

HOTTINGER BALDWIN MESSTECHNIK
HBM Mess- und Systemtechnik GmbH



Mounting Instructions

**Force Transducer with
S.G. Measurement System
Z30, Z30-G**

B 20.Z30.10 en

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Safety instructions

Use in accordance with the regulations

Z30, Z30–G type force transducers are used for high-precision force measurements and for force reference measurements (transfer standard). Use for any additional purpose shall be deemed to be **not** in accordance with the regulations.

In the interests of safety, the transducer should only be operated as described in the Mounting Instructions. It is also essential to observe the appropriate legal and safety regulations for the application concerned during use. The same applies to the use of accessories.

The transducer is not a safety element within the meaning of its use as intended. Proper and safe operation of this transducer requires proper transportation, correct storage, assembly and mounting and careful operation and maintenance.

General dangers of failing to follow the safety instructions

The Z30, Z30–G force transducer corresponds to the state of the art and is fail-safe. The transducers can give rise to remaining dangers if they are inappropriately installed and operated by untrained personnel.

Everyone involved with the installation, commissioning, maintenance or repair of a force transducer must have read and understood the Mounting Instructions and in particular the technical safety instructions.

Remaining dangers

The scope of supply and performance of the transducer covers only a small area of force measurement technique. In addition, equipment planners, installers and operators should plan, implement and respond to the safety engineering considerations of force measurement technique in such a way as to minimise remaining dangers. Prevailing regulations must be complied with at all times. There must be reference to the remaining dangers connected with force measurement technique.

In these mounting instructions remaining dangers are pointed out using the following symbols:

Symbol:  **DANGER**

Meaning: **Maximum danger level**

Warns of an **imminently** dangerous situation in which failure to comply with safety requirements **will result in** death or serious physical injury.

Symbol:  **WARNING**

Meaning: **Dangerous situation**

Warns of a **potentially** dangerous situation in which failure to comply with safety requirements **can result in** death or serious physical injury.

Symbol:  **ATTENTION**

Meaning: **Potentially dangerous situation**

Warns of a **potentially** dangerous situation in which failure to comply with safety requirements **could result in** damage to property or some form of physical injury.

Symbol:  **NOTE**

Means that important information about the product or its handling is being given.

Symbol: **CE**

Meaning: **CE mark**

The CE mark signals a guarantee by the manufacturer that his product meets the requirements of the relevant EC directives (see Declaration of conformity at the end of this document).

Prohibition of own conversions and modifications

The transducer must not be modified from the design or safety engineering point of view except with our express agreement. Any modification shall exclude all liability on our part for any damage resulting therefrom.

Qualified personnel

These transducers are only to be installed by qualified personnel strictly in accordance with the technical data and with the safety rules and regulations which follow. It is also essential to observe the appropriate legal and safety regulations for the application concerned. The same applies to the use of accessories.

Qualified personnel means persons entrusted with the installation, fitting, commissioning and operation of the product who possess the appropriate qualifications for their function.

Conditions on site

Protect the transducer from damp and weather influences such as rain, snow, etc.

Maintenance

The Z30, Z30–G force transducer is maintenance free.

Accident prevention

Although the specified nominal force in the destructive range is several times the full scale value, the relevant accident prevention regulations from the trade associations must be taken into consideration.

1 Scope of supply

- Force transducer Z30/Z30-G¹⁾²⁾
- Operating Manual Z30, Z30-G

Accessories (not included in the scope of supply)

- **DKD calibration certificate** according to EN10002-3
Order no. K-CAL-FD
(Class 00 according to DIN EN10002-3 resp. ISO376 guaranteed;
Specifications see Z30-G)
- **Knuckle eyes ZGW/ZGOW**
for 50 N to 1000 N: Order no. 1-U1R/200kg/ZGW
for 2 kN to 10 kN: Order no. 1-U2A/1t/ZGUW
- **Thrust piece**
(recommended for precision measurements, for example
EN10002-3-Calibrations)
for 50 N to 1000 N: EDO3/1kN Order no. 3-9219.0741
for 2 kN to 10 kN: EDO4/50kN Order no. 3-9219.0719
- **Load button**
for 50 N to 1000 N: Order no. 1-U1R/200kg/ZL
for 2 kN to 10 kN: Order no. 3-9202.0140
- **Cable/male connector**
Connection cable Kab 139A-6, 6m, with cable socket 723 and
unterminated;
Order number: 1-KAB139A-6
Connector MS3106PEMV fitted to Kab139A;
Order number: D-MS/MONT
15-pin D-Sub connector (male) fitted to Kab139A;
Order no.: D-15D/MONT

1) Z30-G is only available in conjunction with DKD calibration carried out by HBM according to EN10002-3.

2) The calibration certificate must be ordered separately (see accessories).

2 Application notes

Force transducer Z30:

Series Z30 precision force transducers measure tensile and compressive forces.

They measure static and quasi-static forces with great accuracy and reproducibility and therefore require judicious handling. You must be particularly vigilant when transporting and installing the devices. If the transducers are dropped or jolted, permanent damage could be caused.

Z30–G force transducers complete with DKD certificate from HBM:

Force transducer calibrated to guaranteed class 00 according to DIN EN10002–3 or ISO / FDIS 376.

As standard these transducers are **calibrated in the tensile direction**. On request they can also be calibrated in the compressive direction to DKD standards.

The limits for permissible mechanical, thermal and electrical stresses are stated in the specifications. Be sure to allow for them when planning, installing and operating the measurement configuration .

