

DATA SHEET

# U10S Force transducers

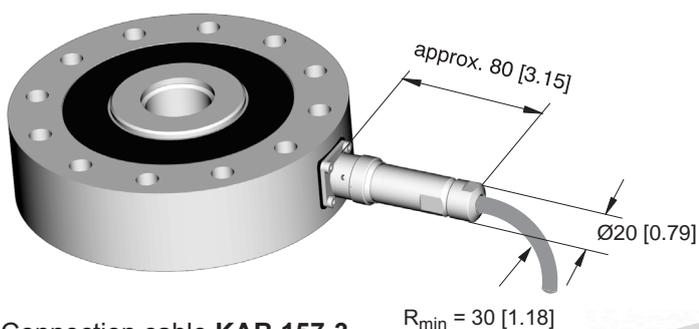
## SPECIAL FEATURES

- Tensile/compressive force transducer
- For dynamic and static applications
- High endurance at high vibration bandwidths
- Electronic bending moment adjustment
- Double bridge version option
- Rust-resistant materials

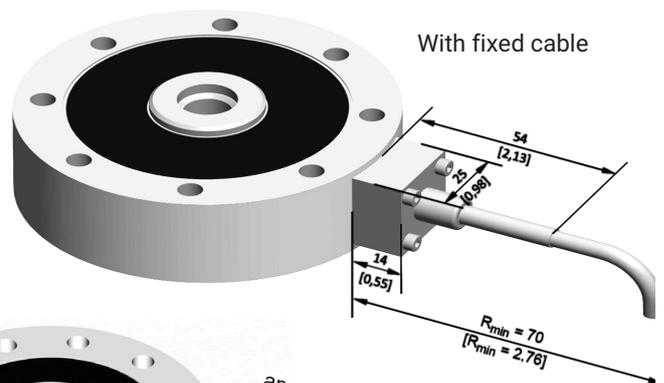


## MOUNTING DIMENSIONS OF THE CONNECTION VARIANTS

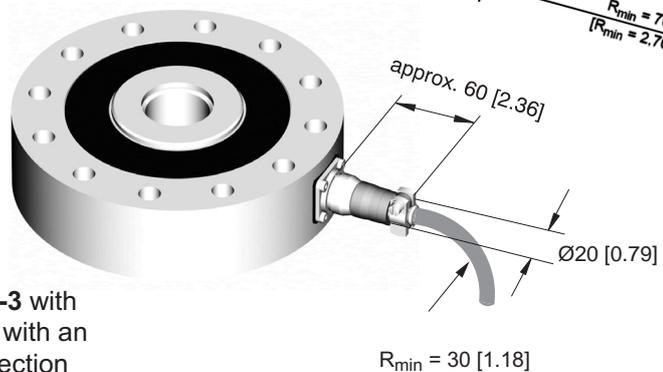
Dimensions in mm [inch]



