Data Sheet | Force Transfer Standard Series KTN-ZD

Nominal Force
5 N – 1 MN

Applications | Key Facts

- Applications: round robin tests of national metrology institutes (NMI) among each other | traceability of accredited calibration laboratories | reference force transducer or master sensor in calibration machines
- ISO 376 accuracy classes: 00 and 0.5
- Static tension and compression forces
- Hermetically sealed
- Insensitive to changes in force application
- Insensitive to disturbing forces and torques
- Low weight and simple mechanical adaptation
- Standardized connection dimensions

Options | Accessories

- Measuring range for ISO 376 accuracy class 00: 10% - 100% or 20% - 100%
- Optional second axial measuring circuit for redundancy
- Optional bending moment measuring circuits Mx, My
- Extensive electrical connection options
- Extensive ISO 376 compliant mechanical accessories | also customized solutions on request
- Customized transducer variants on request | also in small quantities

Technical Data | Class 00 | 5 N - 500 N

	Nominal force	F_{nom}	N	5	10	20	50	100	200	500
Metrological Data	Force measurment range		%	10 - 100						
	Interpolation error	f_c	%	0.02						
	Reversibility error	v	%	0.06						
	Repeatability error in unchanged mounting position	b'	%	0.023						
	Reproducibility error in different mounting positions	b	%	0.045						
	Zero error	f_0	%	0.01						
	Creep		%	0.01						
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.01						
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.01						
Electrical Data	Rated characteristic value	C_{nom}	mV/V	2						
	Input resistance	R_e	Ω	820					> 500	
	Output resistance	R_a	Ω	600 - 700					> 450	
	Insulation resistance	R_{is}	Ω	$> 10^9$						
	Operating range of excitation voltage	$B_{U,G}$	V	5 - 12						
	Protection (DIN EN 60529)			54						
Mechanical Data	Mass[1)]	m	kg	0.35					1.3	
	Mass[2)]	m	kg	0.03					0.07	
	Mass[3)]	m	kg	0.03					0.07	
	Force limit		%	110						
	Breaking force		%	200						
	Permissible eccentricity	e_G	mm	2						
	Rated temperature range	$B_{T,nom}$	°C	17 - 27						
	Operating temperature range	$B_{T,G}$	°C	10 - 35						

1) Transducer
2) Compression load transmission
3) Tension load transmission

Technical Data | Class 00 | 1 kN - 1 MN

	Nominal force	F_{nom}	kN	1	2.5	5	10	20	25	30	50	100	200	500	1000
Metrological Data	Force measurment range		%	10 - 100											
	Interpolation error	f_c	%	0.02											
	Reversibility error	v	%	0.06											
	Repeatability error in unchanged mounting position	b'	%	0.023											
	Reproducibility error in different mounting positions	b	%	0.045											
	Zero error	f_0	%	0.01											
	Creep		%	0.01											
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.01											
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.01											
Electrical Data	Rated characteristic value	C_{nom}	mV/V	2											
	Input resistance	R_e	Ω	> 500		> 1100	> 1200					> 1300			
	Output resistance	R_a	Ω	> 450		> 900	> 1000				> 1100	> 1000		> 1100	
	Insulation resistance	R_{is}	Ω	$> 10^9$											
	Operating range of excitation voltage	$B_{U,G}$	V	5 - 12											
	Protection (DIN EN 60529)			54											
Mechanical Data	Mass[1)]	m	kg	1.3			3.1				3.5	10.5	10.1	45	100
	Mass[2)]	m	kg	0.1			0.1				0,4	0.5	0.9	5.5	5.5
	Mass[3)]	m	kg	0.2		0.3	0.4				0.5	2.3	3.9	17	31
	Force limit		%	110											
	Breaking force		%	200											
	Permissible eccentricity	e_G	mm	2											
	Rated temperature range	$B_{T,nom}$	°C	17 - 27											
	Operating temperature range	$B_{T,G}$	°C	10 - 35											

