

Mounting Instructions

Force Transducer

C18



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Safety instructions

Use in accordance with the regulations

Force transducers of type C18 are to be used for precise force measurements. 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

C18 force transducers comply with the state of the art and are 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 minimize 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: **Highest level of danger**

Warns of a **directly** dangerous situation in which failure to comply with safety requirements **will** lead to death or serious physical injury.



Symbol: **WARNING**

Meaning: **Possibly 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** lead to damage to property, slight or moderate physical injury.



Symbol: **NOTE**

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



Symbol:

Meaning: **CE mark**

The CE mark is the manufacturer's guarantee 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 liability on our part for any resultant loss or damage.

Qualified personnel

These transducers are only to be installed by qualified personnel strictly in accordance with the specifications 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 C18 force transducer is maintenance free.

Accident prevention

Although the specified nominal (rated) 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

- C18 measuring body
- Thrust piece
- Base
- Test report

- Operating Manual C18

Accessories (not included in the scope of supply)

- DKD calibration certificate according to EN10002-3, ISO376
Order no. K-CAL-FD...

2 Application information

Force transducers of the C18 type series are suitable for measuring compressive forces.

Do always install the transducer including base and thrust piece to avoid faulty measurement.

They measure static and quasi-static forces with great accuracy and reproducibility and therefore require careful handling.

You must take particular care when transporting and installing the devices. If you knock or drop the transducers, this could permanently damage them.

The force transducers can be used with both DC amplifiers and CF amplifiers with a maximum carrier frequency of 600 Hz.

C18 force transducer with DKD certificate from HBM:

Additional force calibration according to EN 10002-3 or ISO376, guarantees a transducer rating to class 0.5.

For a DKD calibration, we recommend to calibrate the complete measuring chain including the transducer and the connected amplifier to ensure optimum accuracy.

The limits for the permissible mechanical, thermal and electrical stresses are stated in the Specifications. It is essential that these are taken into consideration in planning the measuring set-up, during installation and finally, during operation.

3 Structure and mode of operation

3.1 Measuring body

The measuring body comprises a measuring beam system made of rust-resistant steel with strain gages (ring torsion principle).

3.2 Base and thrust piece

The base is made from stainless steel for nominal (rated) forces from 10kN to 500kN and from hardened tempering steel for nominal (rated) forces from 1MN to 4.5MN.

3.3 Disturbances

Torsion, bending, and lateral loads are disturbances and must be avoided. The temperature effects on the zero signal (SG bridge and housing) and on the sensitivity are compensated.

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 (rated) temperature range must be maintained. Temperature-induced measurement errors can be caused by heating (for example radiant heat) or cooling on one side. A radiation shield and all-round heat insulation bring about marked improvements. They must not form a force shunt.

4.2 Moisture

Externed humidity and tropical climatic do not affect the transducer's function.

4.3 Air pressure

Barometric variations have similar effects on the force transducer as force variations. Please take into account that barometric variations result in zero offset.

Nominal (rated) load	kN	10	20	50	> 50
Zero effect at a barometric variation of 10mbar (related to the nom. (rated) load)	%	0.01	0.005	0.002	< 0.001

5 Mechanical installation

5.1 Important measures for installation

- treat the transducer gently
- when measuring, make sure that the support structure is rigid
- the force-introduction surfaces must be scrupulously clean and carry in full
- 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 may result in measurement errors and if the limit values are exceeded, could destroy the transducer.

5.3 Installing the transducer



NOTE

Do always install the transducer including base and thrust piece to avoid faulty measurement (both included in scope of supply).

