DATA SHEET

U9C
Force Transducer

SPECIAL FEATURES

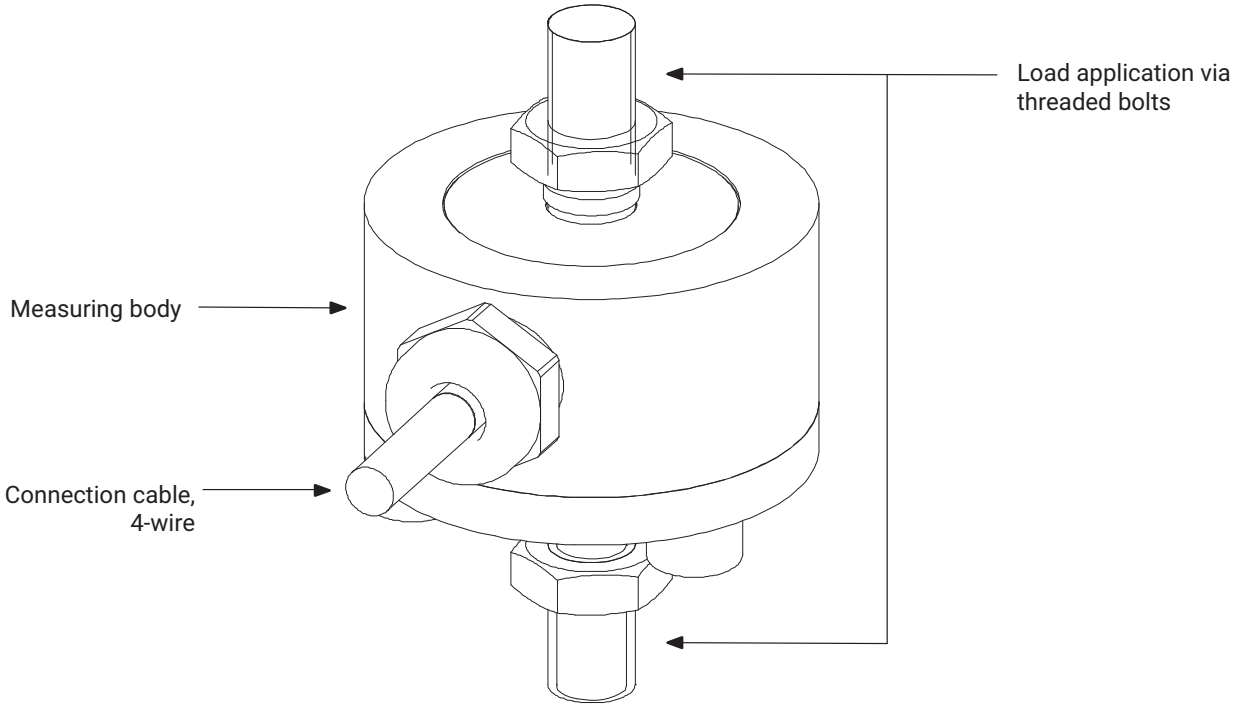
- Tensile/compressive force transducer
- HBK accuracy class 0.2
- Nominal (rated) forces 50 N - 50 kN
- Available on request as a measurement chain with permanently connected inline amplifier.
  Output signals: mA, V or IO-Link
- Non-rusting, protection class IP67
- Configurable with different cable lengths, plug assembly on request
- High rigidity, particularly suited for dynamic measurement tasks
- Cable suitable for drag chains, resistant to most oils and operating materials.