1) Transducer
2) Compression load transmission
3) Tension load transmission

Technical Data | Class 0.5 | 5 N - 500 N

Metrological Data	Nominal force	F_{nom}	N	5	10	20	50	100	200	500
	Force measurment range		%	10 - 100						
	Interpolation error	f_c	%	0.04						
	Reversibility error	v	%	0.14						
	Repeatability error in unchanged mounting position	b'	%	0.045						
	Reproducibility error in different mounting positions	b	%	0.09						
	Zero error	f_0	%	0.02						
	Creep		%	0.02						
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.02						
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.02						
Electrical Data	Rated characteristic value	C_{nom}	mV/V	2						
	Input resistance	R_e	Ω	820					> 500	
	Output resistance	R_a	Ω	600 - 700					> 450	
	Insulation resistance	R_{is}	Ω	$> 10^9$						
	Operating range of excitation voltage	$B_{U,G}$	V	5 - 12						
	Protection (DIN EN 60529)			54						
Mechanical Data	Mass[1)]	m	kg	0.35					1.3	
	Mass[2)]	m	kg	0.03					0.07	
	Mass[3)]	m	kg	0.03					0.07	
	Force limit		%	110						
	Breaking force		%	200						
	Permissible eccentricity	e_G	mm	2						
	Rated temperature range	$B_{T,nom}$	°C	17 - 27						
	Operating temperature range	$B_{T,G}$	°C	10 - 35						

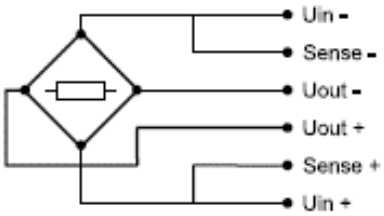
1) Transducer
2) Compression load transmission
3) Tension load transmission

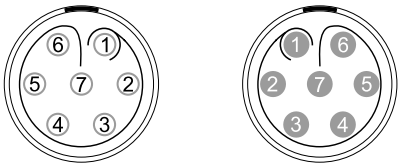
Technical Data | Class 0.5 | 1 kN - 1 MN

	Nominal force	F_{nom}	kN	1	2.5	5	10	20	25	30	50	100	200	500	1000
Metrological Data	Force measurment range		%	10 - 100											
	Interpolation error	f_c	%	0.04											
	Reversibility error	v	%	0.14											
	Repeatability error in unchanged mounting position	b'	%	0.045											
	Reproducibility error in different mounting positions	b	%	0.09											
	Zero error	f_0	%	0.02											
	Creep		%	0.02											
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.02											
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.02											
Electrical Data	Rated characteristic value	C_{nom}	mV/V	2											
	Input resistance	R_e	Ω	> 500		> 1100	> 1200					> 1300			
	Output resistance	R_a	Ω	> 450		> 900	> 1000					> 1100	> 1000		> 1100
	Insulation resistance	R_{is}	Ω	$> 10^9$											
	Operating range of excitation voltage	$B_{U,G}$	V	5 - 12											
	Protection (DIN EN 60529)			54											
Mechanical Data	Mass[1)]	m	kg	1.3			3.1				3.5	10.5	8.4	43	57
	Mass[2)]	m	kg	0.1			0.1				0.4	0,5	1.8	2.2	7.4
	Mass[3)]	m	kg	0.2		0.3	0.1				0.5	2.3	4.2	7.7	27
	Force limit		%	110											
	Breaking force		%	200											
	Permissible eccentricity	e_G	mm	2											
	Rated temperature range	$B_{T,nom}$	°C	17 - 27											
	Operating temperature range	$B_{T,G}$	°C	10 - 35											

1) Transducer
2) Compression load transmission
3) Tension load transmission

Cable Connection



Pluggable connection[1)2)3)]	Open cable ends
7-pin LEMO Series 1 **female** **male** 	Double shielded measuring cable type DMC | yellow cable jacket | Ø 6.5 mm | twisted in pairs | 3 x 2 x 0.25 mm² | temperature range: -40 °C ... +90 °C

Connection		Pin	Wire colour
Supply voltage (+)	U_{in+}	3	blue
Supply voltage (-)	U_{in-}	2	black
Measurement signal (+)	U_{out+}	1	white
Measurement signal (-)	U_{out-}	4	red
Sense (+)	Sense+	5	green
Sense (-)	Sense-	6	grey
Shielding		Housing	yellow

1) View to welding side
2) Female LEMO S.A. Typ: EGG.1B.307.CLL | male: FGG.1B.307.CLA.D72
3) In the nominal force 5 N - 100 N, the connection sockets (female) are led to the outside with a black measuring cable type FMC | 30 cm | Ø 2.9. let

▶ Pluggable cable connection

All transducers of the KTN-ZD series can be equipped with a pluggable LEMO socket (on all measuring circuits selected). Suitable measuring cables S-CAB / C- CAB are available as accessories.