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



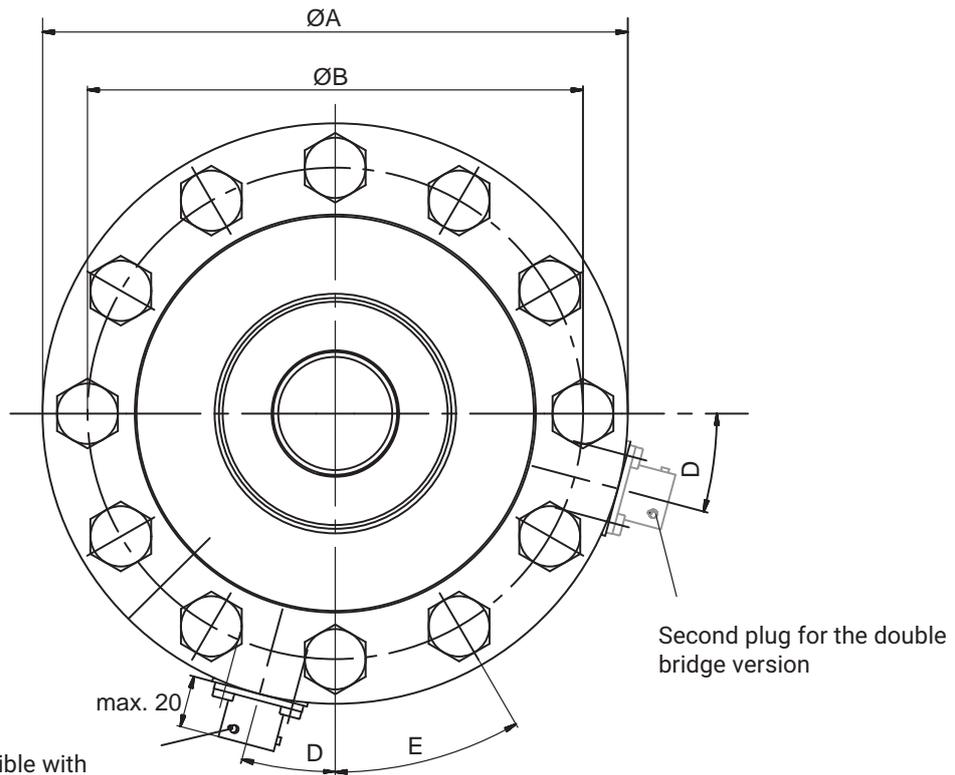
With fixed cable



Connection cable **KAB 158-3** with **screw locking**, compatible with an MIL-C-26482 series 1 connection

