

DATA SHEET

U93A Force transducer

SPECIAL FEATURES

- Miniature tension/pressure transducer
- HBK accuracy class 0.2
- Nominal (rated) forces 1 kN ... 50 kN
- Easy installation thanks to flange connection on both sides
- Available on request as a measurement chain with permanently connected amplifier module. Output signals: 4 ... 20 mA, 0 ... 10 V, IO-Link
- Rugged: High lateral force stability, degree of protection IP68, made of rust-resistant materials
- High rigidity, ideal for fast measurements
- Cable suitable for drag chains, resistant to most oils and operating materials.

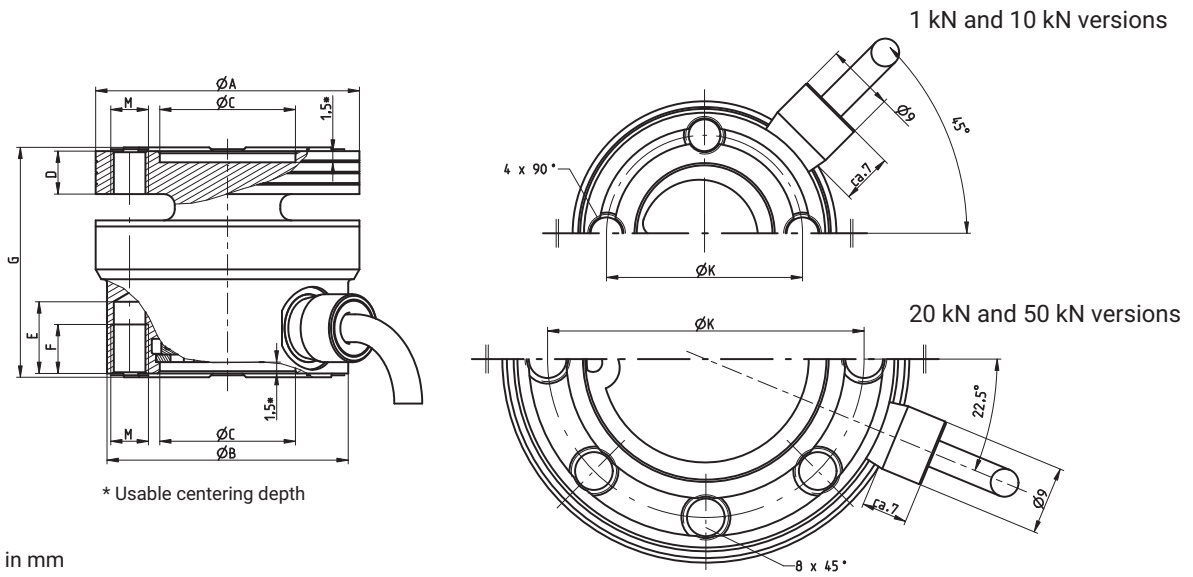


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DIMENSIONS

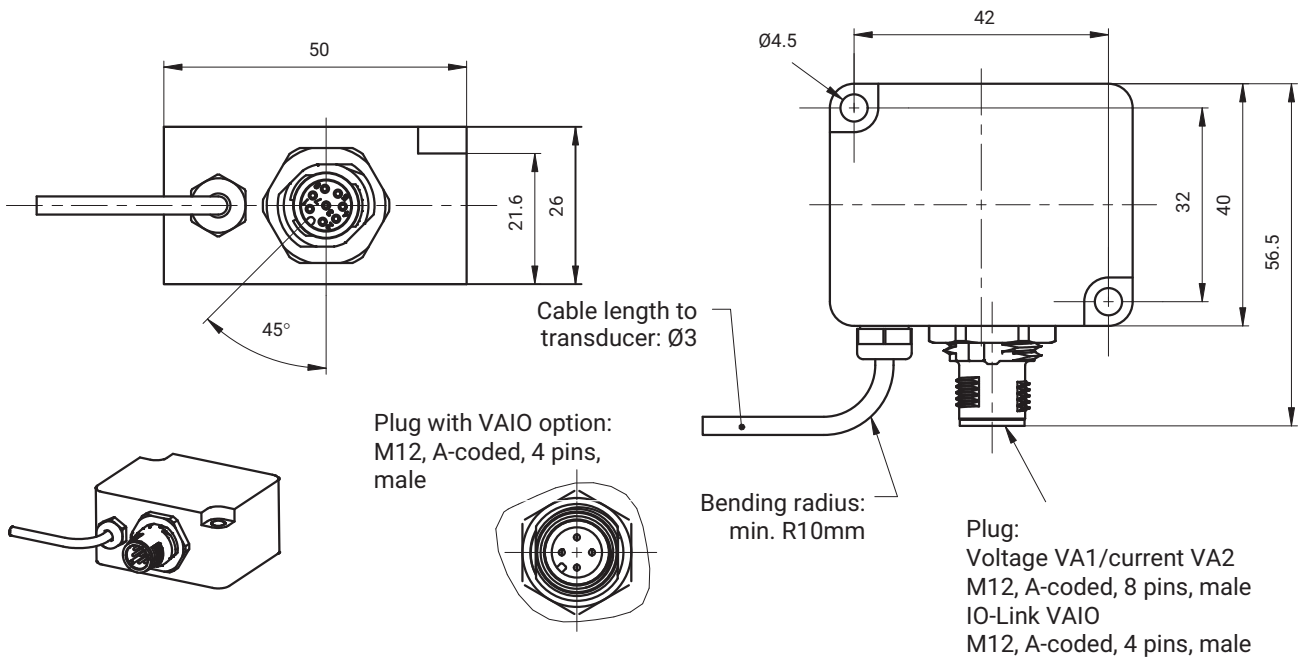
Dimensions U93A



Dimensions in mm

Nominal (rated) force	ØA	ØB	ØCH ³	D	E	F	G	ØK ^{+0.1}	M
U93/1kN...10kN	35	33	18	6.2	9	7	30.5	26	M5
U93/20kN...50kN	54	51	32	11	12	10	48	42	M6

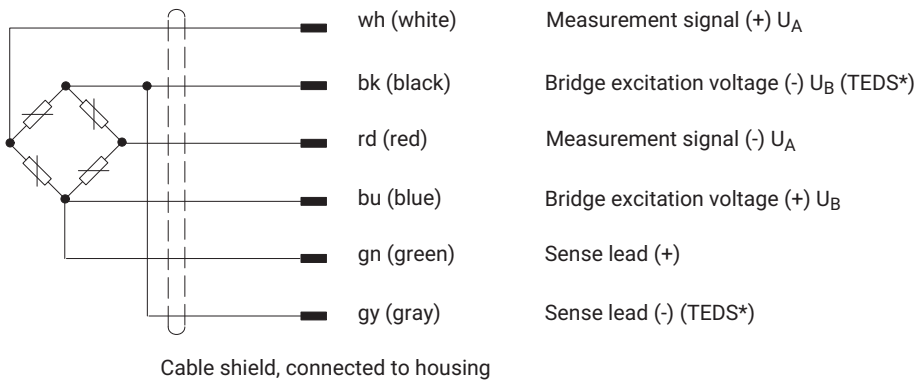
