

HOTTINGER BALDWIN MESSTECHNIK
HBM Mess- und Systemtechnik GmbH



Mounting Instructions

Force transducer
U1A

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Contents	Page
Safety instructions	3
1 Scope of supply	7
2 Application	7
3 Construction and principle of measurement	8
4 Installation	8
4.1 Ambient conditions	8
4.1.1 Moisture	8
4.1.2 External pressure	9
4.1.3 Deposits	9
4.2 Mounting	10
4.2.1 General installation guidelines	10
4.2.2 Installation for compressive/tensile loading	10
4.2.3 Installation for tensile loading	11
5 Electrical connection	13
6 Specifications	15
7 Dimensions	16
8 Declaration of conformity	18

Safety instructions

Use in accordance with the regulations

The U1A force transducer is to be used exclusively for force measurement tasks and directly related control tasks. 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 U1A 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: **Potentially 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: **CAUTION**

Meaning: **Possibly 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 mark**

The CE mark enables the manufacturer to guarantee that the product complies with the requirements of the relevant EC directives (see Declaration of Conformity at the end of this document).

Unauthorised conversions and modifications are prohibited

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 and used by qualified personnel, strictly in accordance with the technical data and the safety requirements and regulations listed below. 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 U1A 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

- U1A transducer
- Force introduction parts (A, B, C ; see Page 10)

Accessories:

Knuckle eye U1/5kg/ZGO

Knuckle eye U1/5kg/ZGU

Coupling with spring (for force introduction part A, included in the list of components supplied)

2 Application

Force transducers of the U1A type series measure static and dynamic tensile and compressive forces in testing machines and in other applications with high-tech requirements.



ATTENTION

Be gentle with the precision transducer! Mechanical action (dropping, hitting) can permanently damage the transducer. The limits for the permissible mechanical thermal and electrical stresses are stated in the Specifications. They must be strictly observed.

3 Construction and principle of measurement

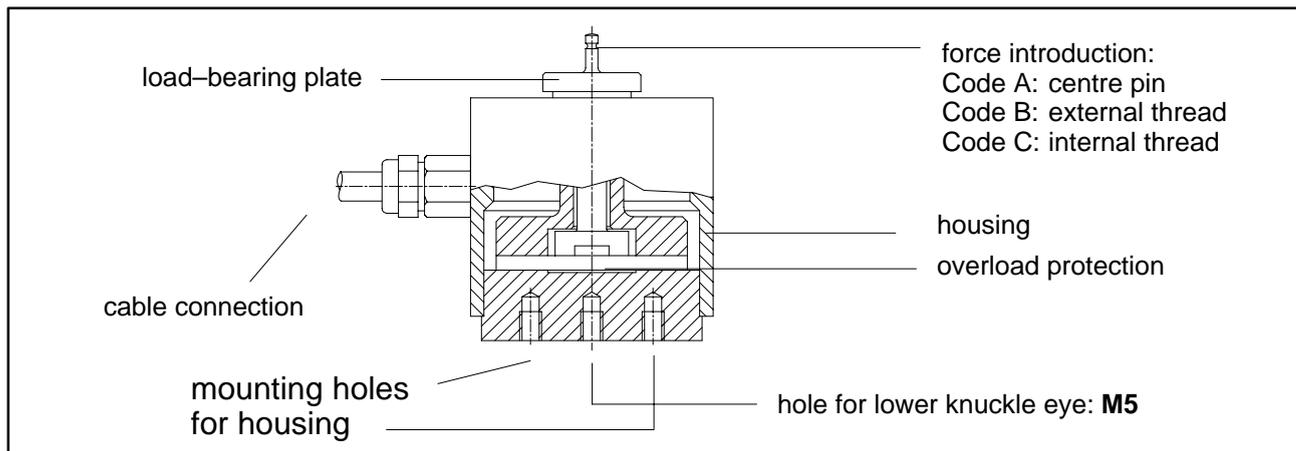


Fig. 3.1: Sectional view U1A

The transducer is equipped with an overload safety device, which in the pulling and pressing direction, takes effect from approx. 150% of the force introduced. The forces are directed by the particular force introduction to the measuring body with a 350 ohm strain gauge full bridge application, which converts the mechanical deformation to a change in resistance. If there is excitation voltage, this results in an output signal which in size and polarity is proportional to the force applied.