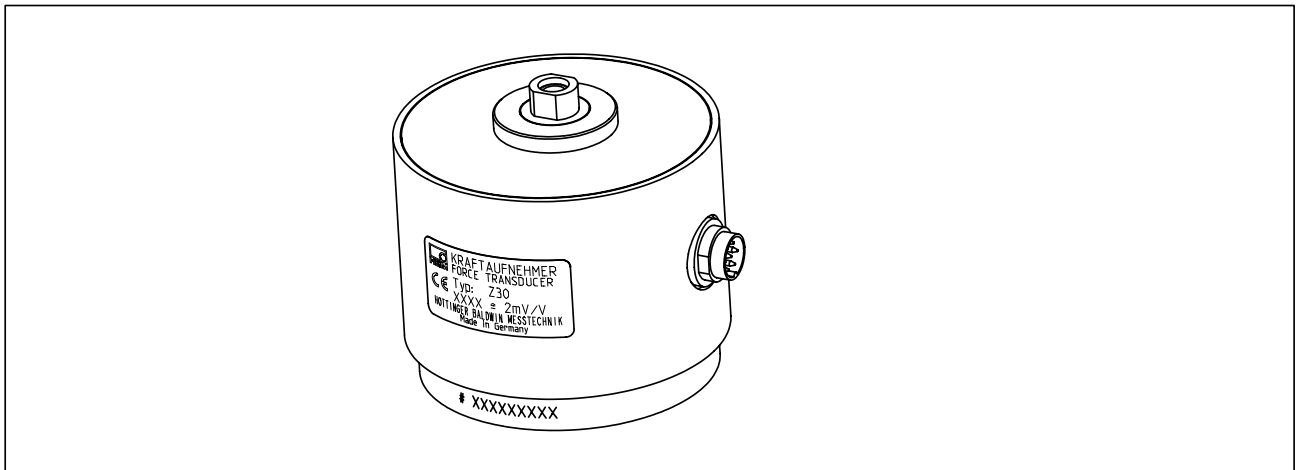
3 Structure and mode of operation

3.1 Measuring body

The measuring body comprises a system of measuring springs with strain gauges (dual-beam spring element principle).

3.2 Housing

The enclosure provides protection against splashes and minor impacts.



3.3 Disturbance variables

Torsion, bending and transverse load are disturbance variables and are therefore to be avoided. If necessary they can be remedied with HBM mounting accessories (chapter 5.3).

The effects of temperature on the zero signal (S.G. bridge and housing) and on the sensitivity are compensated.

Changes in the ambient pressure act as additive (subtractive) forces. These are scarcely of importance when compared with large nominal loads.

4 Conditions on site

4.1 Ambient temperature

The effects of temperature on the zero signal and on the sensitivity are compensated. To achieve optimal measurement results the nominal temperature range must be maintained. Temperature-induced measurement errors can be caused by uneven cooling or heating (for example by radiant heat). A radiation shield and all-round heat insulation bring about marked improvements. They must not form a force shunt.

4.2 Moisture

Extreme humidity or a tropical climate should be avoided if this means that the classified limit values are exceeded (degree of protection IP50 under DIN EN 60529).

4.3 Air pressure

Changes in air pressure have no effect on the force transducer since it is not hermetically sealed.

4.4 Chemical effects

The aluminium enclosures of the transducers is protected by a powder coating. If used in difficult environmental conditions (direct weather effects, contact with media which encourage corrosion) additional protective measures should be employed by the user.

5 Mechanical installation

5.1 Important precautions during installation

- treat the transducer gently
- if measuring compressive forces, make sure there is a solid support structure
- the force-introduction surfaces must be scrupulously clean and fully load-bearing
- keep to the depths of engagement for threaded rods or knuckle eyes
- do not overload the transducer.



WARNING

If there is a risk of breakage through overload on the transducer and thus a risk to persons, additional safety measures are to be taken.

5.2 General installation guidelines

The measurement direction in which forces act on the transducer must be as precise as possible.



WARNING

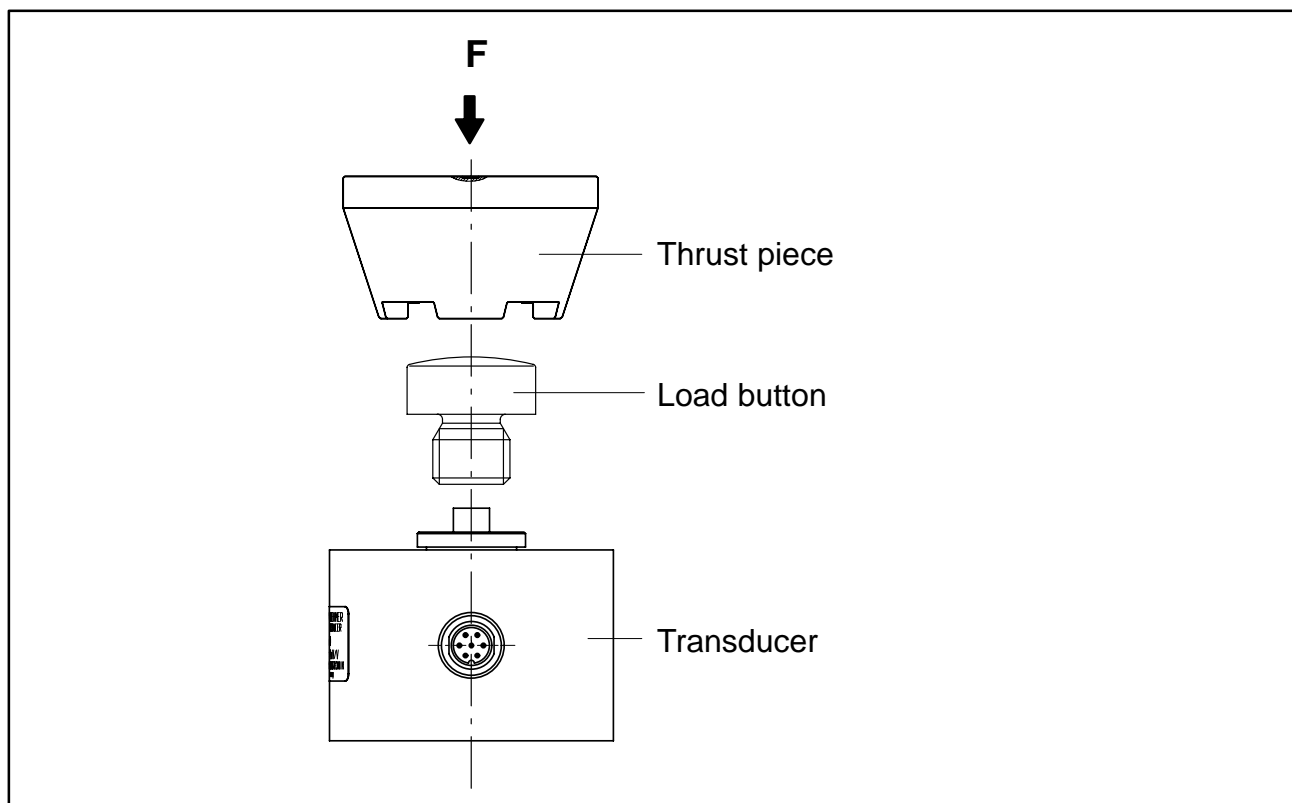
Torsion and bending moments, eccentric loading and transverse forces result in measurement errors and if limit values are exceeded, could destroy the transducer.