Dimensions of inline amplifier VA1, VA2, VAIO



Dimensions in mm

ELECTRICAL CONNECTION

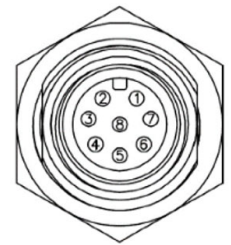
Wiring diagram of U93A without inline amplifier



* only when option T is selected (transducer identification)

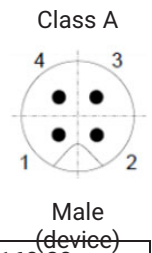
VA1, VA2 inline amplifier wiring diagram

Pin	Version VA1 (voltage output)	Version VA2 (current output)	KAB168 connection cable wire assignment
1	Supply voltage 0 V (GND)		White
2	Not in use		Brown
3	Zero control input		Green
4	Not in use		Yellow
5	Output signal 0 ... 10 V	Output signal 4 ... 20 mA	Gray
6	Output signal 0 V	Not in use	Pink
7	Not in use		Blue
8	Voltage supply +19 ... +30 V		Red



Pin assignment of VAIO inline amplifier

Pin	U93A 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



KAB168-20, PUR connection cable with M12 8-pin socket, 20 m long, free ends on opposite side. To connect the amplifier module to the downstream electronics. Not suitable for use with the IO-Link interface.