4 Installation

4.1 Ambient conditions

To achieve optimal measurement results the nominal temperature range must be maintained. A constant or if need be, slowly changing temperatures, are best. The given specifications apply if the temperature changes no faster than at 5K/h.

Heating or cooling on one side generates temperature gradients in the transducer and falsifies the measurement. A radiation shield and heat insulation on all sides causes a marked improvement.

4.1.1 Moisture

No special action is taken to stop the penetration of moisture. Splashing water and condensation are therefore to be avoided.

4.1.2 External pressure

The transducer does not react to changes in the external pressure.

4.1.3 Deposits

Keep the transducer clean. All deposits which restrict the mobility of the load-bearing plate, form a force shunt, thus falsifying the measurement result.

4.2 Mounting

4.2.1 General installation guidelines

Three force introduction variants are available:

- Force introduction Code A: centre-pin (for compressive loading and tensile loading only with coupling)
- Force introduction Code B: external thread (for compressive or tensile loading)
- Force introduction Code C: internal thread (for compressive or tensile loading)

Forces must pass into the transducer vertically, through the particular force introduction and the load-bearing plate. Torsional and bending moments, eccentric loading, or side forces are disturbance variables and falsify the measurement result. Side forces also include the relevant components of forces introduced diagonally.

If you wish, you can mount the transducer by using one of the three holes in the base of the housing (starting torque: 4Nm).

4.2.2 Installation for compressive/tensile loading

Compressive forces can be introduced directly without additional assistance. The hardness of the upper load-introduction surface should be > 42 HRC, so that a pressure mark is not made at the point of contact.

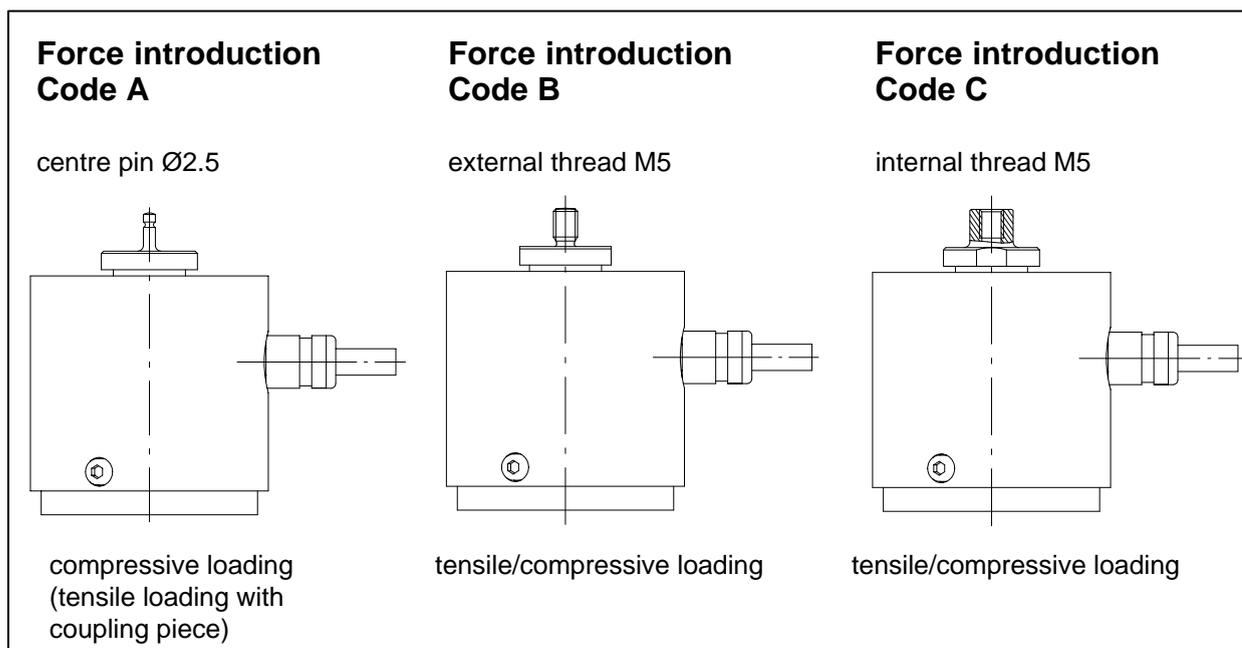


Fig. 4.1: Force introduction variants

4.2.3 Installation for tensile loading

Two knuckle eyes are provided for tensile force introduction:

- an upper knuckle eye (U1/5kg/ZGO) and
- a lower knuckle eye (U1/5kg/ZGU)

The upper knuckle eye is either mounted using the coupling from the list of components supplied (see Fig. 4.2) or is screwed directly into the load-bearing plate. Take care not to exert any forces on the load-bearing plate that might damage the transducer.

