{ K}$
<b>Force limit <math>F_L</math></b>	$150 \% F_{nom}$	
<b>Breaking force <math>F_B</math></b>	$300 \% F_{nom}$	
<b>Permissible vibration loading <math>F_{rb}</math></b>	$50 \% F_{nom}$ (in accordance with DIN 50100)	
<b>Rated displacement (typical) <math>s_{nom}</math></b>		
$< 10 \text{ kN}$ [ $< 2,248 \text{ lbf}$ ]	$< 0.02 \text{ mm}$ [ $< 0.00079 \text{ in}$ ]	
$< 100 \text{ kN}$ [ $< 22,481 \text{ lbf}$ ]	$< 0.2 \text{ mm}$ [ $< 0.0079 \text{ in}$ ]	
<b>Rated temperature range <math>B_{T, nom}</math></b>	$-20 \dots +80 \text{ }^\circ\text{C}$ [ $-4 \dots +176 \text{ }^\circ\text{F}$ ]	
<b>Operating temperature range <math>B_{T, G}</math></b>	<ul style="list-style-type: none"> <li>■ <math>-30 \dots +80 \text{ }^\circ\text{C}</math> [<math>-22 \dots +176 \text{ }^\circ\text{F}</math>]</li> <li>■ <math>-40 \dots +80 \text{ }^\circ\text{C}</math> [<math>-40 \dots +176 \text{ }^\circ\text{F}</math>]</li> </ul>	$-30 \dots +80 \text{ }^\circ\text{C}$ [ $-22 \dots +176 \text{ }^\circ\text{F}$ ]
<b>Storage temperature range <math>B_{T, S}</math></b>	$-40 \dots +85 \text{ }^\circ\text{C}$ [ $-40 \dots +185 \text{ }^\circ\text{F}$ ]	
<b>Electrical connection</b>	<ul style="list-style-type: none"> <li>■ Circular connector M12 x 1, 5-pin</li> <li>■ CANopen®, circular connector M12 x 1, 5-pin</li> </ul>	2-connector variant, 4-pin
<b>Characteristic value range <math>B_C</math> (Output signal)</b>	<ul style="list-style-type: none"> <li>■ 4 ... 20 mA, 2-wire</li> <li>■ 4 ... 20 mA, 3-wire</li> <li>■ DC 0 ... 10 V, 3-wire</li> <li>■ Optional redundant signal</li> <li>■ CANopen®</li> </ul> <p>Protocol in accordance with CiA®301, instrument profile CiA®404, communication services LSS (CiA®305), configuration of the instrument address and baud rate Sync/Async, Node/Lifeguarding, heartbeat; zero point and span <math>\pm 10 \%</math> adjustable via entries in the object directory <sup>2)</sup></p>	<p>Redundant, opposing 4 ... 20 mA, 3-wire / 20 ... 4 mA, 3-wire</p> <p>Version in accordance with requirements for functional safety per machinery directive 2006/42/EC as WIKA overload protection with model ELMS1 (DIN EN ISO 13849-1 with PL d/cat. 3).</p>
<b>Insulation resistance</b>	$> 2 \text{ G}\Omega$	
<b>Current/power consumption</b>	<ul style="list-style-type: none"> <li>■ Current output 4 ... 20 mA, 2-wire: Signal current</li> <li>■ Current output 4 ... 20 mA, 3-wire: <math>&lt; 8 \text{ mA}</math></li> <li>■ Voltage output: <math>&lt; 8 \text{ mA}</math></li> <li>■ CANopen®: <math>&lt; 1 \text{ W}</math></li> </ul>	Current output 4 ... 20 mA: Signal current
<b>Supply voltage <math>U_B</math></b>	<ul style="list-style-type: none"> <li>■ DC 9 ... 36 V for current output</li> <li>■ DC 13 ... 36 V for voltage output</li> <li>■ DC 9 ... 36 V for CANopen®</li> </ul>	DC 10 ... 30 V for current output
<b>Load</b>	<ul style="list-style-type: none"> <li>■ <math>\leq (U_B - 10 \text{ V}) / 0.024 \text{ A}</math> for current output</li> <li>■ <math>&gt; 25 \text{ k}\Omega</math> for voltage output</li> </ul>	<ul style="list-style-type: none"> <li>■ <math>\leq (U_B - 10 \text{ V}) / 0.020 \text{ A}</math> (channel 1) for current output</li> <li>■ <math>\leq (U_B - 7 \text{ V}) / 0.020 \text{ A}</math> (channel 2) for current output</li> </ul>
<b>Ingress protection (per IEC/EN 60529)</b>		
Unplugged state	IP66, IP67	IP67
Plugged-in state	IP68, IP69, IP69K	
<b>Electrical protection</b>	Reverse polarity protection, overvoltage and short-circuit resistance	
<b>Vibration resistance</b>	20 g, 100 h, 50 ... 150 Hz (per DIN EN 60068-2-6)	
<b>Shock resistance</b>	DIN EN 60068-2-27	
<b>Immunity</b>	<ul style="list-style-type: none"> <li>■ In accordance with DIN EN 61326-1/DIN EN 61326-2-3</li> <li>■ EMC-strengthened versions</li> </ul>	
<b>Intended use</b>	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, instrument profile CiA®404, communication service LSS (CiA®305).

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## Specifications per VDI/VDE/DKD 2638

Model	F23C1 ATEX/IECEX EX ib 1)	F2301 Signal jump
Rated force $F_{nom}$ kN	1, 2, 3, 5, 10, 20, 30, 50, 100	
Rated force $F_{nom}$ lbf	225; 450; 674; 1,124; 2,248; 4,496; 6,744; 11,240; 22,481	
Relative linearity error $d_{lin}$ 2)	$\pm 0.5\% F_{nom}$	
Relative reversibility error $v$	$< 0.1\% F_{nom}$	
<b>Temperature effect on</b>		
the characteristic value $TK_C$	$0.4\% F_{nom} / 10\text{ K}$	$0.2\% F_{nom} / 10\text{ K}$
the zero signal $TK_0$	$0.4\% F_{nom} / 10\text{ K}$	$0.2\% F_{nom} / 10\text{ K}$
Force limit $F_L$	$150\% F_{nom}$	
Breaking force $F_B$	$300\% F_{nom}$	
Permissible vibration loading $F_{rb}$	$50\% F_{nom}$ (in accordance with DIN 50100)	
<b>Rated displacement (typical) <math>s_{nom}</math></b>		
$< 10\text{ kN}$ [ $< 2,248\text{ lbf}$ ]	$< 0.02\text{ mm}$ [ $< 0.00079\text{ in}$ ]	
$< 100\text{ kN}$ [ $< 22,481\text{ lbf}$ ]	$< 0.2\text{ mm}$ [ $< 0.0079\text{ in}$ ]	
Rated temperature range $B_{T, nom}$	$-20 \dots +80\text{ °C}$ [ $-4 \dots +176\text{ °F}$ ]	
Operating temperature range $B_{T, G}$	Ex II 2G Ex ib IIC T4 Gb $-25\text{ °C} < T_{amb} < +85\text{ °C}$ Ex II 2G Ex ib IIC T3 Gb $-25\text{ °C} < T_{amb} < +100\text{ °C}$ Ex I M2 Ex ib I Mb $-25\text{ °C} < T_{amb} < +85\text{ °C}$ Ex II 2G Ex ib IIC T4 Gb $-40\text{ °C} < T_{amb} < +85\text{ °C}$ Ex I M2 Ex ib I Mb	$-30 \dots +80\text{ °C}$ [ $-22 \dots +176\text{ °F}$ ]
Storage temperature range $B_{T, S}$	$-40 \dots +85\text{ °C}$ [ $-40 \dots +185\text{ °F}$ ]	
Electrical connection	Circular connector M12 x 1, 4-pin	
Characteristic value range $B_C$ (Output signal)	$4 \dots 20\text{ mA}$ , 2-wire	■ $4 \dots 16\text{ mA}$ , 3-wire 3) ■ DC $2 \dots 8\text{ V}$ , 3-wire 3)
Insulation resistance	$> 2\text{ G}\Omega$	
Current/power consumption	Current output $4 \dots 20\text{ mA}$ 2-wire: Signal current	■ Current output $4 \dots 20\text{ mA}$ 2-wire: Signal current ■ Current output $4 \dots 20\text{ mA}$ 3-wire: $< 8\text{ mA}$ ■ Voltage output: $< 8\text{ mA}$
Supply voltage $UB$	DC $10 \dots 30\text{ V}$ for current output	■ DC $9 \dots 36\text{ V}$ for current output ■ DC $13 \dots 36\text{ V}$ for voltage output
Load	■ $\leq (UB - 10\text{ V}) / 0.024\text{ A}$ for current output ■ $> 25\text{ k}\Omega$ for voltage output	
<b>Ingress protection (per IEC/EN 60529)</b>		
Unplugged state	IP66, IP67	IP67
Plugged-in state	IP68, IP69, IP69K	
Electrical protection	Reverse polarity protection, overvoltage and short-circuit resistance	
Vibration resistance	$20\text{ g}$ , $100\text{ h}$ , $50 \dots 150\text{ Hz}$ (per DIN EN 60068-2-6)	
Immunity	■ In accordance with DIN EN 61326-1/DIN EN 61326-2-3 ■ EMC-strengthened versions	

1) The force transducers with ignition protection type "ib" must only be supplied using galvanically-isolated power supplies. Suitable supply isolators are also optionally available, e.g. order number: 14255084.





