

## Operating manual

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# Force Transfer Standard Series KTN-ZD

Nominal Force  
5 N - 1000 kN





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The content of these manual is intended solely for information purposes and can be changed at any time without prior notification.

With regard to the warranty and liability, we refer expressly to our 'General commercial terms and conditions' ([www.gtm-gmbh.com](http://www.gtm-gmbh.com)) and the instructions and regulations contained in these installation and operating instructions.

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# 1. Product description

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## 1.1 Designated use

The force transducer of the KTN-ZD series is suitable for measuring uniaxial tensile and compressive forces and is used for calibration of static measuring machines, for example in accordance with ISO 376. For safe operation, original force introducing components must be used.

Any other use is not intended and is therefore prohibited. No claims may be made for damage resulting from inappropriate use.

The limit values for the total load and all other limits must be complied with.

## 1.2 Exempted use

The force transducer is not suitable for dynamic applications. The force transducer is not a safety component. You must not use it in a complete system in which its failure may lead to the life and well being of people being endangered.

The transducer is not suitable or approved for use in potentially explosive areas.

## 2. Safety instructions

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### Markings used

The following designations and symbols are used in the operating manual to identify hazards:



**DANGER!**

Denotes a possibly hazardous situation that can lead to physical injuries or death.



**DANGER!**

Denotes a hazardous situation due to electrical voltage that can lead to physical injuries or death.



**NOTE!**

Denotes usage tips, general information and other useful notes.



**DANGER OF BURSTING!**

Denotes a potentially hazardous situation that can cause physical injuries or death if ignored.

▶ Denotes handling instructions

● Denotes lists

## Additional regulations

This operating manual contains the most important notes for safe operation of the transducer. Consideration must also be given to the legal and safety regulations applicable at the operating location, the accident prevention regulations applicable at the operating location and the technical data in connection with the safety regulations listed here.

## Residual hazards

The transducer of series KTN-ZD is state-of-the-art technology and safe to operate.

Residual hazards can arise during operation if the devices are used and operated improperly by unqualified personnel.

The scope of delivery for the transducer only covers a partial area of mechatronic metrology. The safety-related criteria for using the transducer within a complete system must be taken into account by the system design engineer, the equipment manufacturer and/or the operator so that residual hazards are minimised. Reference must be made to the remaining residual hazards in the



### **DANGER!**

In the case of a complete system, the safety-related criteria must be taken into account so that any failure of the transducer does not present a hazard to anyone.

## Transducer condition and modifications

You may only operate the transducer in a perfect condition while complying with the instructions given in the operating manual.

The transducer must not be modified either in its design or safety-related features, without our express, written permission.

## Overloading

All transducers of this series have already been subjected to an overload test at the manufacturer's. No additional overloads are permissible; always comply with the nominal loads of the transducer.



### **DANGER OF BURSTING!**

Do not overload the transducer!

The attached parts must also be designed to bear the maximum load. Only use attached parts in an appropriate condition.

In case of new, untested designs, you must provide additional protective measures against bursting parts.

## Personnel qualifications

The transducer and additional components must only be operated and assembled by qualified personnel. Qualified personnel are those persons who are acquainted with the assembly, commissioning and operation of the transducer and who have the appropriate qualifications for their job.



### **NOTE**

GTM offers training courses to qualify personnel.

## Ambient conditions

The transducer is intended for use in enclosed rooms while complying with the ambient conditions detailed in the technical specifications.

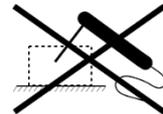
The transducer is not permitted for use in potentially explosive areas.



Protect the transducer against the influences of weather, such as rain and snow. Take appropriate measures on-site against power surges, e.g. from lightning strike.



No welding circuits may be introduced through the body of the transducer. If in doubt, you must dismantle the transducer.



### **DANGER!**

The transducer is not suitable for:

- Potentially explosive areas
- Power surges
- Welding circuits

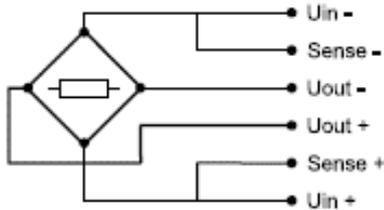
### 3. Storage and transport instructions

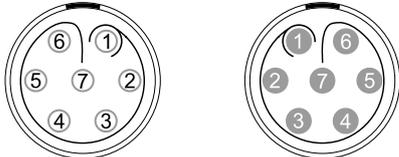
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The transducer series KTN-ZD is a precision measuring device and must be handled with appropriate caution.

