

DATA SHEET

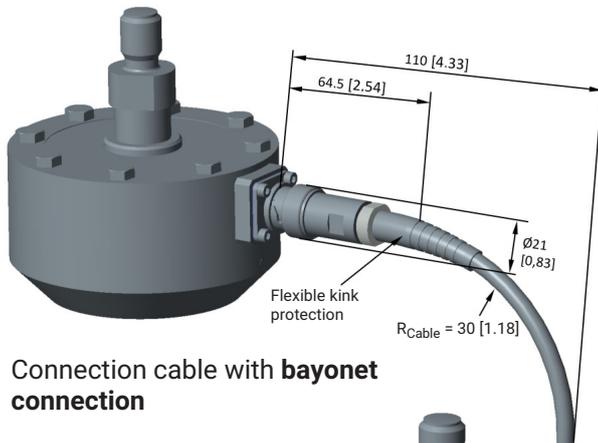
U15 Force transducer

SPECIAL FEATURES

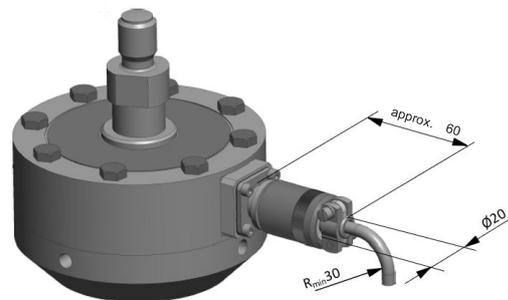
- Tensile/compressive force transducer
- Nominal (rated) forces 2.5 kN to 2.5 MN
- Class 0.5 to ISO 376 in force measurement range between 10 % and 100 % of the nominal (rated) force (in combination with DKD calibration certificate)
- Electronic bending moment adjustment
- Double bridge version, TEDS and other options available



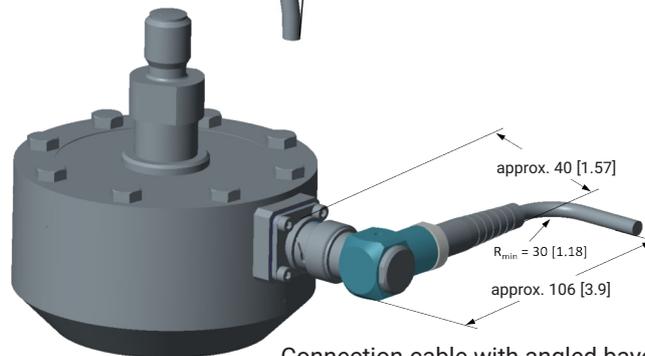
INSTALLED DIMENSIONS OF CONNECTION VARIANTS