1-KAB168-20

SPECIFICATIONS

Specifications for U93A

Nominal (rated) force	F_{nom}	kN	1	2	5	10	20	50
Accuracy								
HBK accuracy class			0.2					
Relative reproducibility and repeatability errors in unchanged mounting position	b_{rg}	%	0.1					
Relative reversibility error	$v_{0.5}$	%	0.2					
Non-linearity	d_{lin}	%	0.2					
Relative creep (30 min)	$d_{cr,F}$	%	0.1					
Bending moment effect at 10% of F_{nom} x 10 mm	d_{Mb}	%	0.1					
Effect of lateral forces at 10% of F_{nom}	d_{fq}	%	0.2		0.5		0.4	
Temperature coefficient of sensitivity								
in the nominal (rated) temperature range	TC_S	%/10K	0.2					
in the operating temperature range	TC_S	%/10K	0.3					
Temperature coefficient of zero signal								
in the nominal (rated) temperature range	TC_0	%/10K	0.2					
in the operating temperature range	TC_0	%/10K	0.3					
Rated electrical output								
Rated output (nominal)	C_{nom}	mV/V	1					
Rated output range (if the "Adjusted rated output" option is not selected)	C	mV/V	1...1.5					
Rated output tolerance with "adjusted rated output" option	d_c	%	1					
Tolerance range of zero signal	$d_{s,0}$	mV/V	0.2					
Rated output variation for tension/pressure	d_{zd}	%	1					
Input resistance	R_e	Ω	> 295					
Output resistance (without "adjusted rated output" option)	R_a	Ω	295...400					
Output resistance (with "adjusted rated output" option)	R_a	Ω	190 ... 400					
Insulation resistance	R_{iso}	Ω	> $5 \cdot 10^9$					
Operating range of the excitation voltage	$B_{U,gt}$	V	0.5...12					
Reference excitation voltage	U_{ref}	V	5					
Connection	6-wire circuit							
Temperature								
Reference temperature	T_{ref}	$^{\circ}C$	23					
Nominal (rated) temperature range	$B_{t,nom}$	$^{\circ}C$	-10...+70					
Operating temperature range	$B_{t,g}$	$^{\circ}C$	-30...+85					
Storage temperature range	$B_{t,s}$	$^{\circ}C$	-50...+85					
Characteristic mechanical quantities								
Maximum operating force	F_G	% of F_{nom}	150					
Force limit	F_L	% of F_{nom}	150					
Breaking force ¹⁾	F_B	% of F_{nom}	400	390	290	230	310	230
Torque limit ¹⁾	$M_{G,max}$	Nm	160	180	170	45	600	600
Limit bending moment when loading with nominal (rated) force ¹⁾	$M_{b,max}$	Nm	15	30	45	120	380	350

Nominal (rated) force	F_{nom}	kN	1	2	5	10	20	50
Static lateral limit force when loaded with nominal (rated) force ¹⁾	F_q	% of F_{nom}	800	500	200	100	200	100
Nominal (rated) displacement	S_{nom}	mm	0.023	0.023	0.033	0.051	0.052	0.082
Natural frequency	f_G	kHz	7.5	11	14.5	17	12.5	14
Relative vibrational stress	f_{rb}	% of F_{nom}	150					
Stiffness	c_{ax}	N/mm	43478	86957	151515	196078	384615	609756
General information								
Degree of protection as per EN 60529				IP68. Test condition: 1 m water depth, 100 hours.				
Spring element material				Stainless steel				
Cable				6-wire, outside diameter 4 mm; 6 x 0.08 mm ² ; PUR sheath; min. bending radius 22 mm				
TEDS				Optional, Zero wire, as per IEEE 1451.4				
Cable lengths		m	Standard 3 m; 1.5 m, 6 m and 12 m available as options					
Weight		g	150				530	
Maximum impact load to IEC 60068-2-6								
Number			1000					
Duration		ms	3					
Acceleration		m/s ²	1000					
Vibrational stress as per IEC 60068-2-27								
Frequency range		Hz	15 ... 65					
Duration		min	30					
Acceleration		m/s ²	150					

¹⁾ Specification for the measuring body; please observe the mechanical limits of the screws used

Specifications of VA1, VA2 inline amplifiers

Module type		VA1	VA2
Accuracy			
HBK accuracy class	%	0.15	
Relative linearity error	%	0.01	
Effect of temperature on amplification	%	0.1	
Effect of temperature on zero point	%	0.15	
Rated electrical output			
Output signal spread		0 ... 10 V	4 ... 20 mA
Output signal at 100% tension		~0 V	~4 mA
Output signal at 100% pressure		~10 V	~20 mA
Signal span		5 V	8mA
Sensitivity tolerance		± 0.1 V	± 0.16 mA
Zero signal		~ 5 V	~ 12 mA
Output signal range		-0,3 ... 11 V	3 ... 21 mA
Cut-off frequency (-3 dB)	kHz	2	
Supply voltage range	V	19 ... 30	
Reference supply voltage	V	24	
Max. current consumption	mA	15	30
Temperature			
Nominal (rated) temperature range	°C	-10 ... +50	

Module type		VA1	VA2
Operating temperature range	°C	-20 ... +60	
Storage temperature range	°C	-25 ... +85	
Reference temperature	°C	23	
Maximum shock load as per IEC 60068-2-6			
Number		1000	
Duration	ms	3	
Acceleration	m/s ²	1000	
Vibrational stress as per IEC 60068-2-27			
Frequency range	Hz	5 ... 65	
Duration	min	30	
Acceleration	m/s ²	150	
General information			
Housing material		Aluminum	
Weight without cable	g	125	
Maximum cable length for supply voltage/output voltage	m	30	
Degree of protection as per EN 60529		IP67	