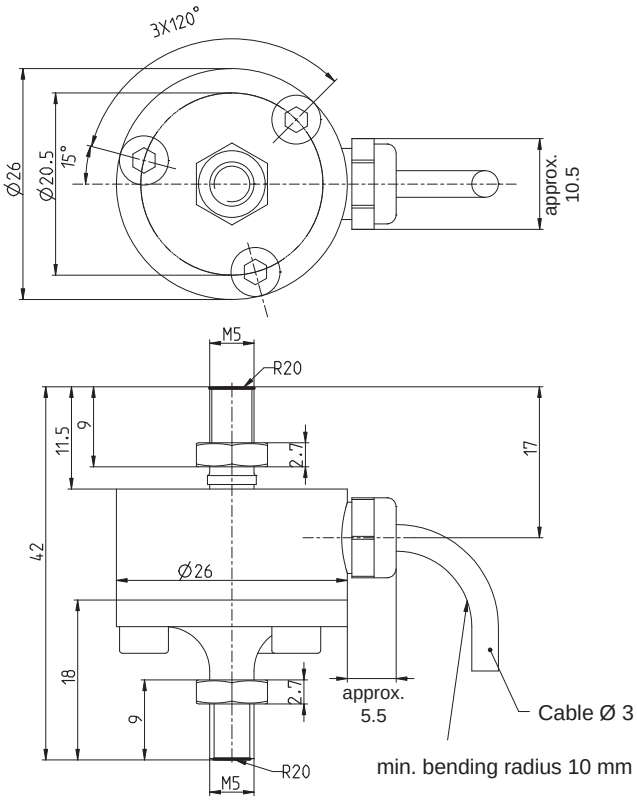
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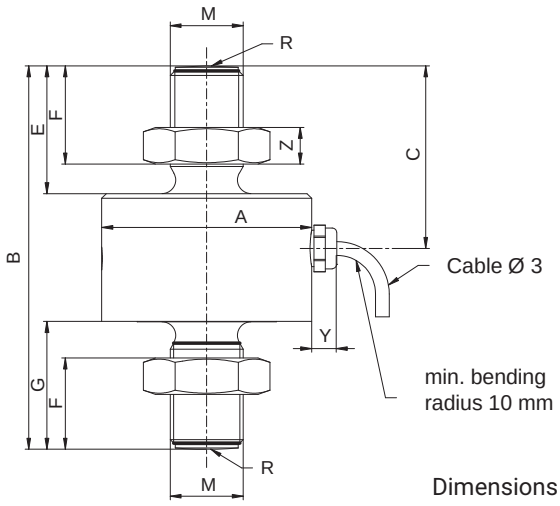
PRINCIPLE OF THE U9C FORCE TRANSDUCER



Dimensions U9C with nominal (rated) forces 50 N, 100 N and 200 N



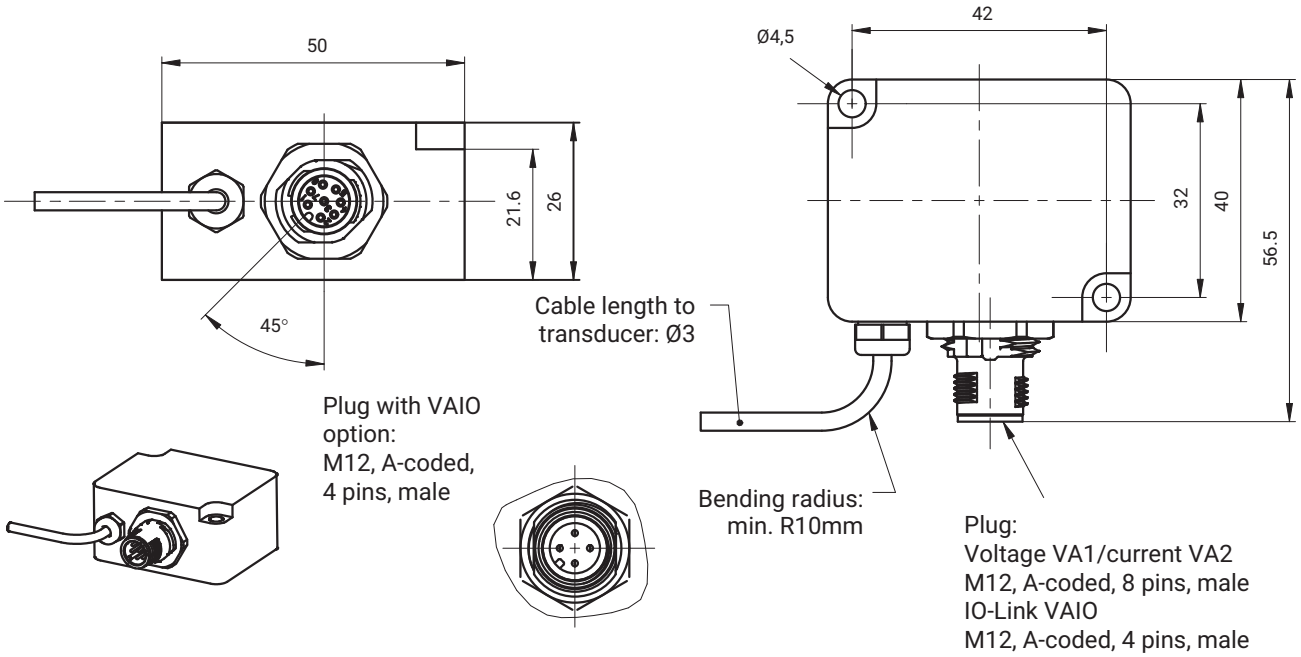
Dimensions U9C with nominal (rated) forces 0.5 kN to 50 kN