2) Relative linearity error is specified in accordance with Directive VDI/VDE/DKD 2638 chapter 3.2.6.

3) Other signal jumps are realisable on request.

## Approvals

Logo	Description	Region
	<b>EU declaration of conformity</b> EMC directive	European Union

## Optional approvals

Logo	Description	Region
	<b>ATEX directive <sup>1)</sup></b> in accordance with EN 60079-0:2012 and EN 60079-11:2012 (Ex ib) Hazardous areas Ex ib Ex II 2G Ex ib IIC T4 Gb $-25\text{ °C} < T_{\text{amb}} < +85\text{ °C}$ Ex II 2G Ex ib IIC T3 Gb $-25\text{ °C} < T_{\text{amb}} < +100\text{ °C}$ Ex I M2 Ex ib I Mb <sup>3)</sup> $-25\text{ °C} < T_{\text{amb}} < +85\text{ °C}$ Ex II 2G Ex ib IIC T4 Gb $-40\text{ °C} < T_{\text{amb}} < +85\text{ °C}$ I M2 Ex ib I Mb <sup>3)</sup>	European Union
	<b>IECEx <sup>1)</sup></b> in accordance with IEC 60079-0:2011 (Ed.6) and IEC 60079-11:2011 (Ed. 6) (Ex ib) Hazardous areas Ex ib Ex ib IIC T4/T3 Gb $-25\text{ °C} < T_{\text{amb}} < +85\text{ °C}$ Ex ib IIC T4 Gb $-25\text{ °C} < T_{\text{amb}} < +100\text{ °C}$ Ex ib I Mb <sup>3)</sup> $-25\text{ °C} < T_{\text{amb}} < +85\text{ °C}$ Ex ib IIC T4 Gb $-40\text{ °C} < T_{\text{amb}} < +85\text{ °C}$	International
	<b>UL <sup>2)</sup></b> nach UL 61010-1 und CSA C22.2 NO. 61010-1 Component approval	USA and Canada
	<b>EAC</b> EMC directive	Eurasian Economic Community

1) Only applies to model F23C1

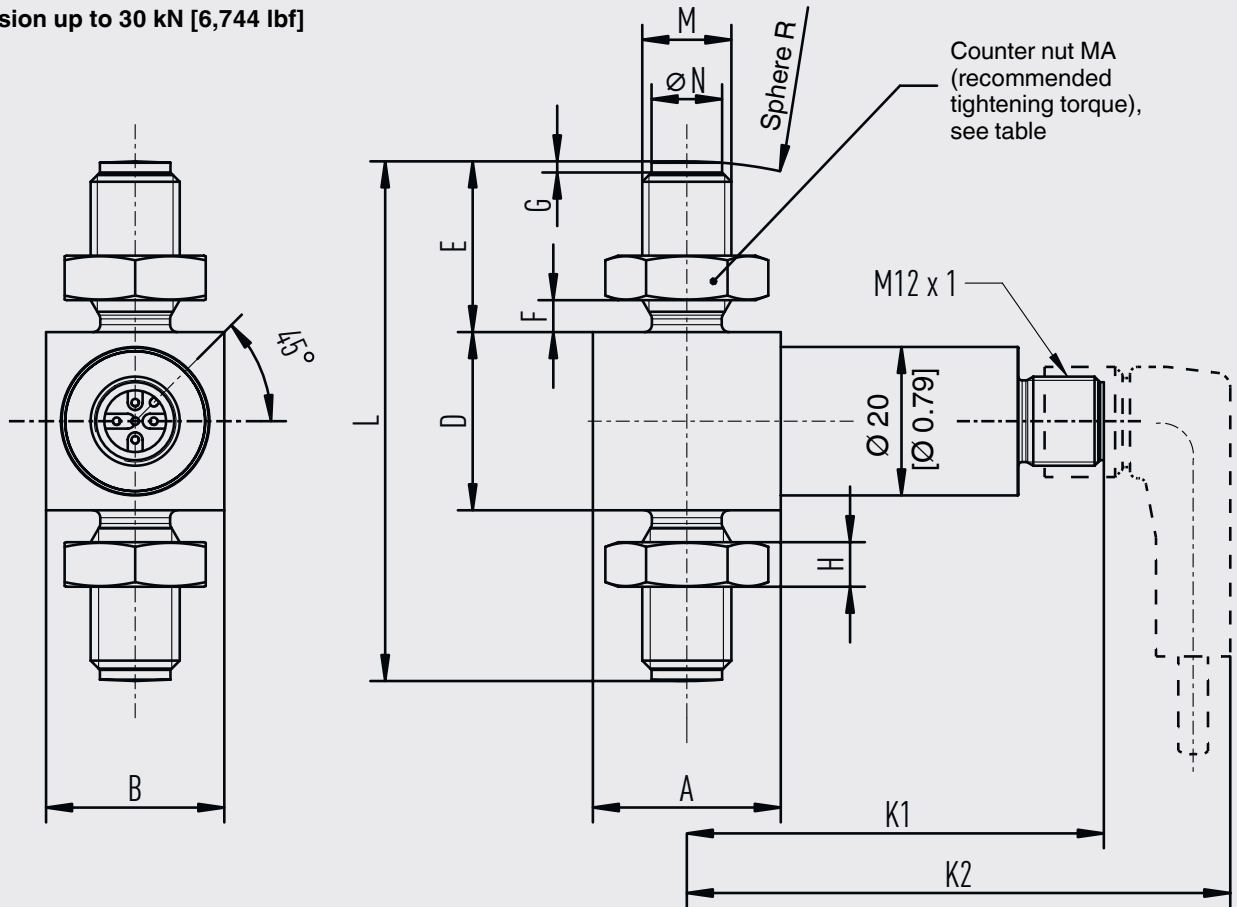
2) Only applies to model F23C1 with UL approval

3) Only available with cable connection

→ For additional approvals and certificates, see website

## Dimensions in mm [in]

Model F2301 and model F23C1 with UL approval  
version up to 30 kN [6,744 lbf]

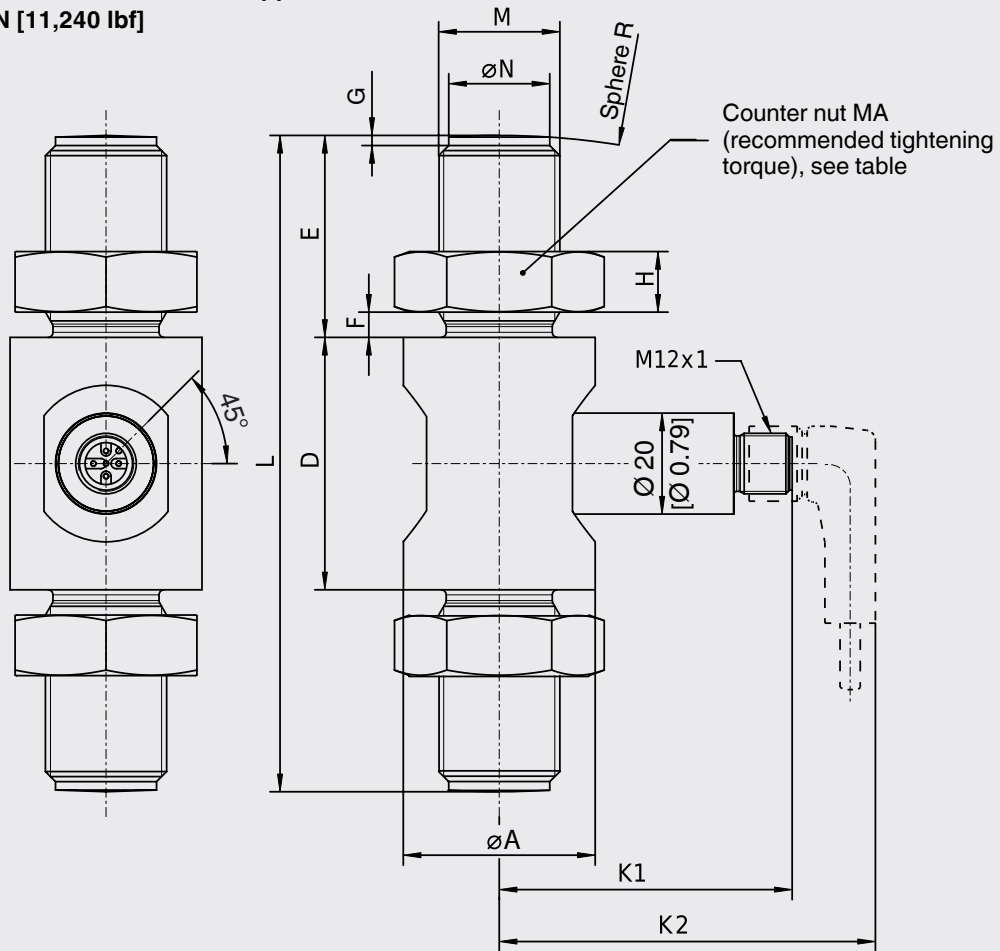


Rated force in kN	Dimensions in mm														Tightening torque MA (Nm)
	A	B	D	E	F	G	H	K1	K2	L	M	ØN -0.1	Sphere R	Rated dis- placement	
1, 2, 3	25.3	24	24	23	4.3	1.5	6	56	76	70	M12	9.5	60	< 0.02	15
5	25.3	24	24	23	4.3	1.5	6	56	76	70	M12	9.5	60	< 0.02	15
10	25.3	24	31	23	4.3	1.5	6	56	76	77	M12	9.5	80	< 0.02	15
20	25.3	26	35	34	3.8	2	10	56	76	103	M20 x 1.5	17	100	< 0.2	60
30	26	27	44	34	3.8	2	10	56.5	76.5	112	M20 x 1.5	17	120	< 0.2	60