Specifications of inline amplifier VAIO

Module type		VAIO
Latency (time between jump at input and event at digital output)	ms	0.3
Accuracy		
HBK accuracy class	%	0.01
Effect of temperature on amplification	%	0.01
Effect of temperature on zero point	%	0.01
Rated electrical output		
Output signal; interface		COM3, to IO-Link standard, class A
Min. cycle	ms	0.9
Sample rate (internal)	S/s	40000
Cut-off frequency (-3 dB) (internal)	kHz	4
Supply voltage range	V	19 ... 30
Reference supply voltage	V	24
Max. power consumption	mW	3200
Noise	% of nominal (rated) force	With Bessel filter 1Hz: 0.0025
		With Bessel filter 10Hz: 0.0063
		With Bessel filter 100Hz: 0.0195
		With Bessel filter 200Hz: 0.0275
		Without filter: 0.302
Filter		
Low-pass filter		Freely adjustable cut-off frequency, Bessel or Butterworth characteristic, 6th order
Device functions		
Limit value switches		2 limit value switches. Invertible, freely adjustable hysteresis. Output via process data or digital output
Digital IO		According to IO-Link Smart Sensor Profile, 1 permanently available digital output, 1 output can be set to data output, then no measurement output possible

Module type		VAIO
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/exceeding dynamic limit of alternating load
Temperature		
Nominal (rated) temperature range	°C	-10 ... +50
Operating temperature range	°C	-20 ... +60
Storage temperature range	°C	-25 ... +85
Reference temperature	°C	23
Maximum shock load as per IEC 60068-2-6		
Number		1000
Duration	ms	3
Acceleration	m/s ²	1000
Vibrational stress as per IEC 60068-2-27		
Frequency range	Hz	5 ... 65
Duration	min	30
Acceleration	m/s ²	150
General information		
Housing material		Aluminum
Weight without cable	g	125
Maximum cable length to IO-Link master	m	20
Degree of protection as per EN 60529		IP67

VERSIONS AND ORDERING NUMBERS

Code	Maximum capacity	Ordering number
01K0	1 kN	1-U93A/1KN
02K0	2 kN	1-U93A/2kN
05K0	5 kN	1-U93A/5kN
10K0	10 kN	1-U93A/10kN
20K0	20 kN	1-U93A/20KN
50K0	50 kN	1-U93A/50KN

Standard sensors are generally available from stock, and start with 1-U93A as the ordering number.

These sensors do not have a calibrated characteristic value, do not have TEDS, and feature a 3 m cable length with free ends.

K-U93A are configurable sensors. The example below is a U93A with a measuring range of 2 kN, 1.5 m cable, permanently connected amplifier module with IO -Link interface, without TEDS, without calibrated rated output.

Measuring range	Cable length	Electrical output	Transducer identification	Firmware	Adjustment
1 kN 01K0	1.5 m ¹⁾ 01M5	Free ends Y	With TEDS chip ²⁾ T	No firmware N	Not adjusted N
2 kN 02K0	3 m ¹⁾ 03M0	15-pin Sub-D connector F	Without TEDS chip S	Version 2.0.0 ³⁾ IO02	Adjusted ⁴⁾ J
5kN 05K0	6 m ¹⁾ 06M0	Male connector MS3106PEMV N		Version 2.0.8 ³⁾ IO03	
10kN 10K0	12 m ¹⁾ 12M0	15-pin Sub-HD connector Q		Version 2.0.10 ³⁾ IO04	
20kN 20K0		8-pin connector M12 M		Version 2.0.12 ³⁾ IO05	
50kN 50K0		With inline amplifier 0...10 V ¹⁾ VA1			
		With inline amplifier 4...20 mA ¹⁾ VA2			
		With IO-Link inline amplifier ¹⁾ VAIO			

K-U93A-	02K0-	01M5-	VAIO-	S-	IO02-	N
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¹⁾ Versions with permanently connected amplifier module can only be supplied with 1.5 m or 3 m cable between sensor and amplifier.

²⁾ TEDS only for sensors without amplifier module

³⁾ Only for versions with IO-Link

⁴⁾ 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

ACCESSORIES (NOT INCLUDED IN THE SCOPE OF SUPPLY)

Description	Ordering number
KAB168-5, PUR connection cable with M12 8-pin socket, 5 m long, opposite ends free. To connect the amplifier module to the downstream electronics. Not suitable for use with the IO-Link interface.	1-KAB168-5
KAB168-20, PUR connection cable with M12 8-pin socket, 20 m long, opposite ends free. To connect the amplifier module to the downstream electronics. Not suitable for use with the IO-Link interface.	1-KAB168-20
Ground cable 400 mm long	1-EEK4
Ground cable 600 mm long	1-EEK6
Ground cable 800 mm long	1-EEK8

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