▶ Plug-in cable connection (from 200 N) with double-shield measuring cable type DMC (S-CAB-DMC-L-5M-F)

▶ Pluggable cable connection with external connection socket 5 N -100 N

▶ Fixed measuring cable

All transducers of the KTN-ZD series can be equipped with permanently mounted measuring cables, e.g. with 5 / 10 m double-shielded measuring cable type DMC. The cable ends can be optionally open or equipped with various connectors for strain gauge amplifier connections.

▶ Fixed double-shield measuring cable type DMC with open cable ends or with ready-made plug for amplifier connection

Double Bridge | from 5 kN

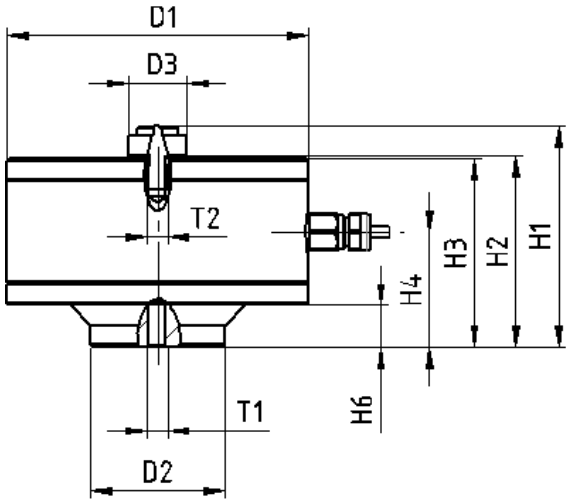
► For version with double measuring bridge (from 10 kN), the technical data apply equally to both measuring circuits

Bending Moment Measuring Circuits | from 5 kN

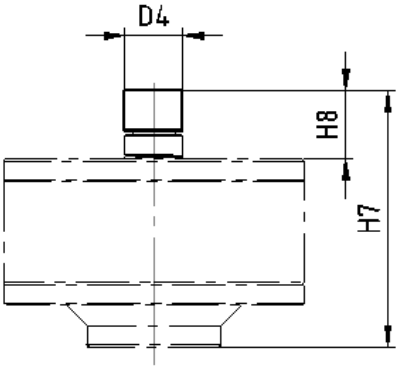
► The bending moment measuring circuits Mx and My (from 5 kN) can be used advantageously with the use of a multichannel measuring amplifier to control the force application.

Nominal force	F_{nom}	kN	5 - 1000
Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0,2
Temperature effect on zero signal per 10 K	TK_0	%/10 K	0,2
Input resistance	R_e	Ω	400
Operating range of excitation voltage	$B_{U,G}$	V	5 - 12

