

DATA SHEET

# U10M

## Force transducer

### SPECIAL FEATURES

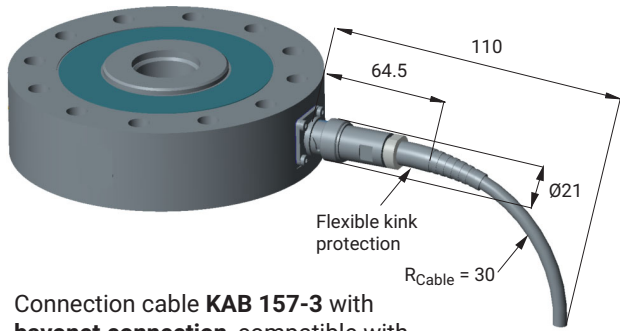
- Precise and rugged tensile/compressive force transducer for static and dynamic measurement tasks
- High lateral force and bending moment stability, the effect of the bending moment is electrically compensated
- For different force ranges from 1.25 kN to 2.5 MN
- The numerous possible configurations (TEDS chip, double bridge, various electrical connections, etc.) mean that it can be flexibly adapted to many measurement tasks (see page 21)
- Made of stainless steel, degree of protection IP68 on request
- High natural frequency - ideal for measuring fast processes
- Available as a passive sensor (mV/V output) or active sensor with integrated amplifiers (IO-Link)



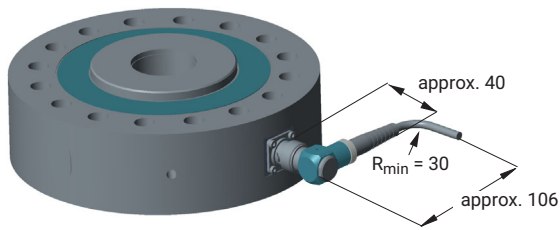
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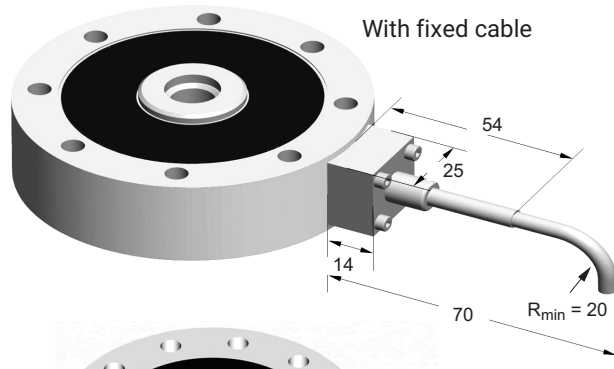
## MOUNTING DIMENSIONS OF CONNECTION VARIANTS



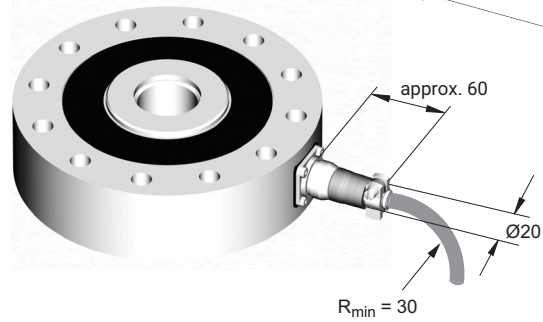
Connection cable **KAB 157-3** with **bayonet connection**, compatible with the MIL-C-26482 series 1 connector



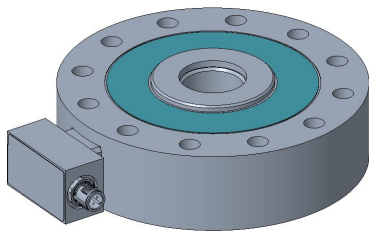
Configurable connection cable **K-CAB-F** with option of angled bayonet connector, compatible with the MIL-C-26482 series 1 connector



Connection cable **KAB-158** with screw connector, compatible with the MIL-C-26482 series 1 connector



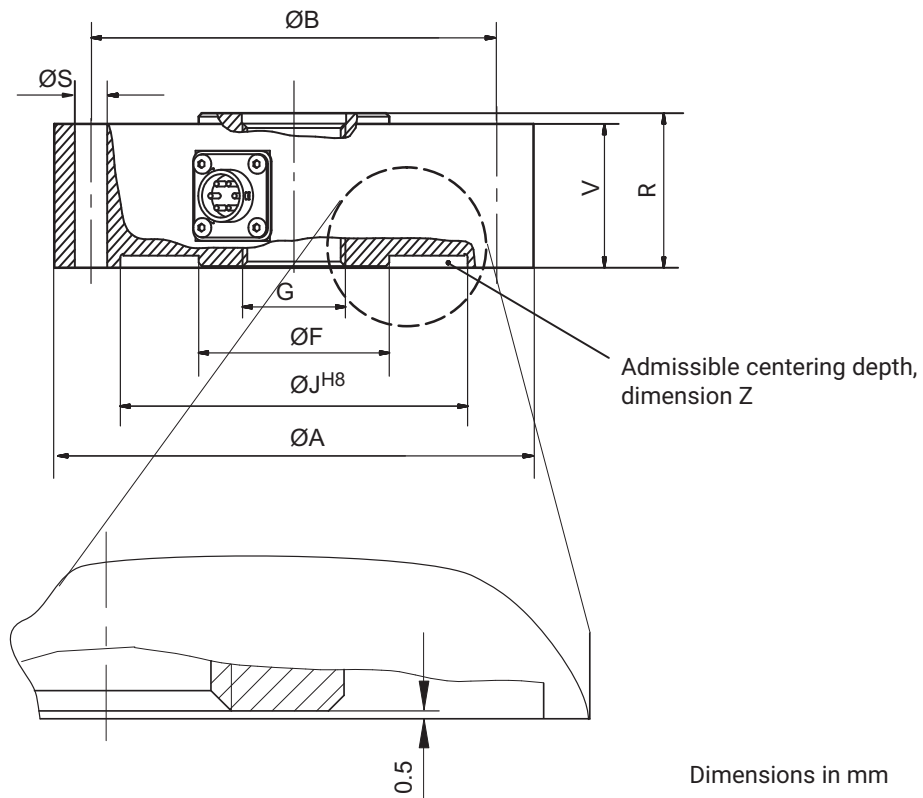
Dimensions in mm



Electrical connection **00A4** with option of integrated amplifier VAIO (plug: M12, A-coded, 4 pins, male)

