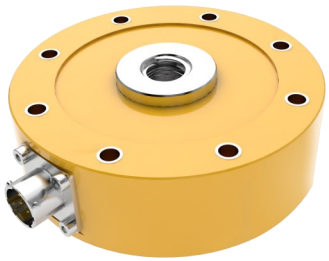
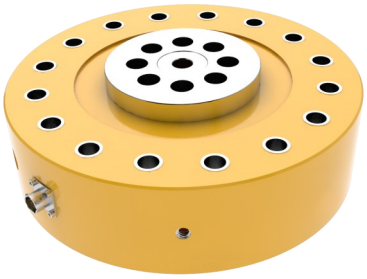
Data Sheet | Force Transducer Series DR

Nominal Force
1.25 kN – 2.5 MN



Threaded version
1.25 kN – 500 kN



Flange version
50 kN – 2.5 MN

Applications | Key Facts

- Dynamic force applications: materials testing | component and structural testing | industrial quality and process control
- Dynamic tensile and compressive forces
- Flat, robust design | low mass and very high resonance frequency
- Accuracy class: 0.03 - 0.06
- Permissible oscillation stress 100%
- Force transmission via flange or thread
- Standard variants or configurable variants for maximum flexibility

Options | Accessories

- Optionally with 2 integrated MEMS acceleration sensors
- Optional second axial measuring circuit for redundancy
- Extensive electrical connection options
- Extensive mechanical accessories | Special solutions (on request)
- Bending moment measuring circuits Mx, My (on request)
- UNF connection threads (on request)
- With additional plug protection (on request)
- Special versions also in small quantities (on request)

Technical Data | Threaded Version | 1.25 – 500 kN

Metrological Data	Nominal force compression/tension	$\pm F_{nom}$	kN	1.25	2.5	5	12.5	25	50	100	125	250	500
	Accuracy class			0.03			0.04						0.06
	Linearity error	d_{lin}	%	0.03			0.04						0.06
	Hysteresis	h	%	0.03			0.04		0.05				0.06
	Repeatability (f.s.)		%	0.025									
	Zero error	f_0	%	0.01									
	Creep		%	0.025									
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.015									
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.015									
	Eccentricity effect		%/mm	< 0.01									
	Bending moment effect		%/N·m	< 0.01									
	Characteristic value difference, tension/compression force	d_{ZD}	%	0.1									
Electrical Data	Rated characteristic value	C_{nom}	mV/V	1			2						
	Characteristic value tolerance	d_c	%	0.25									
	Zero signal deviation	$d_{S,0}$	%	1									
	Input resistance	R_e	Ω	350									
	Output resistance	R_a	Ω	280 - 360									
	Insulation resistance	R_{is}	Ω	$>10^9$									
	Operating range of excitation voltage	$B_{U,G}$	V	0.5 - 12									
	Protection (DIN EN 60529)			67									

Technical Data | Threaded Version | 1.25 – 500 kN

Mechanical Data	Nominal force compression/tension	$\pm F_{nom}$	kN	1.25	2.5	5	12.5	25	50	100	125	250	500
	Rated Displacement	s_{nom}	mm	0.02			0.03			0.04		0.05	0.06
	Spring rigidity	c_{ax}	kN/mm	62.5	125	250	415	830	1650	3125	3125	5000	8300
	Mass	m	kg	0.5			1.3			5		11	28
	Proportionate moving mass	m_{mess}	kg	0.09			0.25			1.1		3.3	6.3
	Fundamental resonant frequency	f_G	kHz	4.5	5.9	9.3	6.6	9.2	6.5	8.1	8.1	6.6	6.1
	Permissible oscillation stress		%	100									
Limits	Force limit		%	230									
	Breaking force		%	> 400									
	Lateral force limit		%	100									
	Permissible eccentricity	e_G	mm	25								20	
	Bending moment limit	$M_{b\,zul}$	N·m	40	80	140	330	635	1750	4500	4500	9000	20000
	Rated temperature range	$B_{T,\,nom}$	°C	-10 - +45									
	Operating temperature range	$B_{T,\,G}$	°C	-30 - +85									