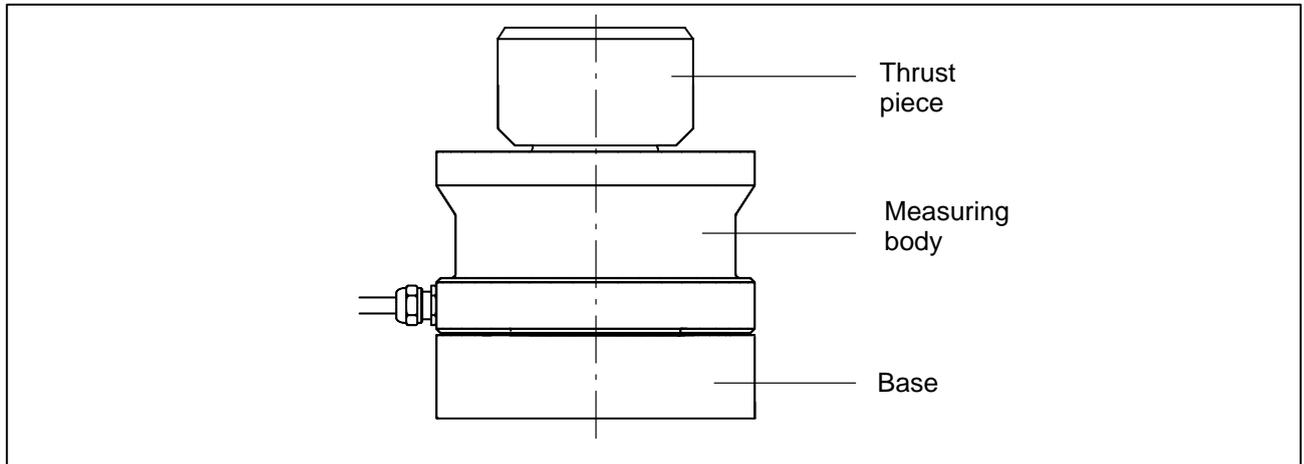


Fig. 5.1: Schematic diagram of the force transducer

C18/10kN...50kN

For measuring ranges from 10kN to 50kN, the base is firmly attached to the underside of the measuring body by four screws.

Tightening torque: 4Nm

C18/100kN...4.5MN

For measuring ranges from 100kN to 4.5MN, the measuring body is placed on the base. There is a centering device in the middle of the base.

6 Electrical connection

6.1 Instructions for cabling

- Use only shielded and low-capacitance measurement cables (HBM cables meet these conditions).
- Do not install measurement cables parallel to 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 meter).
- 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 force transducers have been designed for four-wire connection, the cable must not be shortened.
- For optimum precision, we recommend to realize the cable extension using the six-wire technique.
- The screen of the connection cable is connected to the transducer housing.



CAUTION

Under no circumstances must the screwed cable gland of the force transducer be opened. Should this occur by mistake, the transducer must be returned to the factory for repair.

6.2 Wiring pin assignment

The 5m long transducer connection cable has color-coded pigtails.

If the transducer is connected in accordance with the following connection diagram, when compressive loading is applied to the transducer, the output voltage at the measuring amplifier is positive.

The transducers are fitted with a four-core connection cable and calibrated as standard using the four-wire circuit