- ▶ If the transducer is dropped or jolted it can become damaged prohibiting any further use.
- ▶ During storage, secure rotationally symmetrical transducers and attachment parts from rolling away.
- ▶ Only use the original transport packaging and other appropriate cut-to-size packaging for storage and transport.

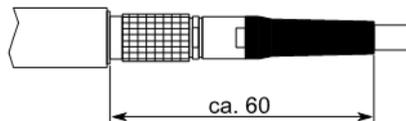
# 4. Cable connection



		Connection pluggable <sup>1) 2)</sup>	End not connected
		7-pin LEMO Series 0 Female: - Male:	
			
			yellow cable Ø 6.5 mm twisted in pairs, 3x2 x 0,25 mm <sup>2</sup> Temperature range: -40 °C bis +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 weldingside

2) Female LEMO S.A. Typ:



▶ pluggable cable connection ; 5 N to 100 N

▶ pluggable cable connection from 200 N

▶ permanent cable connection, end not connected

## 5. Double Bridge

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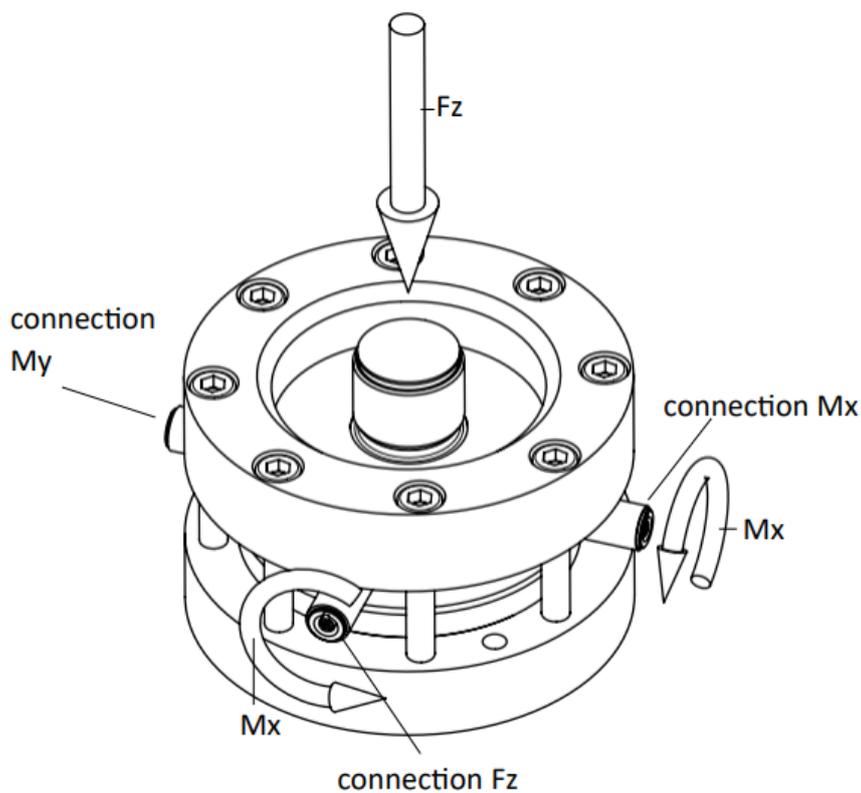
- ▶ For transducers with a double measuring bridge the second signal is measured by means of an additional plug. The respective electrical connections can be found in the chapter Technical Data.

## 6. Bending Moment Measuring Circuits

- ▶ During the test of force and torque introduction the bending moments  $M_x$  and  $M_y$  are measured and output as separate channels.

Nominal force	$F_{nom}$	kN	0.2 - 200 (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
Rated characteristic value	$C_{nom}$	mV/V	1)
Input resistance	$R_e$	$\Omega$	400
Operating range of excitation voltage	$B_{U,G}$	V	5 - 12

1) Specification shown on the label



▶ Position of the coordinate cross

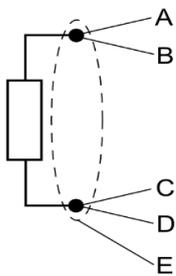
## 7. Temperature measurement

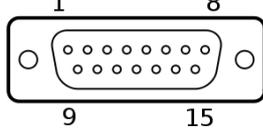
- ▶ For Type PT100 transducers with an integrated temperature sensor, observe the basic values of the resistors of the platinum measuring coils with a nominal resistance of 100 Ohms at 0°C.

These values and the permissible deviations correspond to DIN EN 60751.