## DIMENSIONS

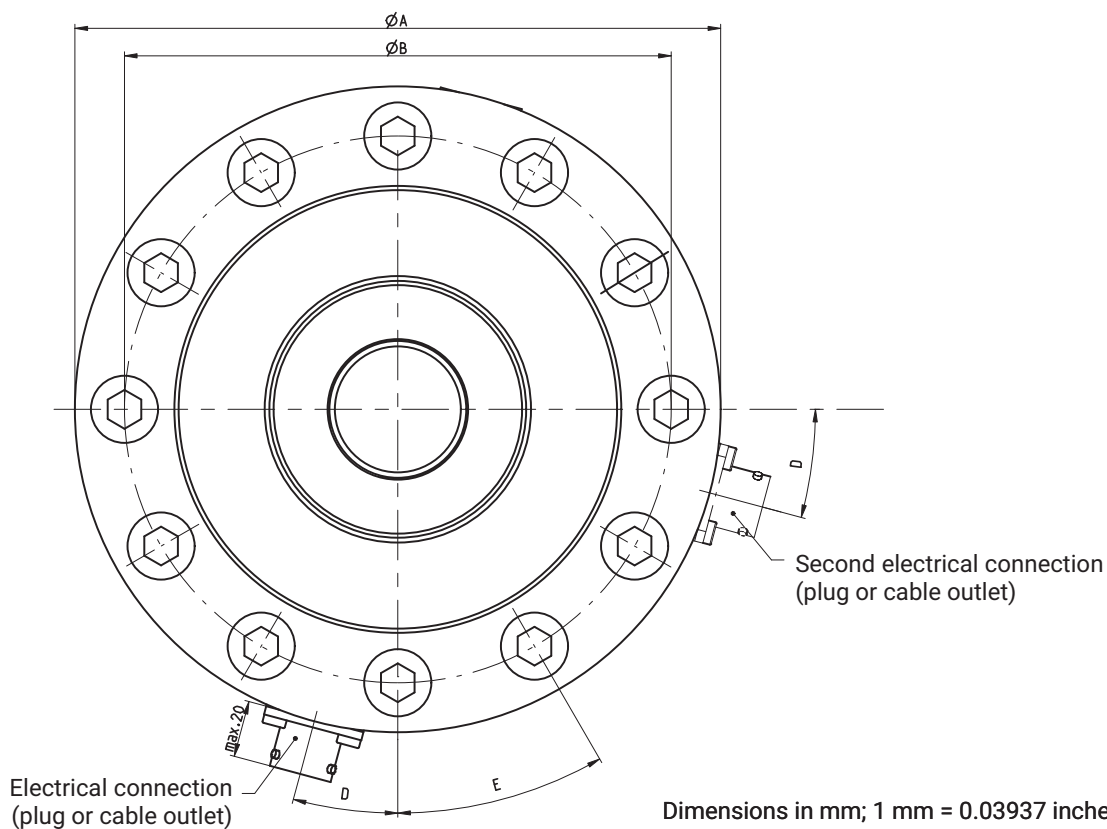
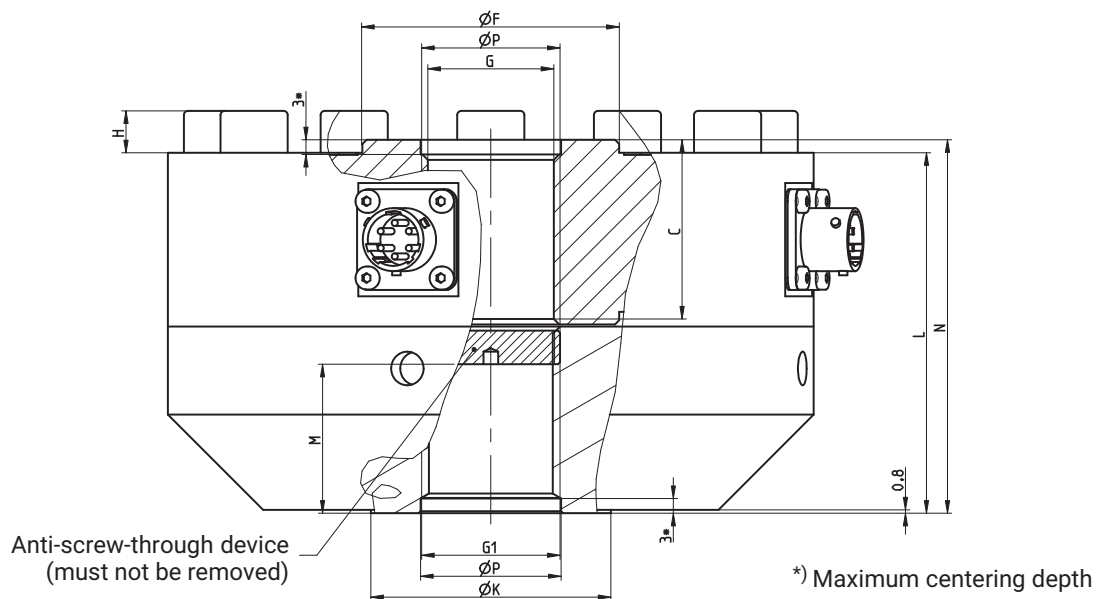
### Dimensions of U10M without amplifier, without foot adapter



Dimensions in mm

Nominal (rated) force	Dimensions in	$\text{ØA}$	$\text{ØB}$	$\text{ØS}$	$\text{ØF}$	$G$	$\text{ØJH8}$	$V$	$R$	$T$
1.25 kN - 5 kN	mm	104.8	88.9	7.0	30.4	M16x2-4H	78	31.7	34.9	2.5
	inch	4.13	3.5	0.27	1.2		3.07	1.25	1.37	0.1
12.5 kN - 25 kN	mm	104.8	88.9	7.0	31.5	M16x2-4H	78	31.7	34.9	2.5
	inch	4.13	3.5	0.27	1.24		3.07	1.25	1.37	0.1
50 kN	mm	153.9	130.3	10.5	61.2	M33x2-4H	111.5	41.4	44.5	2.5
	inch	6.06	5.13	0.41	2.41		4.39	1.63	1.75	0.1
125 kN	mm	153.9	130.3	10.5	67.3	M33x2-4H	111.5	41.4	44.5	2.5
	inch	6.06	5.13	0.41	2.65		4.39	1.63	1.75	0.1
250 kN	mm	203.2	165.1	13.5	95.5	M42x2-4H	143	57.2	63.5	3.5
	inch	8.00	6.51	0.53	3.76		5.63	2.25	2.5	0.14
500 kN	mm	279	229	17.0	122.2	M72x2-4H	175	76.2	88.9	6
	inch	10.98	9.02	0.66	4.81		6.89	3	3.5	0.24
1.25 MN	mm	390	322	23	190	M120x4-4H	262	112	127	6
	inch	15.35	12.68	0.91	7.48		10.31	4.41	5.08	0.24

## Dimensions of U10M without amplifier, with foot adapter



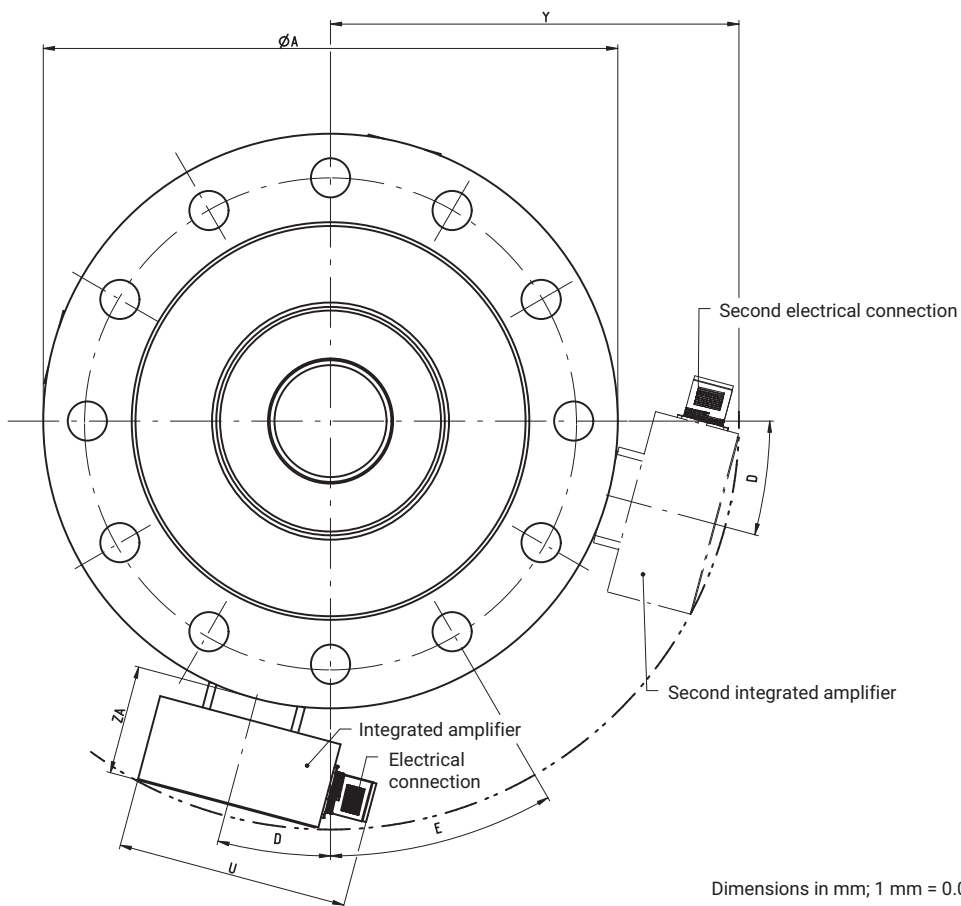
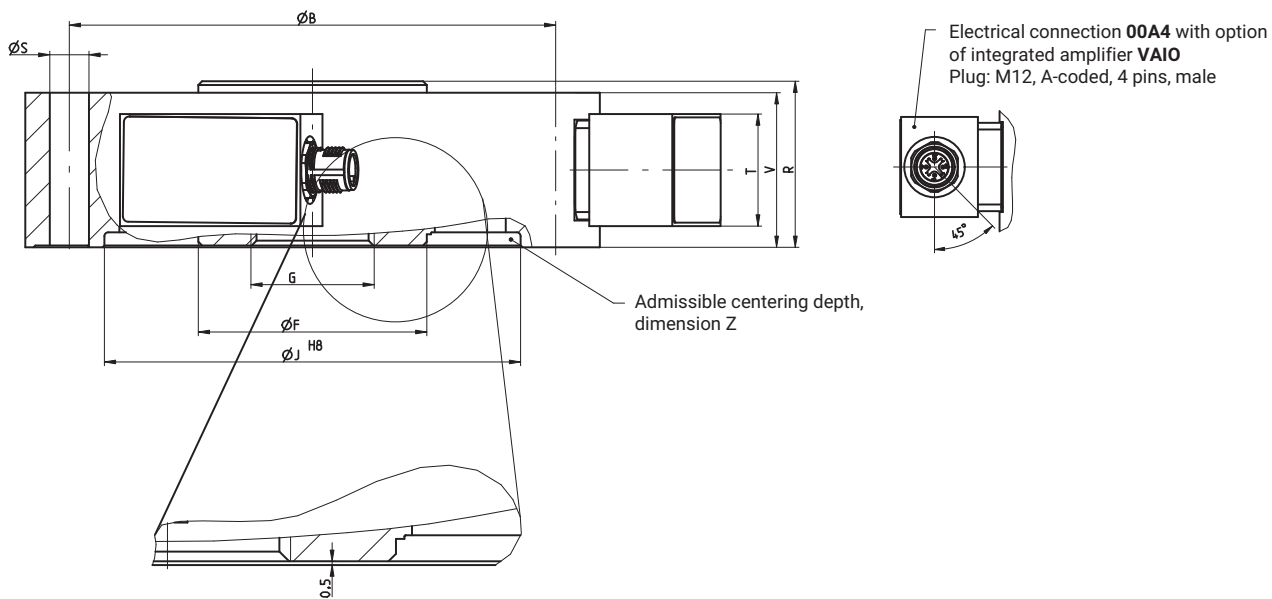
Dimensions in mm; 1 mm = 0.03937 inches