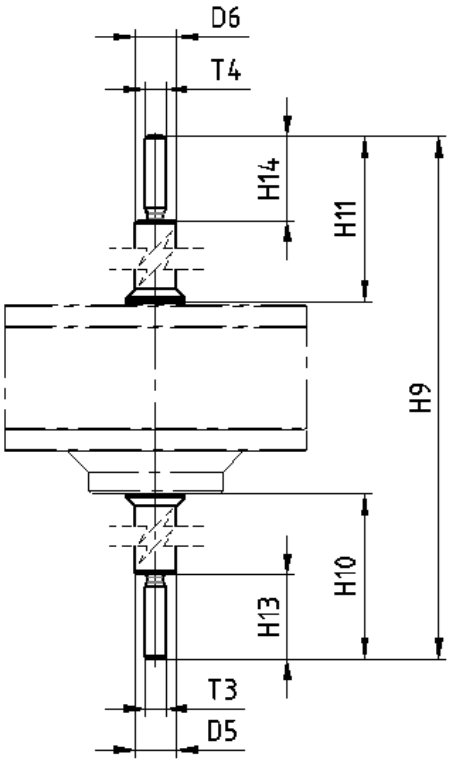
Dimensions | 5 N - 100 N



▶ Standard delivery scope

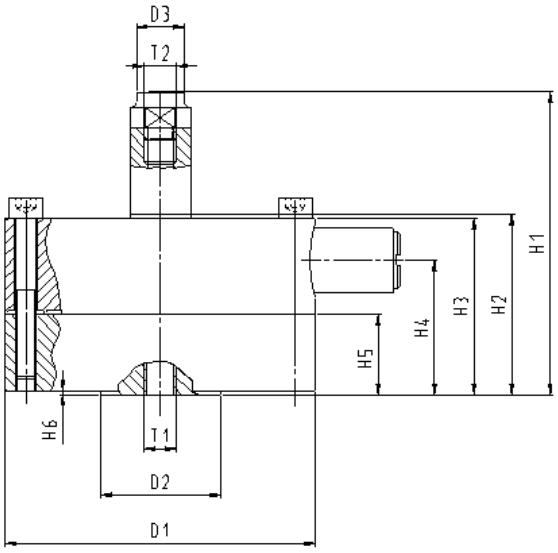


▶ Accessories: Load Button

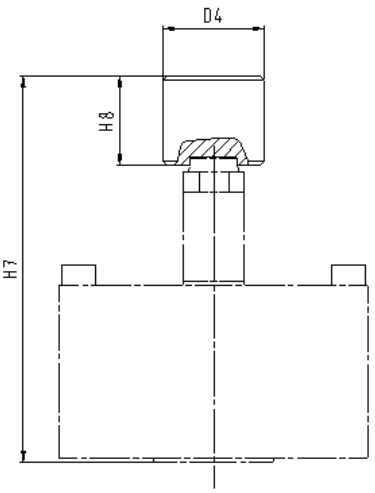


▶ Accessories: tensile adaption

Dimensions | 200 N - 2.5 kN



▶ Standard delivery scope



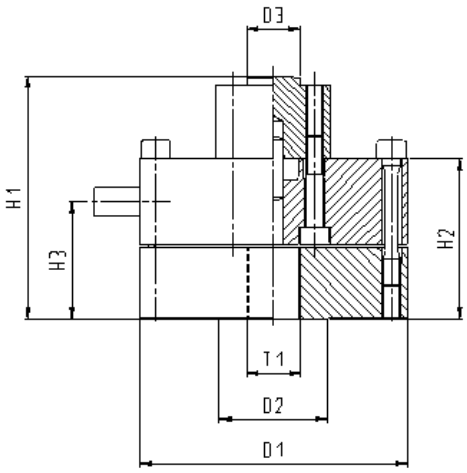
▶ Accessories: Load Button

▶ Accessories: tensile adaption

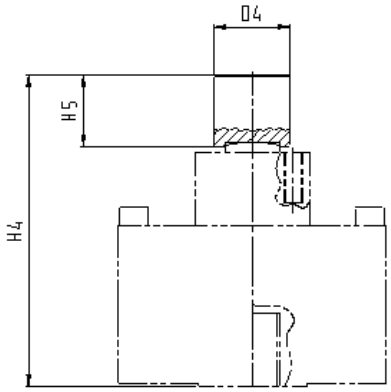
Dimensions | 5 N - 2.5 kN

Nominal force compression/tension	$\pm F_{nom}$	N	5	10	20	50	100	200	500	1000	2500
Diameter	$ØD_1$	mm	72					77			
Diameter	$ØD_2$	mm	32					30			
Diameter	$ØD_3$	mm	14					$11.95^{-0.05}$			
Diameter	$ØD_4$	mm	14					25			
Diameter	$ØD_5$	mm	10					35			
Diameter	$ØD_6$	mm	10					---			
Thread	T_1		M5					M8			
Thread	T_2		M5					M8			
Thread	T_3		M5					M20x1.5			
Thread	T_4		M5					---			
Height	H_1	mm	52.7					74.5			
Height	H_2	mm	45.7					44			
Height	H_3	mm	45					43			
Height	H_4	mm	27.5					32.5			
Height	H_5	mm	---					20			
Height	H_6	mm	10					1			
Height	H_7	mm	61.4					94.5			
Height	H_8	mm	16.4					22			
Height	H_9	mm	253.7					245.5			
Height	H_{10}	mm	104					100			
Height	H_{11}	mm	104					100			
Height	H_{12}	mm	---					24.8			
Height	H_{13}	mm	20					---			
Height	H_{14}	mm	20					---			