Temperature range: see nominal temperature range in Technical Data

Connection type: 4 Conductor technology



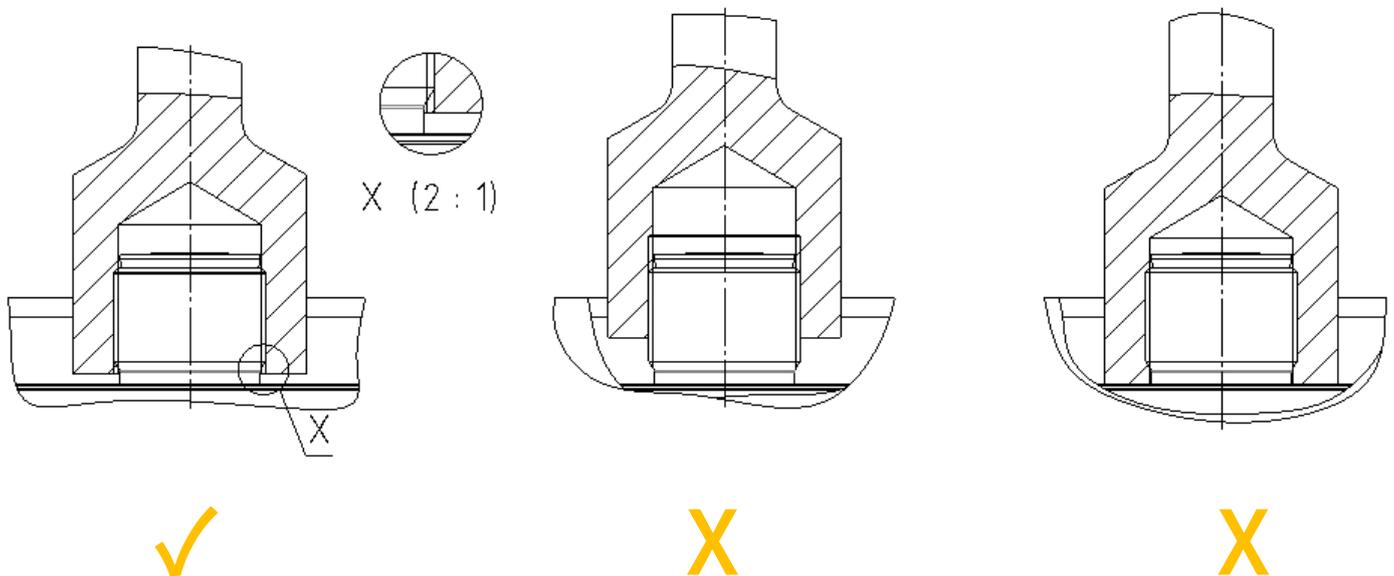
		Permanent connection end not connected	Permanent connection <sup>1)</sup>	
		Black cable 4-wire Ø 2,2 mm 4 x 0,04 mm <sup>2</sup> Temperature range: -50 °C bis +105 °C	6-pin LEMO Series 0 Female: - Male:	15-pin Sub-D male
				
Connection		Color	Pin	Pin
U (+)	A	White	1	5
Sense (+)	B	Red	3	12
U (-)	C	Black	4	6
Sense (-)	D	Green	6	13
Shielding	E	Housing	Housing	Housing