Connection cable with **bayonet connection**

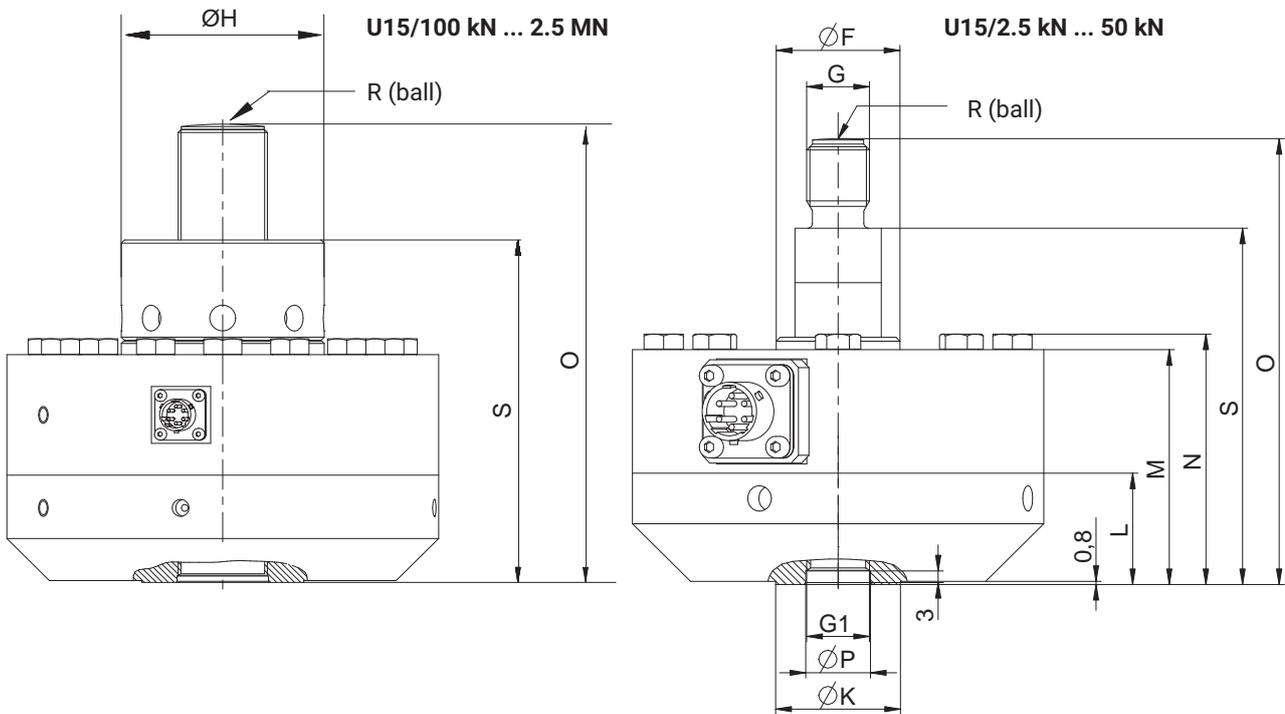
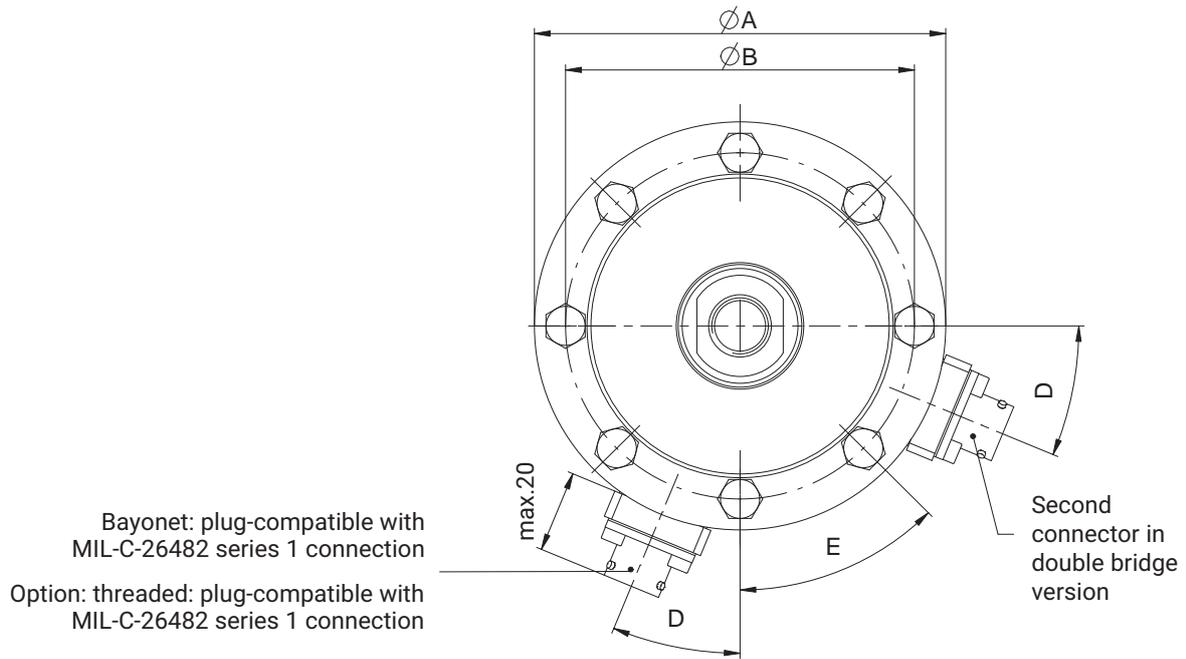