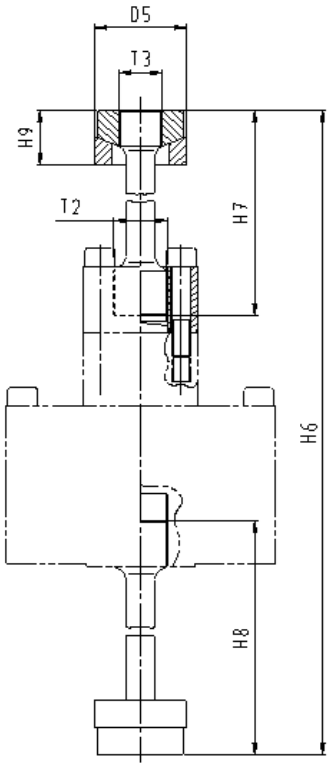
Dimensions | 5 kN - 100 kN



▶ Standard delivery scope

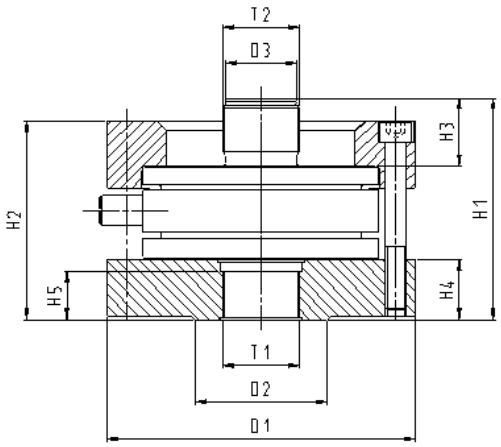


▶ Accessories: Load Button

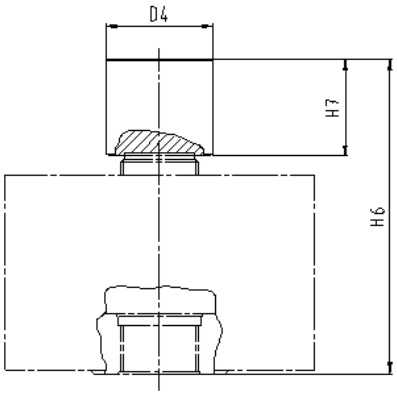


▶ Accessories: tensile adaption

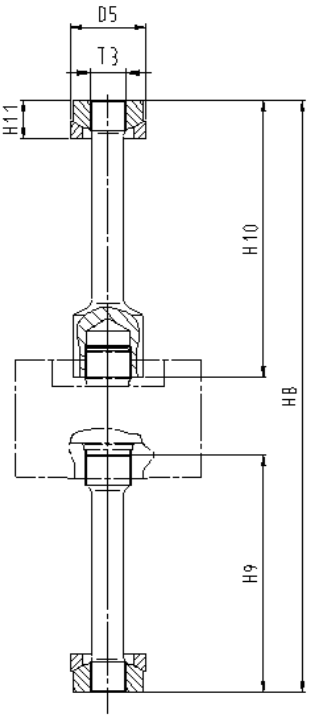
Dimensions | 200 kN - 500 kN



▶ Standard delivery scope

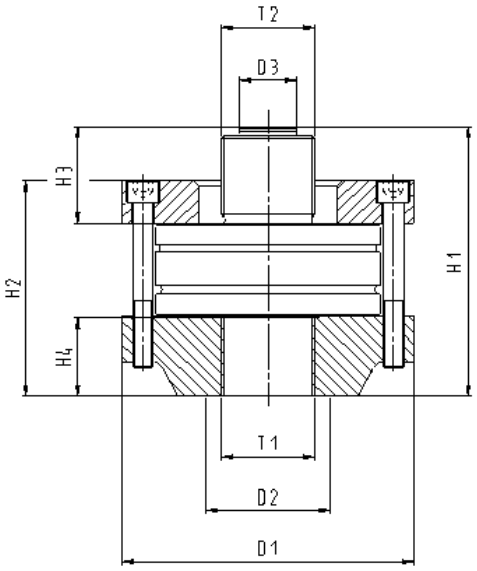


▶ Accessories: Load Button

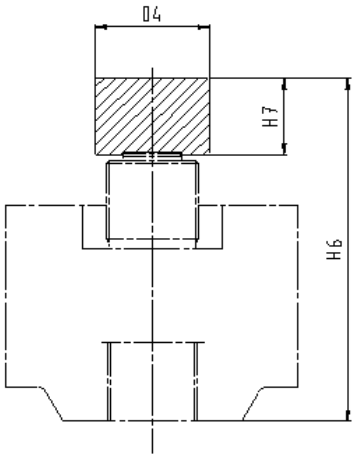


▶ Accessories: tensile adaption

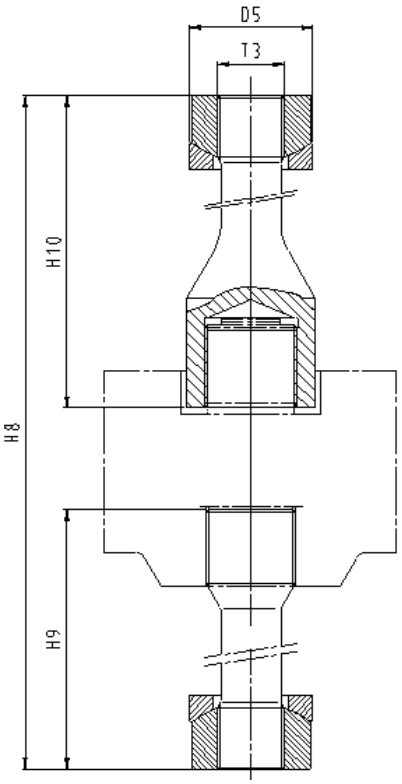
Dimensions | 600 kN - 1 MN



► Standard delivery scope



► Accessories: Load Button



► Accessories: tensile adaption

Dimensions | 5 kN - 1 MN

Nominal force compression/tension	± F_{nom}	kN	5	10	20	25	30	50	100	200	500	1000
Diameter	$ØD_1$	mm	77	95			101		148	157	245	335
Diameter	$ØD_2$	mm	30	40			50		60	67	140	120