Technical Data | Flange Version | 50 kN – 2.5 MN

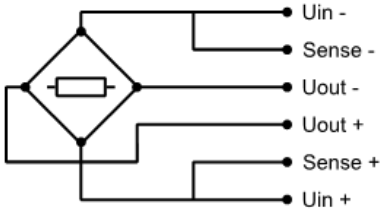
	Nominal force compression/tension	$\pm F_{nom}$	kN	50	100	125	250	500	1000	1500	2000	2500
Metrological Data	Accuracy class			0.04				0.05	0.06		0.08	
	Linearity error	d_{lin}	%	0.04				0.05	0.06		0.08	
	Hysteresis	h	%	0.04				0.05	0.06		0.08	
	Repeatability (f.s.)		%	0.025								
	Zero error	f_0	%	0.01								
	Creep		%	0.025								
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.015								
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.015								
	Eccentricity effect		%/mm	<0.01								
	Bending moment effect		%/N·m	<0.01								
Electrical Data	Rated characteristic value	C_{nom}	mV/V	2								
	Characteristic value tolerance	d_c	%	0.25								
	Zero signal deviation	$d_{S,0}$	%	1								
	Input resistance	R_e	Ω	375								
	Output resistance	R_a	Ω	280 - 360								
	Insulation resistance	R_{is}	Ω	$>10^9$								
	Operating range of excitation voltage	$B_{U,G}$	V	0.5 - 12								
	Protection (DIN EN 60529)			67								

Technical Data | Flange Version | 50 kN – 2.5 MN

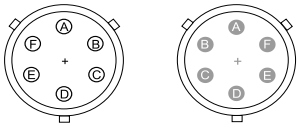
Mechanical Data	Nominal force compression/tension	$\pm F_{nom}$	kN	50	100	125	250	500	1000	1500	2000	2500
	Rated Displacement	s_{nom}	mm	0.03	0.04	0.04	0.06	0.07	0.08	0.09	0.11	0.12
	Spring rigidity	c_{ax}	kN/mm	1650	2700	3125	4200	7150	12500	16650	18250	21000
	Mass	m	kg	4.3	4,3	4.3	10.3	29.1	44.9	93	155.7	192.9
	Proportionate moving mass	m_{mess}	kg	1.1	1,1	1.1	3	7.9	12.7	40	47.1	64.5
	Fundamental resonant frequency	f_G	kHz	6.2	7,3	8.5	6	4.8	5	3.3	3.2	2.8
	Permissible oscillation stress for the transducer [1)]		%	±100								
Limits	Force limit		%	230								
	Breaking force		%	400					300			
	Lateral force limit		%	100								
	Permissible eccentricity	e_G	mm	25			20					
	Bending moment limit	$M_{b\,zul}$	kN·m	1.75	4.5	4.5	7.5	15	30	45	60	75
	Rated temperature range	$B_{T,\,nom}$	°C	-10 - +45								
	Operating temperature range	$B_{T,\,G}$	°C	-30 - +85								

1) Recommendation: Please observe the measures of VDI 2230 Pages 1and 2 regarding to durability of flange connection.

Cable Connection | All Variants



Connection pluggable[1)2)]
6-pin Amphenol cable connector: - appliance inlet:



Connection		Wire color	Pin
Supply voltage (+)	U_{in+}	blue	A
Supply voltage (-)	U_{in-}	black	D
Measurement signal (+)	U_{out+}	white	B
Measurement signal (-)	U_{out-}	red	C
Sense (+)	Sense+	green	F
Sense (-)	Sense-	grey	E
Shielding			Housing

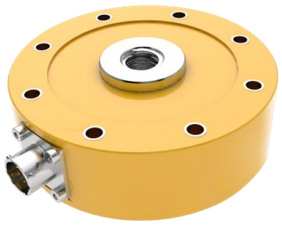
1) View too weldingside
2) Female Amphenol typ: MIL-C-26482 series 1 ; bayonet catch

▶ Pluggable cable connection

▶ Suitable measuring cable: S-CAB-SMC-B-5M-F or C-CAB-...