Nominal (rated) force	Dimensions in	ØA	ØB	C	D	E	ØF	G	H	M
1.25 kN - 5 kN	mm	104.8	88.9	33.3	22.5°	45°	30.4	M16x2-4H	4	22
	inch	4.13	3.5	1.3			1.2		0.16	0.87
12.5 kN - 25 kN	mm	104.8	88.9	33.3	22.5°	45°	31.5	M16x2-4H	4	22
	inch	4.13	3.5	1.3			1.24		0.16	0.87
50 kN	mm	153.9	130.3	42.9	15°	30°	61.2	M33x2-4H	10	35.5
	inch	6.06	5.13	1.69			2.41		0.39	1.4
125 kN	mm	153.9	130.3	42.9	15°	30°	67.3	M33x2-4H	10	35.5
	inch	6.06	5.13	1.69			2.65		0.39	1.4

Nominal (rated) force	Dimensions in	ØA	ØB	C	D	E	ØF	G	H	M
250 kN	mm	203.2	165.1	61.9	11.25°	22.5°	95.5	M42x2-4H	12	44
	inch	8.00	6.51	2.4			3.76		0.47	1.73
500 kN	mm	279	229	87.3	11.25°	22.5°	122.2	M72x2-4H	16	69.5
	inch	10.98	9.02	3.4			4.81		0.63	2.73
1.25 MN	mm	390	322	125	7.5°	15°	190	M120x4-4H	22	112
	inch	15.35	12.68	4.92			7.48		0.87	4.41

Nominal (rated) force	Dimensions in	G1	ØK	L	N	ØPH <sup>8</sup>
1.25 kN - 25 kN	mm	M16x2-4H	31.8	60.3	63.5	16.5
	inch		1.25	2.37	2.5	0.65
50 kN - 125 kN	mm	M33x2-4H	57.2	85.9	89	33.5
	inch		2.25	3.38	3.5	1.32
250 kN	mm	M42x2-4H	76.2	108	114.3	43
	inch		3	4.25	4.5	1.69
500 kN	mm	M72x2-4H	114	152.4	165.1	73
	inch		4.49	6	6.5	2.87
1.25 MN	mm	M120x4-4H	190	239	254	123
	inch		7.48	9.41	10.0	4.84

## Dimensions of U10M with amplifier, without foot adapter



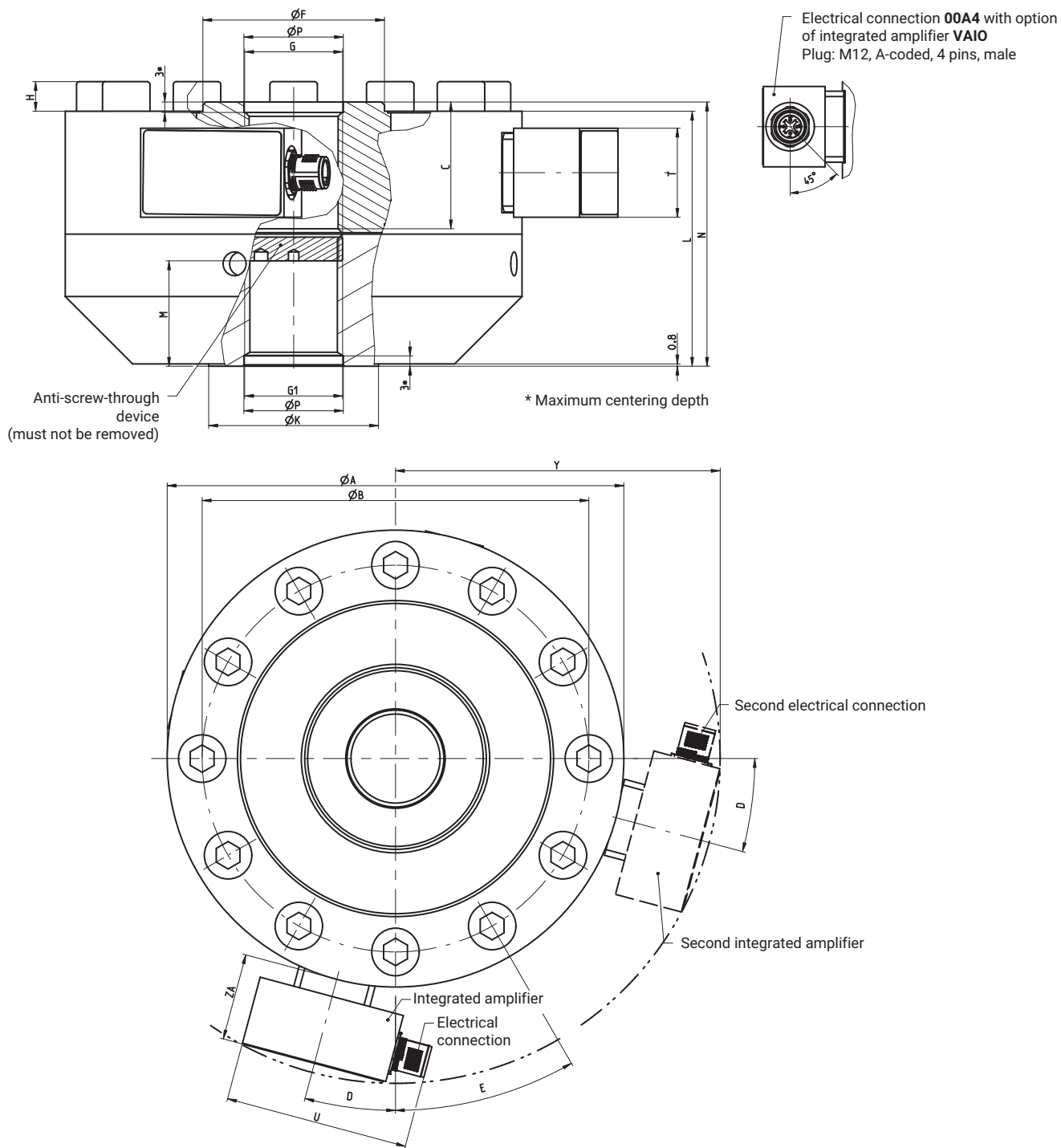
Dimensions in mm; 1 mm = 0.03937 inches

Nominal (rated) force	Dimensions in	$\varnothing A$	$\varnothing B$	E	$\varnothing F$	G	$\varnothing J^{H8}$	R	$\varnothing S$	V	T
1.25 kN...5 kN	mm	104.8	88.9	45°	30.4	M16x2-4H	78	34.9	7.0	31.7	2.5
	inch	4.13	3.5		1.2						
12.5 kN...25 kN	mm	104.8	88.9	45°	31.5	M16x2-4H	78	34.9	7.0	31.7	2.5
	inch	4.13	3.5		1.24						
50 kN	mm	153.9	130.3	30°	61.2	M33x2-4H	111.5	44.5	10.5	41.4	2.5
	inch	6.06	5.13		2.41						