Diameter	$ØD_3$	mm	11,95-0,05	19,95-0,05					25,95-0,05	35,95-0,05	56-0,05/-0,1	56-0,05
Diameter	$ØD_4$	mm	25	30					42	54	110	
Diameter	$ØD_5$	mm	35c11				45c11		50c11	64c11	90c11	120c11
Diameter	$ØD_6$	mm	---									
Thread	T_1		M10x1	M20x1.5					M30x2	M39x2	M72x4	M90x4
Thread	T_2		M10x1	M20x1.5					M30x2	M39x2	M72x4	M90x4
Thread	T_3		M20x1.5						M24x2	M30x2	M56x4	M64x4
Thread	T_4		---									
Height	H_1	mm	69	88					134	112.5	256	298
Height	H_2	mm	46	61					89	101	218.5	236.5
Height	H_3	mm	33	48					65	34	77	94
Height	H_4	mm	89	111					171	30.5	77	76
Height	H_5	mm	22	25					39	24.5	---	
Height	H_6	mm	354	374					412	159.5	328	370
Height	H_7	mm	150							49	75	
Height	H_8	mm	150							500	800	840
Height	H_9	mm	25						30	210	356	340
Height	H_{10}	mm	---							234	342	370
Height	H_{11}	mm	---							32	71.4	

