

Operating manual

Multicomponent Transducer Series MKA

Size
I - VI





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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) and the instructions and regulations contained in these installation and operating instructions.

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1. Product description

1.1 Designated use

The multicomponent transducer of the MKA series is to be used for measuring static and dynamic forces and torque vectors in test benches and test machines.

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 multicomponent 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

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 MKA 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 complete system.



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.

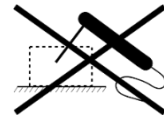
The transducer is not permitted for use in potentially explosive areas.



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:

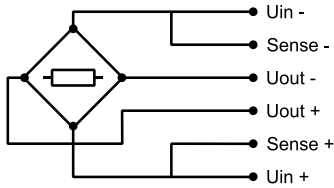
- Potentially explosive areas
- Power surges
- Welding circuits


3. Storage and transport instructions

The transducer series MKA 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



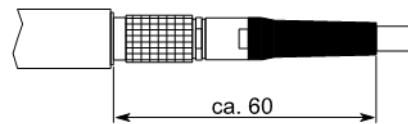
		Permanent connection ³⁾⁴⁾ end not connected		Steckbarer Kabelanschluss ¹⁾²⁾
		Grey cable Ø 6,5 mm 6 x 0,25 mm ² Temperature range: -35 °C to +90 °C	Black cable 6-wire Ø 2,9 mm 6 x 0,04 mm ² Temperature range: -50 °C to +105 °C	7-pin LEMO Series 0 Female: - Male: 
Connection		Color	Color	Pin
Supply voltage (+)	U _{in+}	blue	blue	3
Supply voltage (-)	U _{in-}	black	black	2
Measurement signal (+)	U _{out+}	white	white	1
Measurement signal (-)	U _{out-}	red	red	4
Sense (+)	Sense+	green	green	5
Sense (-)	Sense-	grey	yellow	6
Shielding		yellow	grey	Housing