Nominal (rated) force	Dimensions in	ØA	ØB	E	ØF	G	ØJ <sup>H8</sup>	R	ØS	V	T
125 kN	mm	153.9	130.3	30°	67.3	M33x2-4H	111.5	44.5	10.5	41.4	2.5
	inch	6.06	5.13		2.65		4.39	1.75	0.41	1.63	0.1
250 kN	mm	203.2	165.1	22.5°	95.5	M42x2-4H	143	63.5	13.5	57.2	3.5
	inch	8.00	6.51		3.76		5.63	2.5	0.53	2.25	0.14
500 kN	mm	279	229	22.5°	122.2	M72x2-4H	175	88.9	17.0	76.2	6
	inch	10.98	9.02		4.81		6.89	3.5	0.66	3	0.24
1.25 MN	mm	390	322	15°	190	M120x4-4H	262	127	23	112	6
	inch	15.35	12.68		7.48		10.31	5.08	0.91	4.41	0.24

Nominal (rated) force	Dimensions in	D	T	U	Y	ZA
1.25 kN...25 kN	mm	22.5°	30	62	85.6	29.8
	inch		1.18	2.44	3.37	1.17
50 kN	mm	15°	30	62	110	30.3
	inch		1.18	2.44	4.3	1.19
125 kN	mm	15°	30	62	110	30.3
	inch		1.18	2.44	4.3	1.19
250 kN	mm	11.25°	30	62	134	30.3
	inch		1.18	2.44	5.27	1.19
500 kN	mm	11.25°	30	62	171	30.3
	inch		1.18	2.44	6.73	1.19
1.25 MN	mm	7.5°	30	62	225	28.3
	inch		1.18	2.44	8.86	1.11

## Dimensions of U10M with amplifier and foot adapter



Nominal (rated) force	Dimensions in	ØA	ØB	C	D	E	ØF	G	H	M	Y	ZA	T	U
1.25 kN... 5 kN	mm	104.8	88.9	33.3	22.5°	45°	30.4	M16x2-4H	4	22	85.6	29.8	30	62
	inch	4.13	3.5	1.3			1.2		0.16	0.87	3.37	1.17	1.18	2.44
12.5 kN... 25 kN	mm	104.8	88.9	33.3	22.5°	45°	31.5	M16x2-4H	4	22	85.6	29.8	30	62
	inch	4.13	3.5	1.3			1.24		0.16	0.87	3.37	1.17	1.18	2.44
50 kN	mm	153.9	130.3	42.9	15°	30°	61.2	M33x2-4H	10	35.5	110	30.3	30	62
	inch	6.06	5.13	1.69			2.41		0.39	1.4	4.3	1.19	1.18	2.44
125 kN	mm	153.9	130.3	42.9	15°	30°	67.3	M33x2-4H	10	35.5	110	30.3	30	62
	inch	6.06	5.13	1.69			2.65		0.39	1.4	4.3	1.19	1.18	2.44

Nominal (rated) force	Dimensions in	ØA	ØB	C	D	E	ØF	G	H	M	Y	ZA	T	U
250 kN	mm	203.2	165.1	61.9	11.25°	22.5°	95.5	M42x2-4H	12	44	134	30.3	30	62
	inch	8.00	6.51	2.4			3.76		0.47	1.73	5.27	1.19	1.18	2.44
500 kN	mm	279	229	87.3	11.25°	22.5°	122.2	M72x2-4H	16	69.5	171	30.3	30	62
	inch	10.98	9.02	3.4			4.81		0.63	2.73	6.73	1.19	1.18	2.44
1.25 MN	mm	390	322	125	7.5°	15°	190	M120x4-4H	22	112	225	28.3	30	62
	inch	15.35	12.68	4.92			7.48		0.87	4.41	8.86	1.11	1.18	2.44

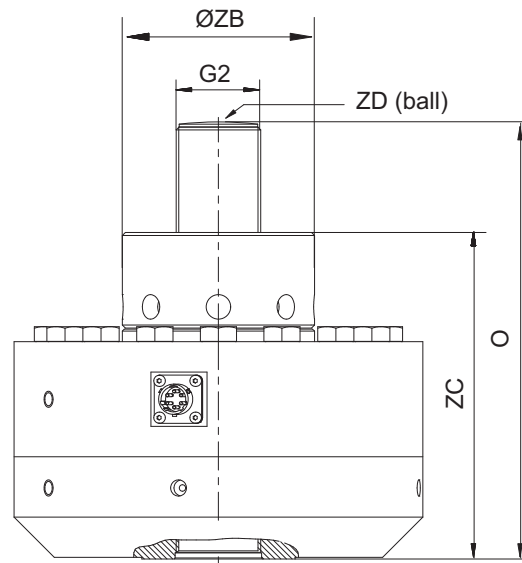
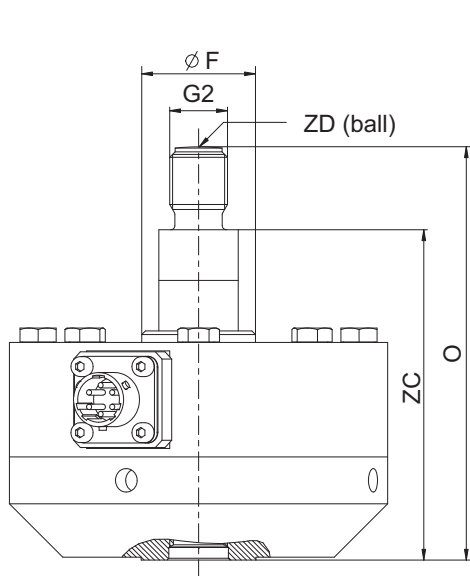
Nominal (rated) force	Dimensions in	G1	ØK	L	N	ØPH <sup>8</sup>
1.25 kN...25 kN	mm	M16x2-4H	31.8	60.3	63.5	16.5
	inch		1.25	2.37	2.5	0.65
50 kN...125 kN	mm	M33x2-4H	57.2	85.9	89	33.5
	inch		2.25	3.38	3.5	1.32
250 kN	mm	M42x2-4H	76.2	108	114.3	43
	inch		3	4.25	4.5	1.69
500 kN	mm	M72x2-4H	114	152.4	165.1	73
	inch		4.49	6	6.5	2.87
1.25 MN	mm	M120x4-4H	190	239	254	123
	inch		7.48	9.41	10.0	4.84

## Dimensions of U10M with force application and foot adapter (all variants)

1.25 kN ... 25 kN

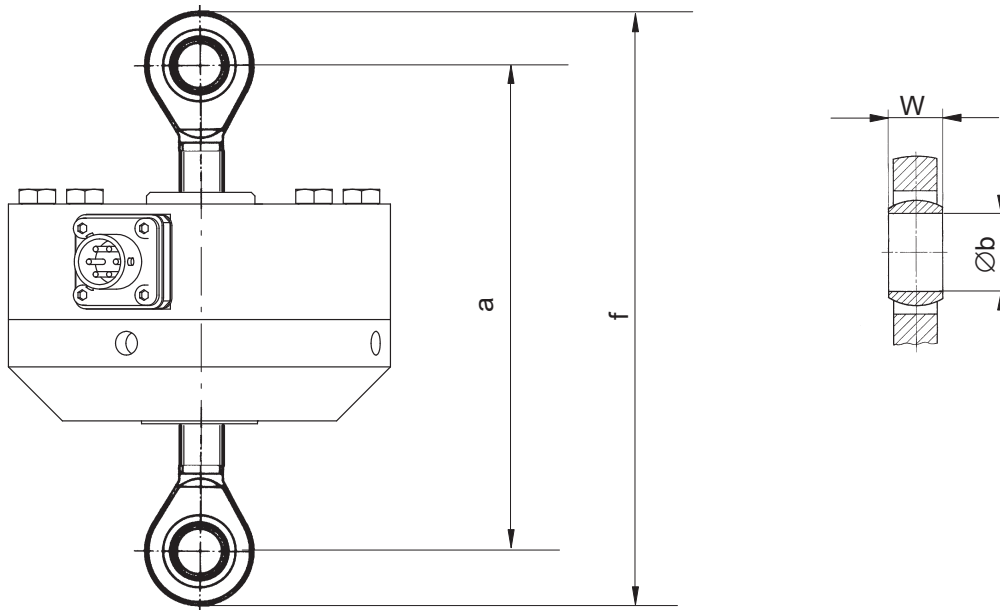
50 kN ... 1.25 MN

Dimensions in mm



Nominal (rated) force	Dimensions in	ØF	G2	O	ØZB	ZC	ZD
1.25 kN - 5 kN	mm	30.4	M16x2	114.5	-	91.5	60
	inch	1.2		4.51		3.6	2.36
12.5 kN - 25 kN	mm	31.5	M16x2	114.5	-	91.5	60
	inch	1.24		4.51		3.6	2.36
50 kN	mm	61.2	M33x2-6 g	174.5	67.3	131.5	160
	inch	2.41		6.87	2.65	5.18	6.3
125 kN	mm	67.3	M33x2-6 g	174.5	67.3	131.5	160
	inch	2.65		6.87	2.65	5.18	6.3
250 kN	mm	95.5	M42x2-6 g	217.3	95.5	162.3	160
	inch	3.76		8.56	3.76	6.39	6.3
500 kN	mm	122.2	M72x2-6 g	307.3	135	230.1	400
	inch	4.81		12.1	5.31	9.06	15.75
1.25 MN	mm	190	M120x4-6 g	465.3	190	351.5	600
	inch	7.48		18.32	7.48	13.84	23.62