5.3 Mounting accessories for tensile loading/compressive loading

Knuckle eyes are available for installing with the Z30. These mounting accessories prevent the introduction of torsional moments into the transducer. Using two knuckle eyes will also exclude bending moments, shear loading and eccentric loading. Knuckle eyes are mainly provided to deal with **static tensile loading** on the transducer.

For **dynamic loading**, Z30 transducers must be installed free from play. Knuckle eyes have only limited application in the case of dynamic loading, since alternating dynamic stress increases the play in the universal joints and falsifies the measured value. It also produces a self-amplifying load cycle which can destroy the knuckle eyes. The breaking force is only 150% F_{nom} . Thrust pieces EDO3/1kN or EDO4/50kN (see page 21) and two load buttons (see page 20) are available for introducing compressive forces.

5.3.1 Installation drawing for compressive loading



Transducer	Load button	Thrust piece
Z30 / 50 N – 1000 N	1-U1R/200kg/ZL	EDO3/1kN
Z30 / 2 kN – 10 kN	3-9202.0140	EDO4/50kN

6 Electrical connection

6.1 Instructions for cabling

- Always use shielded, low-capacity measurement cable (HBM cables meet these requirements).
- Do not lay measurement cable parallel to high-voltage power lines or control circuits. If this is not possible (e.g. in cable ducts) protect the measurement cable, e.g. with armoured steel tube and maintain a minimum distance of 50 cm from the other cables. High-voltage power lines and control lines should be twisted (15 turns per metre).
- Avoid stray fields of transformers, motors and contactors.
- Do not earth transducer, amplifier and display device more than once. All the devices in the measurement chain are to be connected to the same earthed conductor.
- The screen of the connection cable is connected to the transducer housing.

6.2 Pin assignment

Two 7-pin male device connectors are located on the enclosure (male connectors, Series 723, see pages 17 and 18). To avoid creating force bypasses through the cable, you can use either the lower or the lateral connector, depending on the configuration.

If the transducer is connected according to the following connection diagram then when the transducer has compressive loading the output voltage at the measuring amplifier is positive.

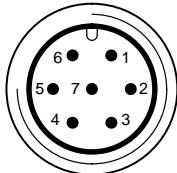
	Pin on male connector	Assignment	Wire colour
<p>Top view</p>  <p>Male connector, series 723</p>	1	Measurement signal (+)	WH
	2	Excitation voltage (-)	BK
	3	Excitation voltage (+)	BU
	4	Measurement signal (-)	RD
	5	No function	-
	6	Sensor circuit (+)	GN
	7	Sensor circuit (-)	GY

Fig. 6.1: Male connector, series 723 (screwed)

