HOTTINGER BALDWIN MESSTECHNIK

Electrical measurement of mechanical quantities

Mounting instructions

Absolute pressure transducer

P6A

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Safety instructions

Use in accordance with the regulations

The P6A pressure transducer is to be used exclusively for pressure measurement and directly related control tasks. Any other use is deemed to be not as prescribed.

To ensure safe operation, the transducer must only be used in accordance with the specifications in the User Manual. It is also essential to comply with the statutory and safety regulations relevant to the particular application. This also applies to the use of accessories.

The pressure transducer is not a safety device as defined in the regulations for use. The perfectly safe operation of this pressure transducer requires suitable transport as well as technically correct storage, installation and assembly coupled with careful operation.

General dangers in non-observance of the safety instructions

The pressure transducer corresponds to the state of the art and is safe to operate. The pressure transducer can give rise to residual danger if improperly installed and operated by untrained personnel.

All personnel involved in the installation, commissioning, maintenance or repair of the pressure transducer must have read and understood the User Manual and in particular the technical safety instructions.

Accident prevention

Care must be taken to ensure that when the pressure transducer is being installed or removed, there is no pressure in the circuit.

Residual dangers

The scope of the capabilities and components provided with the transducer covers only a part of pressure measurement technology. Equipment planners, installers and operators must plan, carry out and accept responsibility for the safety engineering aspects of pressure measurement technology in such a way that residual dangers are kept to a minimum. All existing regulations must be complied with. There must be reference to the residual dangers connected with pressure measurement technology.

Where residual dangers arise when working with the P6A, these are highlighted in this Manual with the following symbols:

Symbol:  **DANGER**

Meaning: Maximum danger level

Signifies a **directly** dangerous situation which, if the safety requirements are not observed, **will** result in death or serious physical injury.

Symbol:  **WARNING**

Meaning: **Possibly dangerous situation**

Signifies a **possible** dangerous situation which, if the safety requirements are not observed, **could** result in death or serious physical injury.

Symbol:  **CAUTION**

Meaning: **Dangerous situation**

Signifies a possible dangerous situation which, if the safety requirements are not observed, **could** result in damage to property or mild to moderate physical injury.

Symbol:  **Note**

Signifies that important information is being given about the product or the use of the product.

Symbol: CE

Meaning: CE mark

The CE mark enables the manufacturer to guarantee that the product complies with the requirements of the relevant EC guidelines (see Certificate of Conformance at the end of this User Manual).

Safety-conscious working

Fault-messages must only be acknowledged if the cause of the fault has been eliminated and no further danger exists.

Conversions and modifications

The pressure transducer must not be modified from the design or safety-engineering point of view without our express agreement. Any modification precludes liability on our part for any damage resulting therefrom.

Qualified personnel

The pressure transducer must only be installed and operated by qualified personnel strictly in accordance with the technical data relating to the safety requirements and safety rules and regulations below. ‘ It is also essential to comply with the statutory and safety regulations relevant to the particular application. This also applies to the use of accessories.

”Qualified personnel” means persons familiar with the installation, assembly, commissioning and operation of the product who possess the qualifications appropriate to their function.

1 List of components supplied

P6A Absolute Pressure Transducer, User Manual

P6A 10 to 500bar: 1 USIT[1)] gasket U 12.7 x 20 x 1.5

Also available:

- Cable socket HK6S (for variants with HS6P connector[2)]) Order no. 3-3312.0095
- Unterminated connector cable (for variants with HS6P connector[2)]) Order no. 1-KAB405.30A-3
- Connecting plug MS3106A16S-1P Order no. 1-MS3106P7
- 15-pin D-connector Order no. 3-3312.0182
- Adapter for process port
  M20 , to 500bar Order no. 1-P3M/500/M20
  G1/2, to 500bar Order no. 1-P3M/500/R1/2

1) The USIT-gasket as delivered is a standard version supplied by C. Freudenberg, 69469 Weinheim. It consists of mineral oil-based synthetic rubber and corrosion-resistant steel, and can be used from –30 to +100° C.

2) Corresponds to PT06E-10-6S, supplied by Bendix or UPT06J-10-6S, supplied by Canon

2 Application

Absolute pressure transducers are suitable for measuring static and dynamic pressures in fluids and gases. They are available for various measuring ranges in steps from 1 to 500bar and with various electrical connection options, see Chapter 10 ”Options”.