## Dimensions of U10M with knuckle eyes (all variants)

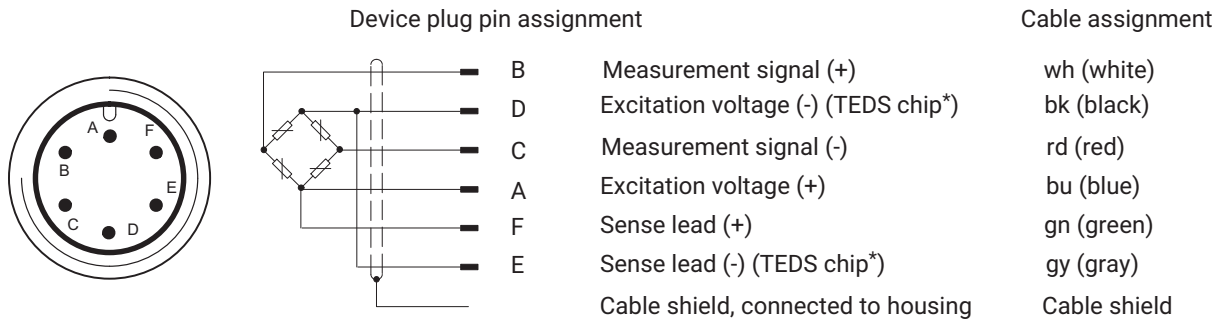


Dimensions in mm

Nominal (rated) force kN	Ordering number for knuckle eye	a (min. - max.)		f (min. - max.)		W		Øb	
		mm	inch	mm	inch	mm	inch	mm	inch
1.25 - 25	1-Z4/20kN/ ZGUW	146.5-152.5	5.77-6.00	186.5 - 192.5	7.34 - 7.58	21	0.827	16	0.630
50 - 125	1-ZGAM33F	263.0-271.0	10.35-11.67	392.0 - 400.0	15.43 - 15.75	35	1.387	50	1.969
250	1-ZGAM42F	300.8-308.8	11.84-12.16	429.8 - 437.8	16.92 - 17.24	44	1.732	60	2.362
500	1-ZGAM72F	439.3-447.3	17.30-17.61	641.9 - 649.3	25.27 - 25.56	60	2.362	90	3.543

## ELECTRICAL CONNECTION

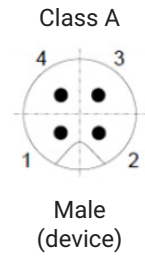
### Electrical connection without integrated amplifier (passive)



\* Only when option T is selected (transducer identification)

### Electrical connection with amplifier VAIO (IO-Link)

Pin	U10M assignment
1	Supply voltage +
2	Digital output (DI/DO pin function)
3	Supply voltage/reference potential
4	IO-Link data (C/Q), switchover to the digital output (SIO mode) possible



## SPECIFICATIONS

### Specifications without amplifier module with 100% calibration

Nominal (rated) force	$F_{nom}$	Force values										
		kN	1.25	2.5	5	12.5	25	50	125	250	500	1.25
		MN										
<b>Accuracy</b>												
Accuracy class			0.02		0.035		0.04		0.05			
Relative repeatability error in unchanged mounting position	$b_{rg}$	%	0.02									
Relative reversibility error (hysteresis) at 0.4 $F_{nom}$	$v_{0.4}$	%	0.02		0.035		0.04		0.05			
Non-linearity	$d_{lin}$	%	0.02		0.03		0.035		0.05			
Relative zero point return	$v_{w0}$	%	0.008									
Relative creep	$d_{cr, F+E}$	%	0.02									
Effect of the bending moment at 10% $F_{nom}$ * 10 mm	$d_{Mb}$	%	0.01									
Effect of lateral forces at 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	0.015									
<b>Rated electrical output</b>												
Rated output (nominal)	$C_{nom}$	mV/V	1				2					
Relative zero signal error	$d_{S,0}$	%	1									
Rated output error with "adjusted rated output" option	$d_C$	%	0.1									
Rated output range without "adjusted rated output" option	C	mV/V	1 ... 1.5				2 ... 2.5					
Rated output variation for tension/pressure	$d_{zd}$	%	0.2									
Input resistance	$R_e$	$\Omega$	> 345									
Output resistance range without "adjusted rated output" option	$R_a$	$\Omega$	280 ... 360									
Output resistance with "adjusted rated output" option	$R_a$	$\Omega$	365									
Output resistance tolerance with "adjusted rated output" option	$d_{Ra}$	$\Omega$	$\pm 0.5$									
Insulation resistance	$R_{iso}$	G $\Omega$	> 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										

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500	
		MN										1.25
<b>Temperature</b>												
Reference temperature	$T_{ref}$	°C	23									
		°F	73.4									
Nominal temperature range	$B_{T,nom}$	°C	-10 ... +45									
		°F	14 ... 113									
Maximum operating temperature range	$B_{T,G}$	°C	-30 ... +85									
		°F	-22 ... 185									
Storage temperature range	$B_{T,S}$	°C	-30 ... +85									
		°F	-22 ... 185									
<b>Characteristic mechanical quantities</b>												
Maximum operating force	$F_G$	% of $F_{nom}$	240									
Force limit	$F_L$		240									
Breaking force	$F_B$		> 400									
Torque limit	$M_{G,max}$	Nm	30	60	125	315	635	1270	3175	5715	11430	28575
Bending moment limit	$M_{b,max}$		30	60	125	315	635	1270	3175	5715	11430	28575
Static lateral force limit	$F_Q$	% of $F_{nom}$	100									
Nominal (rated) displacement	$s_{nom}$	mm	0.02			0.03			0.04	0.05	0.06	0.09
Natural frequency	$f_G$	kHz	4.5	5.9	9.3	6.6	9.2	6.5	8.1	6.6	6.1	3.8
Relative permissible oscillatory stress	$f_{rb}$	% of $F_{nom}$	200									
Stiffness	$c_{ax}$	$10^5$ N/mm	0.625	1.25	2.5	4.17	8.33	16.7	31.3	50	83.3	140
<b>General information</b>												
Degree of protection as per EN 60529, with bayonet connector (standard version), jack connected to sensor			IP67									
Degree of protection as per EN 60529, with "threaded connector" option			IP64									
Degree of protection as per EN 60529, with "integrated cable" option			IP67				IP68 <sup>1)</sup>					
Spring element material			Aluminum				Stainless steel					
Measuring point protection			Firmly glued measuring body				Hermetically welded measuring body					
Cable (only with "integrated cable" option)			Six-wire configuration, TPE insulation. Outside diameter 5.4 mm									
Cable length		m	6 or 15									
<b>Mechanical shock resistance as per IEC 60068-2-6</b>												
Number		n	1000									
Duration		ms	3									
Acceleration		m/s <sup>2</sup>	1000									
<b>Vibrational stress as per IEC 60068-2-27</b>												
Frequency range		Hz	5 ... 65									
Duration		min	30									
Acceleration		m/s <sup>2</sup>	150									
Weight (with adapter)	m	kg	1.2		3		10		23	60	186	
		lbs	2.65		6.61		22.05		50.71	132.28	409.2	
Weight (without adapter)	m	kg	0.5		1.3		5		11	28	77	
		lbs	1.1		2.87		11.02		24.25	61.73	169.4	