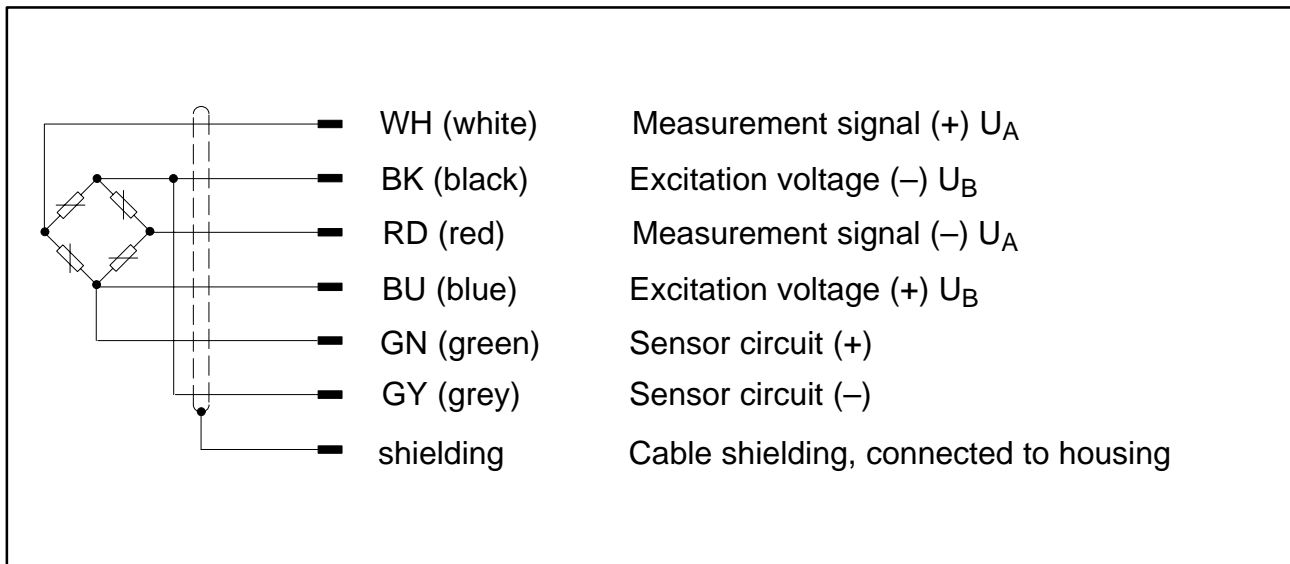


Fig. 6.2: Pin assignment on the unterminated Z30/Z30-G (for KAB139A-6 connection cable)

7 Specifications

Type	Z30 / Z30-G									
Data according to VDI standards 2638										
Nominal force	F_{nom}	N	50	100	200	500	1000	2k	5k	10k
Accuracy class	0.03									
Nominal sensitivity	C_{nom}	mV/V	2							
rel. sensitivity deviation (pressure)	d_c	%	0.1							
rel. tensile/compressive force sensitivity difference	d_{zd}	%	0.1							
rel. zero signal deviation	$d_{s,0}$	%	0.2	0.1				0.1		
rel. zero point compensation ¹⁾	f_0	%	0.012							
Rel. range (0.2F_{nom} to F_{nom}) at:¹⁾										
unchanged mounting position	b_i	%	0.03 (typically 0.02)							
different mounting positions	b	%	0.05 (typically 0.03)							
Hysteresis (0.2F_{nom} to F_{nom})¹⁾	u	%	0.1							
Linearity deviation	d_{lin}	%	0.03							
Effect of temperature on sensitivity/10K by reference to sensitivity¹⁾	TK_c	%	0.03							
Effect of temperature on zero signal/10K by reference to sensitivity¹⁾	TK_0	%	0.03							
Effect of lateral forces (lateral force 10% F_{nom})	d_Q	%	0.1							
Effect of eccentricity per mm	d_E	%	0.03							
Rel. creep over 15 min	d_{crF+E}	%	0.03							
Input resistance	R_e	Ω	>345				>690			
Output resistance	R_a	Ω	300–500				600–800			
Isolation resistance	R_{is}	Ω	>5·10 ⁹							
Reference excitation voltage	U_{ref}	V	5							
Operating range of the excitation voltage	$B_{U,G}$	V	0.5 ... 12							
Nominal temperature range	$B_{t,nom}$	°C	+10...+40							
Operating temperature range	$B_{t,G}$	°C	-10...+70							
Storage temperature range	$B_{t,S}$	°C	-25...+85							
Reference temperature	t_{ref}	°C	+23							
Max. operational force	(F_G)	%	120				150			
Limit force	(F_L)	%	150							
Breaking force	(F_B)	%	250							
Static lateral limit force	(F_Q)	%	60							

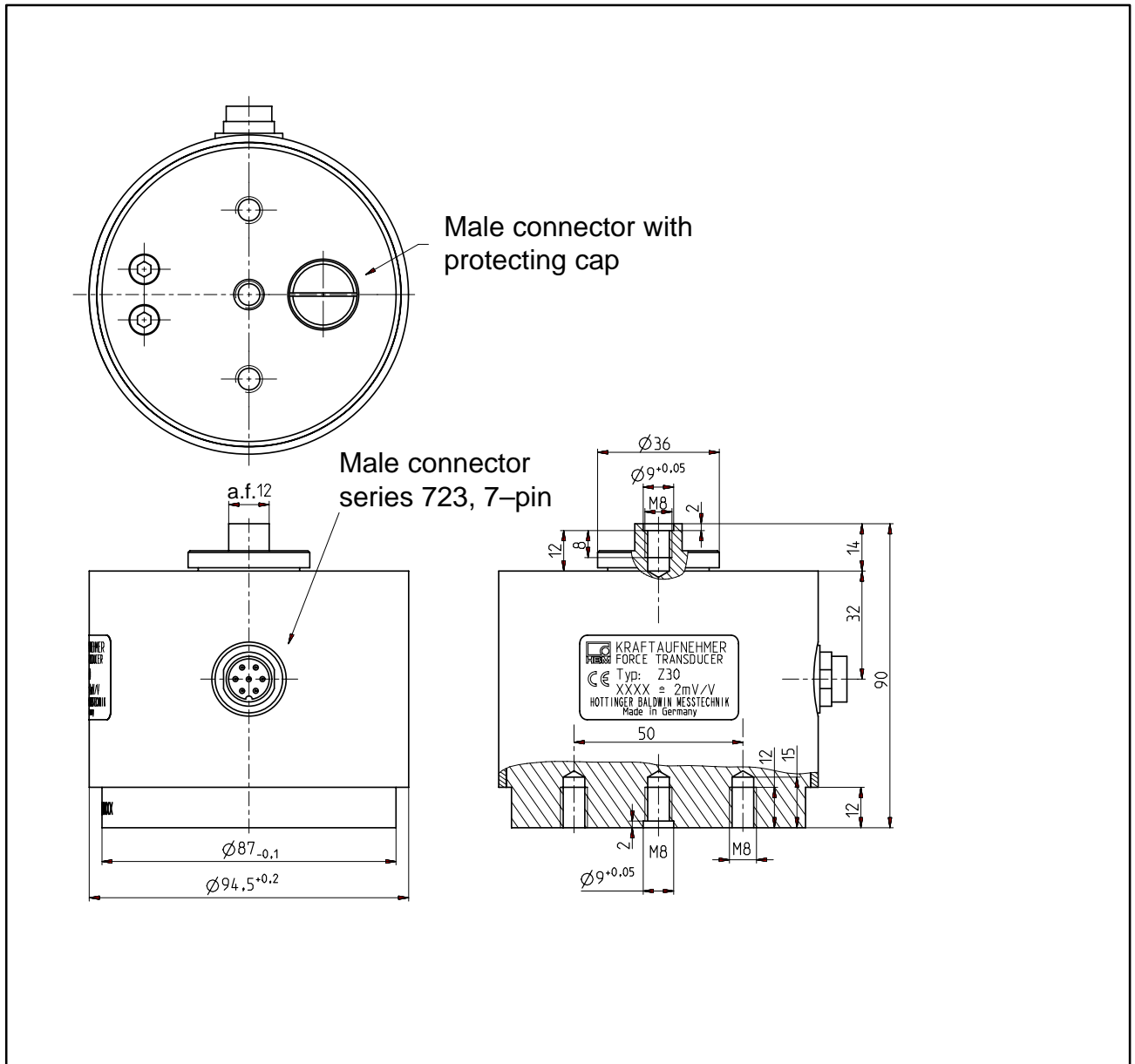
¹⁾ See supplementary information according to DIN EN10002-3 resp. ISO378 for Z30-G on following page