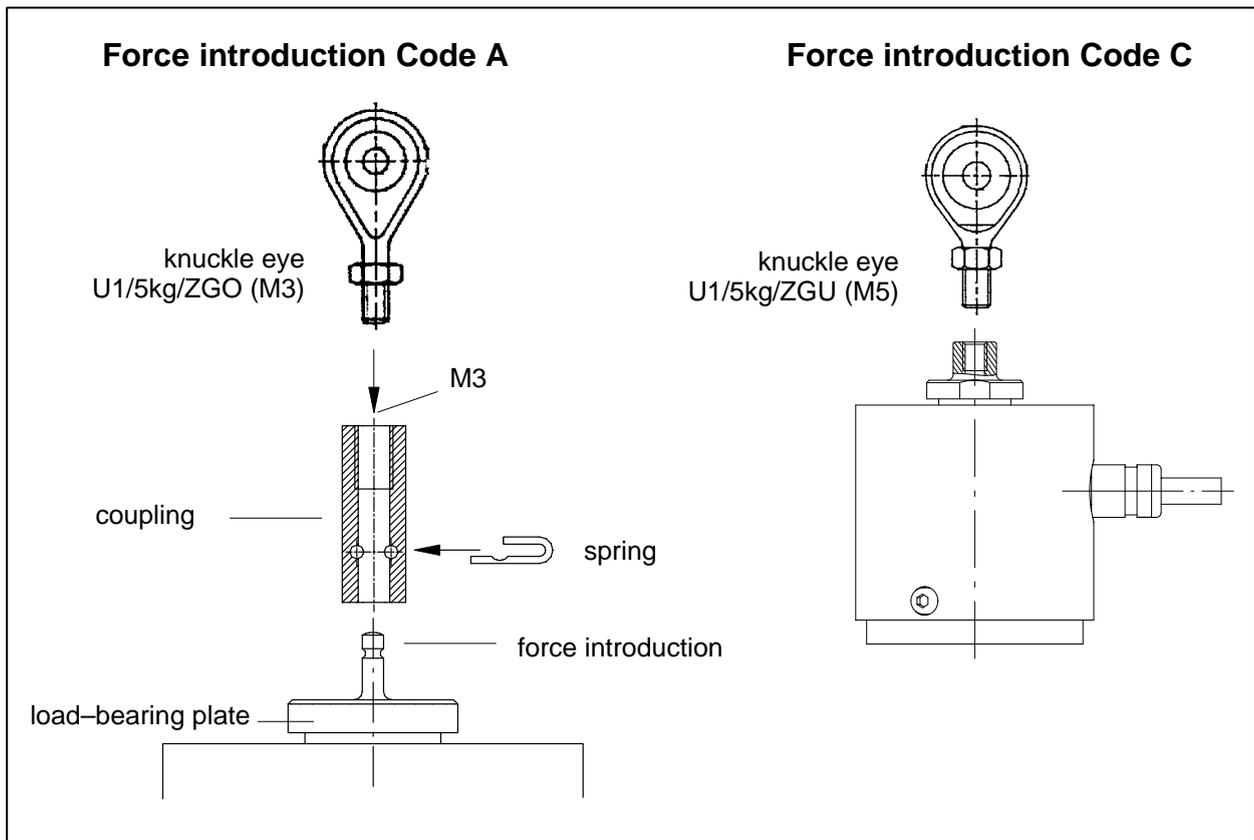


Fig. 4.2: Mounting with coupling and knuckle eye ZGO

Mounting the upper knuckle eye U1/5kg/ZGO in force introduction Code A (centre-pin):

- Screw lower knuckle eye into the coupling; starting torque approx. 2Nm.
- Remove the spring from the coupling
- Push the coupling onto the load-bearing centre pin and use the spring to secure it in the groove provided. Brace against the load-bearing plate, not against the housing.