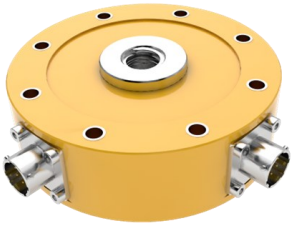
Double Measuring Bridge | > 2.5 kN

▶ In the version with double measuring bridge (available as configurable variant), a second metrological equivalent signal is led out via an additional connector. The technical data for both measuring circuits apply equally.



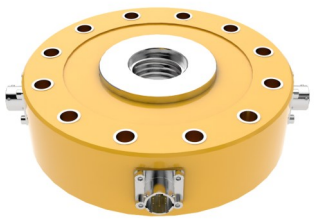
▶ **Standard force transducer series DR**

Single measuring bridge | 1 x bayonet connection | threaded version



▶ **Configurable force transducer series DR**

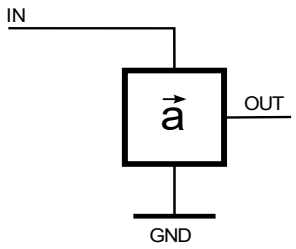
Single measuring bridge | 2 x MEMS accelerometers | 2 x bayonet connection | threaded version



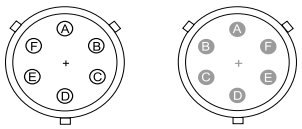
▶ **Configurable force transducer series DR**

Single measuring bridge | 2 x MEMS accelerometers | 3 x bayonet connection | threaded version

Cable Connection | MEMS Acceleration Sensor



Connection pluggable[1)2)]
6-pin Amphenol
cable connector: - appliance inlet:



Connection		wire color	Pin (Type 0)	Pin (Type I)
Supply voltage 5 V	IN	blue	A	
Output voltage	OUT	white	B	
Ground	GND	grey	E	
Supply voltage 5 V	IN	green		F
Output voltage	OUT	red		C
Ground	GND	black		D

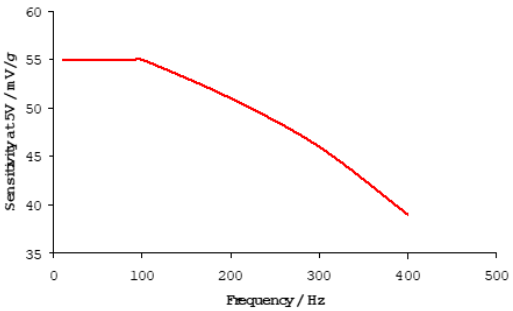
1) View too weldingside

2) Female Amphenol typ: MIL-C-26482 series 1 ; bayonet catch

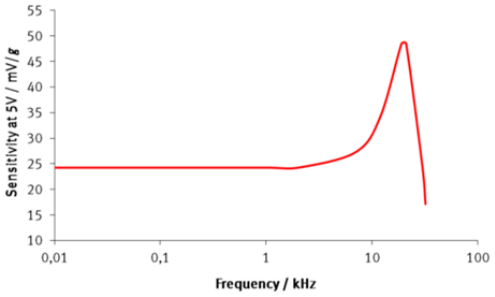
▶ Pluggable cable connection | suitable measuring cable: S-CAB-SMC-B-5M-F

Technical Data | MEMS Acceleration Sensor

Typ		I	II
Rated acceleration	g	19	50
Rated sensitivity at 5 V	mV/g	57 ± 10	40 ± 2 (ratiometric)
Static output voltage at 0 g	V_{DC}	1.5 ± 0.25	2.5 ± 0.25
Typical bandwidth	kHz	1.6	11
Excitation voltage	V_{DC}	(5±0.25)	
Linearity error	%	0.3	0.1
Resonant frequency	kHz	5.5	21