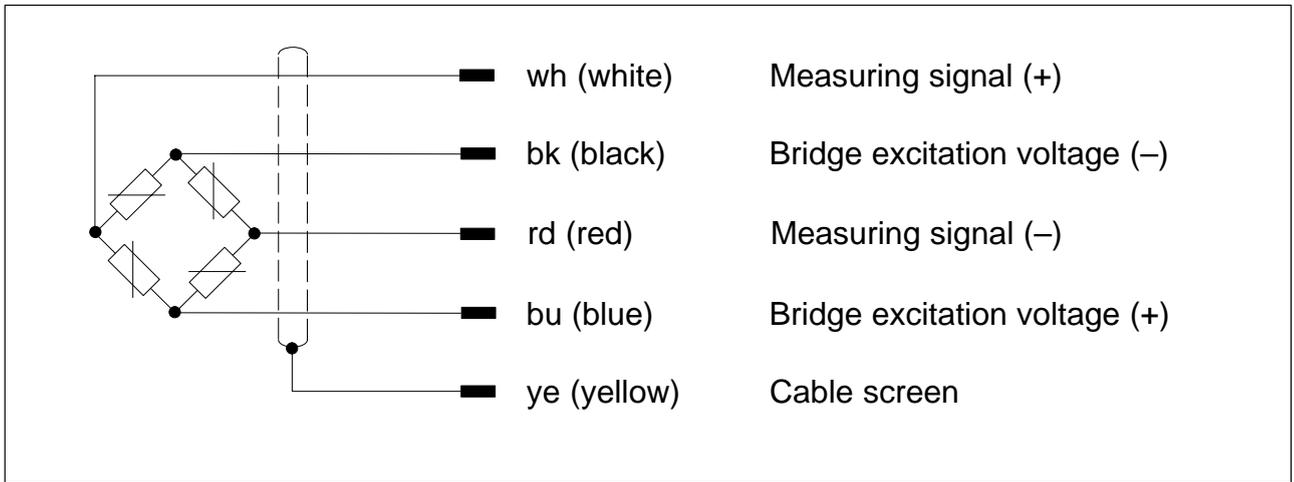


Fig. 7.1: Transducer with four-core cable

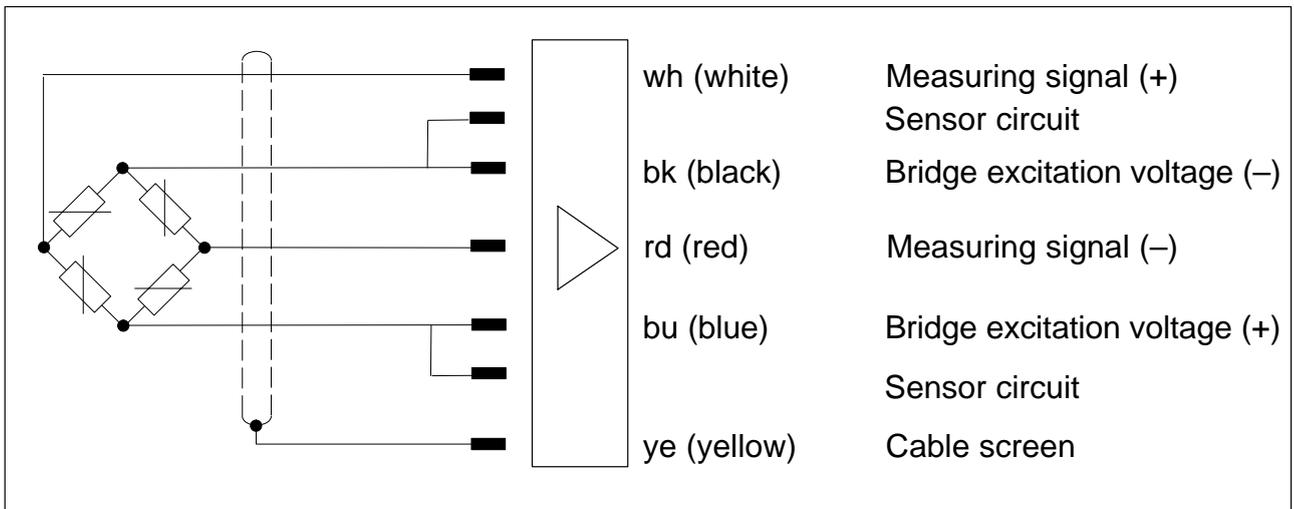


Fig. 7.2: Transducer with four-core cable, amplifier in six wire technique

7 Specifications

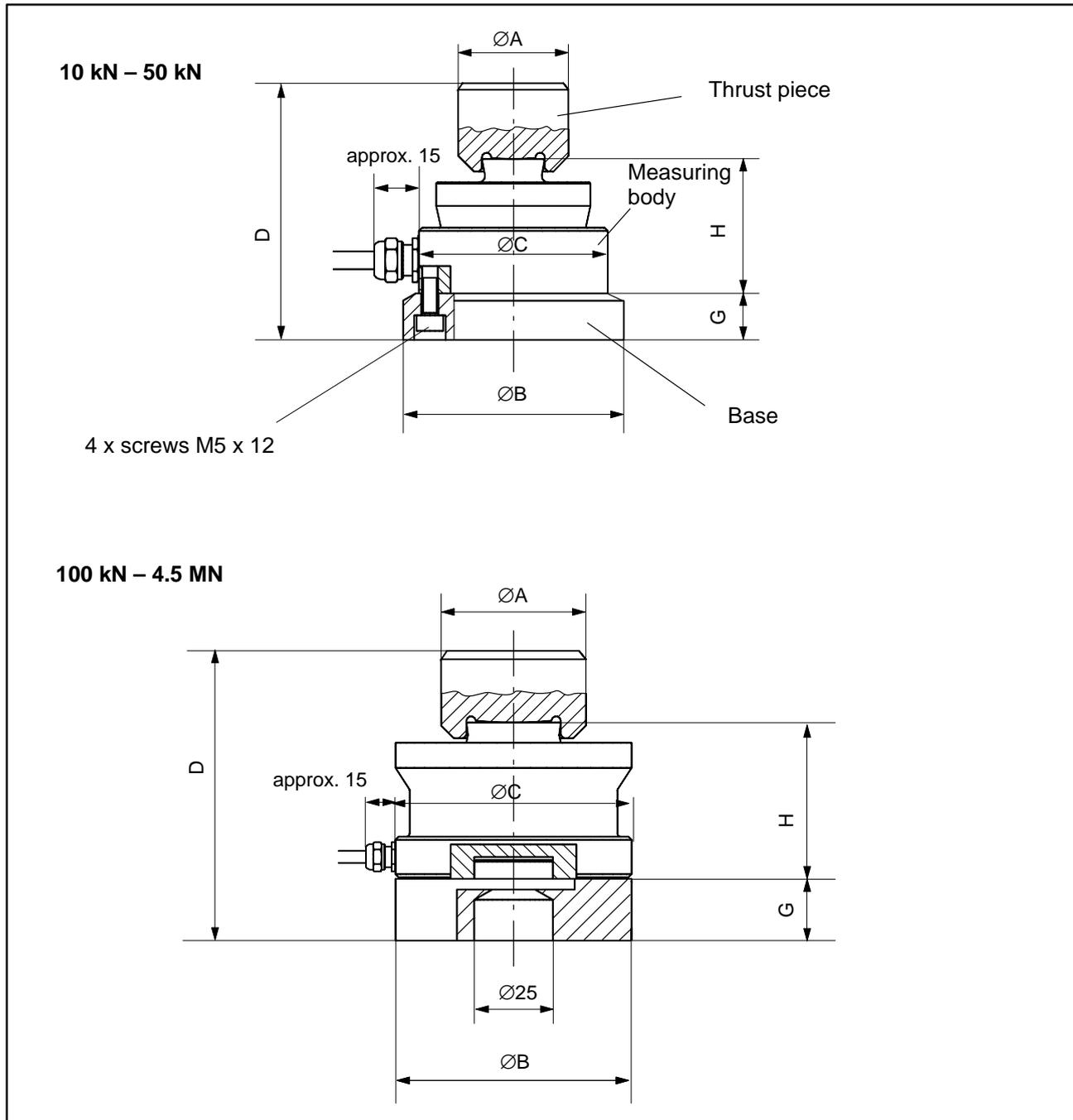
Nominal (rated) force	F_{nom}	kN	10 – 200	300	500 – 1000	2000 – 4500
Accuracy class			0.05			
Nominal (rated) sensitivity	C_{nom}	mV/V	2			
Rel. sensitivity deviation compressive force	d_C	%	0.1			
Rel. zero signal deviation (zero signal tolerance)	$d_{s,0}$	%	1			
Rel. zero point compensation (zero signal return) ¹	f_o	%	0.012	0.024		
Rel. range (0.2 F_{nom} to F_{nom}) at: unchanged mounting position, typically ¹ different mounting positions, typically ¹	b_{rg} b_{rv}	% %	0.04 0.08			
Hysteresis (0.2 F_{nom} to F_{nom}) ¹	u	%	0.08			
Linearity deviation	d_{lin}	%	0.05			
Effect of temperature on sensitivity/10K rel. to sensitivity	TK_c	%	0.01			
Effect of temperature on zero signal/10K rel. to sensitivity	TK_0	%	0.01			