Dimensions in mm (1 mm = 0.03937 inches)

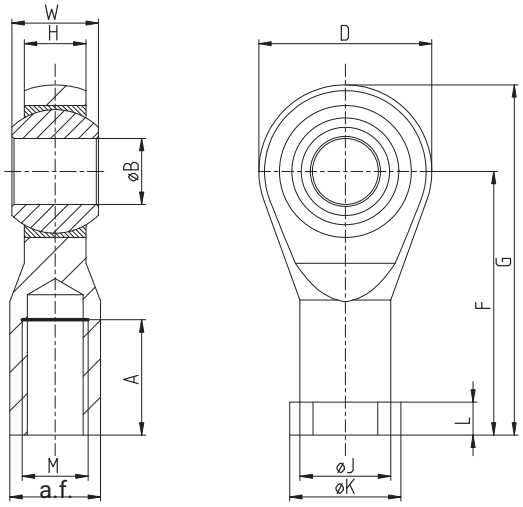
Nominal (rated) force of the U9C	$A_{-0.1}$	B	C	E	F	G	M	R	Y	Z
	mm									
0.5 kN to 1 kN	26	44.5	20.5	13	9.5	13.5	M5	20	approx. 5.5	2.7
2 kN to 20 kN	26	60	28.5	21	16	21	M10	40	approx. 5.5	5
50 kN	46	84	40	28	21.5	28	M16 x 1.5	80	approx. 5.5	8

Dimensions inline amplifier VA1, VA2, VAIO



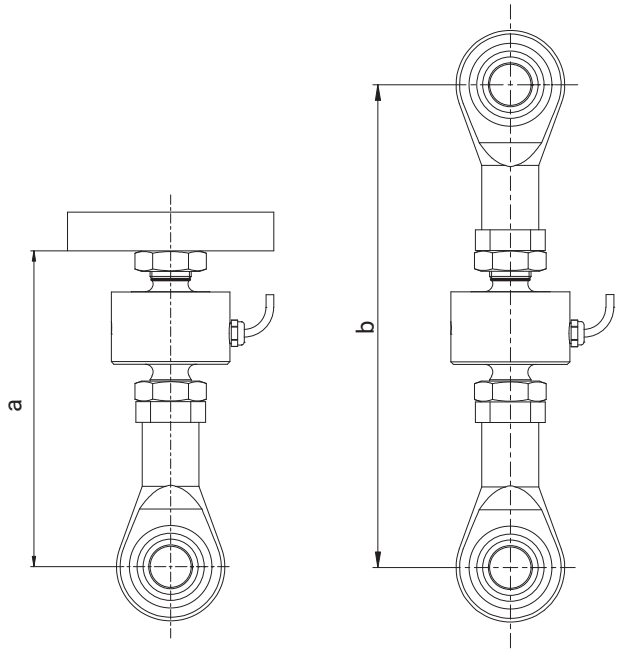
Dimensions in mm

Dimensions Knuckle eyes (to be ordered separately)