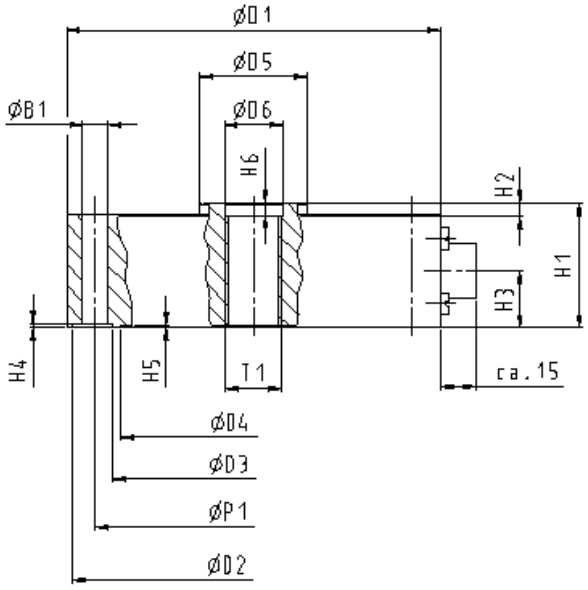


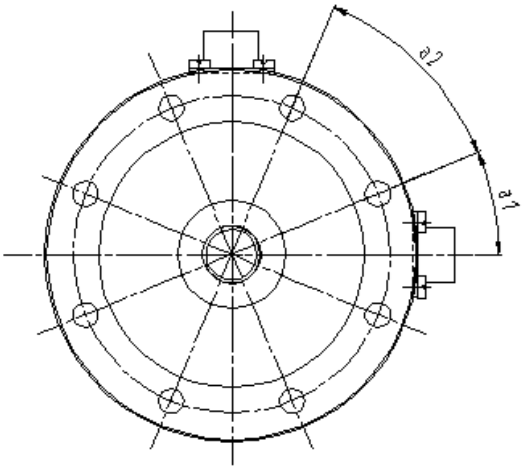
▶ Type I (19 g)



▶ Type II (50 g)