1) View too weldingside

2) Female LEMO S.A. Typ: EGG.1B.307.CLL; Male: FGG.1B.307.CLA.D72

3) Gray cable with cable fitting PG7

4) Black cable with cable fitting M6



▶ permanent cable connection, end not connected

▶ pluggable cable connection

5. Application instructions

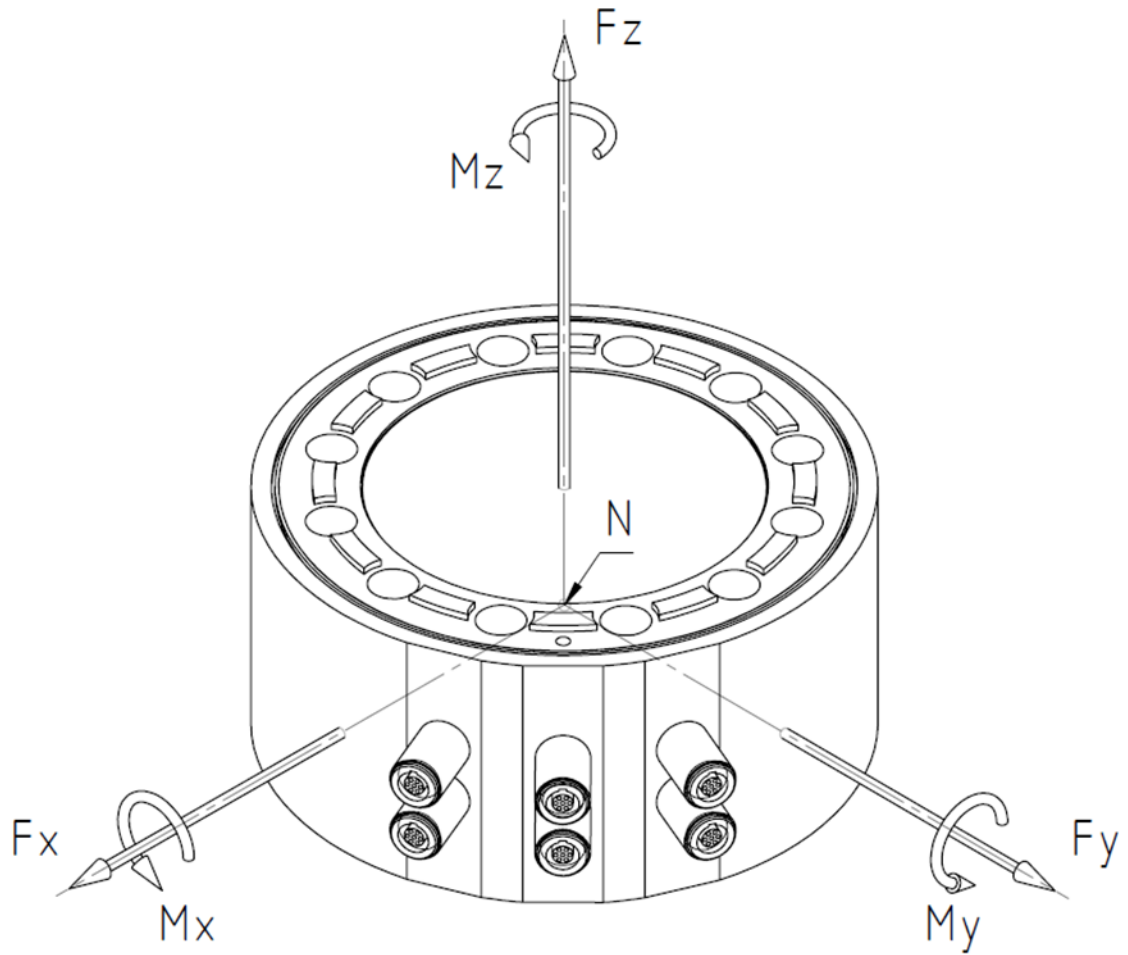
5.1 Assembly instruction

- ▶ Tighten the screws evenly and crosswise. For higher tightening torques, tighten the screws in stages.
- ▶ Avoid mechanical strain on the cable and the connector.
- ▶ Avoid a deformation of the assembly surfaces. This could affect the measurement.
- ▶ 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.

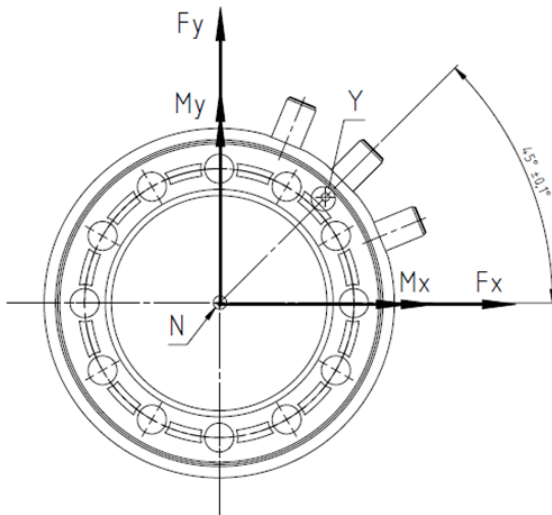
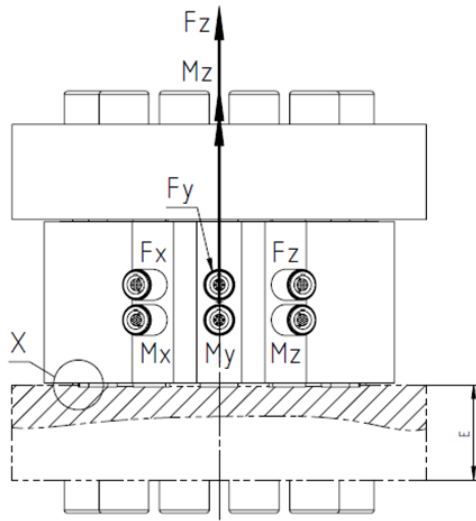
Size	Screw size	Screw quality	Fas tening torque	Surface pres sure ¹⁾
-	-	-	N·m	N/mm ²
I	M8	10.9	34	700
II	M12	10.9	117	800
III	M16	10.9	245	720
IV	M20	10.9	590	795
V	M20	12.9	710	800
VI	M30	10.9	2000	680

1) Surface pres sure on the contact area as a res ult of the max. Fas tening torque

- ▶ **Fastening torque for the screws**

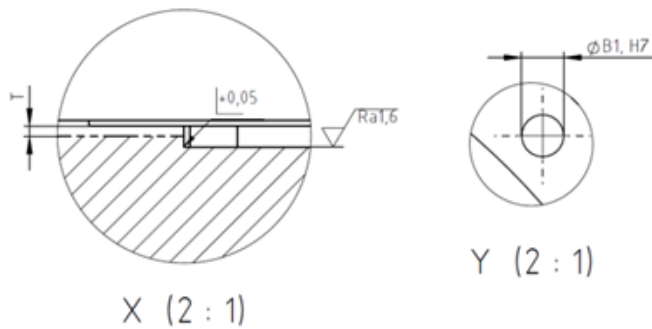


► Position of the coordinate cross



MKA Size		I	II	III	IV	V	VI
ØB1	mm	4 H7	4 H7	4 H7	4 H7	6 H7	8 H7
T	mm	1	1	1	1	2	2
E	mm	20	25	30	40	60	80