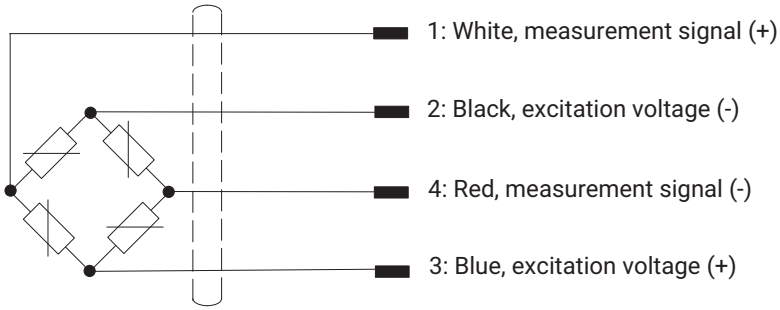
Nominal (rated) forces	Ordering number	A	B^{H7}	D	F	G	H	J	K	L	M	a.f.	W
		mm											
50 N to 1 kN	1-Z8/100kg/ZGW	10	5	18	27	36	6	9	11	4	M5	9	8
2 kN to 20 kN	1-U9/20KN/ZGWR	20	10	28	43	57	10.5	15	19	6.5	M10	17	14
50 kN	1-U9a/50kN/ZGW	28	16	42	64	85	15	22	27	8	M16 x 1.5	22	21

U9C with one or two knuckle eyes



Nominal (rated) force	a_{min}	a_{max}	b_{min}	b_{max}
	mm			
50 - 200 N	55	59	82	86
0.5 - 1 kN	56	61	83	88
2 - 20 kN	79	82	122	125
50 kN	116	116	180	180

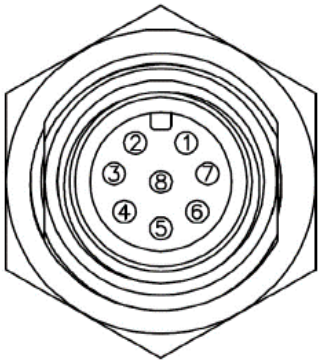
Wiring diagram of U9C without inline amplifier



Cable shield, connected to the housing

Pin assignment of inline amplifier VA1, VA2

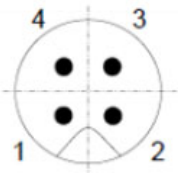
Pin	Version VA 1 (voltage output)	Version VA 2 (current output)	KAB168 connection cable wire assignment
1	Supply voltage 0 V (GND)		white
2	Not in use		brown
3	Control input zero setting		green
4	Not in use		yellow
5	Output signal 0 ... 10 V	Output signal 4 ... 20 mA	gray
6	Output signal 0 V	Not in use	pink
7	Not in use		blue
8	Voltage supply -19 ... +30 V		red



Pin assignment of VAIO inline amplifier

PIN	U9/C9 plug 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)