Mounting the lower knuckle eye U1/5kg/ZGU:

- Screw lower knuckle eye into the central hole (M5) in the base of the housing; starting torque approx. 4Nm.

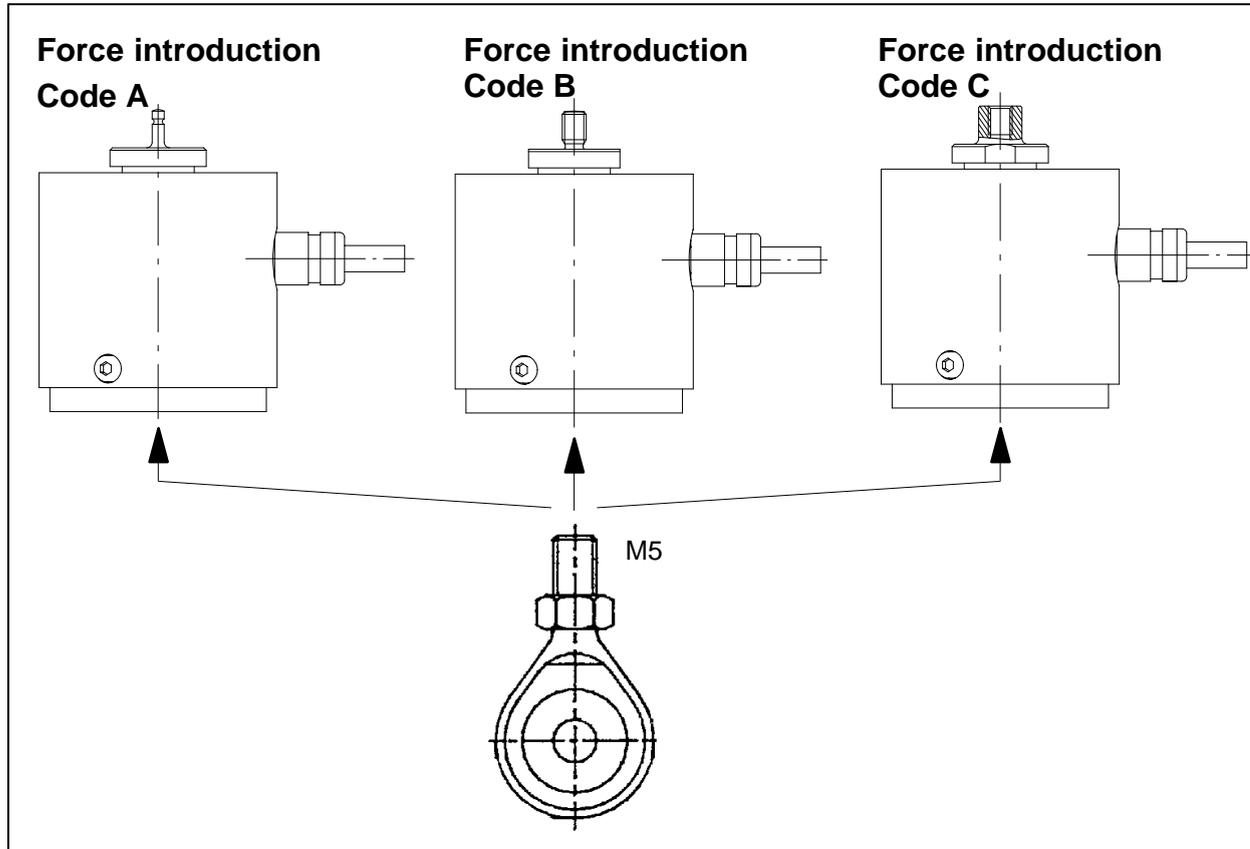


Fig. 4.3: Force introduction with the lower knuckle eye



NOTE: Replacing force introduction parts A, B and C

The force introduction parts (centre-pin, external thread, internal thread) are protected against torsion by an adhesive and can be carefully unscrewed or screwed down by hand, or by using an SW19 hexagonal spanner (in the case of Code B and Code C). Before a force introduction part is screwed down, make sure that any residual adhesive is removed.