Connection cable with **screw connection**



Connection cable with **angled bayonet connector**

DIMENSIONS U15



Nominal (rated) force	ØA	ØB	D	E	ØF	G	G1	ØH	ØK	L
2.5 kN - 50 kN	104.8	88.9	22.5°	45°	31.5	M16x2-6g	M16x2-4H 22.1 deep	-	31.8	28.6
100 kN - 250 kN	153.9	130.3	15°	30°	-	M33x2-6g	M33x2-4H 35.6 deep	67.3	57.2	44.5
500 kN	203.2	165.1	11.25°	22.5°	-	M42x2-6g	M42x2-4H 44.5 deep	95.5	76.2	50.8
1 MN	279	229	11.25°	22.5°	-	M72x2-6g	M72x2-4H 69.8 deep	135	114	76.2
2.5 MN	390	322	7.5°	15°	-	M120x4-4H		190	190	127

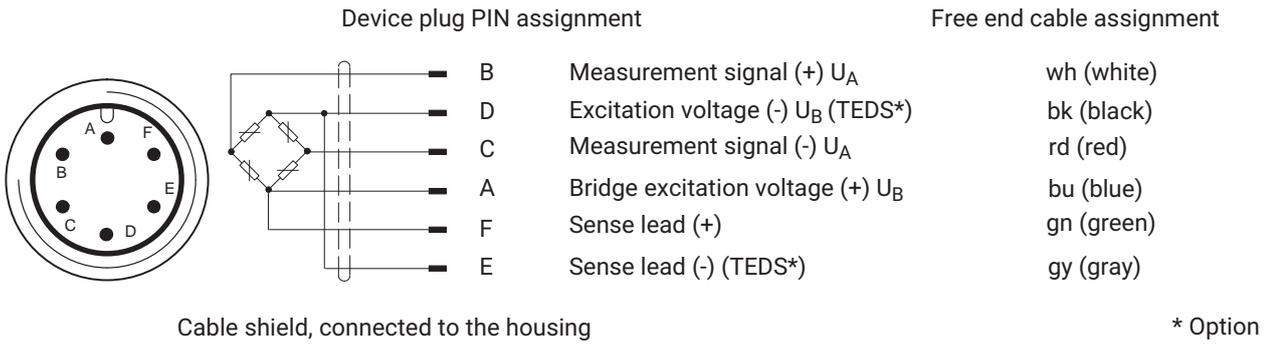
Nominal (rated) force	M	N	S	ØPH ⁸	R	O
2.5 kN - 50 kN	60.3	64.3	91.5	16.5	60	114.5
100 kN - 250 kN	85.9	95.9	131.5	33.5	160	174.5
500 kN	108	120	162.3	43	160	217.3
1 MN	152.4	168.4	230.1	73	400	307.3
2.5 MN	239	261	351.5	123	600	465.3