► Recommended plate thickness



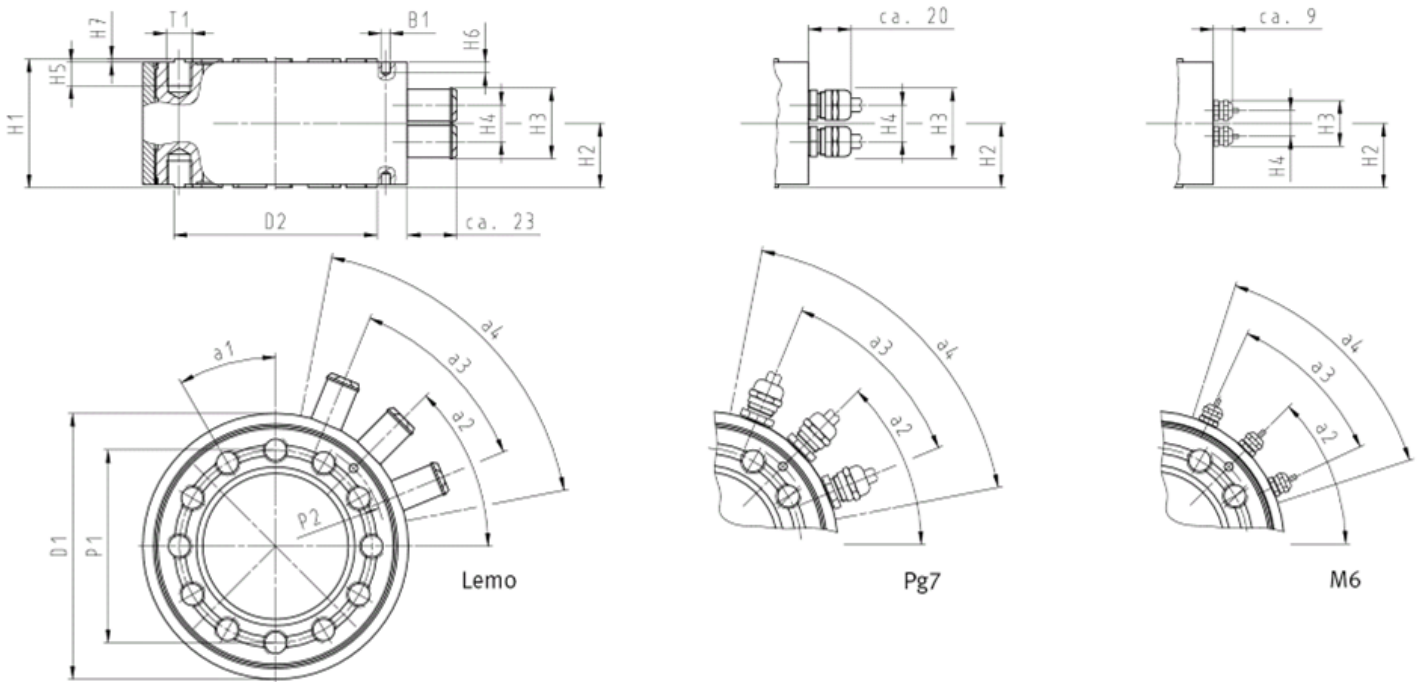
► Surface condition of the mounting area; centering hole on both sides

5.2 Definition of force and torque

A load on the top of the transducer in a positive direction result in a positive signal. Torque vectors are positive according to the „Right-Hand-Rule“.

The zero point [N] of the coordinate system is located in the geometric center of the transducer. Force vectors aligned through this point, doesn't cause a measurable torque M_x , M_y or M_z . On the other hand every vector, which doesn't aligned through the zero point cause a torque signal $F \cdot a$ (a is the distance from the zero point).