Make sure that you do not damage the aluminium thread!



ATTENTION

This method of force introduction part replacement applies **with effect from K-U1A part numbers**. In the case of older versions, force introduction parts have to be replaced at HBM.

5 Electrical connection

The transducer can be used with all measuring amplifiers that are suitable for operation on 350 ohm S.G. full bridges. The amplifier excitation voltage must not exceed 6V.

A 6m long connection cable is connected to prevent measurement errors in the six wire circuit (see Fig. 5.1).

Cable extension:

The cable can be shortened or extended without affecting the sensitivity of the force transducer, as the two additional grey and green sensor leads pick up the voltage at the U1A cable box and run it back to the amplifier. This stabilises the voltage, so that it is available at the transducer loss-free. To make sure that this effect continues, you must use six-wire shielded cable for cable extensions.

Four-wire connection

If the measuring amplifier you are using is only designed for a four-wire connection, bridge the green to the blue wire and the grey to the black wire (see Fig. 5.1).

This will remove the advantage of a six wire circuit and the measurement chain will have to be re-adjusted for high-precision measurements.

This is particularly important in the case of cable extensions using the four-wire technique.

Notes on measurement chain compensation can be found in the amplifier documentation.

For reasons of EMC protection, the cable shield must be connected to the transducer housing. For greater suppression of the increased external interference effects, set up the transducer to comply with the recommendations of the HBM Greenline concept.

During cable installation, please note the following:

- Use only shielded and low-capacitance measurement cables (HBM cables meet these conditions).
- Do not lay measurement cable parallel to high-voltage power lines or control circuits. If this is not possible, protect the measurement cable with armoured steel tubing, for example. Keep it at least 50cm away from the other cables.
- Avoid stray fields of transformers, motors and contactors.
- Do not earth transducer, amplifier and display device more than once. All the devices in the measuring chain are to be connected to the same earthed conductor.