Rated force in lbf	Dimensions in inch														Tightening torque MA (Nm)
	A	B	D	E	F	G	H	K1	K2	L	M	ØN -0.004	Sphere R	Rated dis- placement	
225, 450, 674	0.99	0.99	0.99	0.9	0.17	0.06	0.24	2.2	2.99	2.75	M12	0.37	2.36	< 0.00079	15
1,124	0.99	0.99	0.99	0.9	0.17	0.06	0.24	2.2	2.99	2.75	M12	0.37	2.36	< 0.00079	15
2,248	0.99	0.99	0.99	0.9	0.17	0.06	0.24	2.2	2.99	3.03	M12	0.37	3.15	< 0.00079	15
4,496	0.99	1	1.37	1.34	0.15	0.08	0.39	2.2	2.99	4.05	M20 x 1.5	0.67	3.94	< 0.0079	60
6,744	1.02	1.06	1.73	1.34	0.15	0.08	0.39	2.22	3.01	4.41	M20 x 1.5	0.67	4.72	< 0.0079	60

## Dimensions in mm [in]

Model F2301 and model F23C1 with UL approval  
version from 50 kN [11,240 lbf]

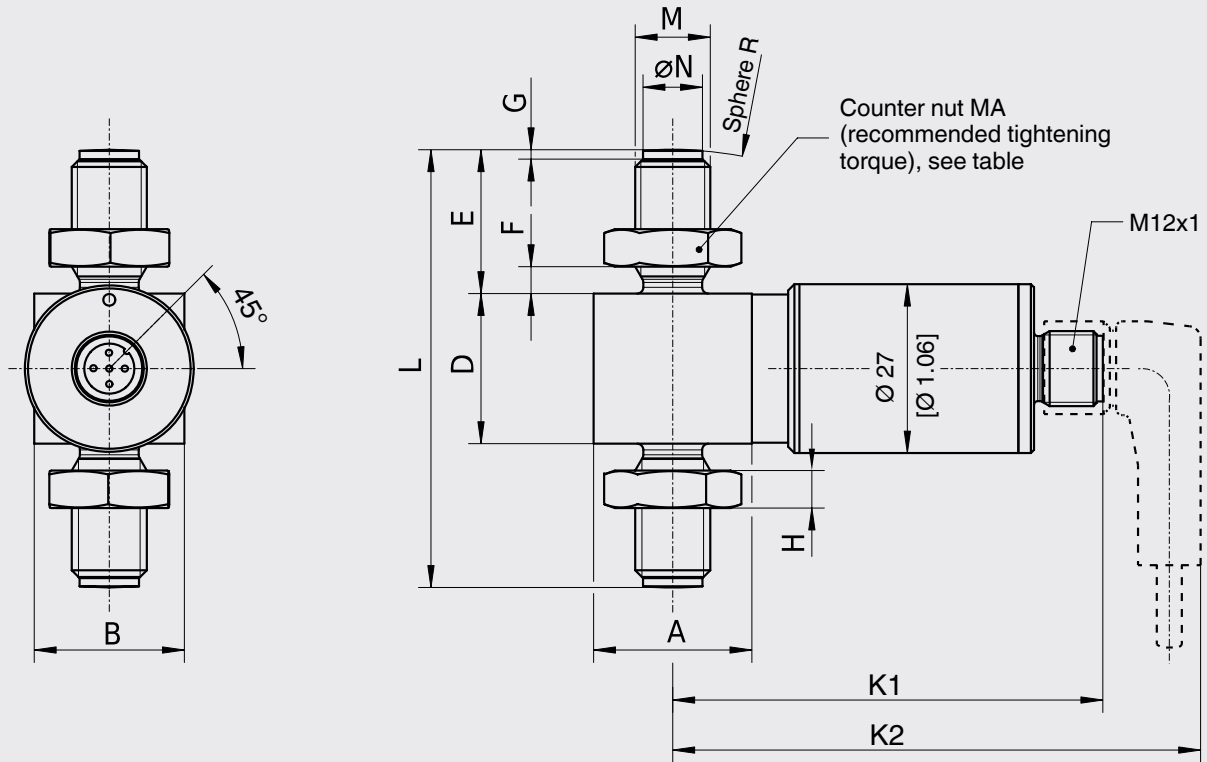


Rated force in kN	Dimensions in mm														Tightening torque MA (Nm)
	ØC	D	E	F	G	H	K1	K2	L	M	ØN <sub>-0.1</sub>	Sphere R	Rated dis- placement		
50	38	50	40	5	2	12	58	68	130	M24 x 2	20	150	< 0.2	110	
100	46	54	71	7.5	3	19.5	62.5	82.5	196	M39 x 3	34	200	< 0.2	390	
200	67	67	82	7.5	3	22.5	73	93	231	M45 x 3	40	250	< 0.2	495	
300	73	73	98	14	3	28	65.5	85.5	269	M56 x 4	50	300	< 0.2	640	
500	94	94	113	17	3	32	65.5	85.5	320	M64 x 4	58	400	< 0.2	760	

Rated force in lbf	Dimensions in inch														Tightening torque MA (Nm)
	ØC	D	E	F	G	H	K1	K2	L	M	ØN <sub>-0.004</sub>	Sphere R	Rated dis- placement		
11,240	1.5	1.97	1.57	0.2	0.08	0.47	2.28	2.68	5.12	M24 x 2	0.79	5.9	< 0.0079	110	
22,481	1.81	2.16	2.8	0.3	0.12	0.76	2.46	3.25	7.72	M39 x 3	1.34	7.87	< 0.0079	390	
44,962	2.64	2.64	3.23	0.3	0.12	0.88	2.87	3.66	9.09	M45 x 3	1.57	9.84	< 0.0079	495	
67,443	2.87	2.87	3.86	0.55	0.12	1.1	2.58	3.37	10.6	M56 x 4	1.97	11.8	< 0.0079	640	
112,404	3.7	3.7	4.45	0.67	0.12	1.26	2.58	3.37	12.6	M64 x 4	2.28	15.75	< 0.0079	760	

## Dimensions in mm [in]

Model F23C1 (ATEX) version up to 30 kN [6,744 lbf]