Effect of lateral forces (lateral force 10% F_{nom}) [*]	d_Q	%	0.035	0.1	0.15	
Eccentricity effect / mm		%	0.02			
Rel. creep over 30 min	$d_{cr,F+E}$	%	0.03			
Input resistance	R_e	Ω	4450 ± 100			
Output resistance	R_a	Ω	4010 ± 5			
Isolation resistance	R_{is}	Ω	> 50 × 10 ⁹			
Reference excitation voltage	U_{ref}	V	5			
Operating range of the excitation voltage	$B_{U,G}$	V	5 to 30			
Carrier frequency of the excitation voltage		Hz	≤ 600			
Nominal (rated) temperature range	$B_{t,nom}$	°C	+10 to +40			
Operating temperature range	$B_{t,G}$	°C	–30 to +80			
Storage temperature range	$B_{t,S}$	°C	–50 to +85			
Reference temperature	t_{ref}	°C	+22			
Max. operational force	(F_G)	%	170			150
Limit force	(F_L)	%	170			150
Breaking force	(F_B)	%	400			320
Static lateral limit force	(F_Q)	%	0.3· F_{nom} ; (to $F_z \leq 0.5F_{nom}$) 0.5·($F_{nom} - 0.8 \cdot F_z$); (for $F_z > 0.5F_{nom}$) (F_z = Force in direction of measurement)			

