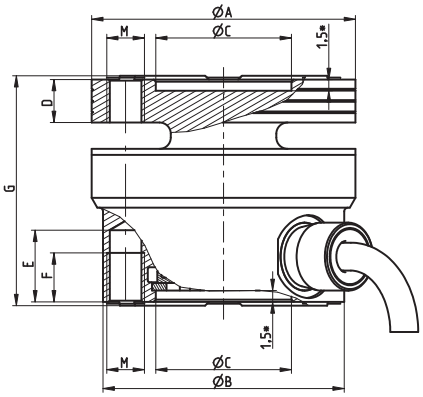
DATA SHEET

U93A
Force transducer

SPECIAL FEATURES

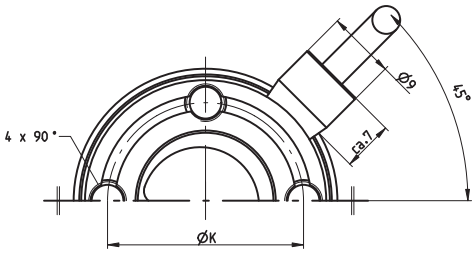
- Miniature tension/pressure transducer
- Accuracy class 0.2
- Nominal (rated) forces 1 kN … 50 kN
- Easy installation thanks to flange connection on both sides
- Available on request as a measurement chain with permanently connected amplifier module. Output signals: 4 … 20 mA, 0 … 10 V, IO-Link
- Rugged: 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.

DIMENSIONS

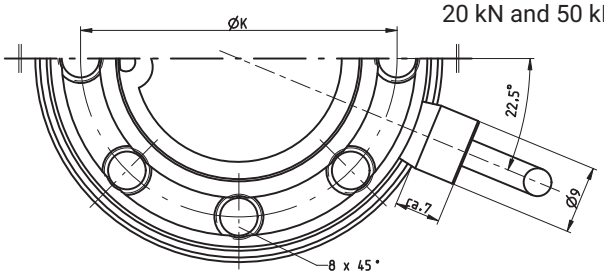


* Usable centering depth

1 kN and 10 kN versions



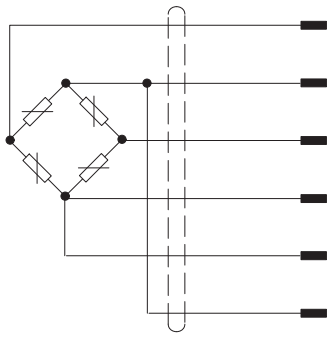
20 kN and 50 kN versions



Dimensions in mm

Nominal (rated) force	ØA	ØB	ØC^{H8}	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

WIRING DIAGRAM OF U93A WITHOUT INLINE AMPLIFIER



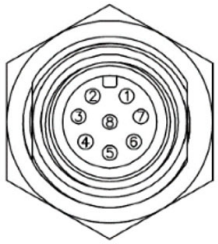
wh (white)	Measurement signal (+) U_A
bk (black)	Bridge excitation voltage (-) U_B (TEDS*)
rd (red)	Measurement signal (-) U_A
bu (blue)	Bridge excitation voltage (+) U_B
gn (green)	Sense lead (+)
gy (gray)	Sense lead (-) (TEDS*)

Cable shield, connected to housing

* only when option T is selected (transducer identification)

VA1, VA2 INLINE AMPLIFIER WIRING DIAGRAM

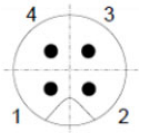
Pin	Version VA1 (voltage output)	Version VA2 (current output)	KAB168 connection cable wire assignment
1	Supply voltage 0 V (GND)		White
2	Not in use		Brown
3	Zero control input		Green
4	Not in use		Yellow
5	Output signal 0 ... 10 V	Output signal 4 ... 20 mA	Gray
6	Output signal 0 V	Not in use	Pink
7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