1) View to weldingside

## 8. Application instructions

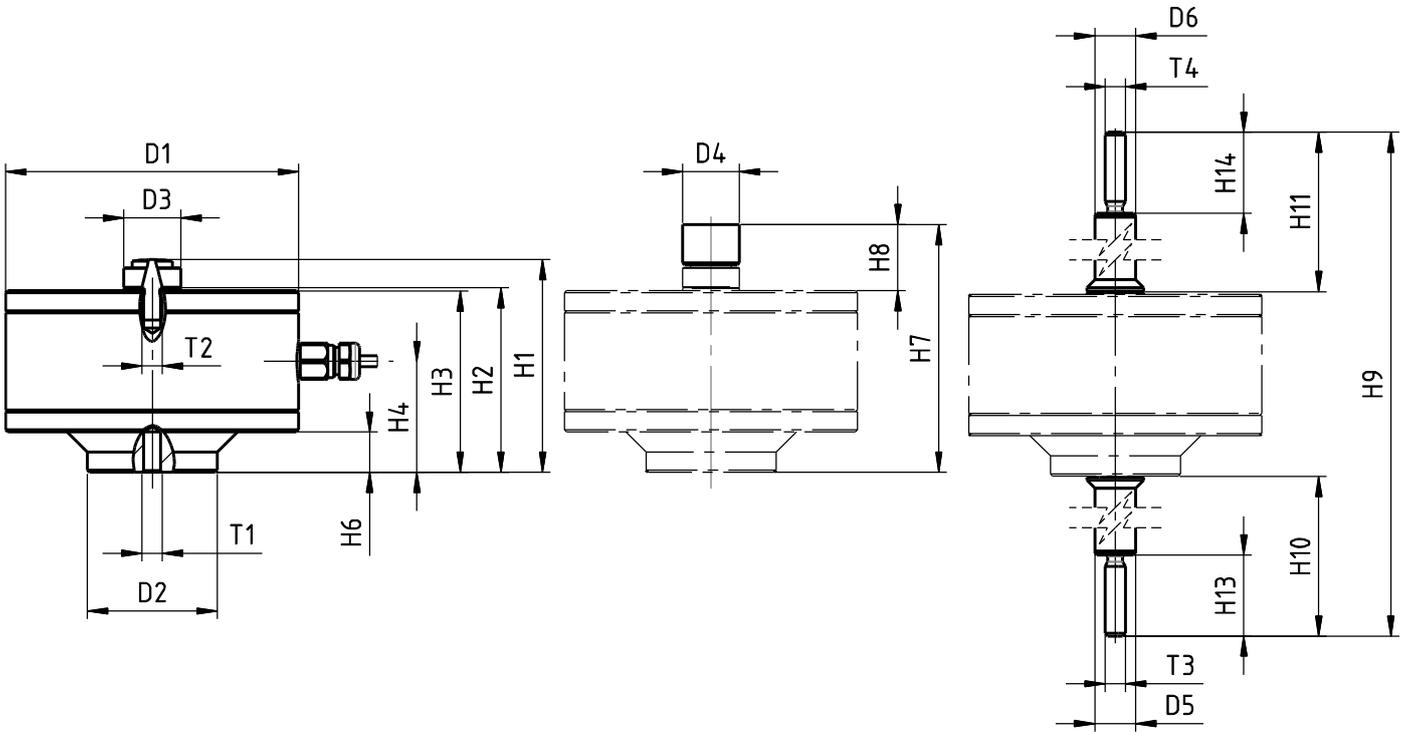
### 8.1 Assembly instruction

- ▶ Avoid mechanical strain on the cable and the connector.
- ▶ Wear gloves if you wish to touch the transducer during a series of measurements.
- ▶ Avoid a deformation of the assembly surfaces. This could affect the measurement.
- ▶ Screw the attaching parts with the total usable thread depth of the threaded adapter. The attachment must not rest on the measuring body.
- ▶ Pay attention to the cleanliness of the mounting surfaces and connections. They should be cleaned from dust and dirt before mounting and measuring, otherwise the measuring would be influenced.