SPECIFICATIONS

Nominal (rated) force	F _{nom}	kN MN	2.5	5	10	25	50	100	250	500	1	2.5
Accuracy values per ISO376												
Accuracy values per ISO376												
from 10 to < 20 % of F _{nom}		%	0.5								1	
from 20 % of F _{nom}		%	0.5									
Reproducibility												
from 10 to < 20 % of F _{nom}	b	%	0.1								0.2	
from 20 % of F _{nom}			0.05								0.1	
Repeatability												
from 10 to < 20 % of F _{nom}	b'	%	0.05								0.1	
from 20 % of F _{nom}			0.02									
Deviation from the fitting curve												
from 10 to < 20 % of F _{nom}	f _c	%	0.01	0.04				0.05	0.1			
from 20 % of F _{nom}									0.05			
Zero error	f ₀	%	0.01								0.02	
Hysteresis error												
from 10 to < 20 % of F _{nom}	v	%	0.07	0.09	0.1			0.15	0.3			
from 20 % of F _{nom}									0.15			
Creep	c	%	0.01								0.02	
Accuracy per VDI/VDE 2638												
HBM accuracy class			0.02	0.03	0.035			0.05				
Relative reproducibility and repeatability errors with unchanging mounting position	b _{rg}	%	0.02									
Rel. reversibility error (hysteresis) at 0.4 F_{nom} (related to the full scale value)	v _{0.4}	%	0.015	0.03	0.03			0.05				
Non-linearity	d _{lin}	%	0.02	0.025	0.035			0.05				
Zero point return		%	0.01								0.02	
Relative creep	d _{crf+E}	%	0.01								0.02	
Effect of the bending moment at 10 % F_{nom} * 10 mm	d _{Mb}	%	0.01									
Effect of lateral forces (lateral force = 10 % of F_{nom})	d _Q	%	0.01									
Temperature coefficient of sensitivity	TC _S	%/10K	0.015									
Temperature coefficient of zero signal	TC ₀	%/10K	0.0075									
Rated electrical outputs												
Rated output range	C	mV/V	2...3				4...4.8					
Nominal sensitivity (with optional "adjusted rated output" option)	C _{nom}		2				3					
Sensitivity error, with "adjusted rated output" option only	d _c	%	0.1									
Relative zero signal error	d _{s,0}	%	1									
Tension/compression sensitivity variation	d _{zd}	%	0.2									
Input resistance	R _e	Ω	>345									
Output resistance	R _a	Ω	220...360									
Output resistance with "adjusted rated output" option	R _a	Ω	365±0.5								220...360	

Nominal (rated) force	F _{nom}	kN	2.5	5	10	25	50	100	250	500			
		MN									1	2.5	
Insulation resistance	R _{is}	GΩ	>2										
Operating range of the excitation voltage	B _{U,G}	V	0.5...12										
Reference excitation voltage	U _{ref}	V	5										
Connection		6-wire configuration											
Temperature													
Reference temperature	T _{ref}	°C [°F]	23 [73.4]										
Nominal temperature range	B _{T, nom}		-10...+45 [14...113]										
Operating temperature range	B _{T, g}		-30...+85 [-22...+185]										
Storage temperature range	B _{T, s}		-30...+85 [-22...185]										
Characteristic mechanical quantities													
Maximum operating force	F _G	% of F _{nom}	120										
Force limit	F _L		120										
Breaking force	F _B		>200										
Torque limit	M _{G max}	N*m	15	30	62	155	315	635	1585	2855	5715	14287	
Bending moment limit	M _{b max}		15	30	62	155	315	635	1585	2855	5715	14287	
Static lateral force limit	F _q	% of F _{nom}	50										
Nominal (rated) displacement	s _{nom}	mm	0.04		0.06			0.08	0.1	0.12	0.18		
Fundamental frequency	f _G	kHz	2.7	3.8	5.6	5.3	7.5	4.3	5.8	4.9	4	2.82	
Relative permissible oscillatory stress	f _{rb}	% of F _{nom}	100										
Rigidity	c _{ax}	10 ⁵ N/mm	0.625	1.25	2.5	4.17	8.33	16.7	31.3	50	83.3	139	
General information													
Degree of protection as per EN 60529, with bayonet connector (standard version), socket connected to sensor		IP67											
Degree of protection as per EN 60529, with "threaded connector" option		IP64											
Spring element material		Aluminum					Stainless steel						
Measuring point protection		Tightly glued measuring element					Hermetically sealed measuring element						
Mechanical shock resistance per IEC 60068-2-27													
Number		n	1000										
Duration		ms	3										
Acceleration		m/s ²	1000										
Vibrational stress per IEC 60068-2-6													
Frequency range		Hz	5...65										
Duration		min	30										
Acceleration		m/s ²	150										
Weight	m	kg	1.4		3.3		10.5		27		73		226
	m	lbs	3.1		7.3		23.1		59.5		161		498