PIN ASSIGNMENT OF VAIO INLINE AMPLIFIER

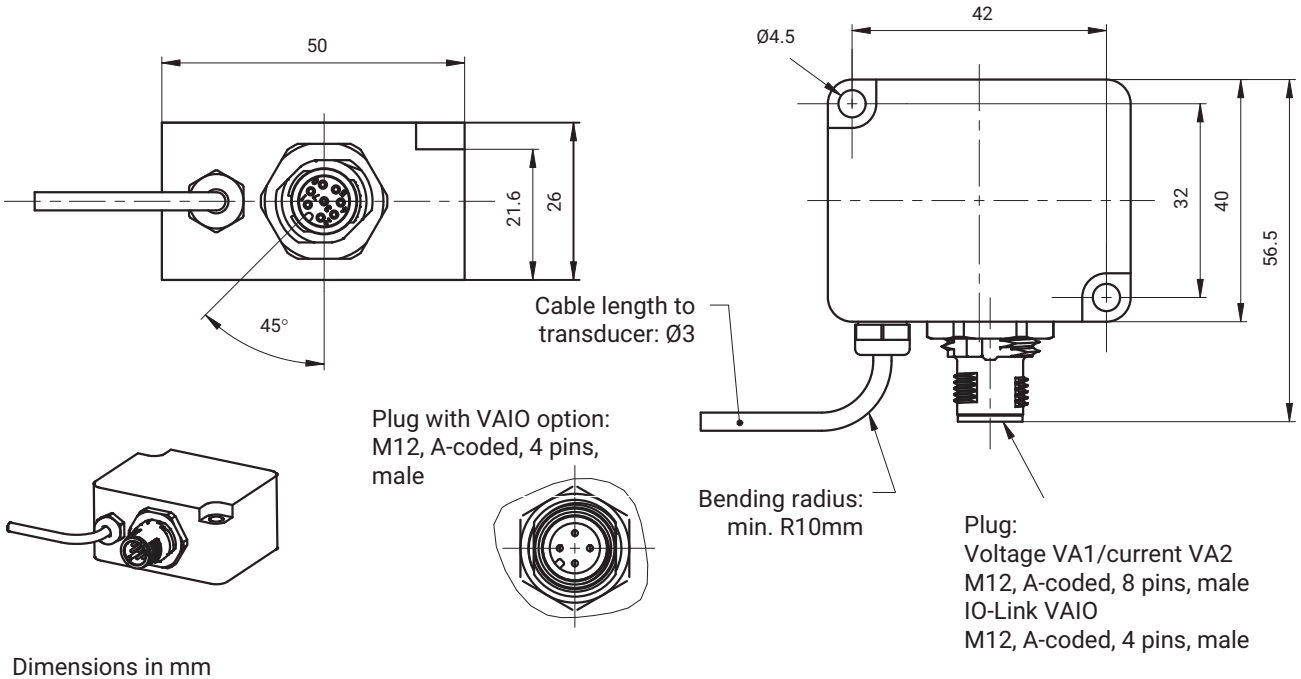
Pin	U93A assignment
1	Supply voltage +
2	Digital output (DI/DO pin function)
3	Supply voltage –, reference potential
4	IO-Link data (C/Q), switchover to the digital output (SIO mode) possible

Class A



Male
(device)

DIMENSIONS OF INLINE AMPLIFIER VA1, VA2, VAIO



Dimensions in mm

ACCESSORY

Description	Ordering number
KAB168-5, PUR connection cable with M12 8-pin socket, 5 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-KAB168-5
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

Nominal (rated) force	F_{nom}	kN	1	2	5	10	20	50
Accuracy								
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					

Nominal (rated) force	F_{nom}	kN	1	2	5	10	20	50
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	190…400					
Output resistance (with "adjusted rated output" option)	R_a	Ω	295 … 400					
Insulation resistance	R_{Iso}	Ω	> 5 * 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}	°C	23					
Nominal (rated) temperature range	$B_{t,nom}$	°C	-10...+70					
Operating temperature range	$B_{t,g}$	°C	-30...+85					
Storage temperature range	$B_{t,s}$	°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
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					

Nominal (rated) force	F_{nom}	kN	1	2	5	10	20	50
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

Module type		VA1	VA2
Accuracy			
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	
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	

Module type		VAIO
Latency (time between jump at input and event at digital output)	ms	0.3
Accuracy		
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
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/s²	1000
Vibrational stress as per IEC 60068-2-27		
Frequency range	Hz	5 ... 65
Duration	min	30

Module type		VAIO
Acceleration	m/s²	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.

	Meas-uring 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**	IO 2.0.0 [3] **IO02**	Adjusted [4] **J**
	5kN **05K0**	6 m [1] **06M0**	Male connector MS3106PEMV **N**		IO 2.0.8 [3] **IO03**	
	10kN **10K0**	12 m [1] **12M0**	15-pin Sub-HD connector **Q**			
	20kN **20K0**		8-pin connector M12 **M**			
	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**

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

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B06144 01 E00 02 26.02.2025