# 9. Mating dimensions

## 9.1 Construction size 5 N – 100 N

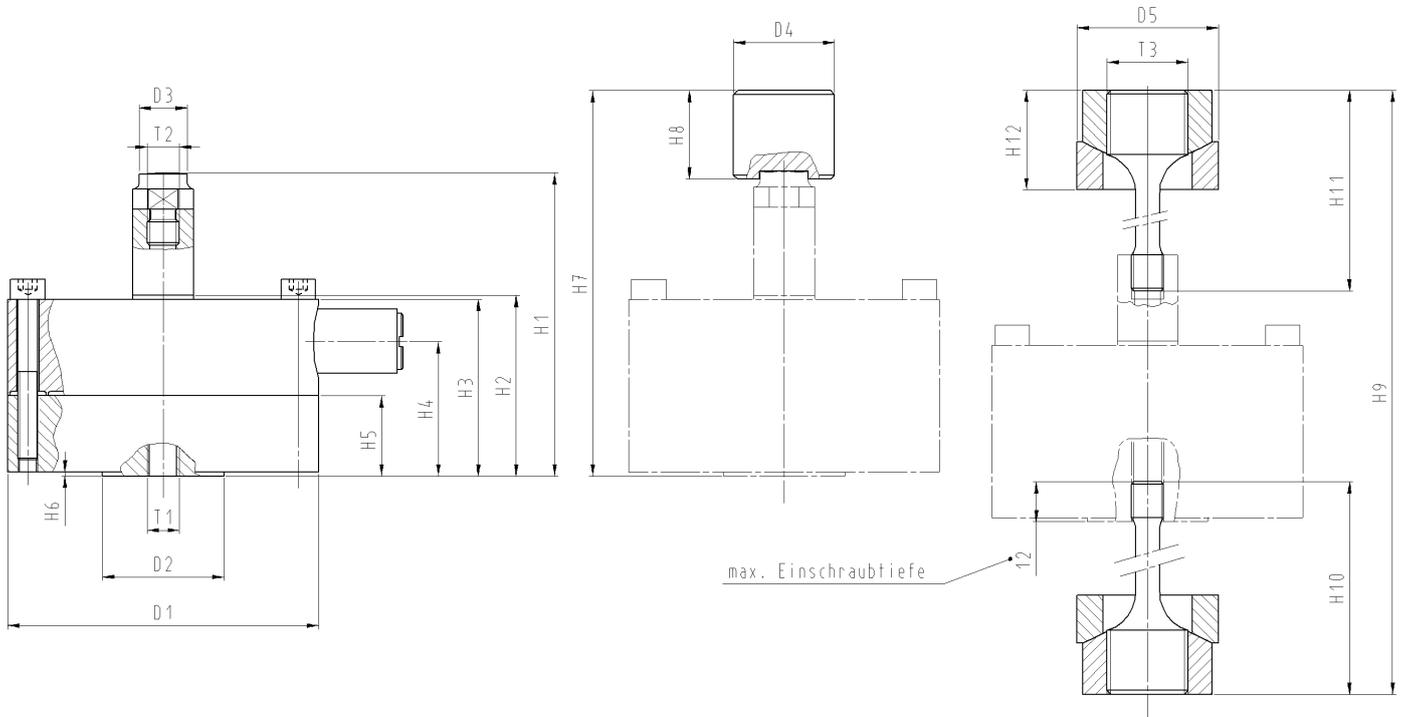


▶ Standard equipment

▶ Accessories: thrust piece

▶ Accessories: tension adaption

## 9.2 Construction size 200 N – 2500 N



▶ Standard equipment

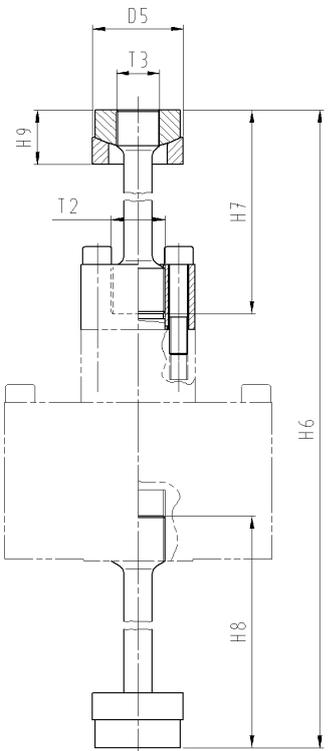
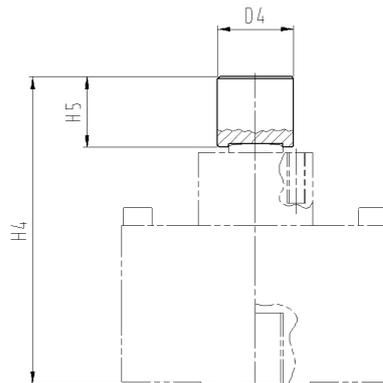
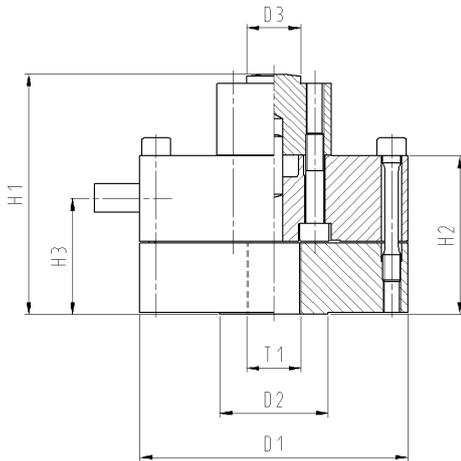
▶ Accessories: thrust piece

▶ Accessories: tension adaption

## 9.3 Dimensions of construction size 5 N – 2500 N

Nominal force compression/tension	$\pm F_{nom}$	N	5	10	20	50	100	200	500	1000	2500
Diameter	$\varnothing D_1$	mm			72					77	
Diameter	$\varnothing D_2$	mm			32					30	
Diameter	$\varnothing D_3$	mm			14				11.95 <sup>-0.05</sup>		
Diameter	$\varnothing D_4$	mm			14					25	
Diameter	$\varnothing D_5$	mm			10					35	
Diameter	$\varnothing D_6$	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					---	