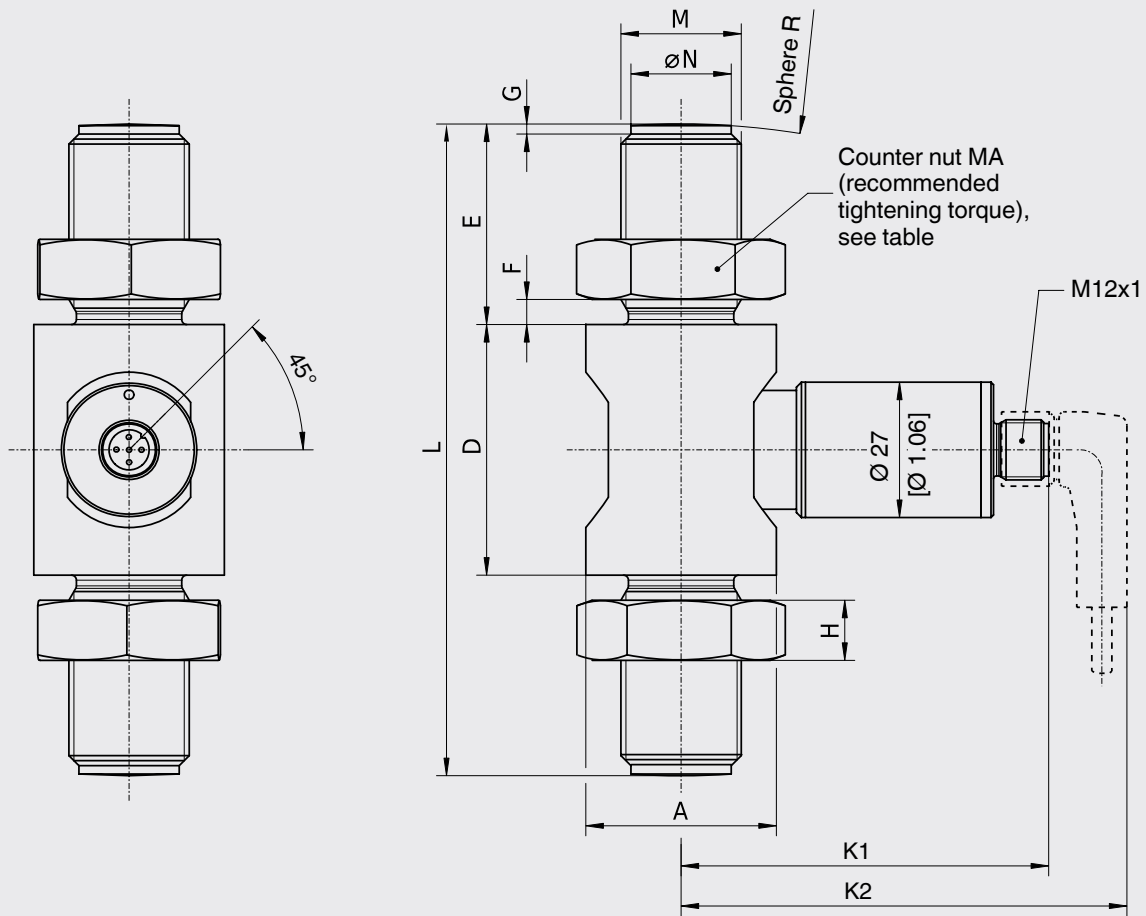


Rated force in kN	Dimensions in mm														Tightening torque MA (Nm)
	A	B	D	E	F	G	H	K1	K2	L	M	ØN -0.1	Sphere R	Rated dis- placement	
<b>1, 2, 3, 5</b>	25.3	24	24	23	4.3	1.5	6	68.8	88.8	70	M12	9.5	60	< 0.02	15
<b>10</b>	25.3	24	31	23	4.3	1.5	6	68.8	88.8	77	M12	9.5	80	< 0.02	15
<b>20</b>	25.3	26	35	34	3.8	2	10	68.8	88.8	103	M20 x 1.5	17	100	< 0.2	60
<b>30</b>	26	27	44	34	3.8	2	10	69.1	89.1	112	M20 x 1.5	17	120	< 0.2	60

Rated force in lbf	Dimensions in inch														Tightening torque MA (Nm)
	A	B	D	E	F	G	H	K1	K2	L	M	ØN -0.004	Sphere R	Rated dis- placement	
<b>225, 450 674, 1,124</b>	0.99	0.94	0.94	0.91	0.17	0.06	0.24	2.71	3.5	2.75	M12	0.37	2.36	< 0.00079	15
<b>2,248</b>	0.99	0.94	1.22	0.91	0.17	0.06	0.24	2.71	3.5	3.03	M12	0.37	3.15	< 0.00079	15
<b>4,496</b>	0.99	1.02	1.38	1.34	0.15	0.08	0.39	2.71	3.5	4.06	M20 x 1.5	0.67	3.94	< 0.0079	60
<b>6,744</b>	1.02	1.06	1.73	1.34	0.15	0.08	0.39	2.72	3.51	4.41	M20 x 1.5	0.67	4.72	< 0.0079	60

## Dimensions in mm [in]

Model F23C1 (ATEX) version from 50 kN [11,240 lbf]

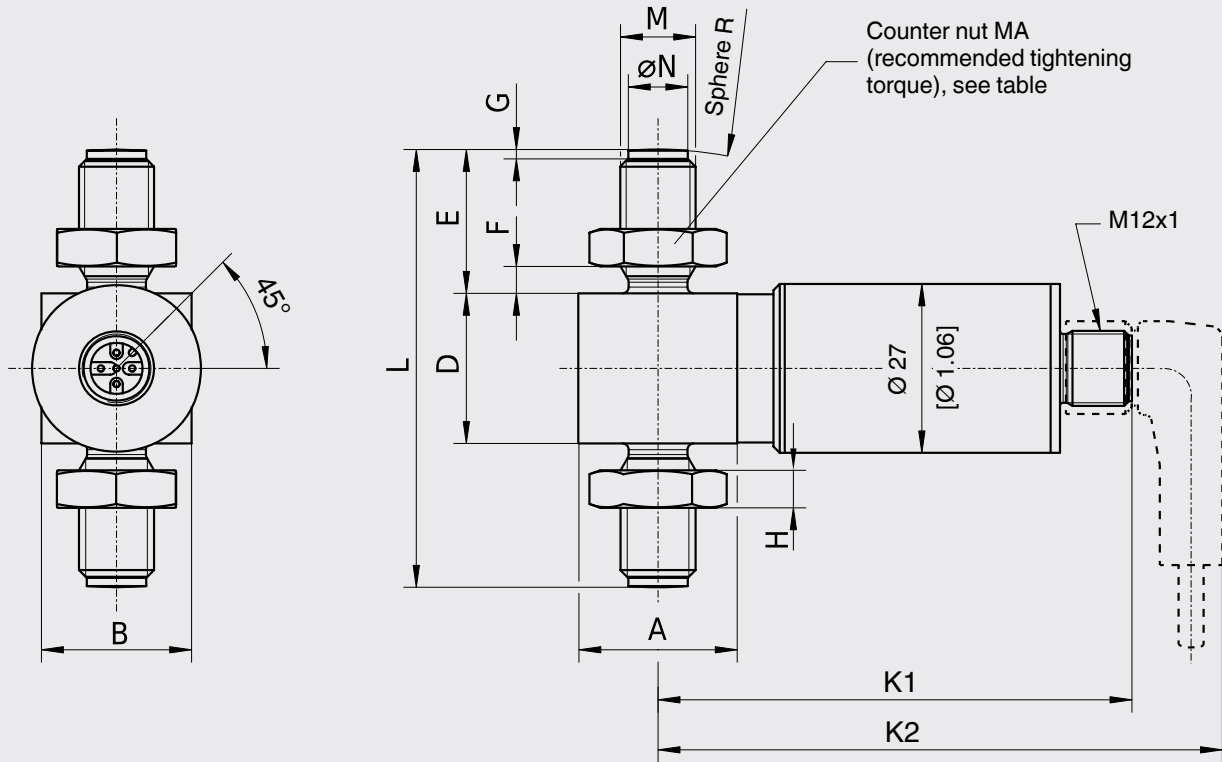


Rated force in kN	Dimensions in mm													Tightening torque MA (Nm)
	ØA	D	E	F	G	H	K1	K2	L	M	ØN <sub>-0.1</sub>	Sphere R	Rated dis- placement	
50	38	50	40	5	2	12	73.3	93.3	130	M24 x 2	20	150	< 0.2	110
100	46	54	71	7.5	3	19.5	77.3	97.3	196	M39 x 3	34	200	< 0.2	390
200	67	67	82	7.5	3	22.5	87.8	107.8	231	M45 x 3	40	250	< 0.2	495
300	73	73	98	14	3	28	92.3	112.3	269	M56 x 4	50	300	< 0.2	640
500	94	94	113	17	3	32	102.8	122.8	320	M64 x 4	58	400	< 0.2	760

Rated force in lbf	Dimensions in inch													Tightening torque MA (Nm)
	ØA	D	E	F	G	H	K1	K2	L	M	ØN <sub>-0.004</sub>	Sphere R	Rated dis- placement	
11,240	1.5	1.97	1.57	0.2	0.08	0.47	2.89	3.67	5.12	M24 x 2	0.79	5.9	< 0.0079	110
22,481	1.81	2.16	2.8	0.30	0.12	0.76	3.04	3.83	7.72	M39 x 3	1.34	7.87	< 0.0079	390
44,962	2.64	2.64	3.23	0.30	0.12	0.88	3.46	4.24	9.09	M45 x 3	1.57	9.84	< 0.0079	495
67,443	2.87	2.87	3.86	0.55	0.12	1.1	3.63	4.42	10.6	M56 x 4	1.97	11.8	< 0.0079	640
112,404	3.7	3.7	4.45	0.67	0.12	1.26	4.05	4.83	12.6	M64 x 4	2.28	15.75	< 0.0079	760

## Dimensions in mm [in]

Model F2301 with signal jump, version up to 30 kN [6,744 lbf]