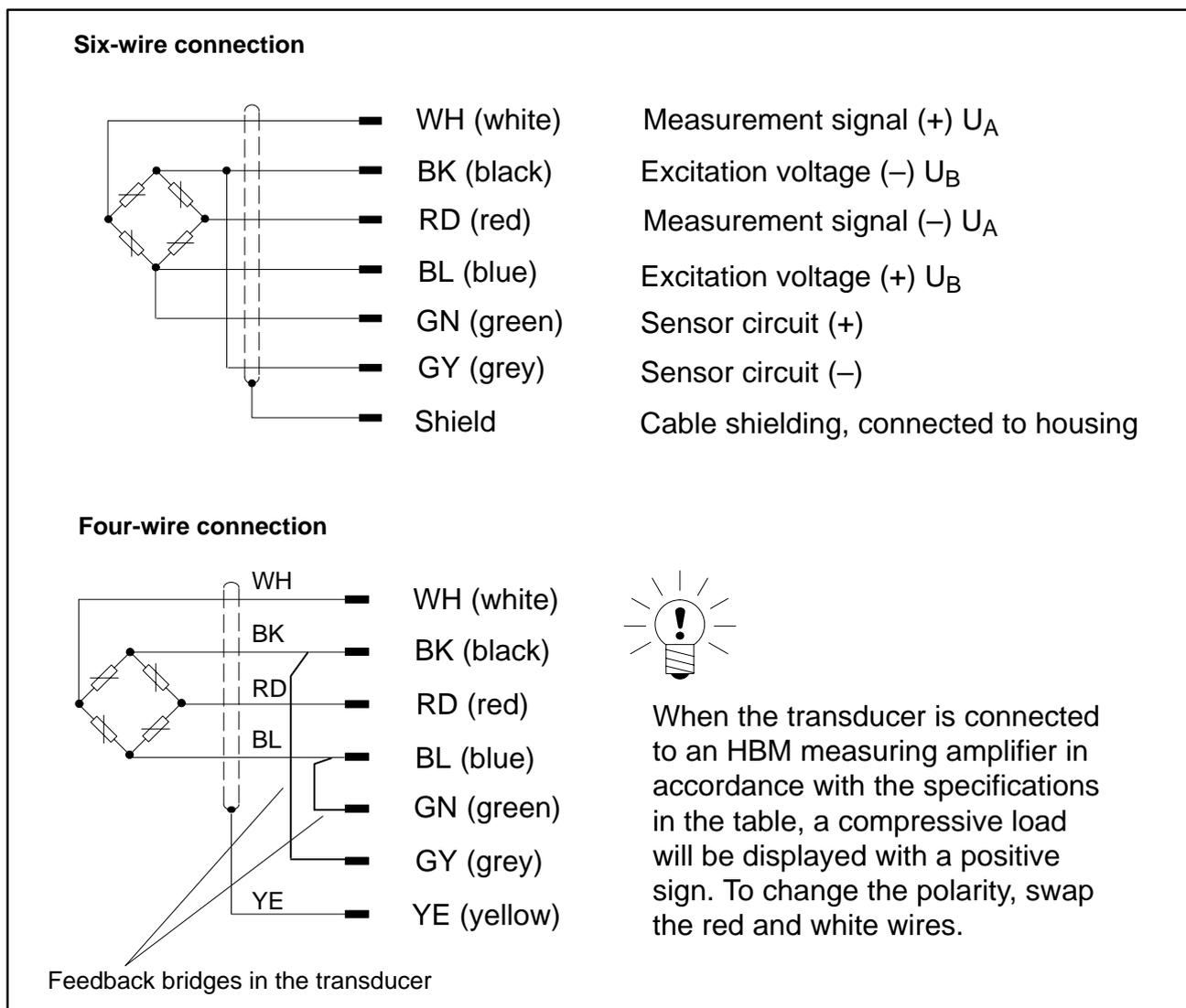


Fig. 5.1: Connection in six-wire and four-wire techniques

6 Specifications

Type			U1A		
Accuracy class			0.1		
Nominal force		N	10	20	50
Nominal sensitivity	C_{nom}	mV/V	2		
Relative sensitivity deviation compressive force	d_c	%	0.2		
Relative tensile/compressive force sensitivity difference	d_{zd}	%	0.4		
Relative zero signal deviation	$d_{s,0}$	%	1		
Rel. range of inversion/hysteresis ($0.2F_{nom}$ to F_{nom})	u	%	0.15		
Linearity deviation	d_{Lin}	%	0.1		
Effect of temperature on sensitivity/10K by reference to sensitivity	TK_C	%	0.1		
Effect of temperature on zero signal/10K by reference to sensitivity	TK_0	%	0.05		
Eccentricity effect / mm	d_E	%	0.1		
Rel. creep over 30min	d_{crF+E}	%	± 0.06		
Input resistance	R_e	Ohm	>345		
Output resistance	R_a	Ohm	300 – 400		
Isolation resistance	R_{is}	Ohm	$>5 \cdot 10^9$		
Reference excitation voltage	U_{ref}	V	5		
Operating range of the excitation voltage	$B_{U,G}$	V	0.5...6		
Nominal temperature range	$B_{t,nom}$	°C	-10 ... +50		
Operating temperature range	$B_{t,G}$	°C	-20 ... +50		
Storage temperature range	$B_{t,S}$	°C	-30 ... +60		
Reference temperature	t_{ref}	°C	+23		
Max. operational force	(F_G)	%	120		
Limit force	(F_L)	%	1000	500	200
Breaking force	(F_B)	%	2000	1000	400
Static lateral limit force	(F_Q)	%	200	100	40
Nominal displacement	S_{nom}	mm	0.28	0.21	0.2
Fundamental resonance frequency	f_G	kHz	300	450	700
Weight		kg	0.3		
Rel. permissible vibrational stress	F_{rb}	%	70		
Degree of protection to DIN EN60529			IP40		