## 9.4 Construction size 5 kN – 100 kN

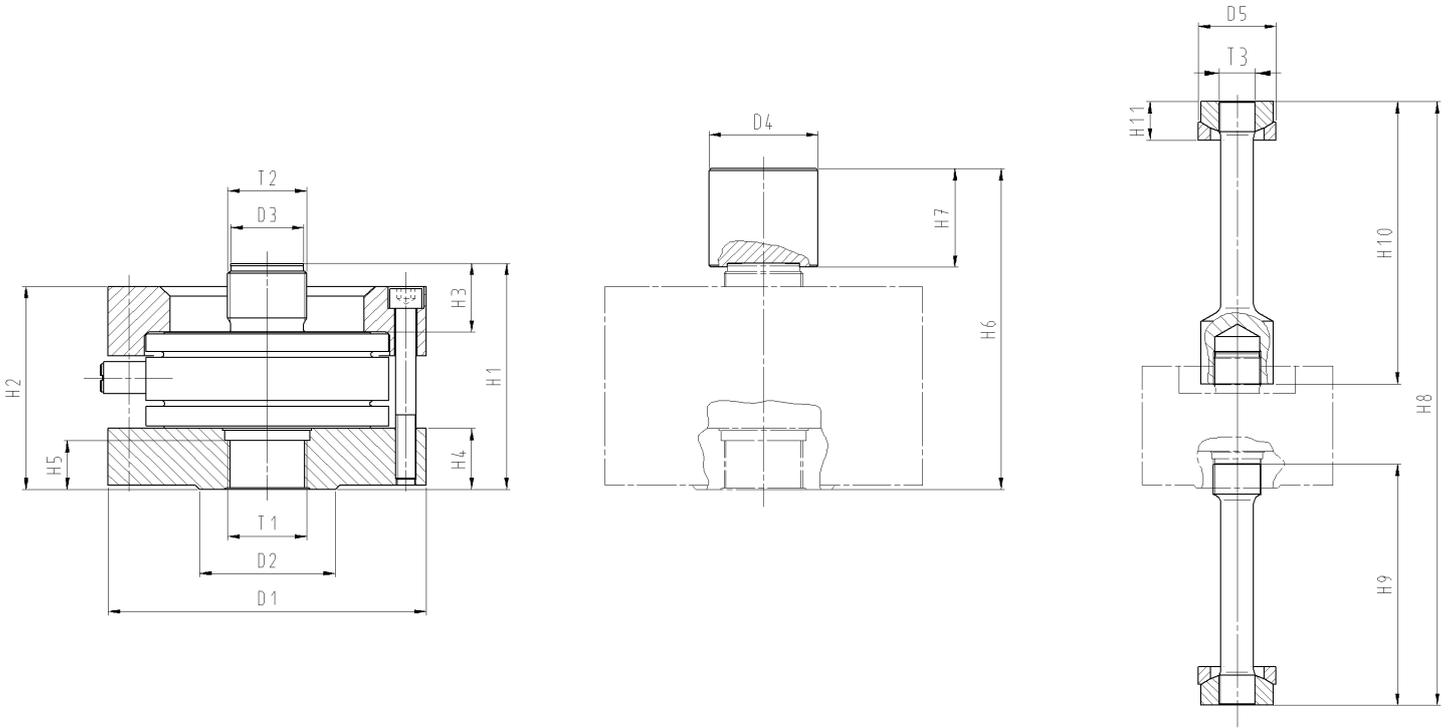


▶ Standard equipment

▶ Accessories: thrust piece

▶ Accessories: tension adaption

## 9.5 Construction size 200 kN – 500 kN

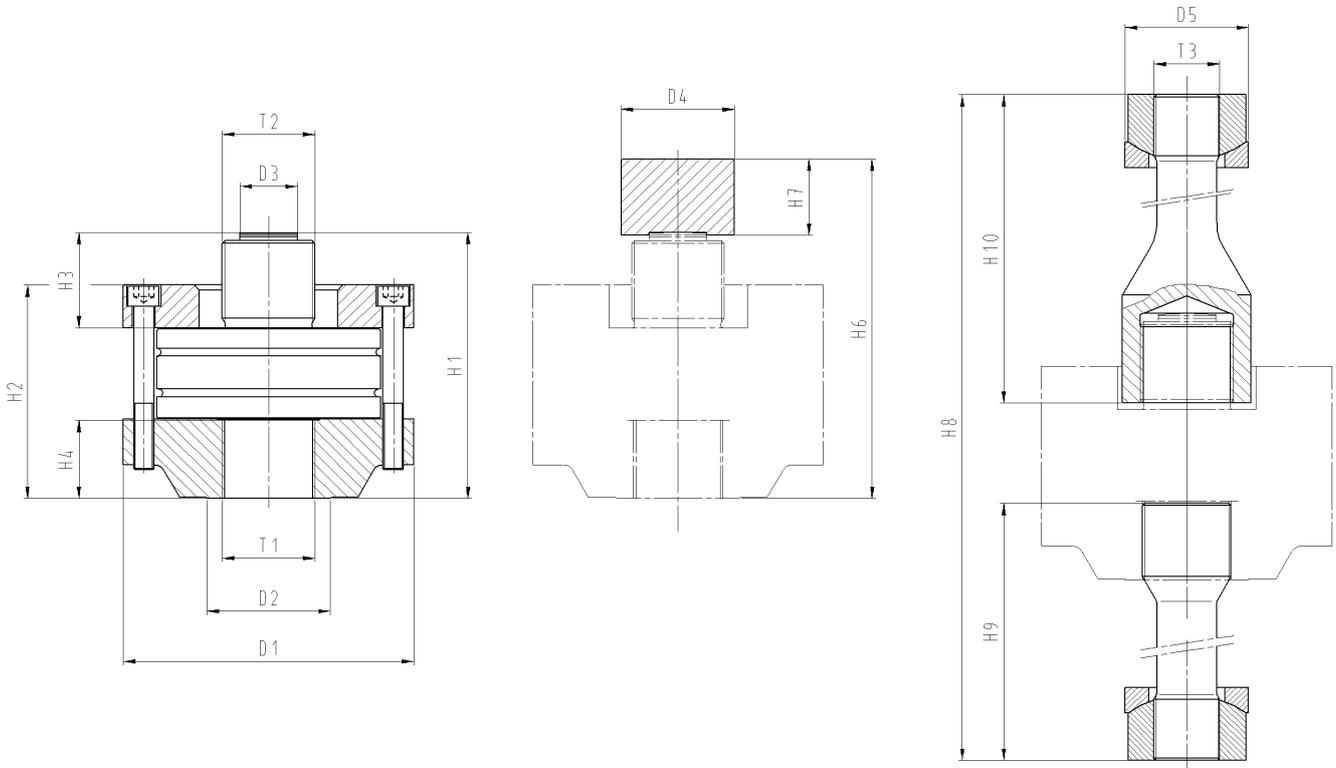


▶ Standard equipment

▶ Accessories: thrust piece

▶ Accessories: tension adaption

## 9.6 Construction size 1000 kN



▶ Standard equipment

▶ Accessories: thrust piece

▶ Accessories: tension adaption

## 9.7 Dimensions of construction size 5 kN – 1000 kN

Nominal force compression/tension	$\pm F_{nom}$	kN	5	10	20	50	100	200	500	1000
Diameter	$\varnothing D_1$	mm	77	95		101	148	157	245	335
Diameter	$\varnothing D_2$	mm	30	40		50	60	67	140	120
Diameter	$\varnothing D_3$	mm	11,95 <sup>-0,05</sup>	19,95 <sup>-0,05</sup>			25,95 <sup>-0,05</sup>	35,95 <sup>-0,05</sup>	56 <sup>-0,05/-0,1</sup>	56 <sup>-0,05</sup>
Diameter	$\varnothing D_4$	mm	25	30			42	54	110	
Diameter	$\varnothing D_5$	mm	35 <sub>c11</sub>			45 <sub>c11</sub>	50 <sub>c11</sub>	64 <sub>c11</sub>	90 <sub>c11</sub>	120 <sub>c11</sub>
Diameter	$\varnothing D_6$	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	24.8			25.4	30	210	356	340
Height	$H_{10}$	mm	---					234	342	370
Height	$H_{11}$	mm	---					32	71.4	

# 10. Technical Data

## 10.1 Class 00 | Construction size 5 N - 500 N

	Nominal force	$F_{nom}$	N	5	10	20	50	100	200	500
Metrological Data	Force measurement 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		$R_e$	$\Omega$	820   > 500						