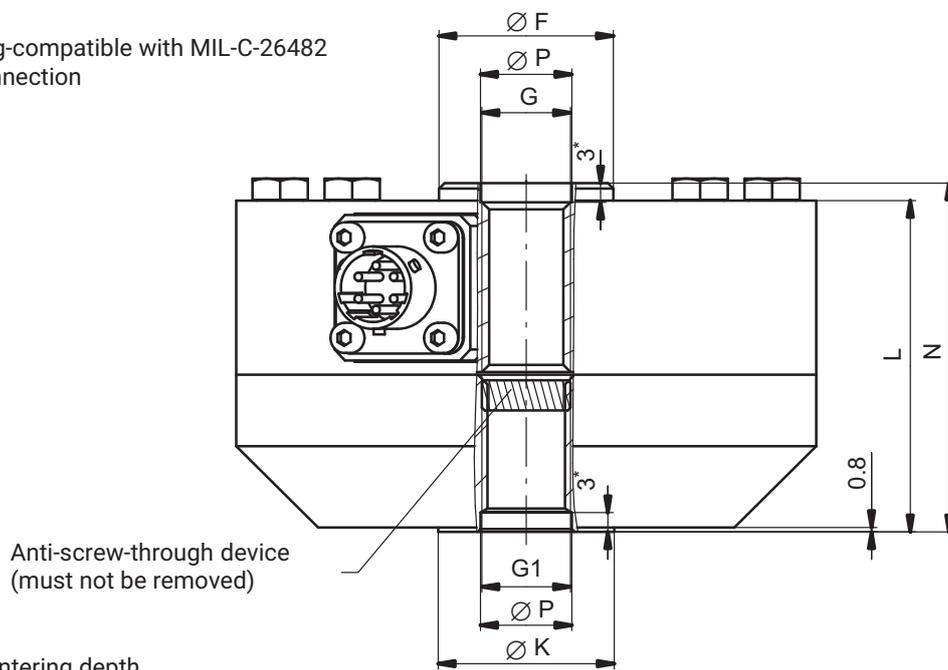
# U10S DIMENSIONS WITH FOOT ADAPTER

Dimensions in mm; 1 mm = 0.03937 inch



Bayonet: plug-compatible with MIL-C-26482 series 1 connection

Option:  
Thread: plug-compatible with MIL-C-26482 series 1 connection



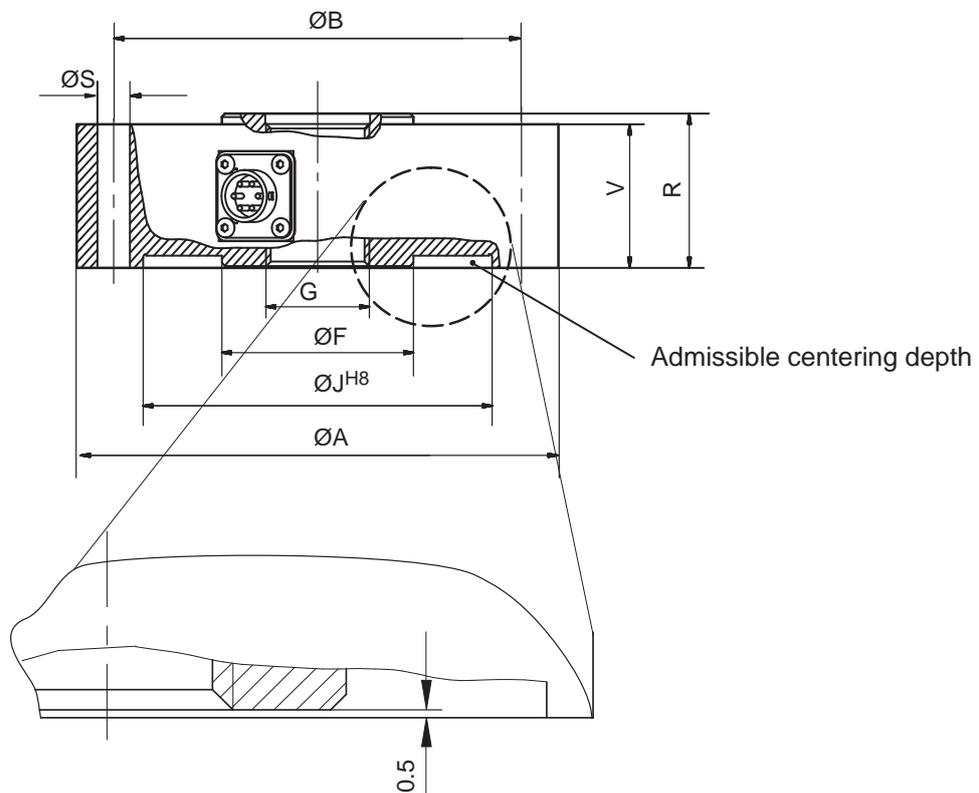
\*) Maximum centering depth

Nominal (rated) force	Dimensions in	ØA	ØB	D	E	ØF	G
1.25 kN - 5 kN	mm	104.8	88.9	22.5°	45°	30.4	5/8 - 18 UNF-3B, 1.3 inch deep
	inch	4.13	3.5			1.2	
12.5 kN - 25 kN	mm	104.8	88.9	22.5°	45°	31.5	5/8 - 18 UNF-3B, 1.3 inch deep
	inch	4.13	3.5			1.24	
50 kN	mm	153.9	130.3	15°	30°	61.2	1 1/4 - 12 UNF-3B, 1.69 inch deep
	inch	6.06	5.13			2.41	
125 kN	mm	153.9	130.3	15°	30°	67.3	1 1/4 - 12 UNF-3B, 1.69 inch deep
	inch	6.06	5.13			2.65	
225 kN	mm	203.2	165.1	11.25°	22.5°	95.5	1 3/4 - 12 UNF-3B, 2.4 inch deep
	inch	8.00	6.51			3.76	
450 kN	mm	279	229	11.25°	22.5°	122.2	2 3/4 - 8 UNF-3B, 3.4 inch deep
	inch	10.98	9.02			4.81	

Nominal (rated) force	Dimensions in	G1	ØK	L	N	ØP <sub>H8</sub>
1.25 kN - 25 kN	mm	5/8 - 18 UNF-3B, 0.87 inch deep	31.8	60.3	63.5	16.5
	inch		1.25	2.37	2.5	0.65
50 kN - 125 kN	mm	1 1/4 - 12 UNF-3B, 1.40 inch deep	57.2	85.9	89	33.5
	inch		2.25	3.38	3.5	1.32
225 kN	mm	1 3/4 - 12 UNF-3B, 1.73 inch deep	76.2	108	114.3	45.5
	inch		3	4.25	4.5	1.79
450 kN	mm	2 3/4 - 8 UNF-3B, 2.74 inch deep	114	152.4	165.1	73
	inch		4.49	6	6.5	2.87