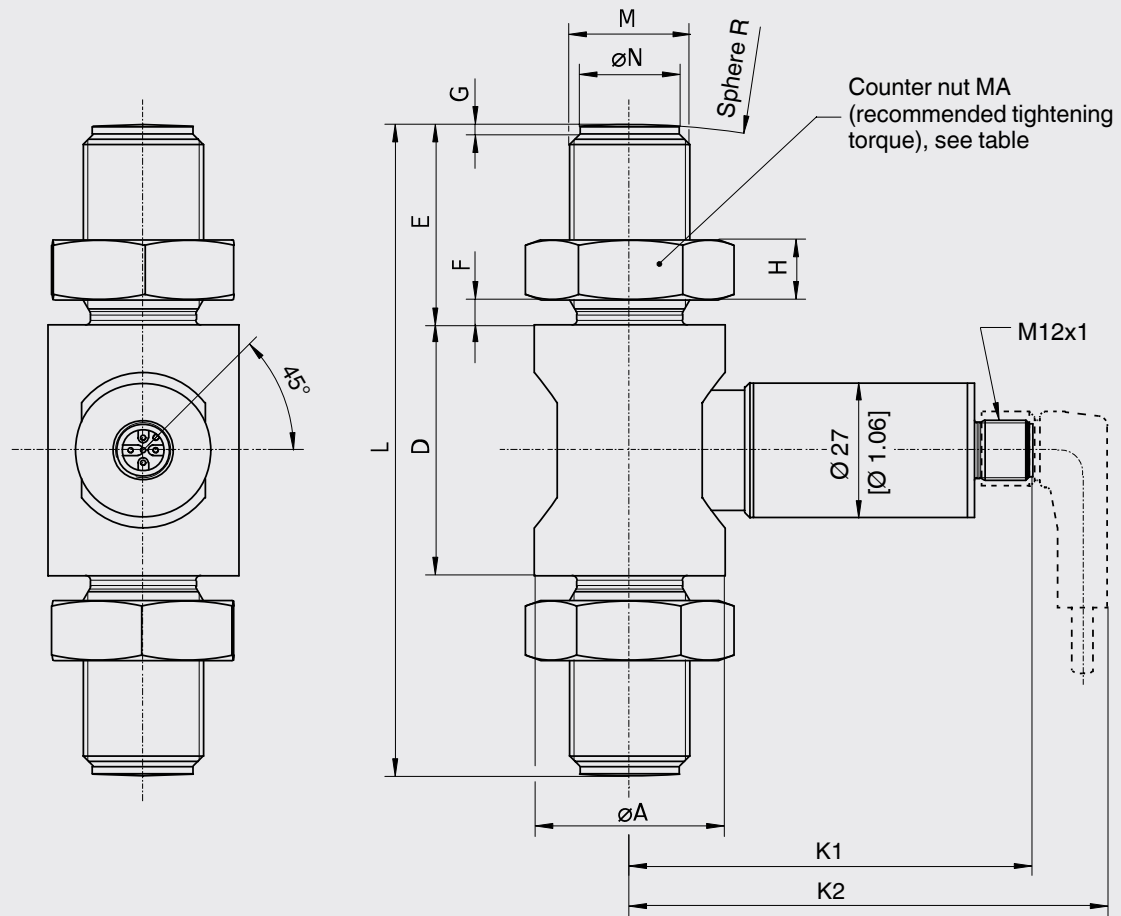


Rated force in kN	Dimensions in mm														Tightening torque MA (Nm)
	A	B	D	E	F	G	H	K1	K2	L	M	N <sub>-0.1</sub>	Sphere R		
5	25.3	24	24	23	4.3	1.5	6	76	96	70	M12	9.5	60	15	
10	25.3	24	31	23	4.3	1.5	6	76	96	77	M12	9.5	80	15	
20	25.3	26	35	34	3.8	2	10	76	96	103	M20 x 1.5	17	100	60	
30	26	27	44	34	3.8	2	10	76	96	112	M20 x 1.5	17	120	60	

Rated force in lbf	Dimensions in inch														Tightening torque MA (Nm)
	A	B	D	E	F	G	H	K1	K2	L	M	ØN <sub>-0.004</sub>	Sphere R		
1,124	1.0	0.94	0.94	0.9	0.17	0.06	0.24	2.99	3.87	2.75	M12	0.37	2.36	15	
2,248	1.0	0.94	1.22	0.9	0.17	0.06	0.24	2.83	3.87	3.03	M12	0.37	3.15	15	
4,496	1.0	1.02	1.38	1.34	0.15	0.08	0.39	2.83	3.87	4.06	M20 x 1.5	0.67	3.94	60	
6,744	1.02	1.06	1.73	1.34	0.15	0.08	0.39	2.83	3.87	4.41	M20 x 1.5	0.67	4.72	60	

## Dimensions in mm [in]

Model F2301 with signal jump, version from 50 kN [11,240 lbf]

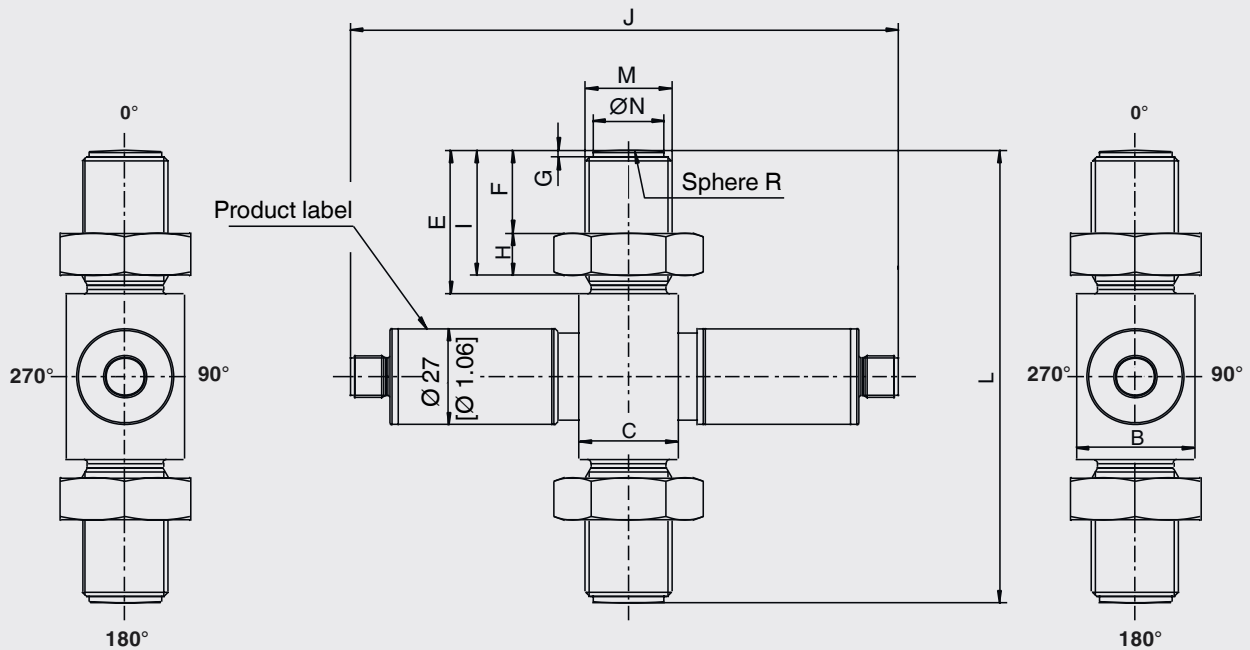


Rated force in kN	Dimensions in mm														Tightening torque MA (Nm)
	ØA	B	D	E	F	G	H	K1	K2	L	M	N <sub>-0,1</sub>	Sphere R	Rated dis- placement	
50	38	--	50	40	5	2	12	80	100	130	M24 x 3	20	150	< 0.2	110
100	46	--	54	71	7.5	3	19.5	85	105	196	M39 x 3	34	200	< 0.2	390
200	67	--	67	82	7.5	3	22.5	95	115	231	M45 x 3	40	250	< 0.2	495
300	73	--	73	98	14	3	28	100	120	269	M56 x 4	50	300	< 0.2	640
500	94	--	94	113	17	3	32	110	130	320	M64 x 4	58	400	< 0.2	760

Rated force in lbf	Dimensions in inch														Tightening torque MA (Nm)
	ØA	B	D	E	F	G	H	K1	K2	L	M	ØN <sub>-0,004</sub>	Sphere R	Rated dis- placement	
11.240	1.5	--	1.97	1.57	0.2	0.08	0.47	3.15	3.94	5.12	M24 x 3	0.79	5.91	< 0.0079	110
22.481	1.81	--	2.13	2.8	0.3	0.12	0.77	3.35	4.13	7.72	M39 x 3	1.34	7.87	< 0.0079	390
44.962	2.64	--	2.64	3.23	0.3	0.12	0.89	3.74	4.53	9.09	M45 x 3	1.57	9.84	< 0.0079	495
67.443	2.87	--	2.87	3.86	0.55	0.12	1.10	3.94	4.72	10.59	M56 x 4	1.97	11.81	< 0.0079	640
112.405	3.7	--	3.7	4.45	0.67	0.12	1.26	4.33	5.12	12.60	M64 x 4	2.28	15.75	< 0.0079	760

## Dimensions in mm [in]

Model F23S1 version from 3 kN [674 lbf]