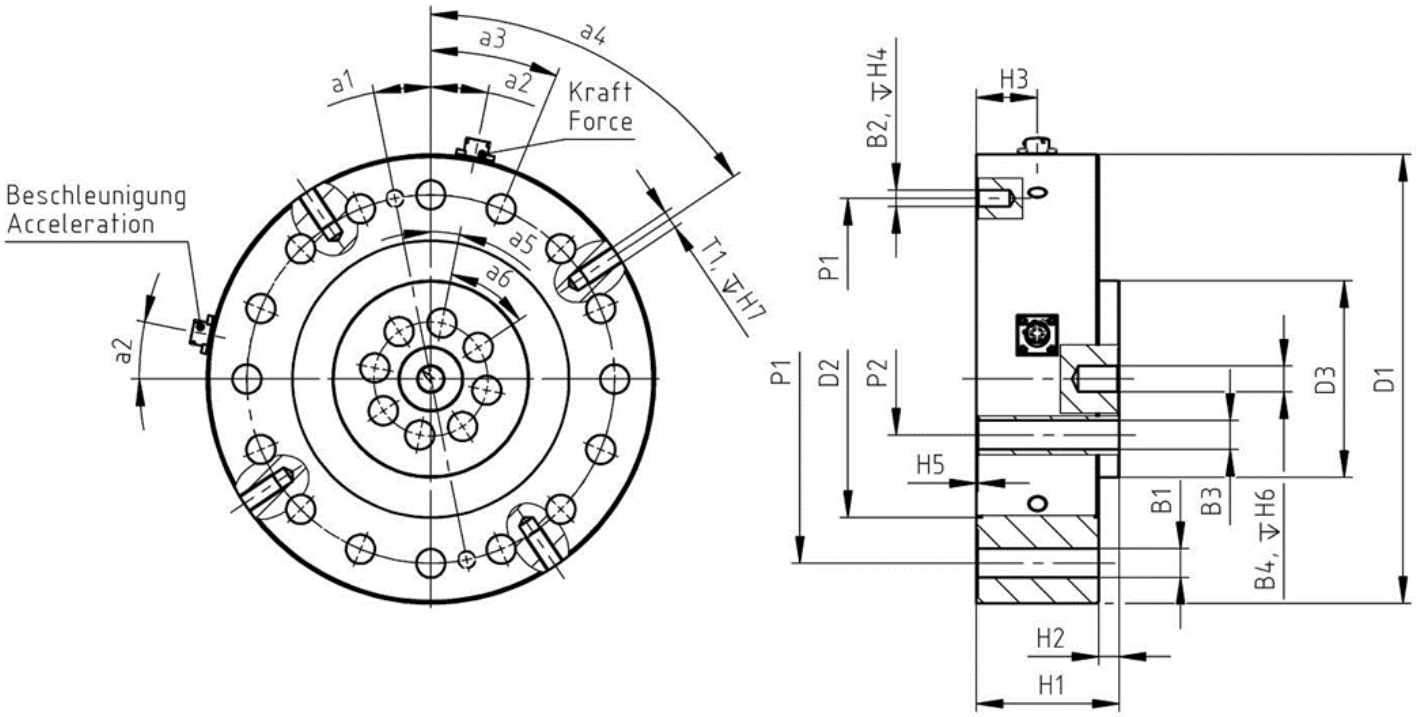
Dimensions | Threaded Version | 1.25 – 500 kN





Nominal force compression/tension	$\pm F_{nom}$	kN	1.25	2.5	5	12.5	25	50	100	125	250	500
Bore	$ØB_1$	mm	7.1					10.4			13.5	16.8
Thread	$ØT_1$	mm	M16x2-4H					M33x2-4H			M42x2-4H	M72x2-4H
Diameter	$ØD_1$	mm	104.8-0.1					153.9-0.1			203,2-0.1	279-0.1
Diameter	$ØD_2$	mm	101.6+0.1					149+0.1			198.1+0.1	269.2+0.1
Diameter	$ØD_3$	mm	79.2-0.1					115-0.1			146-0.1	188-0.1
Diameter	$ØD_4$	mm	74.7+0.1					108+0.1			138.9+0.1	172.1+0.1
Diameter	$ØD_5$	mm	34+0.1					61.2-0.1	67.3-0.1		95.2-0.1	122.2-0.1
Diameter	$ØD_6$	mm	16.5H8					33.5H8			43H8	73H8
Pitch circle diameter	$ØP_1$	mm	88.9±0.1					130.3±0.1			165.1±0.1	229±0.1
Height	H_1	mm	34.9-0.1					44.5-0.1			63.5-0.1	88.9-0.1
Height	H_2	mm	3.2					3.1			6.3	12.7
Height	H_3	mm	15.9					20.7			28.6	38.1
Height	H_4	mm	0.5									0.8
Height	H_5	mm	0.5								1	
Height	H_6	mm	3.4					3.5			3	
Angle	a_1		22.5°					15°			11.25°	
Angle	a_2		8x45°					12x30°			16x22.5°	