Order Numbers | Configurable Variants

▶ Force transducer Series KTN-ZD | configurable variants

Item	Code	Description
Force transfer standard Series KTN-D	C-KTN_ZD	Configurable force transfer standard Series KTN-ZD
Nominal Force	K005	5 N
	K010	10 N
	K020	20 N
	K050	50 N
	K100	100 N
	K200	200 N
	K500	500 N
	1K00	1 kN
	2K50	2.5 kN
	5K00	5 kN
	10K0	10 kN
	20K0	20 kN
	25K0	25 kN
	30K0	30 kN
	50K0	50 kN
	100K	100 kN
	200K	200 kN
	500K	500 kN
	1M00	1 MN
Accuracy class	05	ISO 376 | class 0.5
	00	ISO 376 | class 00
Measuring range accuracy class	10	ISO 376 | 10 - 100 %
	20	ISO 376 | 20 - 100 %
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
	BM	bending moment measuring circuits Mx, My
Temperature range	S	Standard temperature range | +17°C … +27°C
Electrical transducer connection (for all selected measuring circuits)	P	LEMO female plug(s) selected | 7-pole | push-pull
	A	5 m | permanently mounted standard measuring cables type DMC | for all measuring circuits
	B	10 m | permanently mounted standard measuring cables type DMC | for all measuring circuits
Cable connection type (for all selected measuring circuits)	P	LEMO female plug(s) selected | no permanently mounted measuring cable(s)
	F	Free cable ends | on one permanently mounted measuring cable | for all measuring circuits
	A	D-Sub 9 Pol | on one permanently mounted measuring cable | for all measuring circuits
	B	D-Sub 15 Pol | on one permanently mounted measuring cable | for all measuring circuits
	C	MS 7 Pol | on one permanently mounted measuring cable | for all measuring circuits
	D	HD-Sub 15 Pol | 3-row | on one permanently mounted measuring cable | for all measuring circuits

Notes:

▶ *Not all variants can be freely combined.*

Order-Example

C	-	KTN_ZD	-	250K	-	00	-	20	-	DB	-	NO	-	S	-	A	-	F
				250 kN		ISO 376 | class 00		ISO 376 | 20 - 100 %		double bridge		no bending moment circuits Mx, My		standard temperature range		5 m permanently mounted cable type DMC		free cable ends

Order Numbers | Configurable Variants

Item	Description
Accuracy class acc. to ISO 376	Force transducers calibrated according to ISO 376 are divided into accuracy classes. The highest accuracy class is class 00, followed by 0.5 and others. A smaller accuracy class represents a more precise sensor. GTM force transfer transducers that meet the requirements of an ISO 376 accuracy class are called reference force transducers or transfer standards. These transducers achieve defined accuracy classes in a specified measuring range, e.g. the force transducer KTN-ZD achieves accuracy class 00 according to ISO 376 in a measuring range between min. 10 % and 100 % of the nominal force.
Measuring range accuracy class	The measuring range indicates in which measuring range the transducer complies with the selected class. Through internal quality assurance processes, we always ensure that the specified accuracy class is maintained in the selected measuring range. We always recommend a GTM internal calibration of the transducer incl. standard compliant attachments. Every transducer calibrated according to ISO 376 receives a calibration certificate, which provides an evaluation of the characteristic values of the sensor and information about the calibration equipment used, the traceability and measurement uncertainty as well as the environmental conditions during the calibration process. In the calibration certificate, in addition to other technical information, you will find, for example, the measurement uncertainties of the calibrated force transducer for the respective load levels
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 or fixed double shielded measuring cables (if selected). A combination of double measuring bridges is possible on request. This option is available from 5 kN.
Bending moment measuring circuits Mx, My	The force transfer transducer series KTN-ZD can be equipped with bending moment measuring circuits optional. 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. A combination of double measuring bridges is possible on request. This option is available from 5 kN.
Temperature range	The KTN-ZD series force transfer transducer can be used in a nominal temperature range of +17°C – +27 °C. Notes: Please observe the corresponding ambient conditions and ensure that there are no significant temperature fluctuations. These can possibly have an effect on the metrological performance.
Electrical transducer connection	The KTN-ZD series force transfer transducer can be configured with fixed push-pull connectors or fixed double shielded measuring cables leads (type DMC) in different lengths. Notes: The number of connection sockets or measuring cables is determined by the number of measuring bridges selected. Double shielded measuring cable(s) type DMC are always used as fixed measuring cables. In the nominal force 5 N - 100 N, the connection sockets (female) are led to the outside with a black measuring cable type FMC | 30 cm | Ø 2.9. let outwards
Cable connection type	If the KTN-ZD series is configured with fixed double shielded measuring cables, different connector types for high precision strain gauge measuring amplifiers can be selected in addition to open cable ends. The assembly of the selected connector plugs is done by GTM. The transducer can be connected directly to a measuring amplifier.