1) Test condition: 1 m water column, 100 hours

## Specifications with amplifier VAIO with 100% calibration

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500		
		MN											1.25
<b>Accuracy</b>													
Accuracy class			0.02		0.035		0.04		0.05				
Relative repeatability error in unchanged mounting position	$b_{rg}$	%	0.02										
Relative reversibility error (hysteresis) at 0.4 $F_{nom}$	$v_{0.4}$	%	0.02		0.035		0.04		0.05				
Non-linearity	$d_{lin}$	%	0.005								0.03		
Relative zero point return	$v_{w0}$	%	0.008										
Relative creep	$d_{cr, F+E}$	%	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	0.015				0.0075						
<b>Rated electrical output VAIO</b>													
Output signal, interface			IO-Link standard, COM3										
Min. cycle time		ms	< 0.9										
Sample rate (internal)		S/s	40000										
Cut-off frequency (-3 dB)	$F_G$	kHz	4										
Nominal (rated) supply voltage	$U_{ref}$	V	24										
Operating range of the supply voltage	$B_{u,gt}$	V	19 ... 30										
Maximum power consumption		mW	3200										
Noise		ppm of nominal (rated) force	With Bessel filter 1Hz: 28 With Bessel filter 10 Hz: 76 With Bessel filter 100 Hz: 234 With Bessel filter 200 Hz: 330 Without filter: 3624				With Bessel filter 1Hz: 14 With Bessel filter 10 Hz: 38 With Bessel filter 100 Hz: 117 With Bessel filter 200 Hz: 165 Without filter: 1812						
Low-pass filter			Freely adjustable cut-off frequency, Bessel or Butterworth characteristic, 6th order										
Relative rated output variation for tension/pressure	$d_{zd}$	%	0.03										
<b>Device functions</b>													
Limit value switches	2 limit value switches, invertible, freely adjustable hysteresis, output via process data or digital output												
Digital IOs	Based on IO-Link Smart Sensor Profile, 1 permanently available digital output, 1 output can be set to data output, then no measurement is possible												
Slave pointer function	Yes												
Peak value memory	Yes												
Peak-to-peak memory	Yes												
Warning functions	Warning on exceeding nominal (rated) force/maximum operating force; nominal (rated) temperature/maximum operating temperature												

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500	
		MN										
<b>Temperature</b>												
Reference temperature	$T_{ref}$	°C	23									
		°F	73.4									
Nominal temperature range	$B_{T,nom}$	°C	-10 ... +45									
		°F	14 ... 113									
Maximum operating temperature range	$B_{T,G}$	°C	-10 ... +60									
		°F	14 ... 140									
Storage temperature range	$B_{T,S}$	°C	-25 ... +85									
		°F	-13 ... 185									
<b>Characteristic mechanical quantities</b>												
Maximum operating force	$F_G$	% of $F_{nom}$	240									
Force limit	$F_L$		240									
Breaking force	$F_B$		> 400									
Torque limit	$M_{G,max}$	N*m	30	60	125	315	635	1270	3175	5715	11430	28575
Bending moment limit	$M_{b,max}$		30	60	125	315	635	1270	3175	5715	11430	28575
Static lateral force limit	$F_Q$	% of $F_{nom}$	100									
Nominal (rated) displacement	$s_{nom}$	mm	0.02			0.03			0.04	0.05	0.06	0.09
Natural frequency	$f_G$	kHz	4.5	5.9	9.3	6.6	9.2	6.5	8.1	6.6	6.1	3.8
Relative permissible oscillatory stress	$f_{rb}$	% of $F_{nom}$	200									
Stiffness	$c_{ax}$	$10^5$ N/mm	0.625	1.25	2.5	4.17	8.33	16.7	31.3	50	83.3	140
<b>General information</b>												
Degree of protection as per EN 60529 with connected cable			IP67									
Spring element material			Aluminum				Stainless steel					
Material of permanently mounted amplifier housing			Stainless steel									
Measuring point protection			Firmly glued measuring body				Hermetically welded measuring body					
<b>Mechanical shock resistance as per IEC 60068-2-6</b>												
Number		n	1000									
Duration		ms	3									
Acceleration		m/s <sup>2</sup>	1000									
<b>Vibrational stress as per IEC 60068-2-27</b>												
Frequency range		Hz	5 ... 65									
Duration		min	30									
Acceleration		m/s <sup>2</sup>	150									
Weight (without adapter, with amplifier)	m	kg	0.65			1.45		5.15		11	28	77
		lbs	1.43			3.2		11.35		24,25	61,73	169,4
Weight (with adapter and amplifier)	m	kg	1.35			3.15		10.15		23	60	186
		lbs	3			7		22.38		50,71	132,28	409,2

## Specifications without amplifier module with 200% calibration

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500	
		MN										
Calibration force	$F_{cal}$	kN	2.5	5	10	25	50	100	250	500	1000	
		MN										2.5
<b>Accuracy</b>												
Accuracy class			0.02			0.035		0.04			0.05	
Relative repeatability error in unchanged mounting position	$b_{rg}$	%	0.02									
Relative reversibility error (hysteresis) at 0.4 $F_{cal}$	$v_{0.4}$	%	0.02			0.035		0.04			0.05	
Non-linearity	$d_{lin}$	%	0.02			0.03		0.035			0.05	
Relative zero point return			0.008									
Relative creep	$d_{cr, F+E}$	%	0.02									
Effect of the bending moment at 10% $F_{cal}$ * 10 mm	$d_{Mb}$	%	0.01									
Effect of lateral forces (lateral force = 10% of $F_{cal}$ )	$d_Q$	%	0.01									
Temperature coefficient of sensitivity	$TC_S$	% / 10K	0.015									
Temperature coefficient of zero signal	$TC_0$		0.0075									
<b>Rated electrical output</b>												
Rated output (nominal)	$C_{nom}$	mV/V	2				4					
Relative zero signal error	$d_{S,0}$	%	1									
Rated output error with "adjusted rated output" option	$d_c$	%	0.1									
Rated output range without "adjusted rated output" option		mV/V	2 ... 3				4 ... 4.95					
Rated output variation for tension/pressure	$d_{ZD}$	%	0.2									
Input resistance	$R_e$	$\Omega$	> 345									
Output resistance range without "adjusted rated output" option	$R_a$	$\Omega$	280 ... 360									
Output resistance with "adjusted rated output" option	$R_a$	$\Omega$	365									
Output resistance tolerance with "adjusted rated output" option	$d_{Ra}$	$\Omega$	$\pm 0.5$									
Insulation resistance	$R_{ISO}$	G $\Omega$	> 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											
<b>Temperature</b>												
Reference temperature	$T_{ref}$	$^{\circ}C$	23									
		$^{\circ}F$	73.4									
Nominal temperature range	$B_{T,nom}$	$^{\circ}C$	-10 ... +45									
		$^{\circ}F$	14 ... 113									
Maximum operating temperature range	$B_{T,G}$	$^{\circ}C$	-30 ... +85									
		$^{\circ}F$	-22 ... 185									
Storage temperature range	$B_{T,S}$	$^{\circ}C$	-30 ... +85									
		$^{\circ}F$	-22 ... 185									

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500	
		MN										
Calibration force	$F_{cal}$	kN	2.5	5	10	25	50	100	250	500	1000	
		MN										2.5
<b>Characteristic mechanical quantities</b>												
Maximum operating force	$F_G$	% of $F_{cal}$	120									
Force limit	$F_L$		120									
Breaking force	$F_B$		> 200									
Torque limit	$M_{G max}$	N*m	30	60	125	315	635	1270	3175	5715	11430	28575
Bending moment limit	$M_{b max}$		30	60	125	315	635	1270	3175	5715	11430	28575
Static lateral force limit	$F_Q$	% of $F_{cal}$	50									
Nominal (rated) displacement	$s_{nom}$	mm	0.04			0.06			0.08	0.1	0.12	0.06
Natural frequency	$f_G$	kHz	4.5	5.9	9.3	6.6	9.2	6.5	8.1	6.6	6.1	3.8
Relative permissible oscillatory stress	$f_{rb}$	% of $F_{nom}$	200 (100% of the calibration force)									
Stiffness	$c_{ax}$	$10^5$ N/mm	0.625	1.25	2.5	4.17	8.33	16.7	31.3	50	83.3	140
<b>General information</b>												
Degree of protection as per EN 60529, with bayonet connector (standard version), jack connected to sensor			IP67									
Degree of protection as per EN 60529, with "threaded connector" option			IP64									
Degree of protection as per EN 60529, with "fixed cable" option			IP67				IP68 <sup>1)</sup>					
Spring element material			Aluminum				Stainless steel					
Measuring point protection			Firmly glued measuring body				Hermetically welded measuring body					
Cable (only with "fixed cable" option)			Six-wire configuration, TPE insulation. Outside diameter 5.4 mm									
Cable length		m	6 or 15									
<b>Mechanical shock resistance as per IEC 60068-2-6</b>												
Number		n	1000									
Duration		ms	3									
Acceleration		m/s <sup>2</sup>	1000									
<b>Vibrational stress as per IEC 60068-2-27</b>												
Frequency range		Hz	5 ... 65									
Duration		min	30									
Acceleration		m/s <sup>2</sup>	150									
Weight (with adapter)	m	kg	1.2		3		10		23	60	186	
		lbs	2.65		6.61		22.05		50.71	132.28	409.2	
Weight (without adapter)	m	kg	0.5		1.3		5		11	28	77	
		lbs	1.1		2.87		11.02		24.25	61.73	169.4	