Dimensions | Flange Version | 50 kN – 2,5 MN



Nominal force compression/tension	$\pm F_{norm}$	kN	50	100	125	250	500	1000	1500	2000	2500
Bore	$ØB_1$	mm	10.5			13	17.5	22	26	33	30
Bore	$ØB_2$	mm	10H7								
Bore	$ØB_3$	mm	10.5			17	17.5	26		33	
Bore	$ØB_4$	mm	10H7			16H7					
Diameter	$ØD_1$	mm	153.9			203.2	279	304.8	393.7	480	520.7
Diameter	$ØD_2$	mm	108H8			138.9H8	172.1H8	195H8	254.4H8	310H8	340H8
Diameter	$ØD_3$	mm	67.3h9			95.5h9	122.2h9	144.3h9	196.9h9	232h9	267.9h9
Pitch circle diameter	$ØP_1$	mm	130.3±0.1			165.1±0.1	229±0.1	241.3±0.1	322.1±0.1	385±0.2	419.1±0.2
Pitch circle diameter	$ØP_2$	mm	45±0.1			71±0.1		105±0.1	150±0.1	180±0.2	215±0.2
Thread	T_1		-			M12					
Height	H_1	mm	44.5-0.1			63.5-0.1	88.9-0.1	114.3-0.1	139.7-0.1	155-0.1	158.8-0.1
Height	H_2	mm	3.1			6.3	12.7	6.3	12.7	6.3	
Height	H_3	mm	20.5			28.6	37.9	54	63.5	74.5	
Height	H_4	mm	17								
Height	H_5	mm	0.5				1				
Height	H_6	mm	10			20					
Height	H_7	mm	-			24					

Dimensions | Flange Version | 50 kN – 2,5 MN

Nominal force compression/tension	$\pm F_{norm}$	kN	50	100	125	250	500	1000	1500	2000	2500
Angle	a_1		15°			11.25°		9°	7.5°		6.43°
Angle	a_2		15°			11.25°		9°	7.5°		6.43°
Angle	a_3		12x30°			16x22.5°		20x18°	24x15°		28x12.86°
Angle	a_4		-				56.25°	63°	52.5°		57.8°
Angle	a_5		15°			11.25°		9°	7.5°		6.43°
Angle	a_6		8x45°						12x30°		14x25.71°

Order Numbers | Standard Variants

▶ Force transducer Series DR | standard variants

Nominal		Description	Figure (similiar)	Order number
Force	Signal			
Standard force transducer series DR | threaded version				
1.25 kN	1 mV/V	Force transducer series DR | 1.25 kN | threaded version		S-DR-1K25-T
2.5 kN	1 mV/V	Force transducer series DR | 2.5 kN | threaded version		S-DR-2K50-T
5 kN	1 mV/V	Force transducer series DR | 5 kN | threaded version		S-DR-5K00-T
12.5 kN	2 mV/V	Force transducer series DR | 12.5 kN | threaded version		S-DR-12K5-T
25 kN	2 mV/V	Force transducer series DR | 25 kN | threaded version		S-DR-25K0-T
50 kN	2 mV/V	Force transducer series DR | 50 kN | threaded version		S-DR-50K0-T
125 kN	2 mV/V	Force transducer series DR | 125 kN | threaded version		S-DR-125K-T
250 kN	2 mV/V	Force transducer series DR | 250 kN | threaded version		S-DR-250K-T
500 kN	2 mV/V	Force transducer series DR | 500 kN | threaded version		S-DR-500K-T
Standard force transducer series DR | flange version				
50 kN	2 mV/V	Force transducer series DR | 50 kN | flange version		S-DR-50K0-F
125 kN	2 mV/V	Force transducer series DR | 125 kN | flange version		S-DR-125K-F
250 kN	2 mV/V	Force transducer series DR | 250 kN | flange version		S-DR-250K-F
500 kN	2 mV/V	Force transducer series DR | 500 kN | flange version		S-DR-500K-F

Note: all standard variants always (1) with metric thread (2) without mounting parts (3) no plug protection (4) single measuring bridge (5) no integrated accelerometers (6) standard temperature range (7) 1x bayonet connection socket 6-pin | no measuring cables included