Order Numbers | Accessories

Description	Order number
Measuring cables	
Double-shielded measuring cable | yellow | 5 m | double shielded and twisted in pairs | cable sheath Ø 6.5 mm | 6-wire technology | transducer connection: straight plug (male) type LEMO 7-pole push-pull (male) | cable end amplifier: open	S-CAB-DMC-L-5M-F
Configurable measuring cable type DMC and others | in different lengths | with different connectors for amplifier connection	C-CAB-DMC-…
Series KTN-ZD | thrust piece(1 piece)	
Series KTN-ZD | 5 - 100 N | thrust piece	S-MA-KTN_ZD-TP-01
Series KTN-ZD | 0.2 - 5 kN | thrust piece	S-MA-KTN_ZD-TP-02
Series KTN-ZD | 10 - 50 kN | thrust piece	S-MA-KTN_ZD-TP-03
Series KTN-ZD | 100 kN | thrust piece	S-MA-KTN_ZD-TP-04
Series KTN-ZD | 200 kN | thrust piece	S-MA-KTN_ZD-TP-05
Series KTN-ZD | 500 kN - 1 MN | thrust piece	S-MA-KTN_ZD-TP-06
Series KTN-ZD | tension adaption (1 set)	
Series KTN-ZD | 5 - 100 N | tension adaption	S-MA-KTN_ZD-TA-01
Series KTN-ZD | 0.2 - 2.5 kN | tension adaption | mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-02
Series KTN-ZD | 5 kN | tension adaption | mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-03
Series KTN-ZD | 10 - 30 kN | tension adaption | mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-04
Series KTN-ZD | 50 kN | tension adaption | mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-05
Series KTN-ZD | 100 kN | tension adaption| mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-06
Series KTN-ZD | 500 - 600 kN | tension adaption | mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-08
Series KTN-ZD | 1 MN | tension adaption | mounting Ø acc. ISO 376	S-MA-KTN_ZD-TA-09
Notes: ▶ *GTM recommends the use of standard-compliant GTM components for the KTN-ZD series in ISO 376 class 00 in all cases. GTM calibration is performed as a whole unit. Transducer + mechanical accessories.* ▶ *5 - 100 N: consisting of a set of tie rod adapter in carbon lightweight construction with connecting thread M5* ▶ *0.2 - 2.5 kN: consisting of a set of rods with spherical shells/nuts* ▶ *5 kN: consisting of a set of rods with spherical shells/nuts, tie rod adapter, 6 pcs. M5 x 20 socket head cap screw, allen key 4 mm* ▶ *10 - 30 kN: consisting of a set of rods with spherical shells/nuts, tie rod adapter, 8 pcs. M6 x 30 socket head cap screw, allen key 5 mm* ▶ *50 kN: consisting of a set of rods with spherical shells/nuts, tie rod adapter, 8 pcs. M6 x 30 socket head cap screw, allen key 5 mm* ▶ *100 kN: consisting of a set of rods with spherical shells/nuts, tie rod adapter, 8 pcs. M10 x 50 socket head cap screw, allen key 6 mm*	
Series KTN-ZD | cases	
Case for series KTN-ZD | 5 - 100 N	S-TC-KTN_ZD-01
Case for series KTN-ZD | 0.2 - 2.5 kN	S-TC-KTN_ZD-02
Case for series KTN-ZD | 5 kN	S-TC-KTN_ZD-03
Case for series KTN-ZD | 10 - 25 kN	S-TC-KTN_ZD-04
Case for series KTN-ZD | 30 - 50 kN	S-TC-KTN_ZD-05
Case for series KTN-ZD | 100 kN	S-TC-KTN_ZD-06
Case for series KTN-ZD | 200 kN	S-TC-KTN_ZD-07
Flight case for series KTN-ZD | 500 - 600 kN	S-TC-KTN_ZD-08
Flight case for series KTN-ZD | 1 MN	S-TC-KTN_ZD-09
Notes: ▶ *GTM recommends in any case to use the series KTN-D with transport case.* ▶ *More stable flight cases are used for nominal forces from 500 kN.*	

GTM
DEFINING PRECISION

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