¹) class 0.5 acc. to EN10002–3 or ISO376,
Classification only guaranteed in conjunction with a DKD calibration certificate acc. to EN10002–3
resp. ISO376

²) relative to a force introduction point on the force-introduction surface of the measuring body

Nominal (rated) force	F _{nom}	kN	10	20	50	100	200	300	500	1000	2000	3000	4500
Nominal (rated) displacement	S _{nom}	mm	0.13	0.12	0.13	0.17	0.19	0.23	0.26	0.45	0.62	0.79	0.98
Weight		kg	1.2	1.2	1.2	2.3	2.3	3.9	10.4	15.3	45.6	52.6	90.4
Rel. permissible vibrational stress	F _{rb}	%	70										
Degree of protection acc. to DIN EN60529	IP68												
Cable length, four-wire connection	5												
Measuring body material	stainless steel												

8 Dimensions C18



Type	$\varnothing A$	$\varnothing B$	$\varnothing C$	D	G	H
C18 / 10 kN ... 50kN	35	70	60	72	15	43
C18 / 100 kN ... 200 kN	45	75	75	89	20	50
C18 / 300 kN	58	95	95	112	20	65
C18 / 500 kN	85	130	130	157	37	85
C18 / 1 MN	100	150	150	171	40	90
C18 / 2 MN	135	230	225	239	50	130
C18 / 3 MN	135	230	225	254	50	145
C18 / 4.5 MN	160	275	270	303	60	170

9 Declaration of conformity



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Konformitätserklärung

Declaration of Conformity

Déclaration de Conformité

Document: 210/05.2002

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

Typenreihe C18

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 Mitgliedstaaten 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 sicherheitsrelevanten 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, 2002-05-07

Dr. Michael Altwein

H. Fritz

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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 61326 : 2002

Elektrische Betriebsmittel für Leittechnik und Laboreinsatz - EMV-Anforderungen;
Deutsche Fassung

Messbereich:

10kN; 20kN; 50kN; 100kN; 200kN; 300kN; 500kN; 1MN; 2MN; 3MN; 4,5MN

Modifications reserved.
All details describe our products in general form only. They are not to be understood as express warranty and do not constitute any liability whatsoever.

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