7 Dimensions

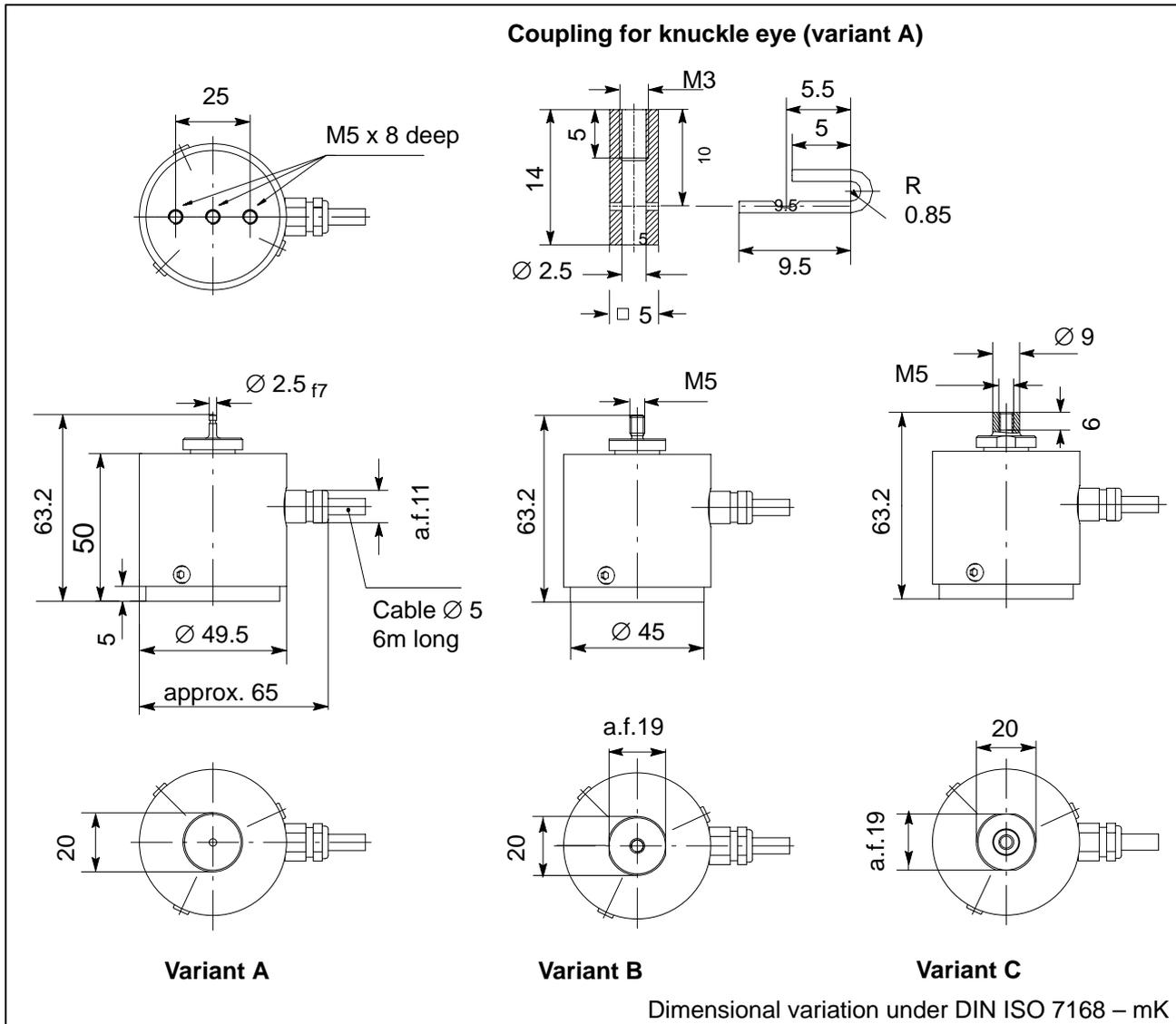


Fig. 7.1: Dimensions U1A and knuckle eyes

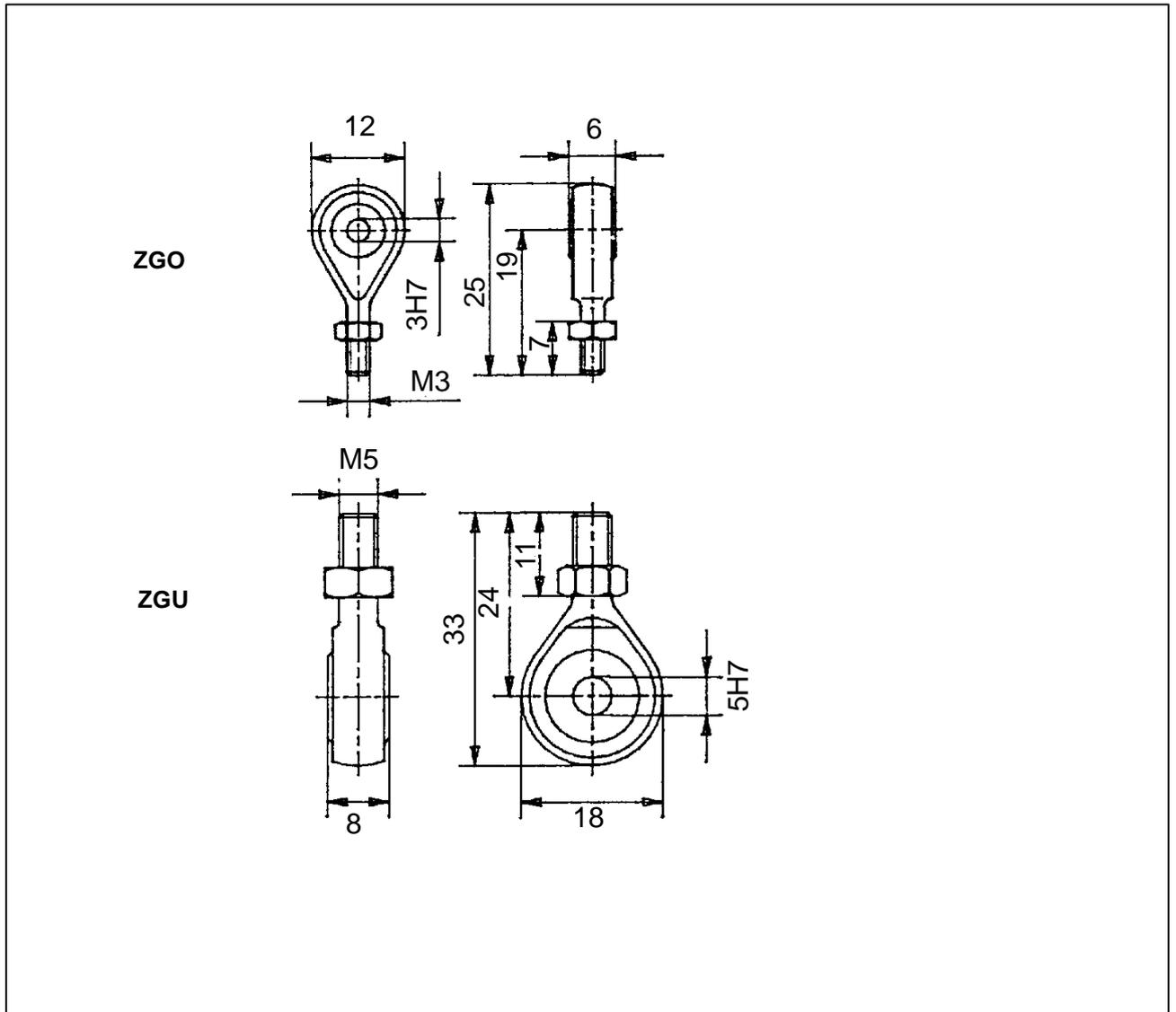


Fig. 7.2: Knuckle eye dimensions

8 Declaration of conformity



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Konformitätserklärung

Declaration of Conformity

Déclaration de Conformité

Document: **068/05.1996**

Wir,

We,

Nous,

Hottinger Baldwin Messtechnik 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 der Typenreihe U1A

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 und 93/68/EWG

Die Absicherung aller produkt-spezifischen Qualitätsmerkmale erfolgt auf Basis eines von der DQS (Deutsche Gesellschaft zur Zertifizierung von Qualitätsmanagementsystemen) seit 1986 zertifizierten Qualitätsmanagementsystems nach DIN ISO 9001 (Reg.Nr. DQS-10001).

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 Qualitätsmanagementsystemen) since 1986 (Reg. No. DQS-10001). 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 Qualitätsmanagementsystemen) certifiant, depuis 1986, notre système d'assurance qualité selon DIN ISO 9001 (Reg.Nr. DQS-10001).

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, 10.05.96

Seite 2 zu

Page 2 of

Page 2 du

Document: 068/05.1996

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



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They are not to be understood as express warranty and do not constitute any liability whatsoever.

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