Output resistance		$R_a$	$\Omega$	600 - 700   > 450						
Insulation resistance		$R_{is}$	$\Omega$	> $10^9$						
Operating range of excitation voltage		$B_{U,G}$	V	5 - 12						
Protection (DIN EN 60529)				54						
Mechanical Data	Mass <sup>1)</sup>	$m$	kg	0.35   1.3						
	Mass <sup>2)</sup>	$m$	kg	0.03   0.07						
	Mass <sup>3)</sup>	$m$	kg	0.03   0.07						
	Force limit		%	110						
	Breaking force		%	200						
	Permissible eccentricity	$e_G$	mm	2						
	Rated temperature range	$B_{T,nom}$	$^{\circ}C$	17 - 27						
Operating temperature range	$B_{T,G}$	$^{\circ}C$	10 - 35							

1) Force transducer

2) Compression load transmission

3) Tension load transmission

## 10.2 Class 00 | Construction size 1 kN - 1000 kN

Nominal force		$F_{nom}$	kN	1	2.5	5	10	20	50	100	200	500	1000
Metrological Data	Force measurement 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		$R_e$	$\Omega$	> 500	> 1100	> 1200	> 1300						
Output resistance		$R_a$	$\Omega$	> 450	> 900	> 1000	> 1100	> 1000	> 1100				
Insulation resistance		$R_{is}$	$\Omega$	> 10 <sup>9</sup>									
Operating range of excitation voltage		$B_{U,G}$	V	5 - 12									
Protection (DIN EN 60529)				54									
Mechanical Data	Mass <sup>1)</sup>	$m$	kg	1.4	1.3	3.1	3.5	10.5	10.1	45	100		
	Mass <sup>2)</sup>	$m$	kg	0.08		0.13		0.5	0.9	5.5	5.5		
	Mass <sup>3)</sup>	$m$	kg	0.2	0.3	0.35	0.5	1.7	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) Force transducer

