Data Sheet | Force Transfer Standard Series KTN-D

Nominal Force
10 kN – 5 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
- GTM accuracy class VN | exceeds ISO 376 class 00 many times over
- ISO 376 accuracy classes: 00 and 0.5
- Static compression forces
- Hermetically sealed
- Insensitive to changes in force application
- Insensitive to disturbing forces and torques
- Low weight and simple mechanical adaptation

Options | Accessories

- Selectable measuring range for ISO 376 accuracy class | 10% - 100% | 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 | Classification

Nominal force/kN	10	20	25	30	50	100	200	250	300	500	600	1000	1200	2000	3000	5000
Class																
VN[1)]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
00[2)]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0,5[2)]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1) GTM-Classification, better then class 00 according to ISO 376.
2) Class according to ISO 376 | measuring range selectable

Technical Data | Class VN

	Nominal force	F_{nom}	kN	10	20	25	30	50	100	200	250	300	500	600	1000	1200
Metrological Data	Force measurment range		%	40 - 100												
	Interpolation error	f_c	%	0.002												
	Reversibility error	v	%	0.06												
	Repeatability error in unchanged mounting position	b, b_{rg}	%	0.002												
	Reproducibility error in different mounting positions	b', b_{rv}	%	0.005												
	Zero error	f_0	%	0.008												
	Creep		%	0.008												
	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	>1200			>1100								>1400	
	Output resistance	R_a	Ω	>900											>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 transducer	m	kg	1			2.3		2.4	4.5	4.8		7.7		15.6	
	Mass thrust piece	m	kg	0,2			0.5		0.5	0.9	0.9		2.3		5.5	
	Force limit		%	110												
	Breaking force		%	200												
	Permissible eccentricity	e_G	mm	5											10	
	Rated temperature range	$B_{T,nom}$	°C	17 - 27												
	Operating temperature range	$B_{T,G}$	°C	10 - 35												

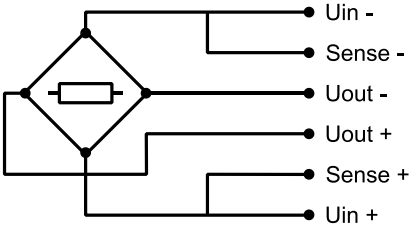
Technical Data | Class 00

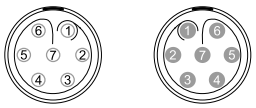
	Nominal force	F_{nom}	kN	10	20	25	30	50	100	200	250	300	500	600	1000	1200	2000	3000	5000
Metrological Data	Force measurment range		%	10 - 100															
	Interpolation error	f_c	%	0.02															
	Reversibility error	v	%	0.06															
	Repeatability error in unchanged mounting position	b, b_{rg}	%	0.023															
	Reproducibility error in different mounting positions	b', b_{rv}	%	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	>1200			>1100								>1400		>1100	>900	
	Output resistance	R_a	Ω	>900											>1100		>900	>800	
	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 transducer	m	kg	1			2.3		2.4	4.5	4.8	7.7			15.6		39.4	124.3	133
	Mass thrust piece	m	kg	0.2			0.5		0.5	0.9	0.9	2.3			5.5		18.6	36.7	36.7
	Force limit		%	110															
	Breaking force		%	200															
	Permissible eccentricity	e_G	mm	5											10				
	Rated temperature range	$B_{T,nom}$	°C	17 - 27															
	Operating temperature range	$B_{T,G}$	°C	10 - 35															

Technical Data | Class 0.5

	Nominal force	F_{nom}	kN	10	20	25	30	50	100	200	250	300	500	600	1000	1200	2000	3000	5000
Metrological Data	Force measurment range		%	20 - 100															
	Interpolation error	f_c	%	0.04															
	Reversibility error	v	%	0.14															
	Repeatability error in unchanged mounting position	b, b_{rg}	%	0.045															
	Reproducibility error in different mounting positions	b', b_{rv}	%	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	>1200			>1100								>1400		>1100	>900	
	Output resistance	R_a	Ω	>900											>1100		>900	>800	
	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 transducer	m	kg	1			2.3		2.4	4.5	4.8	7.7			15.6		39.4	124.3	133
	Mass thrust piece	m	kg	0,2			0.5		0.5	0.9	0.9	2.3			5.5		18.6	36.7	36.7
	Force limit		%	110															
	Breaking force		%	200															
	Permissible eccentricity	e_G	mm	5											10				
	Rated temperature range	$B_{T,nom}$	°C	17 - 27															
	Operating temperature range	$B_{T,G}$	°C	10 - 35															