Nominal force	F_{nom}	N	50	100	200	500	1000	2k	5k	10k
Nominal xxxxx	M_G	Nm	1,5	3	5	5	5	80		
Nominal displacement	S_{nom}	mm	< 0.4					approx. 0.2		
Fundamental resonance frequency	f_G	kHz	0.2	0.3	0.5	0.9	1.1	1.1	1.1	1.25
Weight		kg	appr.1					appr. 2.3		
Rel. permissible vibrational stress	F_{rb}	%	70							
Cable length, six-wire technique		m	6m as standard, see Accessoires							
Degree of protection to DIN EN60529			IP50							

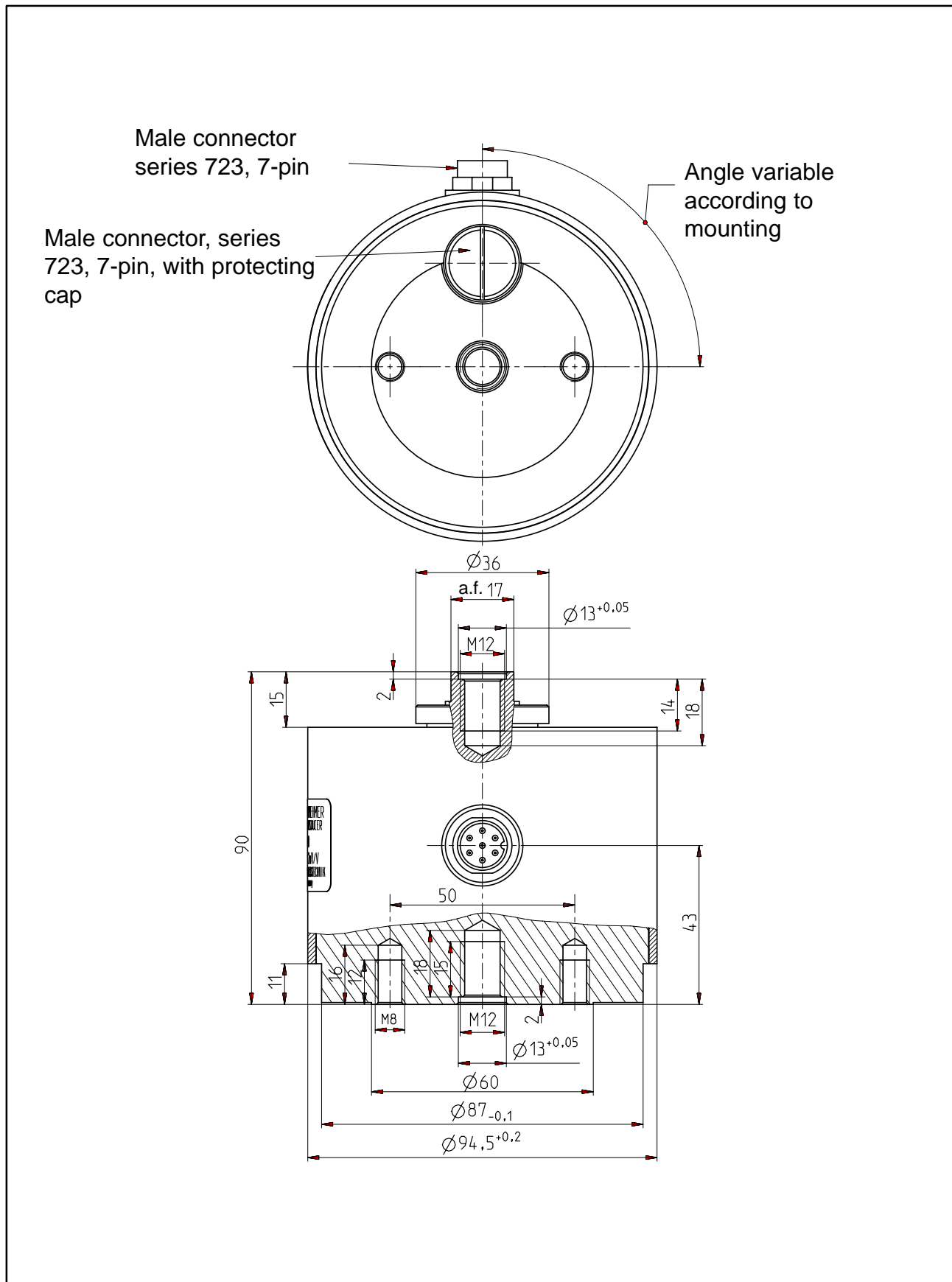
Supplementary information according to EN10002-3 for Z30-G²⁾											
Nominal force	F_{nom}	N	50	100	200	500	1000	2k	5k	10k	
Class according to EN 10002-3 or ISO376			00								
rel. zero point compensation (zero signal return)	f_o	%	< 0.008								
Rel. range (0.1F_{nom} to F_{nom}) at:											
unchanged mounting position	b_i	%	< 0.02 (typically < 0.01)								
different mounting positions	b	%	< 0.03 (typically < 0.02)								
Hysteresis (0.1F_{nom} to F_{nom})	u	%	< 0.04								
Effect of temperature on sensitivity/10K by ref. to sensitivity	TKc	%	< 0.02					< 0.02 (typ.0.01)			
Effect of temperature on zero signal/10K by ref. to sensitivity	TK0	%	< 0.02					< 0.02 (typ.0.01)			