Rated force in kN	Dimensions in mm											
	B	C	E	F	G	H	I	J	L	M	Ø N <sub>-0.1</sub>	Sphere R
<b>3-7</b>	22	25.3	23	12.7	1.5	6	18.7	152.5	75	M12	9.5	60
<b>6-13</b>	25.3	25.3	26	13.5	1.5	8	21.5	152.5	85	M16 x 1.5	13	80
<b>12-26</b>	27.5	27.6	34	20.2	2	10	30.2	152.5	108	M20 x 1.5	17	120
<b>18-40</b>	33	27.6	40	23	2	12	35	152.5	126	M24 x 2	20	120
<b>31-70</b>	40	40	48	25	2	15	40	157.4	154	M30 x 2	26	150
<b>67-151</b>	60	60	78	47.8	3	19.7	67.5	177.4	223	M39 x 3	38	250

Rated force in lbf	Dimensions in inch											
	B	C	E	F	G	H	I	J	L	M	Ø N <sub>-0.004</sub>	Sphere R
<b>674.48-1,574</b>	0.87	0.99	0.9	0.5	0.06	0.27	0.736	6	2.95	M12	0.37	2.36
<b>1,349-2,923</b>	0.99	0.99	1	0.53	0.06	0.315	0.85	6	3.35	M16 x 1.5	0.51	3.15
<b>2,698-5,845</b>	1.08	1.09	1.34	0.79	0.079	0.39	1.19	6	4.25	M20 x 1.5	0.67	4.72
<b>4,047-8,992</b>	1.3	1.09	1.57	0.9	0.079	0.47	1.38	6	4.96	M24 x 2	0.79	4.72
<b>6,969-15,737</b>	1.57	1.57	1.89	0.98	0.079	0.59	1.57	6.2	6.06	M30 x 2	1.02	5.9
<b>15,062-33,946</b>	2.36	2.36	3.07	1.88	0.19	0.78	2.66	6.98	8.78	M39 x 3	1.5	9.84

## Pin assignment of analogue output

### Abbreviations, definitions

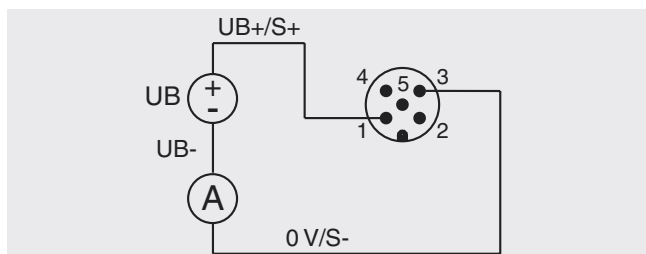
Signal	Description
UB	Voltage source for sensor
UB+	Sensor-supply voltage (+)
UB-	Sensor-supply voltage (-)
S+	Output signal (+)
S-	Output signal (-)
0 V	0 V potential

Signal	Description
Ⓐ	Ammeter
Ⓥ	Voltmeter
⊕	Voltage source
⌞	Switch
⊕	Shield (grounding)

### For models F2301 and F23C1 with UL approval

#### Output 4 ... 20 mA, 2-wire

Connector M12 x 1, 5-pin

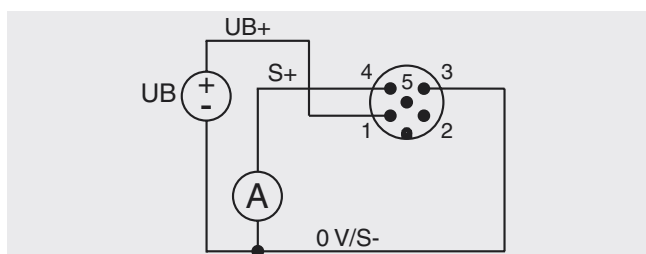


Signal	4 ... 20 mA, 2-wire	Cable colour
UB+/S+	1	Brown
0 V/S-	3	Black
Shield ⊕	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

#### Output 4 ... 20 mA, 3-wire

Connector M12 x 1, 5-pin

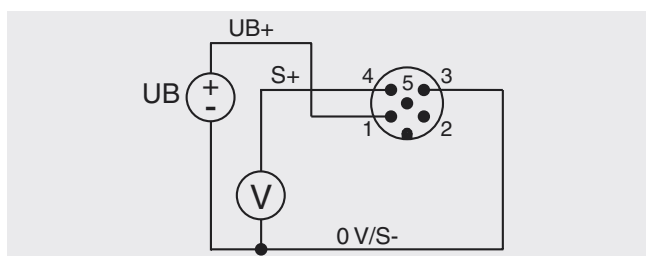


Signal	4 ... 20 mA, 3-wire	Cable colour
UB+	1	Brown
S+	4	Black
0 V/S-	3	Blue
Shield ⊕	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

#### Output 0 ... 10 V, 3-wire

Connector M12 x 1, 5-pin

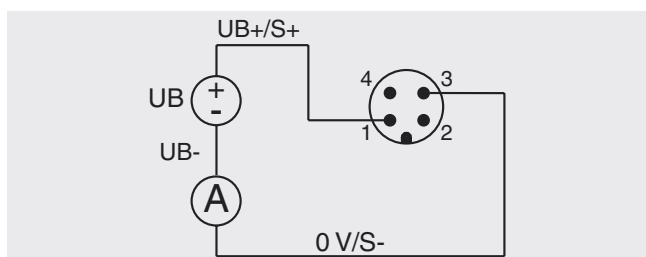


Signal	0 ... 10 V, 3-wire	Cable colour
UB+	1	Brown
S+	4	Black
0 V/S-	3	Blue
Shield ⊕	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

#### Output 4 ... 20 mA, 2-wire for ATEX Ex ib

Connector M12 x 1, 4-pin



Signal	ATEX/IECEx Ex ib 4 ... 20 mA, 2-wire	Cable colour
UB+/S+	1	Brown
0 V/S-	3	Blue
Shield ⊕	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

## Pin assignment with signal jump

### Abbreviations, definitions

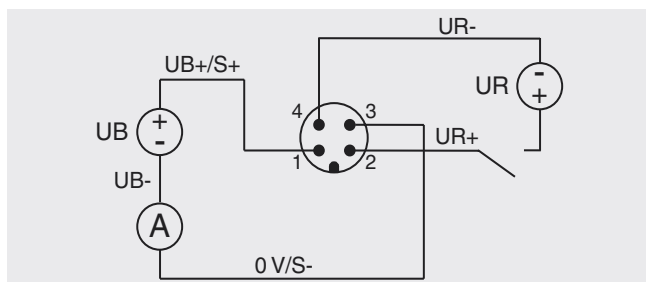
Signal	Description
UB	Voltage source for sensor
UB+	Sensor-supply voltage (+)
UB-	Sensor-supply voltage (-)
UR	Voltage source for den signal jump
UR+	Signal jump-supply voltage (+)
UR-	Signal jump-supply voltage (-)
S+	Output signal (+)
S-	Output signal (-)
0 V	0 V potential

Signal	Description
(A)	Ammeter
(V)	Voltmeter
(+)	Voltage source
⎓	Switch
(⊕)	Shield (grounding)

### For model F2301 with signal jump

#### Output 4 ... 20 mA, 2-wire

Circular connector M12 x 1, 4-pin

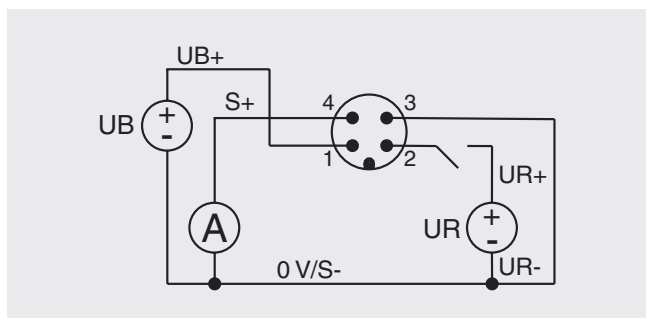


Signal	4 ... 20 mA, 2-wire	Cable colour
UB+/S+	1	Brown
0 V/S-	3	Blue
UR+	2	White
UR-	4	Black
Shield (⊕)	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

#### Output 4 ... 20 mA, 3-wire

Circular connector M12 x 1, 4-pin

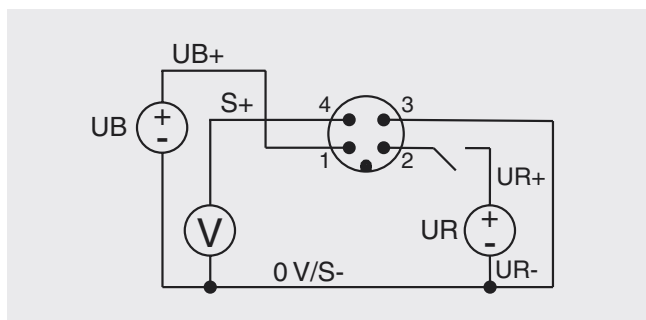


Signal	4 ... 20 mA, 3-wire	Cable colour
UB+	1	Brown
0 V/S-	3	Blue
UR+	2	White
UR-	3	Blue
S+	4	Black
Shield (⊕)	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 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
0 V/S-	3	Blue
UR+	2	White
UR-	3	Blue
S+	4	Black
Shield (⊕)	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