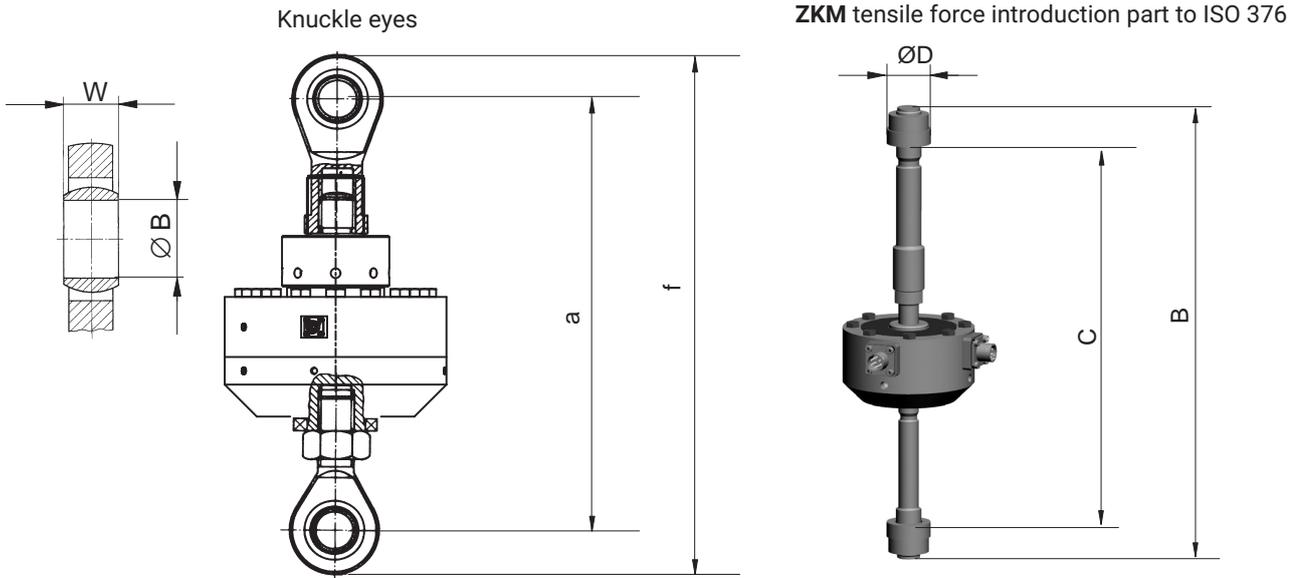
PIN AND CABLE ASSIGNMENT



ACCESSORIES (NOT INCLUDED AMONG THE ITEMS SUPPLIED)

Order number	
K-CAL-F	DKD calibration certificate to ISO 376
K-CAB-F	Configurable connection cable for connecting the force transducer to the bridge amplifier. Different lengths are available. The relevant plug for an HBM amplifier can be fitted on request.
1-KAB157-3	Connection cable with bayonet locking; IP67; 3 m long, \varnothing 6.5 mm; TPE outer sheath; $6 \times 0.25 \text{ mm}^2$; free ends, shielded
1-KAB158-3	Connection cable with screw locking; IP67; 3 m long, \varnothing 6.5 mm; TPE outer sheath; $6 \times 0.25 \text{ mm}^2$; free ends, shielded
3-3312.0382	Loose connecting socket, bayonet locking
3-3312.0354	Loose connecting socket, screw locking