Cable Connection



Pluggable connection[1)2)3)]	Open cable ends
7-pin LEMO Series 0 **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 too 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 outwards

▶ Pluggable cable connection

All transducers of the KTN-D 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.

▶ Fixed measuring cable

All transducers of the KTN-D 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.

▶ Plug-in cable connection with double-shielded measuring cable type DMC (S-CAB-DMC-L-5M-F)

▶ Fixed double-shielded measuring cable type DMC with open cable ends or with assembled plug for strain gauge amplifier connection

Double Bridge | from 10 kN

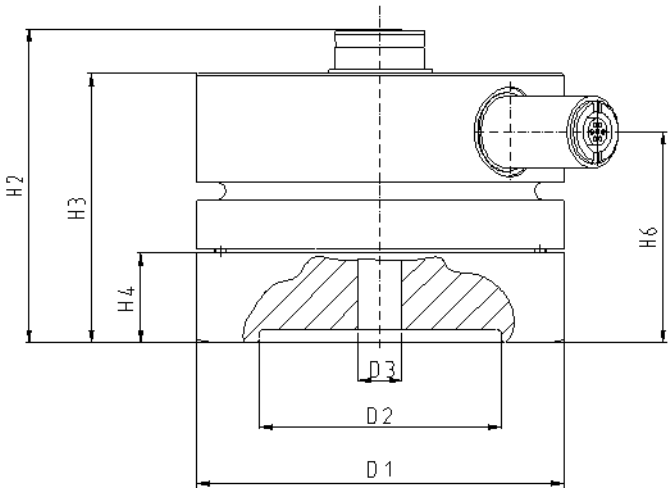
► For version with double measuring bridge (from 10 kN), the technical data apply equally to both measuring circuits.

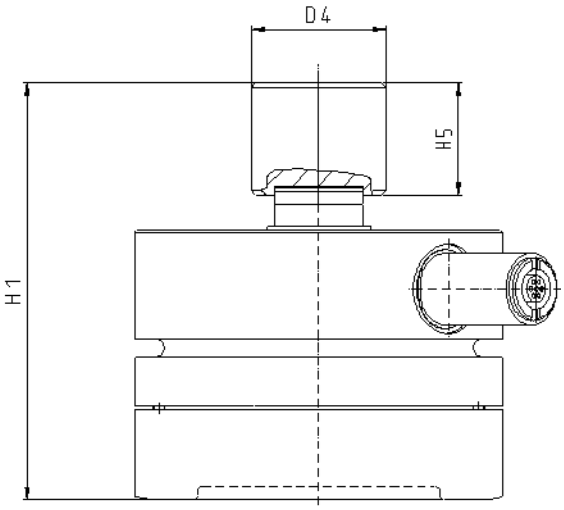
Bending Moment Measuring Circuits | from 10 kN

► The bending moment measuring circuits Mx and My (from 10 kN) can be used advantageously with the use of a multichannel measuring amplifier to control the force application.

Nominal force	F_{nom}	kN	10 - 5000 (2mV/V)
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





Standard delivery scope

Accessories: thrust piece

Nominal force	F_{nom}	kN	10	20	25	30	50	100	200	250	300	500	600	1000	1200	2000	3000	5000
Diameter	$ØD_1$	mm	82			92			120		140			200		270	375	
Diameter	$ØD_2$	mm	54			64			85		100			177		228	312.6	
Diameter	$ØD_3$	mm	10^{H7}											150		215	25^{H8}	
Diameter	$ØD_4$	mm	30			42			54		80			110		160	200	
Height	H_1	mm	93			107			124		149			195		267	360	
Height	H_2	mm	70						77		93			125		153	213	
Height	H_3	mm	60						66.75		82.35			103		140	197	
Height	H_4	mm	20											25			37	
Height	H_5	mm	25			39			49		58			75		119	153	
Height	H_6	mm	47			46					54.5			73.5		126	167	