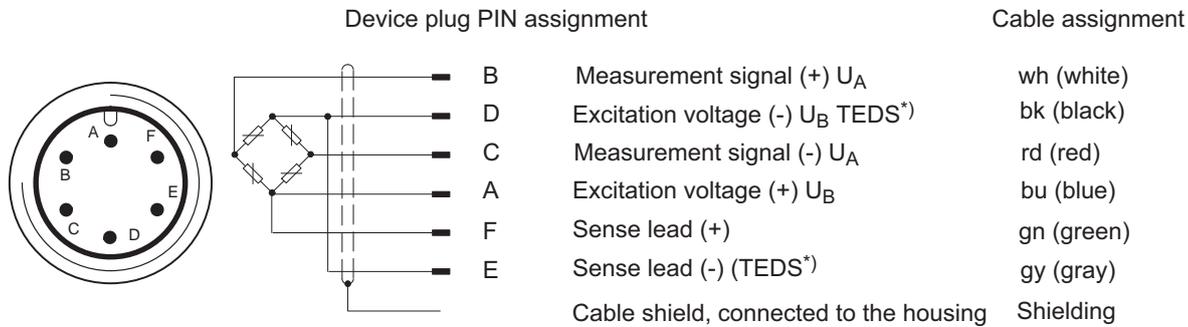
## U10S DIMENSIONS WITHOUT FOOT ADAPTER

Dimensions in mm; 1 mm = 0.03937 inch



Nominal (rated) force	Dimensions in	ØA	ØB	ØS	ØF	G	ØJH <sup>8</sup>	V	R	N
1.25 kN - 5 kN	mm	104.8	88.9	6.8	30.4	5/8 - 18 UNF-3B	78	31.7	34.9	2.5
	inch	4.13	3.5	0.27	1.2		3.07	1.25	1.37	0.1
5 kN - 25 kN	mm	104.8	88.9	6.8	31.5	5/8 - 18 UNF-3B	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	mm	153.9	130.3	10.4	61.2	1 1/4 - 12 UNF-3B	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	mm	153.9	130.3	10.4	67.3	1 1/4 - 12 UNF-3B	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
225	mm	203.2	165.1	13.5	95.5	1 3/4 - 12 UNF-3B	143	57.2	63.5	3.5
	inch	8.00	6.51	0.53	3.76		5.63	2.25	2.5	0.14
450	mm	279	229	16.8	122.2	2 3/4 - 8 UNF-3B	175	76.2	88.9	6
	inch	10.98	9.02	0.66	4.81		6.89	3	3.5	0.24

## PIN AND CABLE ASSIGNMENT



<sup>\*</sup>) Only with selected option T (transducer identification)

## ACCESSORIES (TO BE ORDERED SEPARATELY)

Cables/plugs	Order number
Connection cable KAB157-3; IP67 (with bayonet locking); 3 m long, TPE outer sheath; 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 locking); 3 m long, TPE outer sheath; 6 x 0.25 mm <sup>2</sup> ; free ends, shielded, outside diameter 6.5 mm	1-KAB158-3
Cable, configurable with different plugs and lengths	K-CAB-F
Loose connecting socket (bayonet locking)	3-3312.0382
Loose connecting socket (screw locking)	3-3312.0354
Ground cable (400 mm long)	1-EEK4
Ground cable (600 mm long)	1-EEK6
Ground cable (800 mm long)	1-EEK8