## Pin assignment redundant with 1 x connector

### Abbreviations, definitions

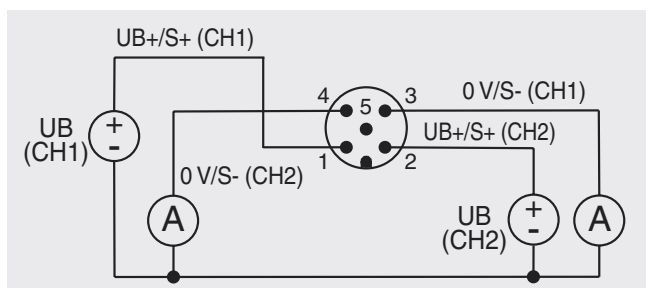
Signal	Description
UB	Voltage source for sensor
UB+	Sensor-supply voltage (+)
UB-	Sensor-supply voltage (-)
S+	Output signal (+)
S-	Output signal (-)
CH1	Channel 1
CH2	Channel 2
CH1+2	Channel 1 and channel 2
0 V	0 V potential

Signal	Description
$\text{ⓐ}$	Ammeter
$\text{Ⓥ}$	Voltmeter
$\text{⊕}$	Voltage source
$\text{⎓}$	Switch
$\text{Ⓢ}$	Shield (grounding)

### For models F2301 and F23C1 with UL approval

#### Output 4 ... 20 mA, 2-wire

Circular connector M12 x 1, 5-pin

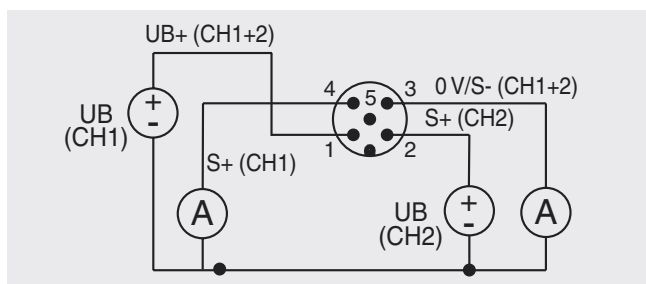


Signal	4 ... 20 mA, 2-wire	Cable colour
UB+/S+ (CH1)	1	Brown
UB+/S+ (CH2)	2	White
0 V/S- (CH1)	3	Blue
0 V/S- (CH2)	4	Black
Shield $\text{Ⓢ}$	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

#### Output 4 ... 20 mA, 3-wire

Circular connector M12 x 1, 5-pin

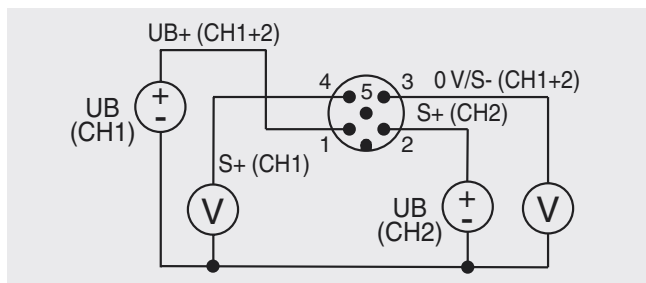


Signal	4 ... 20 mA, 3-wire	Cable colour
UB+ (CH1+2)	1	Brown
0 V/S- (CH1+2)	3	Blue
S+ (CH1)	4	Black
S+ (CH2)	2	White
Shield $\text{Ⓢ}$	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 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
0 V/S- (CH1+2)	3	Blue
S+ (CH1)	4	Black
S+ (CH2)	2	White
Shield $\text{Ⓢ}$	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

## Diverse redundant pin assignment, opposing, with 2 x connectors

### Abbreviations, definitions

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

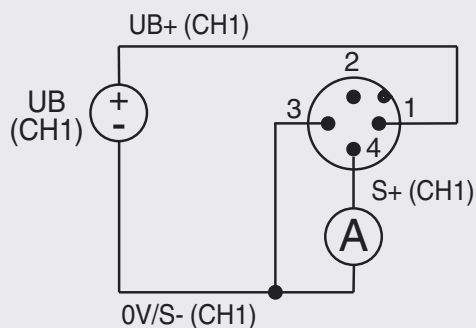
Signal	Description
<b>(A)</b>	Ammeter
<b>(V)</b>	Voltmeter
<b>(+)</b>	Voltage source
<b>—</b>	Switch
<b>(⊕)</b>	Shield (grounding)

### For model F23S1

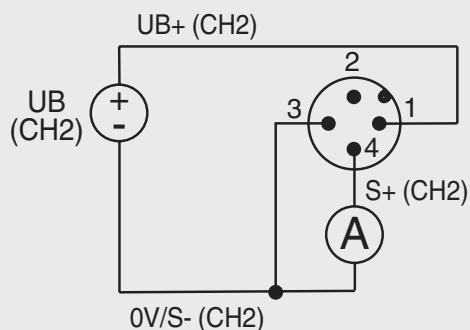
#### Output 4 ... 20 mA, 3-wire

Circular connector M12 x 1, 4-pin

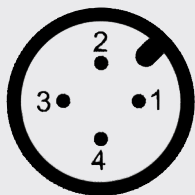
Connector, channel 1



Connector, channel 2



Circular connector M12 x 1, 4-pin



#### 4 ... 20 mA, 3-wire diverse redundant opposing

Signal	Connector, channel 1	Connector, channel 2	Cable colour
<b>UB+</b>	1	1	Brown
<b>0 V/S-</b>	3	3	Blue
<b>S+</b>	4	4	Black
<b>Shield (⊕)</b>	Case / connector	Case / connector	-

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 14259454

2-connector variant, e.g. in combination with ELMS1 overload protection (F23S1).

Version in accordance with requirements for functional safety per machinery directive 2006/42/EC.

## Pin assignment for CANopen®

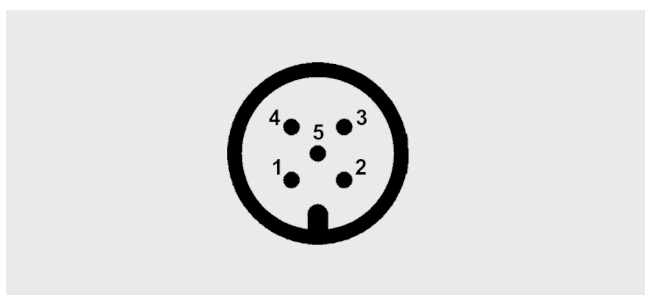
### Abbreviations, definitions

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

### For models F2301 and F23C1 with UL approval

#### Output CANopen® in according to CiA®303-1

Circular connector M12 x 1, 5-pin

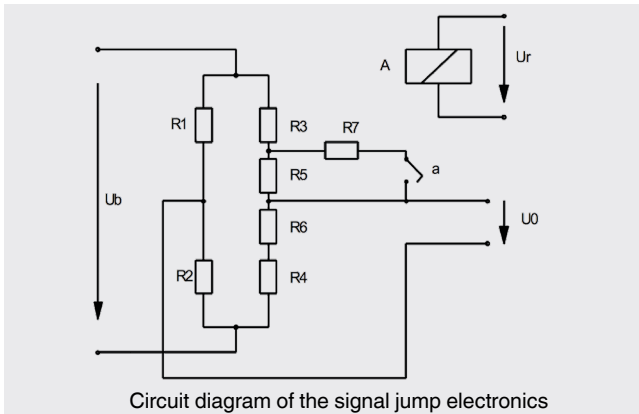


Signal	Pin	Cable colour
CAN-SHLD, shield ⚡	1 / case / connector	Brown
CAN-V+	2	Blue
CAN-GND	3	White
CAN-High	4	Blue
CAN-Low	5	Black

Cable colours only apply when using the WIKA standard cable, e.g. order no.: 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.



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  $U_0$ .

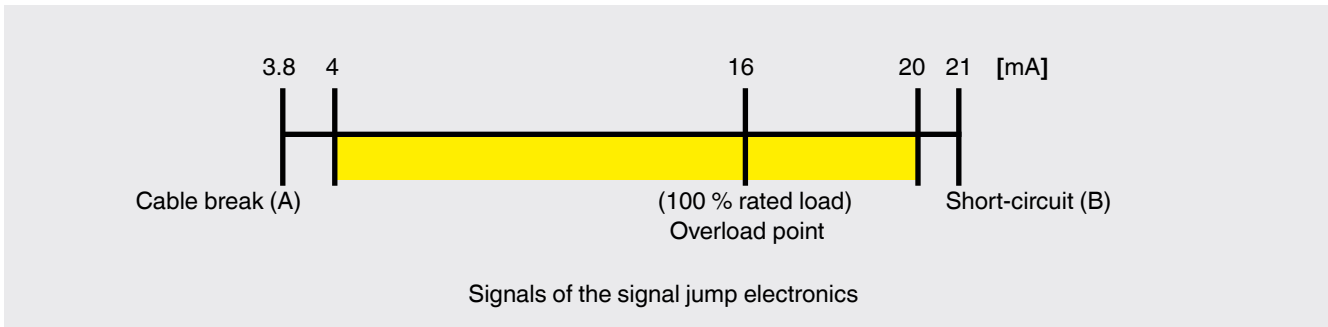
The test resistor R7 is now important in connection with checking the subsequent amplifier circuit and the subsequent signal paths. This is switched parallel to the resistor R5 via the relay contact (a) as soon as the excitation voltage  $U_r$  of the relay A is present. The connection of the resistor 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:



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.