²⁾ Z30-G is only available in conjunction with DKD calibration carried out by HBM according to EN10002-3.

8 Dimensions Z30, Z30-G (50 N – 1000 N)

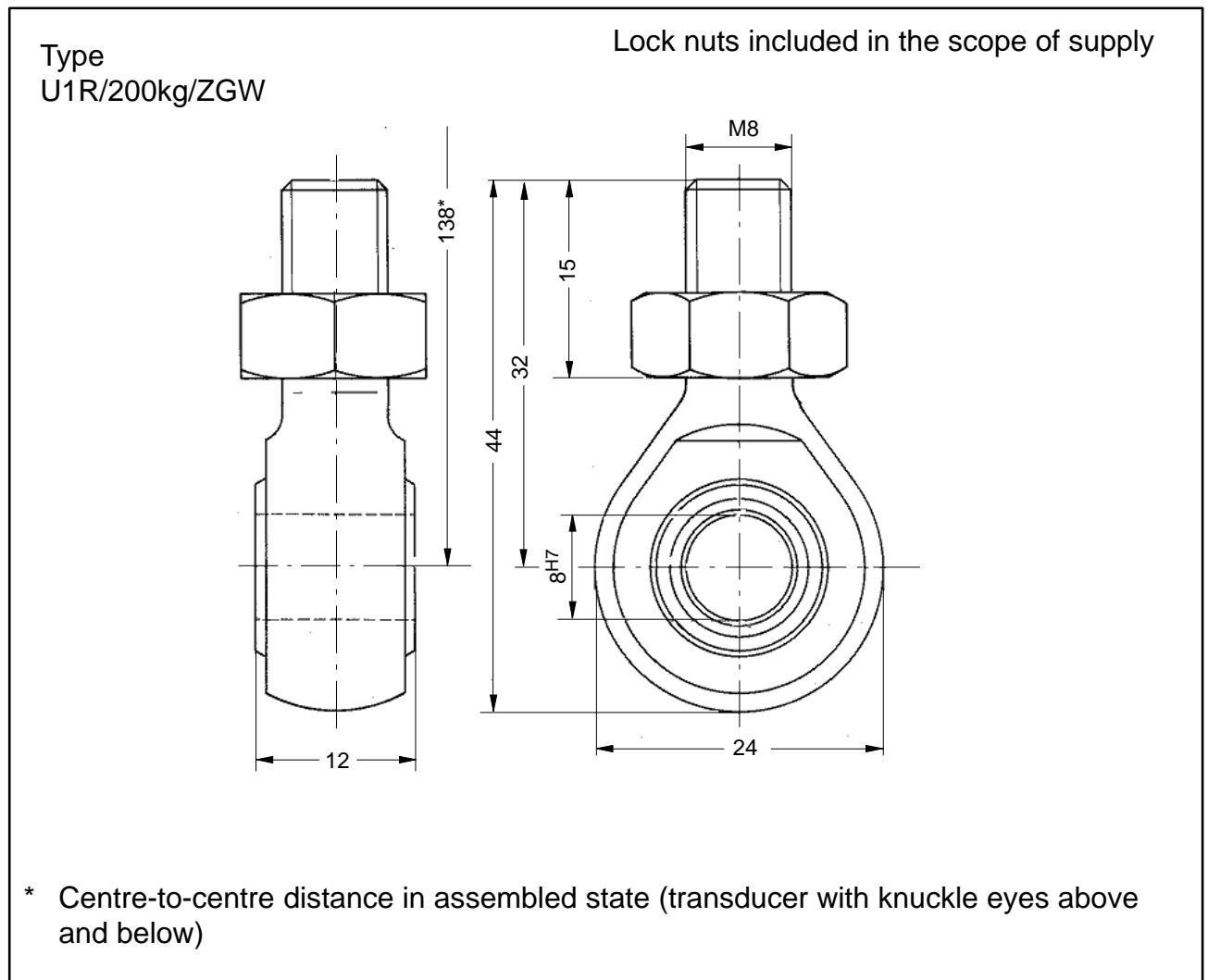


Dimensions Z30, Z30-G (2 kN – 10 kN) (continued)