## SPECIFICATIONS (VDI/VDE 2638)

Nominal (rated) force	$F_{nom}$	kN	1.25	2.5	5	12.5	25	50	125	225	450	
Nominal (rated) sensitivity	$C_{nom}$	mV/V	1 ... 1.5 <sup>1)</sup>			2 ... 2.5 <sup>1)</sup>						
Accuracy class			0.03			0.04		0.05		0.06		
Relative repeatability error in an unmodified mounting position	$b_{rg}$	%	0.025									
Relative zero signal error	$d_{s,0}$	%	1									
Relative reversibility error <sup>2)</sup> (at $0.4 \cdot F_{nom}$ )	$v_{0.4}$	%vl %vc	< 0.075 0.03		< 0.1 0.04		< 0.125 0.05		< 0.125 0.05			
Relative linearity error	$d_{lin}$	%	< $\pm 0.03$			< $\pm 0.04$					< $\pm 0.06$	
Relative creep over 30min	$d_{crf+E}$	%	< $\pm 0.04$			< $\pm 0.025$						
Effect of temperature on sensitivity/10K	$TK_C$	%	< $\pm 0.015$									
Temperature effect on the zero signal/10K	$TK_0$	%	< $\pm 0.015$									
Bending moment influence (at $10\% \cdot F_{nom} \cdot 10 \text{ mm}$ )	$d_Q$	%	< 0.01									
Output resistance	$R_o$	$\Omega$	280 ... 360									
Input resistance	$R_i$	$\Omega$	> 345									
Insulation resistance	$R_{is}$	G $\Omega$	> 2									
Reference excitation voltage	$U_{ref}$	V	5									
Operating range of excitation voltage	$B_{U,G}$	V	0.5 to 12									
Reference temperature	$T_{ref}$	°C [°F]	+23 [73.4]									
Nominal (rated) temp. 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]									
Max. operating force	$F_G$	% v. $F_{nom}$	240									
Breaking force	$F_B$		> 400									
Static lateral limit force <sup>3)</sup>	$F_Q$		100									
Limit bending moment <sup>5)</sup>	$M_{b,perm}$	N · m	30	60	125	315	635	1270	3175	5146	10290	
Limit torque <sup>5)</sup>	$M_L$	N · m	30	60	125	315	635 <sup>4)</sup>	1270	3175	5146	10290	
Nominal (rated) displacement	$s_{nom}$	mm	0.02			0.03			0.04	0.05	0.06	
Fundamental resonance freq.	$f_G$	kHz	4.5	5.9	9.3	6.6	9.2	6.5	8.1	6.5	5.8	
Rigidity	$c_{ax}$	10 <sup>5</sup> N/mm	0.625	1.25	2.5	4.17	8.33	16.7	31.3	48.8	79.7	
Permissible vibrational stress Vibration bandwidth per DIN 50100	$F_{rb}$	% v. $F_{nom}$	200									
Weight (without cable)												
With adapter		kg	1.2			3		10		23		60
		lbs	2.65			6.61		22.05		50.71		132.28
Without adapter		kg	0.5			1.3		5		11		28
		lbs	1.1			2.87		11.02		24.25		61.73

Nominal (rated) force	F <sub>nom</sub>	kN	1.25	2.5	5	12.5	25	50	125	225	450
<b>Immunity from interference</b> (EN 61326-1, Table A.1)			Industrial environment								
Electromagnetic field (AM)		V/m						10			
Magnetic field		A/m						30			
Electrostatic discharge (ESD)											
Contact discharge		kV						4			
Air discharge		kV						8			
Burst (rapid transients)		kV						1			
Surge (impulse voltages)		kV						1			
Grid-bound interferences (AM)		V						3			
<b>Mechanical shock</b> (Test severity level IEC 68-2-29-1987)											
Number		n						1000			
Duration		ms						3			
Acceleration		m/s <sup>2</sup>						1000			
<b>Vibrational stress</b> (Test severity level per DIN IEC 68; Part 2-6; IEC68-2-6-1982)											
Frequency range		Hz						5 ... 65			
Duration		min						30			
Acceleration		m/s <sup>2</sup>						150			
<b>Degree of protection per DIN EN 60529</b>								IP64 / IP67 / IP68 <sup>5)</sup>			

1) Option: Adjustment of sensitivity to 2 mV/V (or 1 mV/V).

2) Reversibility error at 200% is typically the same as at nominal (rated) force.

3) Pure lateral force relating to the link centre of the transducer.

4) For transducer with adapter: 370 N · m.

5) IP67 for version with bayonet locking (and inserted plug) and for versions with fixed cable and nominal (rated) force ≤ 5 kN. The versions with fixed cable and nominal (rated) force ≥ 12.5 kN are IP68, all other versions are IP64.