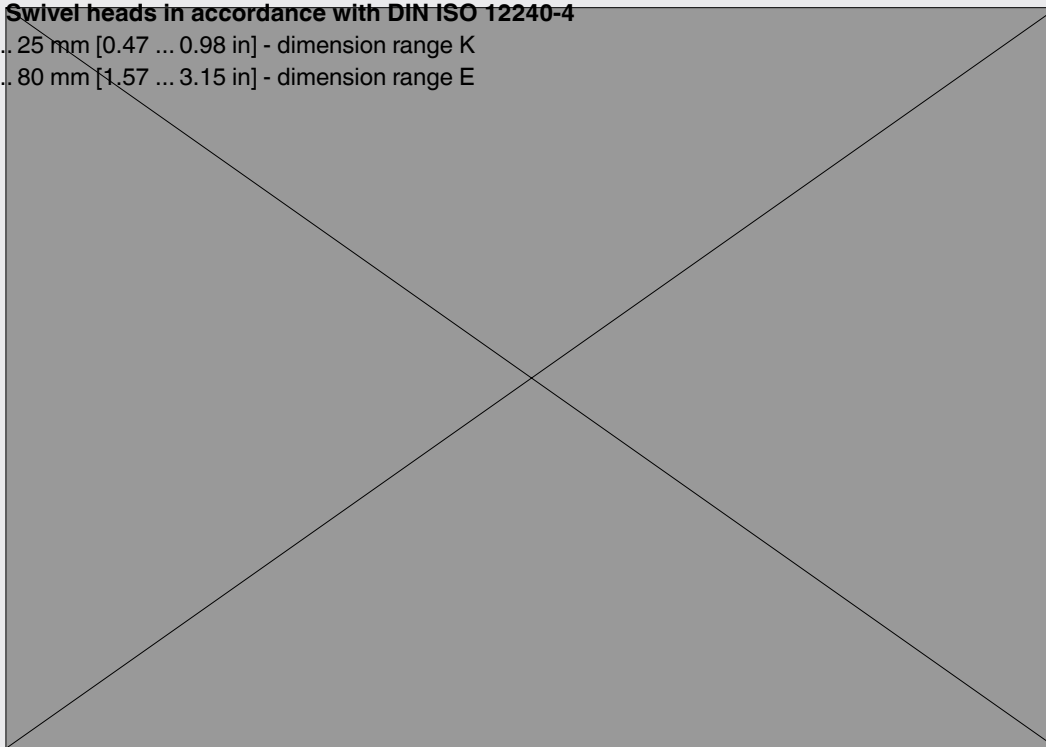
## Accessories

### Dimensions in mm [in]

Accessory: Swivel heads in accordance with DIN ISO 12240-4





Ø-D1 = 12 ... 25 mm [0.47 ... 0.98 in] - dimension range K

Ø-D2 = 40 ... 80 mm [1.57 ... 3.15 in] - dimension range E



Rated force in kN	Dimensions in mm													Weight in kg
	A	B	ØD <sub>1</sub>	ØD <sub>2</sub>	F	G	GL	approx. H	ØK	L	M	SW	T	
1, 2, 3, 5	32	16	12 H7	15.4	50	M12	22	148 ±3	22	55	12	19	9.5	0.115
10	32	16	12 H7	15.4	50	M12	22	155 ±3	22	55	12	19	9.5	0.115
20	50	25	20 H7	24.3	77	M20 x 1.5	33	219 ±4	34	102	18	32	16	0.415
30	50	25	20 H7	24.3	77	M20 x 1.5	33	226 ±4	34	102	18	32	16	0.415
50	60	31	25 H7	29.6	94	M24 x 2	42	276 ±4	42	124	22	36	19.5	0.750
100	92]	28	40 <sub>-0.012</sub>	45	142	M39 x 3	65	405 ±7	65	188	23	55	31	2
200	112	35	50 <sub>-0.012</sub>	56	160	M45 x 3	68	466 ±13	75	216	30	65	36	3.5
300	160	49	70 <sub>-0.015</sub>	77.9	200	M56 x 4	80	568 ±11	98	280	42	85	45	8.6
500	180	55	80 <sub>-0.015</sub>	89.4	230	M64 x 4	85	665 ±13	110	320	47	100	51	12

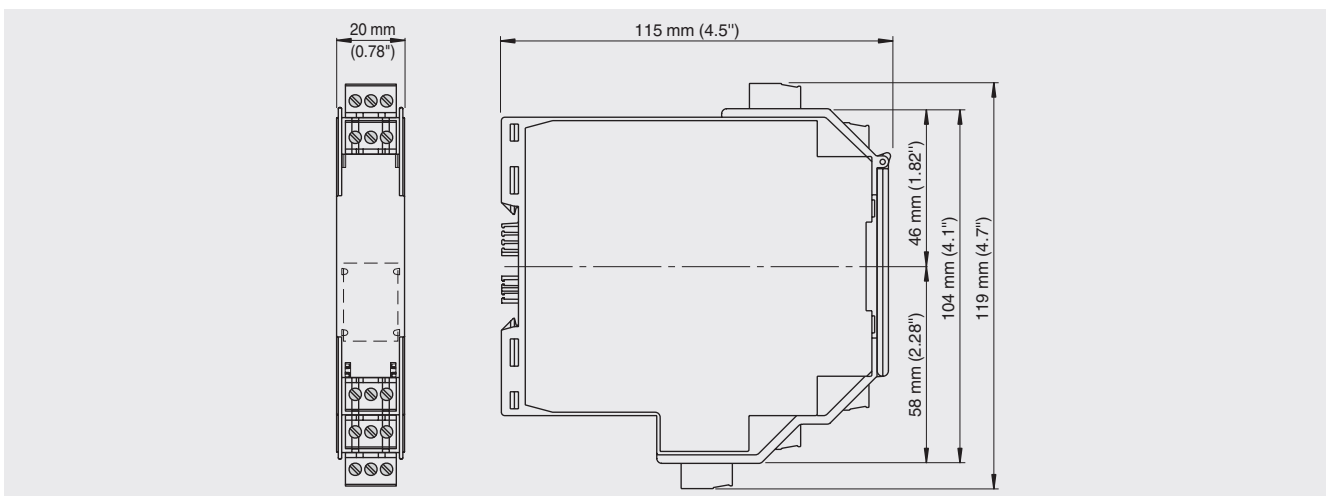
Rated force in lbf	Dimensions in inch													Weight in lbs
	A	B	ØD <sub>1</sub>	ØD <sub>2</sub>	F	G	GL	approx. H	ØK	L	M	SW	T	
225, 450, 674, 1,124	1.26	0.63	0.47 H7	0.61	1.97	M12	0.87	5.83 ±0.12	0.87	2.16	0.47	0.75	0.37	0.254
2,248	1.26	0.63	0.47 H7	0.61	1.97	M12	0.87	6.10 ±0.12	0.87	2.16	0.47	0.75	0.37	0.254
4,496	1.97	0.98	0.79 H7	0.96	3.03	M20 x 1.5	1.3	8.62 ±0.16	1.34	4.02	0.71	1.26	0.63	0.915
6,744	1.97	0.98	0.79 H7	0.96	3.03	M20 x 1.5	1.3	8.88 ±0.16	1.34	4.02	0.71	1.26	0.63	0.915
11,240	2.36	1.22	0.98 H7	1.16	3.7	M24 x 2	1.65	10.87 ±0.16	1.65	4.88	0.87	1.42	0.77	1.653
22,481	3.62	1.10	1.57 <sub>-0.0005</sub>	1.77	5.59	M39 x 3	2.56	15.94 ±0.28	2.56	7.4	0.9	2.16	1.22	4.41
44,962	4.41	1.38	1.97 <sub>-0.0005</sub>	2.2	6.3	M45 x 3	2.68	18.35 ±0.51	2.95	8.5	1.18	2.56	1.48	7.72
67,443	6.3	1.93	2.75 <sub>-0.0006</sub>	3.07	7.87	M56 x 4	3.15	22.36 ±0.43	3.86	11	1.65	3.35	1.77	18.96
112,404	7.09	2.16	3.15 <sub>-0.0006</sub>	3.52	9.05	M64 x 4	3.35	26.18 ±0.51	4.33	12.6	1.85	3.94	2.01	26.45

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

Other cable lengths and cable types are available on request.

### Repeater power supply

The analogue input signal is transmitted to the non-hazardous area as galvanically isolated current value. The input signal can be overlaid on the Ex or non-Ex sides with binary signals transmitted bidirectionally.



Repeater power supply	Order number
1-channel with DC 24 V supply	14255084

→ WIKA accessories can be found online at [www.wika.com](http://www.wika.com).

### Ordering information

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



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