6. Mating dimensions



Typ Connection			I LEMO	I Pg7	I M6	II LEMO	II Pg7	II M6	III LEMO	III Pg7	IV LEMO	IV Pg7	V LEMO	V Pg7	VI LEMO	VI Pg7
Bore	$\varnothing B_1$	mm	4 H7										6 H7	8 H7		
Diameter	$\varnothing D_1$	mm	88			124			169		180		250		352	
Diameter	$\varnothing D_2$	mm	63-0.05			95-0.05			136-0.05		145-0.05		205-0.1		300-0.5	
Pitch circle diameter	$\varnothing P_1$	mm	60±0.1			90±0.1			130±0.1				200±0.2		280±0.2	
Centering diameter	$\varnothing P_2$	mm	68+0.05			103+0.05			145+0.05		155+0.05		220+0.05		315-0.05	
Thread	T_1		M8			M12			M16		M20				M30	
Height	H_1	mm	52			60			82		112		180		180	
Height	H_2	mm	26			30			41		56		90		90	
Height	H_3	mm	33		21	33		21	33				36			
Height	H_4	mm	17										20			
Height	H_5	mm	8			10.5			16		22		30		30	
Height	H_6	mm	5					7				8		10		
Height	H_7	mm	2										5		5	
Angle	a_1		12 x 30°												16 x 22.5° +11.25°	
Angle	a_2		45°										45°			
Angle	a_3		45°	40°	45°	40°	45°				20					
Angle	a_4		68°	54°	68°	54°	68°				30°					

7. Technical Data

7.1 Metrological Data

Metrological Data	Nominal force	F_{nom}	kN	100
	Accuracy class		%	0.2
	Linearity error	d_{lin}	%	0.2
	Hysteresis	h	%	0.1
	Repeatability (f.s.)		%	0.01
	Creep		%	0.05
	Temperature effect on characteristic value per 10 K	TK_C	%/10 K	0.025
	Temperature effect on zero signal per 10 K	TK_0	%/10 K	0.04
Electrical Data	Input resistance	R_e	Ω	400 - 800
	Output resistance	R_a	Ω	350 - 700
	Insulation resistance	R_{is}	Ω	$> 10^9$
	Operating range of excitation voltage	$B_{U,G}$	V	5 - 12
	Protection (DIN EN 60529)			IP 50 ¹⁾
Mechanical Data	Rated Displacement	s_{nom}	mm	2)
	Spring rigidity	c_{ax}	kN/mm	2)
	Mass	m	kg	2)
	Proportionate moving mass	m_{mess}	kg	2)
	Fundamental resonant frequency	f_G	kHz	2)
Limits	Force limit		%	2)
	Torque limit		%	2)
	Breaking force		%	2)
	Breaking torque		%	2)
	Rated temperature range	$B_{T,nom}$	°C	10 - 60
	Operating temperature range	$B_{T,G}$	°C	5 - 80

1) Permanent connection

2) Data depending on configuration. Data available on request

7.2 Load range

Size			I	II	III	IV	V	VI
Load range ¹⁾	F_{xy}	kN	0.3 - 30	1 - 80	2 - 200	3 - 300	5 - 500	25 - 500
Load range ¹⁾	F_z	kN	1 - 100	2 - 200	5 - 500	10 - 1000	20 - 1000	100 - 4000
Load range ¹⁾	M_{xy}	N·m	5 - 1500	25 - 5000	100 - 20000	250 - 25000	1000 - 100000	5000 - 200000
Load range ¹⁾	M_z	N·m	5 - 1000	25 - 5000	100 - 10000	250 - 15000	1000 - 25000	5000 - 200000

¹⁾ This specifies the minimum and maximum load of the component for which an MKA can be interpreted. Not every combination is possible.
For the best possible design for your application please contact us. Other special load ranges / designs on request

7.3 Configurations

MKA size			I	II	III	IV	V	VI	
	$\pm F_{nom}^{1)}$	kN	5	40	100	160	200	500	
	$\pm M_{nom}^{2)}$	N·m	250	3000	10000	15000	20000	50000	
Rated characteristic value	C_{Fx}, C_{Fy}	mV/V	2					1.6	
Rated characteristic value	C_{Fz}	mV/V	0.4					0.4	
Rated characteristic value	C_{Mx}, C_{My}	mV/V	2				1		
Rated characteristic value	C_{Mz}	mV/V	2				1		

¹⁾ F_x, F_y, F_z

²⁾ M_x, M_y, M_z

Other combinations of forces and moments are possible. The resulting nominal values are gladly given on request.

► Other combinations of forces and torques vectors are possible.

The resulting signals are gladly given on request.

8. Technical support

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

E-mail support

contact@gtm-gmbh.com

Worldwide contact

GTM Testing and Metrology GmbH
Philipp-Reis-Straße 4-6
64404 Bickenbach
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Fax +49 6257 9720-77
www.gtm-gmbh.com

Local contact in Czech Republic

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Prosecká 811/76 a
19000 Praha 9
Czech Republic
Tel. +420 286 891 392
info@gtm.cz
www.gtm.cz

9. Declaration of incorporation

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

Multicomponent Transducer Series MKA

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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Illustrations may differ from originals.