Specifications U9C

Nominal (rated) force	F_{nom}	N	50	100	200							
		kN				0.5	1	2	5	10	20	50
Accuracy												
HBK accuracy class			0.2									
Relative reproducibility and repeatability errors without rotation	b_{rg}	%	< 0.2									
Relative reversibility error	$v_{0.5}$	%	< 0.2									
Non-linearity	d_{lin}	%	< 0.2									
Relative creep (30 min)	$d_{cr,F}$	%	< 0.2			< 0.1						
Effect of the bending moment at 10% F_{nom} * 10 mm (typical)	d_{Mb}	%	0.055		0.045	2.35					2.45	0.5
Effect of temperature on sensitivity												
in the nominal (rated) temperature range	TK_C	% / 10 K	0.2									
in the operating temperature range	TK_C	% / 10 K	< 0.5									
Effect of temperature on the zero signal												
in the nominal (rated) temperature range	TK_0	% / 10 K	< 0.2									
in the operating temperature range	TK_0	% / 10 K	< 0.50									
Electrical characteristics												
Nominal (rated) sensitivity	C_{nom}	mV/V	1									
Tolerance range of zero signal	$d_{s,0}$	mV/V	± 0.2									
Sensitivity error	d_c	%	< ± 1 tensile , < ± 2 compressive									
Tensile/compressive sensitivity variation	d_{zd}	%	< 2									
Input resistance	R_i	Ω	250 - 400			300 - 450						
Output resistance	R_o	Ω	200 - 400			145 - 450						
Insulation resistance	R_{Iso}	Ω	> $1*10^9$									
Operating range of the excitation voltage	$B_{u,gt}$	V	0.5 - 12									
Reference excitation voltage	U_{ref}	V	5									
Connection			4-wire circuit									
Temperature												
Reference temperature	$t._{ref}$	°C	23									
Nominal (rated) temperature range	$B_{t,nom}$	°C	-10 to +70									
Operating temperature range	$B_{t,g}$	°C	-30 to +85									
Storage temperature range	$B_{t,S}$	°C	-30 to +85									
Characteristic mechanical quantities												
Max. operating force	F_G	% of F_{nom}	200			150						
Limit force	F_L		> 200			> 150						
Breaking force	F_B		> 400									
Limit torque	M_G	Nm	1.7	3.4	2.5	3.7	4.5	28	23	11	11	35
Limit bending moment when loading with nominal (rated) force	$M_{b,zul}$	Nm	0.17	0.7	1.5	3.7	3.8	10.2	14.4	8.2	8.6	28.5
Static lateral limit force when loading with nominal (rated) force [2)]	F_q	% of F_{nom}	100				50	100	50	18	6	8
Nominal (rated) displacement	s	mm	0.008			0.018			0.03	0.05	0.09	0.14

Nominal (rated) force	F_{nom}	N	50	100	200							
		kN				0.5	1	2	5	10	20	50
Fundamental resonance frequency	f_G	kHz	6.5	9.1	12.6	15.3	15.9	13.2	14.5	14.6	14.6	7.2
Relative oscillation width	F_{rb}	% of F_{nom}	70			80						70
Maximum impact load to ICE 60068-2-6												
Number			1,000									
Duration		ms	3									
Acceleration		m/s^2	1,000									
Vibrational stress to IEC 60068-2-27												
Frequency range		Hz	5 … 65									
Duration		min	30									
Acceleration		m/s^2	150									
General information												
Degree of protection per EN 60529 [1]			IP67									
Spring element material			Steel									
Potting material			Silicone									
Cables			Four-wire circuit, PUR insulation									
Cable length		m	1.5; 3; 5; 6; 7; 12									
Weight		g	75			100						400

1) 1 m water column; 0.5 h
2) Pure lateral force without bending moment

Specifications Inline amplifier VA1, VA2

Module type		VA1	VA2
Accuracy			
HBK accuracy class	%	0.15	
Relative linearity error	%	0.01	
Effect of temperature on amplification	%	0.10	
Effect of temperature on zero point	%	0.15	
Rated electrical output			
Output signal		0… 10 V	4 … 20 mA
Nominal (rated) output		10 V	16 mA
Rated output tolerance		± 0.1 V	± 0.16 mA
Zero signal		5 V	12 mA
Range of output signal		-0.3… 11 V	3 … 21 mA
Cut-off frequency (-3 dB)	kHz	2	
Supply voltage	V	19 … 30	
Nominal (rated) voltage	V	24	
Maximum 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 impact load to ICE 60068-2-6			
Number		1,000	
Duration	ms	3	

Module type		VA1	VA2
Acceleration	m/s^2	1,000	
Vibrational stress to 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 signal	m	30	
Degree of protection per EN 60529		IP67	