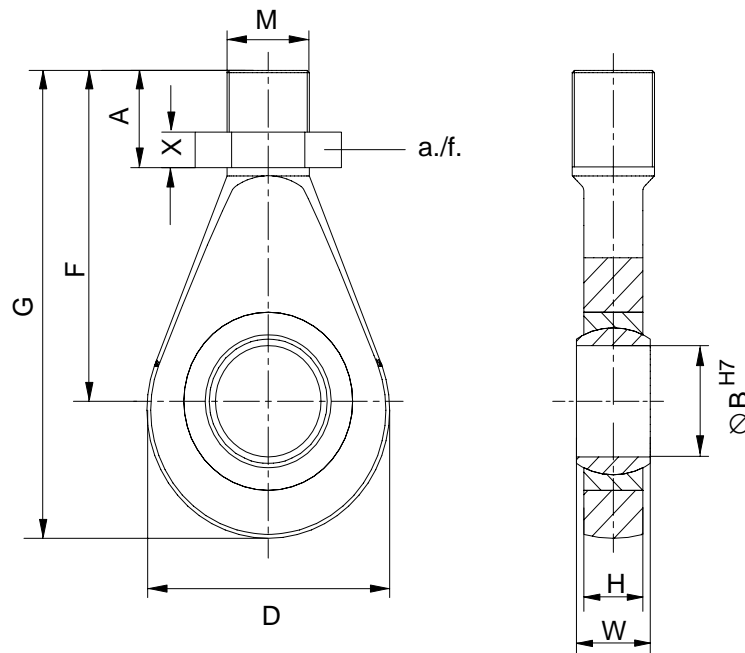
Accessories:

Knuckle eye ZGOW for nominal load 50 N to 1000 N



Accessories:**Knuckle eye ZGUW for nominal load 2 kN to 10 kN**

Type U2A/1t/ZGUW

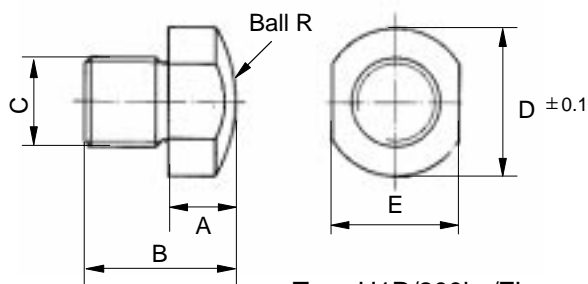


Material: quenched and tempered steel, galvanised; anti-friction bearing steel and PTFE/bronze fabric foil

Nominal force (kN)	A	ØB ^{H7}	D	F	G	H	M	X	W	a./f.	Weight (kg)
0.5 ... 10	33.5	12	32	54.5	70.5	12	M12	7	16	19	0.1