Order Numbers | Configurable Variants

▶ Force transfer standard series KTN-D | configurable variants

Item	Code	Description
Force transfer standard Series KTN-D	C-KTN_D	Configurable force transfer standard series KTN-D
Nominal Force	10K0	10 kN
	20K0	20 kN
	25K0	25 kN
	30K0	30 kN
	50K0	50 kN
	100K	100 kN
	200K	200 kN
	250K	250 kN
	300K	300 kN
	500K	500 kN
	600K	600 kN
	1M00	1 MN
	1M20	1.2 MN
	2M00	2 MN
	3M00	3 MN
	5M00	5 MN
Accuracy class	05	ISO 376 | class 0.5
	00	ISO 376 | class 00
	VN	GTM | class VN
Measuring range accuracy class	10	ISO 376 | 10 - 100 %
	20	ISO 376 | 20 - 100 %
	40	GTM VN | 40 - 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_D	-	250K	-	00	-	20	-	SB	-	NO	-	S	-	A	-	F
				250 kN		ISO 376 | class 00		ISO 376 | 10 - 100 %		single 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 | GTM	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-D achieves accuracy class 00 according to ISO 376 in a measuring range between min. 10 % and 100 % of the nominal force. In addition, GTM also offers the KTN-D series as GTM class VN. This class exceeds the ISO 376 class 00 by a multiple and is characterized, for example, by outstanding precision and a particularly high repeatability.
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 option double measuring bridges can be selected from 10 kN and has an effect on the number of connection sockets or fixed double-shielded measuring cables (if selected).
Bending moment measuring circuits Mx, My	The force transfer transducer series KTN-D 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 option bending moment measuring circuits Mx, My is available from 10 kN and has an effect on the number of connection sockets or fixed double shielded measuring cables (if selected). A combination of double measuring bridges is possible on request.
Temperature range	The KTN-D 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-D series force transfer transducer can be configured with fixed push-pull connectors or fixed double shielded measuring cables (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 test lead(s) type DMC are always used as fixed test lead(s).
Cable connection type	If the KTN-D 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-D | Thrust piece (1 piece)	
Series KTN-D | 10 kN | thrust piece	S-MA-KTN_D-TP-01
Series KTN-D | 20 - 25 kN | thrust piece	S-MA-KTN_D-TP-02
Series KTN-D | 50 kN | thrust piece	S-MA-KTN_D-TP-03
Series KTN-D | 100 kN | thrust piece	S-MA-KTN_D-TP-04
Series KTN-D | 200 - 250 kN | thrust piece	S-MA-KTN_D-TP-05
Series KTN-D | 300 kN | thrust piece	S-MA-KTN_D-TP-06
Series KTN-D | 1 - 1.2 MN | thrust piece	S-MA-KTN_D-TP-08
Series KTN-D | 2 MN | thrust piece	S-MA-KTN_D-TP-09
Series KTN-D | 3 MN | thrust piece	S-MA-KTN_D-TP-10
Series KTN-D | 5 MN | thrust piece	S-MA-KTN_D-TP-11
Notes: ▶ *GTM recommends the use of standard-compliant GTM components for the KTN-D series in all cases. GTM calibration is performed as a whole unit. Transducer + mechanical accessories.*	
Series KTN-D | Cases	
Case for series KTN-D | 10 - 20 kN	S-TC-KTN_D-01
Case for series KTN-D | 50 - 100 kN	S-TC-KTN_D-02
Case for series KTN-D | 200 - 250 KN	S-TC-KTN_D-03
Case for series KTN-D | 500 kN	S-TC-KTN_D-04
Case for series KTN-D | 1 MN	S-TC-KTN_D-05
Flight case for series KTN-D | 2 MN	S-TC-KTN_D-06
Flight case for series KTN-D | 3 - 5 MN	S-TC-KTN_D-07
Flight case for series KTN-D | 10 MN	S-TC-KTN_D-08
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 2 MN.*	

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