Specifications VAIO inline amplifier

Module type		VAIO
Accuracy		
HBK accuracy class		0.01
Effect of temperature on amplification	%/10K	0.01
Effect of temperature on zero point	%/10K	0.01
Rated electrical output		
Output signal; interface		COM3, to IO-Link standard, class A
Min. cycle (max. output rate)	ms	0.9
Sample rate (internal)	S/s	40000
Cut-off frequency (-3 dB)	kHz	4
Reference supply voltage	V	24
Supply voltage range	V	19 - 30
Max. power consumption	mW	3200
Noise	ppm of nominal force	With Bessel filter 1 Hz: 25 With Bessel filter 10 Hz: 63 With Bessel filter 100 Hz: 195 With Bessel filter 200 Hz: 275 Without filter: 3020
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 possible
Lag indicator 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 force
Temperature		
Nominal temperature range	°C	-10 … +50
Operating temperature range	°C	-10 … +60
Storage temperature range	°C	-25… +85
Reference temperature	°C	23

Module type		VAIO
Maximum impact load to IEC 60068-2-6		
Number		1000
Duration	ms	3
Acceleration	m/s^2	1000
Maximum vibrational stress to IEC 60068-2-27		
Frequency range	Hz	5 … 65
Duration	min	30
Acceleration	m/s^2	150

VERSIONS AND ORDERING NUMBERS

Code	Measuring range	Ordering number
050N	50 N	
100N	100 N	
200N	200 N	
00K5	0.5 kN	
01K0	1 kN	
02K0	2 kN	
05K0	5 kN	
10K0	10 kN	
20K0	20 kN	
50K0	50 kN	

The ordering numbers shown in gray are preferred types, they can be delivered rapidly.
All preferred types with 1.5 m cable, open ends, without TEDS and without firmware.
The order no. for the preferred types is 1-U9C…
The order no. for customer-specific designs is K-U9C-…

The ordering number example **K-U9C-05K0-03M0-VAIO-S-IO02** shown below is a: U9C, nominal force 5 kN with 3 m cable, inline amplifier with IO-Link output, firmware version 2.0.0

Nominal (rated) force	Cable length	Electrical connection	Transducer identification	Firmware
50 N **050N**			With TEDS chip **T**	
100 N **100N**	3 m **03M0**	15-pin Sub-D connector **F**		Version 1.2.6 **IO01**
200 N **200N**	5 m **05M0**	Male connector MS3106PEMV **N**		Version 2.0.0 **IO02**
0,5 kN **00K5**	6 m **06M0**	15-pin Sub-HD connector **Q**		Version 2.0.8 **IO03**
1 kN **01K0**	7 m **07M0**	8-pin M12 connector **M**		Version 2.0.10 **IO04**
2 kN **02K0**	12 m **12M0**	With inline amplifier 0 .. 10 V **VA1**		Version 2.0.12 **IO05**
5 kN **05K0**		With inline amplifier 4 .. 20mA **VA2**		
10 kN **10K0**		With IO-Link inline amplifier **VAIO**		
20 kN **20K0**				
50 kN **50K0**				

Ordering example

K-U9C-	05K0-	03M0-	VAIO-	S-	IO02

All cable lengths can be combined with all plugs.

TEDS can only be ordered in conjunction with a plug option. TEDS can only be ordered in conjunction with a plug option. A combination of TEDS and free cable ends or the 8-pin M12 plug (option M) is not possible.

Versions with inline amplifiers (VA1, VA2 and VAIO) can only be combined with cable lengths 1.5 m and 3 m; TEDS is not available for these measurement chains.

All firmware versions only for sensors with IO-LINK interface.

ACCESSORIES

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
Knuckle eye for nominal (rated) forces 50 N to 1 kN	1-Z8/100kg/ZGW
Knuckle eye for nominal (rated) forces 2 kN to 20 kN	1-U9/20kN/ZGWR
Knuckle eye for nominal (rated) force 50 kN	1-U9a/50kN/ZGW

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