1) Test condition: 1 m water column, 100 hours

## Specifications with amplifier VAIO with 200% calibration

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500	
		MN										
Calibration force	$F_{cal}$	kN	2.5	5	10	25	50	100	250	500	1000	
		MN										
<b>Accuracy</b>												
Accuracy class			0.02			0.035		0.04			0.05	
Relative repeatability error in unchanged mounting position	$b_{rg}$	%	0.02									
Relative reversibility error (hysteresis) at 0.4 $F_{nom}$	$v_{0.4}$	%	0.02			0.035		0.04			0.05	
Non-linearity	$d_{lin}$	%	0.005						0.03			
Relative zero point return	$v_{w0}$	%	0.008									
Relative creep	$d_{cr, F+E}$	%	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	0.006									
<b>Rated electrical output VAIO</b>												
Output signal, interface			IO-Link standard, COM3									
Min. cycle time		ms	0.9									
Sample rate (internal)		S/s	40000									
Cut-off frequency (-3 dB)	$F_G$	kHz	4									
Nominal (rated) supply voltage	$U_{ref}$	V	24									
Operating range of the supply voltage	$B_{u,gt}$	V	19 ... 30									
Maximum power consumption		mW	3200									
Noise		ppm of nominal (rated) force	With Bessel filter 1 Hz: 14 With Bessel filter 10 Hz: 38 With Bessel filter 100 Hz: 117 With Bessel filter 200 Hz: 165 Without filter: 1812				With Bessel filter 1Hz: 7 With Bessel filter 10 Hz: 19 With Bessel filter 100 Hz: 58 With Bessel filter 200 Hz: 82 Without filter: 906					
Low-pass filter			Freely adjustable cut-off frequency, Bessel or Butterworth characteristic, 6th order									
<b>Device functions</b>												
Limit value switches			2 limit value switches, invertible, freely adjustable hysteresis, output via process data or digital output									
Digital IOs			Based on IO-Link Smart Sensor Profile. 1 permanently available digital output, 1 output can be set to data output, then no measurement output is possible									
Slave pointer function			Yes									
Peak value memory			Yes									
Peak-to-peak memory			Yes									
Warning functions			Warning on exceeding nominal (rated) force/maximum operating force; nominal (rated) temperature/maximum operating temperature/dynamic force overshoot									

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	250	500	
		MN										
Calibration force	$F_{cal}$	kN	2.5	5	10	25	50	100	250	500	1000	
		MN										2.5
<b>Temperature</b>												
Reference temperature	$T_{ref}$	°C	23									
		°F	73.4									
Nominal temperature range	$B_{T,nom}$	°C	-10 ... +45									
		°F	14 ... 113									
Maximum operating temperature range	$B_{T,G}$	°C	-10 ... +60									
		°F	14 ... 140									
Storage temperature range	$B_{T,S}$	°C	-25 ... +85									
		°F	-13 ... 185									
<b>Characteristic mechanical quantities</b>												
Maximum operating force	$F_G$	% of $F_{cal}$	120									
Force limit	$F_L$		120									
Breaking force	$F_B$		> 200									
Torque limit	$M_{G,max}$	N*m	30	60	125	315	635	1270	3175	5715	11430	28575
Bending moment limit	$M_{b,max}$		30	60	125	315	635	1270	3175	5715	11430	28575
Static lateral force limit	$F_Q$	% of $F_{cal}$	50									
Nominal (rated) displacement	$s_{nom}$	mm	0.04			0.06			0.08	0.1	0.12	0.09
Natural frequency	$f_G$	kHz	4.5	5.9	9.3	6.6	9.2	6.5	8.1	6.6	6.1	3.8
Relative permissible oscillatory stress	$f_{rb}$	% of $F_{nom}$	200 (100% of the calibration force)									
Stiffness	$c_{ax}$	$10^5$ N/m	0.625	1.25	2.5	4.17	8.33	16.7	31.3	50	83.3	140
<b>General information</b>												
Degree of protection as per EN 60529 with connected cable			IP67									
Spring element material			Aluminum				Stainless steel					
Material of permanently mounted amplifier housing			Stainless steel									
Measuring point protection			Firmly glued measuring body				Hermetically welded measuring body					
<b>Mechanical shock resistance as per IEC 60068-2-6</b>												
Number		n	1000									
Duration		ms	3									
Acceleration		m/s <sup>2</sup>	1000									
<b>Vibrational stress as per IEC 60068-2-27</b>												
Frequency range		Hz	5 ... 65									
Duration		min	30									
Acceleration		m/s <sup>2</sup>	150									
Weight (without adapter, with amplifier)	m	kg	0.65			1.45		5.15		11	28	77
		lbs	1.43			3.2		11.35		24,25	61,73	169,4
Weight (with adapter and amplifier)	m	kg	1.35			3.15		10.15		23	60	186
		lbs	3			7		22.38		50,71	132,28	409,2

## VERSIONS AND ORDERING NUMBERS

Code	Measuring range	Ordering number
<b>1K25</b>	1.25 kN	1-U10M/1.25kN
<b>2K50</b>	2.5 kN	1-U10M/2.5kN
<b>5K00</b>	5 kN	1-U10M/5kN
<b>12K5</b>	12.5 kN	1-U10M/12.5kN
<b>25K0</b>	25 kN	1-U10M/25kN
<b>50K0</b>	50 kN	1-U10M/ 50kN
<b>125K</b>	125 kN	1-U10M/125kN
<b>250K</b>	250 kN	1-U10M/250kN
<b>500K</b>	500 kN	1-U10M/500kN
<b>1M25</b>	1.25 MN	1-U10M/1.25MN

The ordering numbers shown in gray are preferred types. They can be delivered rapidly.

All preferred types with bayonet connector, single bridge, without rated output adjustment, 100 % calibration, without TEDS, with adapter, without plug protection, without force application, without amplifier and without firmware.

The ordering no. for preferred types is 1-U10M/...

The ordering no. for customized versions is K-U10M-...

The ordering no. example shown below **K-U10M-25K0-DB-**

**N-2-S-N-U-00A4-00A4-O-X-X-VAIO-VAIO-IO03** is a: U10M, nominal (rated) force 25 kN with double bridge, without rated output adjustment, 200 % calibration, without TEDS, without adapter, without plug protection, without load application bolt and with integrated amplifier (IO-Link output).

Nominal (rated) force	No. of measuring bridges	Rated output	Calibration	Transducer identification	Mechanical design	Plug protection	Electrical connection		Force application	Plug version for the "fixed mounted cable" option		Integrated amplifier		Firmware	
							Bridge A	Bridge B		Bridge A	Bridge B	Bridge A	Bridge B		
1.25 kN <b>1K25</b>	Single bridge <b>SB</b>	Not adjusted <b>N</b>	100% (dyn.) <b>1</b>	Without TEDS chip <b>S</b>	With adapter <b>W</b>	Without <b>U</b>	Bayonet connector <b>B</b>		Without <b>O</b>	Free ends <b>Y</b>		Without integrated amplifier <b>N</b>		No firmware <b>N</b>	
2.5 kN <b>2K50</b>	Double bridge <b>DB</b>	Adjusted <b>J</b>	200% (stat.) <b>2</b>	With TEDS chip <b>T</b>	Without adapter <b>N</b>	With <b>P</b>	Threaded connector <b>G</b>		With <b>L</b>	D-Sub-D, 15-pin <b>F</b>		Digital amplifier: IO-Link <b>VAIO</b>		Version 2.0.8 <b>IO03</b>	
5 kN <b>5K00</b>							Fixed cable (6 m) <b>K</b>				D-Sub-HD, 15-pin <b>Q</b>				Version 2.0.10 <b>IO04</b>
12.5 kN <b>12K5</b>							Fixed cable (15 m) <b>V</b>				Connector ME3106PEMV <b>N</b>				Version 2.0.12 <b>IO05</b>
25 kN <b>25K0</b>							M12 connector, 4-pin, A-coded <b>00A4</b>				ODU connector, 14-pin <b>P</b>				
50 kN <b>50K0</b>											M12 connector, 8-pin <b>M</b>				
125 kN <b>125K</b>											No cable available <b>X</b>				
250 kN <b>250K</b>															
500 kN <b>500K</b>															
1.25 MN <b>1M25</b>															