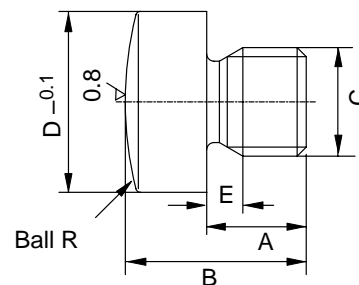
Load button for compressive loading

Nominal load 50 N – 1 kN



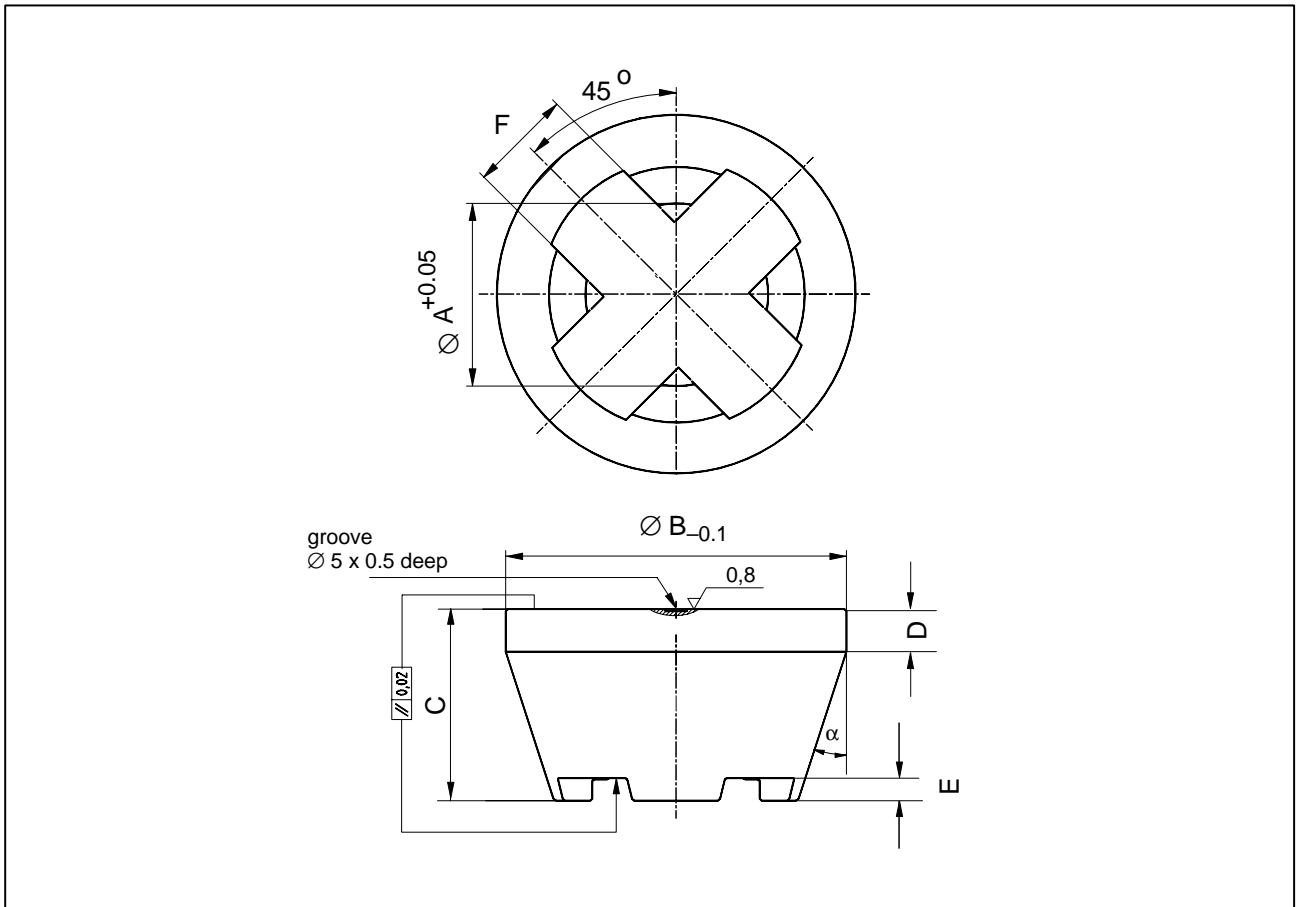
Type U1R/200kg/ZL

Nominal load 2 kN – 10 kN



Nominal force	A	B	C	D	E	R	Weight (kg)
50 N ... 1 kN	8	15	M8	13	11	16	0.1
2 kN ... 10 kN	11	20	M12	20	4	40	0.026

Thrust piece EDO4/EDO3 for precision measurements, for example, DIN EN10002-3 or ISO376 calibrations



Type	Thrust piece	Weight (kg)	$\varnothing A$	$\varnothing B$	C	D	E	F	α
Z30/ 50 N...1000 N	EDO3/1 kN	approx. 0.2	13.2	37	20	6	3	8	18°
Z30/ 2 kN...10 kN	EDO4/50 kN	0.34	20.2	48	29	8	5	12	18°

9 Declaration of conformity



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spectris group

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Konformitätserklärung

Declaration of Conformity

Déclaration de Conformité

Document: 159/06.2000

Wir,

We,

Nous,

HBM Mess- und Systemtechnik GmbH, Darmstadt

erklären in alleiniger Verantwortung,
dass das Produkt

declare under our sole
responsibility that the product

déclarons sous notre seule
responsabilité que le produit

Kraftaufnehmer

Typenreihe Z30, Z30-G

auf das sich diese Erklärung
bezieht, mit der/den folgenden
Norm(en) oder normativen
Dokument(en) übereinstimmt (siehe
Seite 2) gemäß den Bestimmungen
der Richtlinie(n)

to which this declaration relates is
in conformity with the following
standard(s) or other normative
document(s) (see page 2)
following the provisions of
Directive(s)

auquel se réfère cette déclaration
est conforme à la (aux) norme(s) ou
autre(s) document(s) normatif(s)
(voir page 2) conformément aux
dispositions de(s) Directive(s)

89/336/EWG - *Richtlinie des Rates vom 3. Mai 1989 zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über die elektromagnetische Verträglichkeit, geändert durch 91/263/EWG, 92/31/EWG, 93/68/EWG und 93/97/EWG*

Die Absicherung aller produkt-spezifischen Qualitätsmerkmale erfolgt auf Basis eines von der DQS (Deutsche Gesellschaft zur Zertifizierung von Managementsystemen) seit 1986 zertifizierten Qualitätsmanagementsystems nach DIN ISO 9001 (Reg. Nr. DQS-00001). Die Überprüfung der sicherheits-relevanten Merkmale (Elektromagnetische Verträglichkeit, Sicherheit elektrischer Betriebsmittel) führt ein von der DATech erstmals 1991 akkreditiertes Prüflaboratorium (Reg. Nr. DAT-P-006 und DAT-P-012) unabhängig im Hause HBM durch.

All product-related features are secured by a quality system in accordance with DIN ISO 9001, certified by DQS (Deutsche Gesellschaft zur Zertifizierung von Managementsystemen) since 1986 (Reg. No. DQS-00001). The safety-relevant features (electromagnetic compatibility, safety of electrical apparatus) are verified at HBM by an independent testing laboratory which has been accredited by DATech in 1991 for the first time (Reg. Nos. DAT-P-006 and DAT-P-012).

Chez HBM, la détermination de tous les critères de qualité relatifs à un produit spécifique est faite sur la base d'un protocole DQS (Deutsche Gesellschaft zur Zertifizierung von Managementsystemen) certifiant, depuis 1986, notre système d'assurance qualité selon DIN ISO 9001 (Reg. Nr. DQS-00001). De même, tous les critères de protection électrique et de compatibilité électromagnétique sont certifiés par un laboratoire d'essais indépendant et accrédité depuis 1991 (Reg. Nr. DAT-P-006 et DAT-P-012).

Darmstadt, 2000-06-07

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Document: 159/06.2000

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

This declaration certifies conformity with the Directives listed above, but is no asseveration of characteristics.
Safety directions of the delivered product documentation have to be followed.

Cette déclaration atteste la conformité avec les directives citées mais n'assure pas un certain caractère.
S.v.p. observez les indications de sécurité de la documentation du produit ajoutée.

Folgende Normen werden zum Nachweis der Übereinstimmung mit den Vorschriften der Richtlinie(n) eingehalten:

The following standards are fulfilled as proof of conformity with the provisions of the Directive(s):

Pour la démonstration de la conformité aux disposition de(s) Directive(s) le produit satisfait les normes:

EN 50082-2 : 1995

Elektromagnetische Verträglichkeit (EMV); Fachgrundnorm Störfestigkeit; Teil 2: Industriebereich; Deutsche Fassung

EN 55011 : 1998

Funk-Entstörung von Elektrischen Betriebsmitteln und Anlagen; Grenzwerte und Meßverfahren für Funkstörungen von industriellen, wissenschaftlichen und medizinischen Hochfrequenzgeräten (ISM-Geräten); Deutsche Fassung, Klasse B

Optionen

Nennkraft: **50N, 100N, 200N, 500N, 1000N, 2kN, 5kN, 10kN**



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