2) Compression load transmission

3) Tension load transmission

## 10.3 Class 0,5 | Construction size 5 N - 500 N

Nominal force		$F_{nom}$	N	5	10	20	50	100	200	500
Metrological Data	Force measurement 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		$R_e$	$\Omega$	820   > 500						
Output resistance		$R_a$	$\Omega$	600 - 700   > 450						
Insulation resistance		$R_{is}$	$\Omega$	> $10^9$						
Operating range of excitation voltage		$B_{U,G}$	V	5 - 12						
Protection (DIN EN 60529)				54						
Mechanical Data	Mass <sup>1)</sup>	$m$	kg	0.35   1.3						
	Mass <sup>2)</sup>	$m$	kg	0.03   0.07						
	Mass <sup>3)</sup>	$m$	kg	0.03   0.07						
	Force limit		%	110						
	Breaking force		%	200						
	Permissible eccentricity	$e_G$	mm	2						
	Rated temperature range	$B_{T,nom}$	$^{\circ}C$	17 - 27						
	Operating temperature range	$B_{T,G}$	$^{\circ}C$	10 - 35						

1) Force transducer

2) Compression load transmission

3) Tension load transmission

## 10.4 Class 0,5 | Construction size 1 kN - 1000 kN

Nominal force		$F_{nom}$	kN	1	2.5	5	10	20	50	100	200	500	1000
Metrological Data	Force measurement 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		$R_e$	$\Omega$	> 500	> 1100	> 1200	> 1300						
Output resistance		$R_a$	$\Omega$	> 450	> 900	> 1000	> 1100	> 1000	> 1100				
Insulation resistance		$R_{is}$	$\Omega$	> 10 <sup>9</sup>									
Operating range of excitation voltage		$B_{U,G}$	V	5 - 12									
Protection (DIN EN 60529)				54									
Mechanical Data	Mass <sup>1)</sup>	$m$	kg	1.3	3.1	3.5	5.5	8.4	43	57			
	Mass <sup>2)</sup>	$m$	kg	0.07	0.11	1.1	1.8	2.2	7.4				
	Mass <sup>3)</sup>	$m$	kg	0.07	0.11	1.3	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) Force transducer

2) Compression load transmission

3) Tension load transmission

# 11. Technical support

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If problems arise while working with the product the following GTM services can be used:

## E-mail support

[contact@gtm-gmbh.com](mailto:contact@gtm-gmbh.com)

## Worldwide contact

GTM Testing and Metrology GmbH  
Philipp-Reis-Straße 4-6  
64404 Bickenbach  
Tel. +49 6257 9720-0  
Fax +49 6257 9720-77  
[www.gtm-gmbh.com](http://www.gtm-gmbh.com)

## Local contact in Czech Republic

GTM Praha s.r.o.  
Prosecká 811/76 a  
19000 Praha 9  
Czech Republic  
Tel. +420 286 891 392  
[info@gtm.cz](mailto:info@gtm.cz)  
[www.gtm.cz](http://www.gtm.cz)

## 12. Declaration of incorporation

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In accordance with EC Machinery Directive 2006/42/EC from May 17, 2006,  
Appendix II B

We,

**GTM Testing and Metrology GmbH  
Philipp-Reis-Straße 4-6  
64404 Bickenbach  
Deutschland**

hereby declare that the product

**Force Transfer Standard Series KTN-ZD**

complies with the following basic requirement:

- ▶ 2006/42/EG, Appendix II B      EC Machinery Directive
- ▶ 2004/108/EC                      EMC Directive

The special technical documents were created in accordance with Appendix VII, Part B of the EC Machinery Directive 2006/42/EC. Upon reasoned request we shall undertake to submit them to the market supervision authority in electronic form within an appropriate period.

The product delivered by us may only be put into operation if it has been determined that the machine into which the product is to be incorporated likewise complies with the provisions of the Machinery Directive.



Daniel Schwind, Technical Manager

Bickenbach, 30.06.2022



#precision wins

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Subject to change without notice. All information describes our products in general terms. They do not represent agreed quality in the sense of § 434 Para. 1 of the BGB (German Civil Code).

Illustrations may differ from originals.