## Ordering example

K-U10M-	25K0-	DB-	N-	2-	S-	N-	U-	00A4-	00A4-	O-	X-	X-	VAIO-	VAIO-	IO03
U10, 25 kN nominal (rated) force		Double bridge	Not adjust- ed	Cali- brated at 200% of nominal (rated) force	With- out TEDS chip	With- out adapt- er	With- out plug protect- ion	Measur- ing bridge A: M12 male con- nect-or, 4-pin, A-coded	Measur- ing bridge B: M12 male con- necto- r, 4-pin, A-coded	Without load applic- ation bolts	Mea- suring bridge A: No cable avail- able	Mea- suring bridge B: No cable avail- able	Mea- suring bridge A: With amplifi- er, digital IO-Link	Mea- suring bridge B: With amplifi- er, digital IO-Link	Firm- ware 2.0.8

<b>No. of measuring bridges</b>	To ensure redundancy, in safety-relevant devices the plausibility of the measurement signal must be checked using a second measuring bridge (installed on the same measuring body). The signals are independently conditioned and evaluated by two separate signal conditioners. It is therefore possible to connect two signal conditioners with different characteristics.
<b>Rated output</b>	The exact rated output (nominal) is stated on the type plate. The transducer can also be adjusted to an exact rated output of 1.0 mV/V or 2.0 mV/V (if 200% calibration is selected: 2 mV/V or 4 mV/V). The relative rated output tolerance is then 0.1% of the rated output (nominal). The rated output range of a non-adjusted transducer is between 1 and 1.5 or 2 and 2.5 mV/V. See Specifications for details. This option is only required if sensors with no amplifier module are to be calibrated in the rated output. Not necessary for sensors with permanently connected amplifier module.
<b>Calibration</b>	In the standard version, the transducer is designed for dynamic application up to an oscillation bandwidth of $\pm 100 \% F_{nom}$ . For quasi-static applications, the transducer can be used up to $200 \% F_{nom}$ . Suitable calibration to $200 \% F_{nom}$ is possible as an option.
<b>Transducer identification</b>	Integration of TEDS (Transducer Electronic Data Sheet) chip as per IEEE1451.4. If the relevant amplifier electronics are provided, the measurement chain will parameterize itself. TEDS chip only for sensors without amplifier module.
<b>Mechanical design</b>	The U10M can optionally also be ordered as a flange assembly. This version does not include a screwed-on adapter. During installation, please pay attention to the notes in the mounting instructions.
<b>Plug protection</b>	Mechanical protection through the installation of an additional square profile around the connector. Dimensions in mm approx.: WxHxD: 30x30x20
<b>Electrical connection, bridge A</b>	The standard version is the device plug with a bayonet connection (compatible with PT02E10-6P). A screw-fitting male device connector (compatible with PC02E10-6P) may also be installed. A third variant where the force transducers are fitted with a fixed cable is also available. In this version, all U10M units achieve degree of protection IP68 with a nominal (rated) force equal to or greater than 12.5 kN. Sensors with a digital output (VAIO) are connected via the 4-pin M12 connector.
<b>Electrical connection, bridge B</b>	See Electrical connection, bridge A.
<b>Force application</b>	Mounted force application. The product is supplied as standard without force application, although a force application bolt can be fitted on request. For dimensions, see page 10.
<b>Plug selection for the "fixed mounted cable" option</b>	When ordering the U10M with a permanently fitted cable, you can also order the connector assembly at the end of the cable, so that the force sensor can be directly connected to an amplifier. Y = free ends, no connector fitted F = D-sub-HD15, 15-pin, for connection to MGC+ (e.g. AP01) Scout Q = HD-sub-HD15, 15-pin, for connection to many HBK amplifiers of the Quantum series (MX410, MX440, MX840) N = MS connector, for connection to HBK amplifiers such as MGC+ (AP03) DMP or DK38 P = ODU connector, 14-pin, degree of protection IP68, for connection to all HBK amplifiers of the Somat XR series that are suitable for measuring full bridge circuits. M = M12 plug, 8-pin, suitable for measuring amplifiers digiBOX and DSE X = No cable available
<b>Integrated amplifier</b>	The force transducer can also be ordered with permanently connected amplifier modules: N = without integrated amplifier VAIO = digital amplifier: IO-Link
<b>Firmware</b>	If you order the U10M with the VAIO option, the measurement chain is always shipped with the latest firmware. N = no firmware, for sensors with analog output signal IO03 = firmware 2.0.8 IO04 = firmware 2.0.10 IO05 = firmware 2.0.12

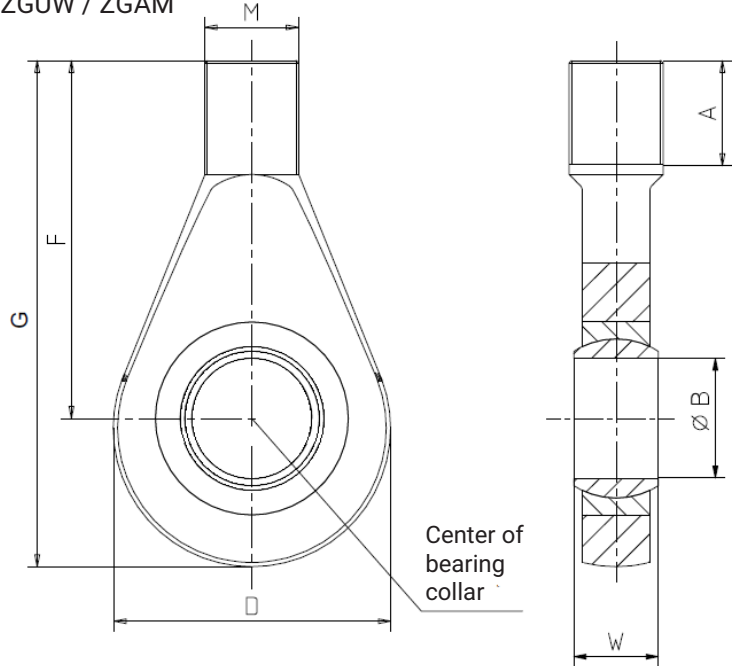
## ACCESSORIES

The accessories are not included in the scope of supply.

Cables/plugs	Ordering number
Connection cable KAB157-3; IP67 (with bayonet connection); 3 m long, outer sheath TPE; 6 x 0.25 mm <sup>2</sup> ; free ends, shielded, outside diameter 6.5 mm	1-KAB157-3
Connection cable KAB158-3; IP54 (with screw connection), 3 m long, outer sheath TPE; 6 x 0.25 mm <sup>2</sup> ; free ends, shielded, outside diameter 6.5 mm	1-KAB158-3
Cable, configurable with different connectors and lengths	K-CAB-F
Bayonet connector for cables with an outside diameter of 4 mm to 6.5 mm	1-CON/BS1
Bayonet connector for cables with an outside diameter of 6.5 mm or more	1-CON/BS2
Female connector, supplied loose (screw connection)	3-3312.0354
Ground cable (400 mm long)	1-EEK4
Ground cable (600 mm long)	1-EEK6
Ground cable (800 mm long)	1-EEK8
Knuckle eye, M16 external thread	1-Z4/20kN/ZGUW
Knuckle eye, M33x2 external thread	1-ZGAM33F
Knuckle eye, M42x2 external thread	1-ZGAM42F
Knuckle eye, M72x2 external thread	1-ZGAM72F
Knuckle eye, M16 internal thread	1-Z4/20kN/ZGOW
Knuckle eye, M33x2 internal thread	1-ZGIM33F
Knuckle eye, M42x2 internal thread	1-ZGIM42F
Knuckle eye, M72x2 internal thread	1-ZGIM72F

## Accessories - Knuckle eyes

ZGUW / ZGAM



Dimensions in mm

Nominal (rated) force	Knuckle eye ordering no.	A	$\varnothing B$	D	F	G	M	W	Weight
1.25 kN - 25 kN	1-Z4/20kN/ZGUW	41.7	16 <sup>+0.018</sup>	42	67.7	88.7	M16	21	0.2 kg
50 kN - 125 kN	1-ZGAM33F	35	50 <sup>-0.012</sup>	115	118	182.5	M33x2	35	2.5 kg
250 kN	1-ZGAM42F	45	60 <sup>-0.015</sup>	126	134	202	M42x2	44	3.8 kg
500 kN	1-ZGAM72F	70	90 <sup>-0.02</sup>	190	203	305	M72x2	60	12.6 kg

Knuckle eyes are only suitable for static tensile loads.

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