## VERSIONS AND ORDER NUMBERS

Code	Nominal (rated) force	Order number
1k25	1.25 kN	1-U10S / 1.25 kN
2k50	2.5 kN	1-U10S / 2.5 kN
5k00	5 kN	1-U10S / 5 kN
12k5	12.5 kN	1-U10S / 12.5 kN
25k0	25 kN	1-U10S / 25 kN
50k0	50 kN	1-U10S / 50 kN
125k	125 kN	1-U10S / 125 kN
225k	225 kN	1-U10S / 225 kN
450k	450 kN	1-U10S / 450 kN

 Preferred version, available at short notice

The order number for the preferred types is 1-U10S..., the order number for customer-specific versions is K-U10S...

Number of measuring bridges	Characteristic value	Calibration	Transducer identification	Mechanical design	Plug protection	El. connection Bridge A	El. connection Bridge B
Single bridge <b>SB</b>	Not adjusted <b>N</b>	100 % (dyn.) <b>1</b>	Without TEDS <b>S</b>	With adapter <b>W</b>	Without plug protection <b>U</b>	Bayonet connector <b>B</b>	Bayonet connector <b>B</b>
Double bridge <b>DB</b>	Adjusted <b>J</b>	200 % (stat.) <b>2</b>	With TEDS <b>T</b>	Without adapter <b>N</b>	With plug protection <b>P</b>	Threaded connector <b>G</b>	Threaded connector <b>G</b>
						Fixed cable (6 m) <b>K</b>	Fixed cable (6 m) <b>K</b>

<b>K-U10S-</b>	<b>12k5</b>	<b>DB</b>	<b>J</b>	<b>2</b>	<b>T</b>	<b>W</b>	<b>P</b>	<b>B</b>	<b>G</b>
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<b>Number of measuring bridges</b>	For reasons of redundancy, in devices relevant to safety it is necessary to check the plausibility of the measurement signal with a second measuring bridge (applied on the measuring element). The signals are independently conditioned and evaluated using two separate measuring amplifiers.
<b>Characteristic value</b>	The exact nominal (rated) sensitivity is specified on the identification plate. The transducer can also be adjusted to a linear, adjusted sensitivity of 1 mV/V or 2 mV/V (when 200% calibration is selected: 2 mV/V or 4 mV/V). The rel. sensitivity error (compression) is then 0.1% of the nominal (rated) sensitivity. The sensitivity range of a unadjusted transducer lies between 1 and 1.5 or 2 and 2.5 mV/V.
<b>Calibration</b>	In the standard version, the transducer is designed for dynamic application up to a vibration bandwidth of $\pm 100\% F_{nom}$ . For quasistatic applications, the transducer can be used up to $200\% F_{nom}$ . The option is available to calibrate accordingly to $200\% F_{nom}$ .
<b>Transducer identification</b>	TEDS integration (integrated electronic data sheet) in accordance with IEEE1451.4
<b>Mechanical design</b>	The sensitivity is determined at the factory with the bolted-on adapter. The bolted-on adapter ensures the best-possible screw-fastening conditions and allows the transmission of axial force through a central internal thread. If this is not used, a sensitivity deviation of $< 1\%$ must be taken into account.
<b>Plug protection</b>	Mechanical protection through the installation of an additional square profile around the connector. Dimensions approx.: width x height x depth: 30x30x20
<b>Electrical connection Bridge A</b>	The standard version is the male device connector with bayonet locking (PT02E10-6P-compatible). The option is also available to install a screw-fitting male device connector (PC02E10-6P-compatible). A third variant where the force transducers are fitted with a fixed cable is also available. In this version, all U10 achieve degree of protection IP68 with a nominal (rated) force equal to or greater than 12.5 kN.
<b>Electrical connection Bridge B</b>	The standard version is the male device connector with bayonet locking (PT02E10-6P-compatible). The option is also available to install a screw-fitting male device connector (PC02E10-6P-compatible). Both these connection variants are often used for differentiation in the double-bridge version. A third variant where the force transducers are fitted with a fixed cable is also available. In this version, all U10 achieve degree of protection IP68 with a nominal (rated) force equal to or greater than 12.5 kN.

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