FORCE APPLICATION PARTS FOR TENSILE LOADING

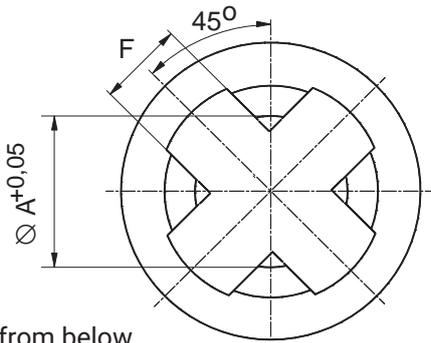


Type	ZKM Order number	B	C		ØD
			min	max	
U15/2.5kN-50kN	1-Z4/20kN/ZKM	approx. 372	approx. 277	approx. 313	35
U15/100kN-250kN	1-U15/250kN/ZKM	approx. 478	approx. 364	approx. 404	64
U15/500kN	1-U15/500kN/ZKM	approx. 650	approx. 447	approx. 539	90
U15/1MN	1-U15/1MN/ZKM	approx. 833	approx. 549	approx. 679	120
U15/2.5MN	1-U15/2.5MN/ZKM	approx. 1,429	approx. 987	approx. 1,129	235

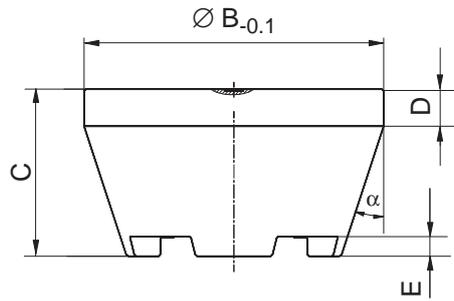
Type	Knuckle eye top/bottom Order number	a	f	W	ØB
U15/2.5kN-50kN	1-Z4/20kN/ZGOW / 1-Z4/20kN/ZGUW	approx. 209	approx. 246	21	16
U15/100kN-250kN	1-ZGIM33F / 1-ZGAM33F	approx. 362	approx. 488	35	50
U15/500kN	1-ZGIM42F / 1-ZGAM42F	approx. 418	approx. 554	44	60
U15/1MN	1-ZGIM72F / 1-ZGAM72F	approx. 588	approx. 792	60	90