Order Numbers | Configurable Variants

▶ Force transducer Series DR | configurable variants

Item	Code	Description
Force Transducer Series DR	C-DR	Configurable force transducer series DR
Nominal Force	1K25	1.25 kN
	2K50	2.5 kN
	5K00	5 kN
	12K5	12.5 kN
	15K0	15 kN
	25K0	25 kN
	50K0	50 kN
	100K	100 kN
	125K	125 kN
	250K	250 kN
	500K	500 kN
	1M00	1 MN
	1M50	1.5 MN
	2M00	2 MN
	2M50	2.5 MN
Mechanical design	F	Flange
	T	Thread
Mounting	M	Metric
	F	Flange
Mounting adapter	N	No mounting parts
	Y	With mounting parts
Plug protection	N	No plug protection
Nominal sensitivity	2.0	2 mV/V
	1.0	1 mV/V
Single or double measuring bridge	SB	Single bridge
	DB	Double bridge
Bending moment measuring circuits Mx, My	NO	No bending moment measuring circuits Mx, My
Accelerometers	NO	No accelerometers
	AC	With 2 integrated accelerometers
Temperature range	S	Standard temperatur range | +10°C – +45°C
Electrical transducer connection (for all selected measuring circuits)	P	Bayonet connector socket(s) | 6-pole
Cable connection type (for all selected measuring circuits)	P	Bayonette connector(s) on all selected measuring circuits | no permanently mounted measuring cable(s)

Order-Example

C	-	DR	-	125K	-	T	-	M	-	Y	-	N	-	2	-	SB	-	NO	-	AC	-	S	-	P	-	P
				125 kN		Threaded version		Metric		with bottom plate		no plug protection		2 mV/V		single bridge		No bending moment circuits Mx, My		with 2 integrated accelerometers		standard temperatur e range		Bayonet socket(s)		Bayonet socket(s)

Order Numbers | Configurable Variants | Glossary

Item	Description
Mechanical design	The series DR force transducer has different mechanical interfaces depending on the nominal load. F = flange version | nominal load: 50 kN - 2.5 MN T = Threaded version | Nominal load: 1.25 kN - 1.25 MN
Mounting	The DR series force transducer can be equipped and fitted in the threaded version with both metric and inch threads. Both variants are identical in construction. UNF threads are available on request and in selected nominal loads. *Flange version* F = Flange mounting *Threaded version* M = Metric | Standard UNF thread on request and in selected nominal loads.
Mounting adapter	Depending on the nominal load, the force transducer series DR-T (threaded version) can be equipped with additional attachments. The attachments are all pre-assembled at the factory. - Nominal load: 1.25 - 2.5 kN with base plate (aluminium) M16 | mounted - Nominal load: 12.5 - 25 kN with base plate M16 (steel) | mounted - Nominal load: 50 kN with base plate M16 (steel) | mounted - Nominal load: 125 kN with base plate M33x2 (steel) | mounted - Nominal load: 250 kN with base plate M42x2 (steel) | mounted - Nominal load: 500 kN with base plate M72x2 (steel) | mounted
Plug protection	In special cases it may be necessary to additionally equip the electrical connections on the force transducer series DR with a protective profile around the plug connection. Dimensions depending on nominal load and on request.
Nominal sensitivity	The DR series force transducer has the following nominal sensitivity depending on the nominal force. The permissible oscillation stress of ±100% applies to all nominal forces. 1 mV/V = 1.25 - 5 kN 2 mV/V = > 5 kN
Single or double measuring bridge	For redundancy reasons, it is necessary, for example in safety-relevant applications, to check the safety-relevant integrity of the measuring signal by means of a second measuring bridge (functional redundancy in the same force transducer). Two force transducer output signals are processed and evaluated independently of each other via two separate measuring amplifier channels. This makes it possible to connect two measuring amplifiers with different characteristics (DC / TF). The second redundant measuring circuit, is characterised by no crosstalk between the channels at different carrier frequencies. Notes: The selection of a double measuring bridge affects the number of connection sockets. The double measuring bridge can be selected from 2.5 kN (also applies to the combination with optional acceleration sensors).
Bending moment measuring circuits Mx, My	The Series DR force transducer can be equipped with bending moment measuring circuits on request. The additional bending moment measuring circuits can be measured to control the horizontal bending moments Mx and My and can be provided as separate channels. Notes: The selection of bending moment measuring circuits affects the number of connection sockets. The bending moment circuits can only be selected in combination with a single or double measuring bridge. A combination with accelerometers on request.
MEMS accelerometers	The Series DR force transducer can optionally be equipped with two integrated MEMS accelerometers. In this way, for example, the resulting inertial forces of the force measurement setup or the test stand setup can be determined easily and effectively during dynamic measurements.
Temperature range	S = Standard temperature range -10°C – +45°C