FORCE APPLICATION PARTS FOR COMPRESSIVE LOADING

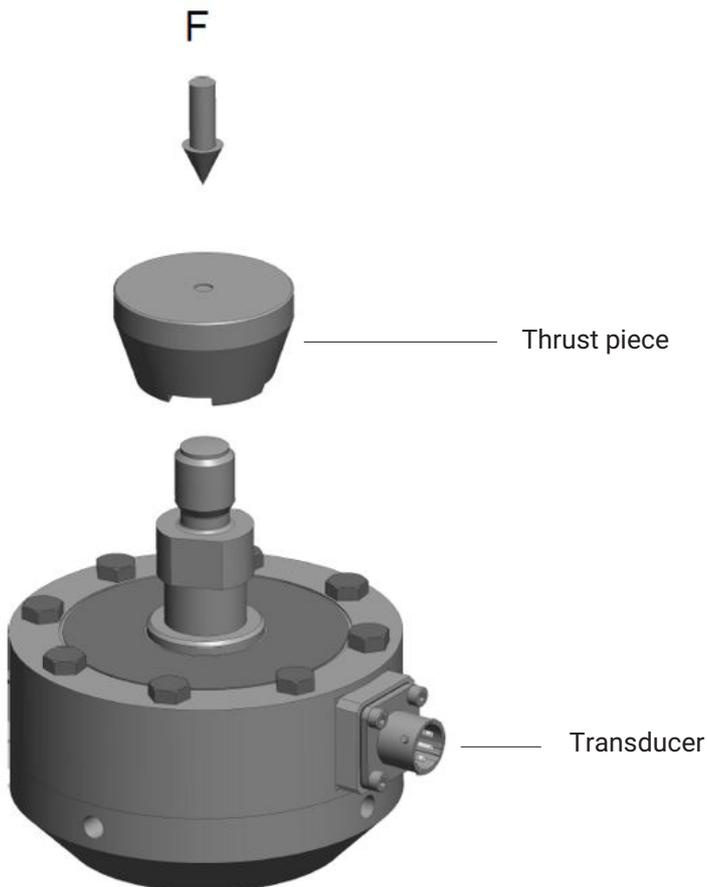
Thrust piece to ISO 376



View from below



Type	Thrust piece Order number	Weight (kg)	$\varnothing A$	$\varnothing B$	C	D	E	F	α
U15/2.5kN-50kN	1-EDO4/20kN	approx. 0.34	16,2	48	29	8	5	8	18°
U15/100kN-250kN	1-U15/250kN/EDO	approx. 1.3	33,2	80	45	10	5	23	18°
U15/500kN	1-U15/500kN/EDO	approx. 1.3	42,2	80	45	10	5	23	18°
U15/1MN	1-EDO4/500kN	approx. 3.5	72,4	112	68	15	12	30	15°
U15/2.5MN	1-EDO4/2.5MN	approx. 15	120.3	180	104	25	14	54	18°



VERSIONS AND ORDER NUMBERS

Code	Nominal (rated) force
2k50	2.5 kN
5k00	5 kN
10k0	10 kN
25k0	25 kN
50k0	50 kN
100k	100 kN
250k	250 kN
500k	500 kN
1M00	1 MN
2M50	2,5 MN

Number of measuring bridges	Transducer identification	Plug protection	Plug version bridge A	Plug version bridge B	Sensitivity adjustment
Single bridge SB	Without TEDS S	Without plug protection U	Bayonet connector B	Bayonet connector B	Adjusted J
Double bridge DB	With TEDS T	With plug protection P	Threaded connector G	Threaded connector G	Not adjusted U

K-U15-	2M50	SB	S	U	B	G	U
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The ordering example is for a U15 with a nominal (rated) force of 2.5 MN with one measuring bridge (single bridge), without transducer identification (TEDS), bayonet connector and without adjusting the rated output.

No. of meas. bridges	For reasons of redundancy, it is necessary in devices relevant to safety to check the plausibility of the measurement signal with a second measuring bridge. The signals are independently conditioned and evaluated using two separate measuring amplifiers. So the option is also available to connect two amplifiers with different characteristics.
Transducer identification	With this option, you can order an integrated TEDS (Transducer Electronic Data Sheet), installed in the U15. Assuming the relevant amplifier electronics are present, the amplifier system reads out this chip and automatically sets the parameters.
Plug protection	Mechanical protection by fitting an additional, strong, square profile (tubular profile for nominal (rated) force 2.5 MN) around the plug.
Electrical connection Bridge A	The standard version is the device plug with a bayonet connection (PT02E 10-6P-compatible). You also have the option of ordering a device plug with a screw thread (PC02E 10-6P-compatible).
Electrical connection Bridge B	The standard version is the device plug with a bayonet connection (PT02E 10-6P-compatible). You also have the option of ordering a device plug with a screw thread (PC02E 10-6P-compatible).
Rated output	The standard version is a non-adjusted (calibrated) rated output. In all sensors with nominal (rated) forces greater than 10 kN, the output signal at nominal (rated) force is between 4 and 4.8 mV/V. In all force transducers with nominal (rated) forces up to and including 10 kN, the output signal is between 2 and 3 mV/V. If you choose the 'adjusted rated output' option, the rated output will be adjusted to 3 mV/V (all transducers greater than 10 kN) or 2 mV/V (all transducers up to and including 10 kN). Please note the input range of your amplifier.

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