Note: Continued on next page

Order Numbers | Configurable Variants | Glossary

Item	Description
Electrical transducer connection	The DR series force transducer can be configured with fixed bayonet connection sockets. The number of connection sockets results from the number of selected measuring bridges. P = Bayonet connection socket(s) | 6-pole Note: Fixed measuring cables on request.
Cable connection type	With pluggable Bayonet connection, no additional cable connection type is available. P = Bayonet connection socket(s) selected | no permanently mounted test lead(s). Note: Further options with measuring cables on request.

Order-Example

C	DR	125K	T	M	Y	N	2	SB	NO	AC	S	P	P
		125 kN	Threaded version	Metric	with bottom plate	no plug protection	2 mV/V	single bridge	No bending moment circuits Mx, My	with 2 integrated accelerometers	standard temperature range	Bayonet socket(s)	Bayonet socket(s)

Order Numbers | Accessories

Description	Order number
Measuring cable	
Standard measuring cable | grey | 5 m | shielded and twisted in pairs | outer sheath Ø 6.5 mm | 6-wire technology | transducer connection: Bayonet connector type MIL-C-26482 S | 6-pole | Cable end amplifier: open	S-CAB-SMC-B-5M-F
Configurable measuring cable type SMC, DMC, TMC, FMC | in different lengths | with different connectors for amplifier connection	C-CAB-xxx-BA6S-xxx-xxxx
Series DR | bottom plate for threaded version (1 piece)	
Serie DR | 1.25 - 5 kN | bottom plate	S-MA-DR-BP-01
Serie DR | 12.5 - 25 kN | bottom plate	S-MA-DR-BP-02
Serie DR | 50 kN | bottom plate	S-MA-DR-BP-03
Serie DR | 125 kN | bottom plate	S-MA-DR-BP-04
Serie DR | 250 kN | bottom plate	S-MA-DR-BP-05
Serie DR | 500 kN | bottom plate	S-MA-DR-BP-06
Notes: *1.25 - 5 kN | material: aluminium* *> 12.5 kN | material: steel*	
Series DR | bolt set outer hole circle for threaded version (1 set)	
Serie DR | 1.25 - 5 kN | bolt set outer hole circle | 8 pcs.	S-MA-DR-BO-01
Serie DR | 12.5 - 25 kN | bolt set outer hole circle | 8 pcs.	S-MA-DR-BO-02
Serie DR | 50 - 125 kN | bolt set outer hole circle | 12 pcs.	S-MA-DR-BO-03
Serie DR | 250 kN | bolt set outer hole circle | 12 pcs.	S-MA-DR-BO-04
Serie DR | 500 kN | bolt set outer hole circle | 16 pcs.	S-MA-DR-BO-05
Note: 1 set for mounting the bottom plate via outer hole circle threaded version	

Configurable force transducer series DR

Single measuring bridge | MEMS accelerometers | 2 x bayonet connection | threaded version | bottom plate pre-assembled

DEFINING PRECISION

GTM Testing and Metrology GmbH
Philipp-Reis-Straße 4-6, 64404 Bickenbach, Germany
www.gtm-gmbh.com
contact@gtm-gmbh.com
Phone +49(0)6257-9720-0
Fax +49(0)6257-9720-77