The transducer housings are made from stainless steel, and seal the measuring system hermetically against all harmful influences, so that even continuous harsh operating conditions do not adversely affect the reliability and precision of the transducers.

Parts in contact with the medium are made of 1.4301 and 1.4542 stainless steel. Any fluid or gas (vapour) that does not attack these steels is a suitable measurement medium. The pressure transducer is attached by means of its threaded connector for the pressure connector and can be installed in any position. In particular cases there are specific instructions in Chap. 4 ”Assembly” which must be followed!

3 Construction and operating mode

The internal measurement tube bears the strain gauges that are connected to a Wheatstone bridge. The SG application is located in a hermetically sealed reference chamber. This protects it from ambient effects and the pressure measurement is not affected by the ambient pressure (absolute pressure transducer).

The measuring membrane is strained by the pressure applied. As a result, with thin-film strain gauges the ohmic resistance changes proportionally to the pressure and the Wheatstone bridge is detuned.

4 Installation

Caution: Pulling on the housing or the cable entry will result in mechanical damage to the transducer.

Pressure transducers can be screwed into place in any location. If a transducer is used for measuring dynamic pressure trends in **fluids**, it must be installed with the pressure connector **upwards** so that an air-bulge cannot form in the measurement tube.

WARNING

When tightening, the wrench (size 27) must only be applied to the clamping area of the mounting flange, and not to the housing or cable entry. The permitted tightening torque is 30Nm.

For a perfect seal the bearing surfaces must be substantially flat and free from tooling marks. The pin hole must have no spot-facing and should be only lightly deburred, since the pressure of the measurement medium forces the packing lips against the transducer and the bearing surface.

DANGER

Caution: Before the P6A pressure transducer is installed or removed, care must be taken to ensure that there is no pressure in the circuit.

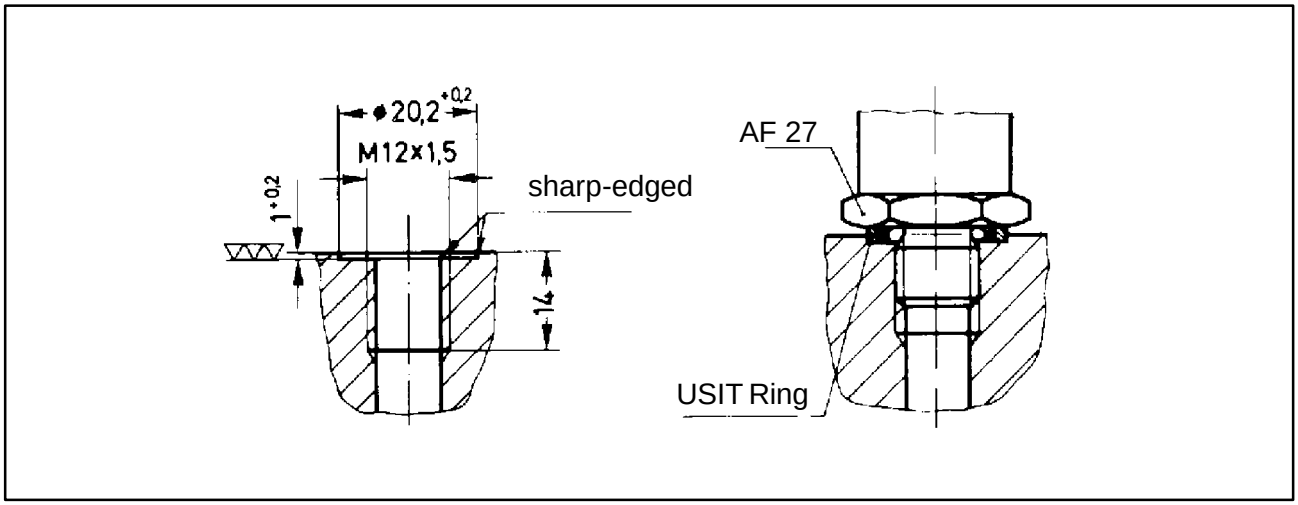


Fig. 4.1: Installation of the pressure transducer

5 Electrical connection

Pressure transducers can be connected to carrier-frequency and DC voltage amplifiers.

In the standard version, pressure transducers are fitted with a 3m length of unterminated connector cable. As an option, they are also available with an MS connector, a D15 connector or an integral HS6P connector; see also Chapter 10 ”Options”.

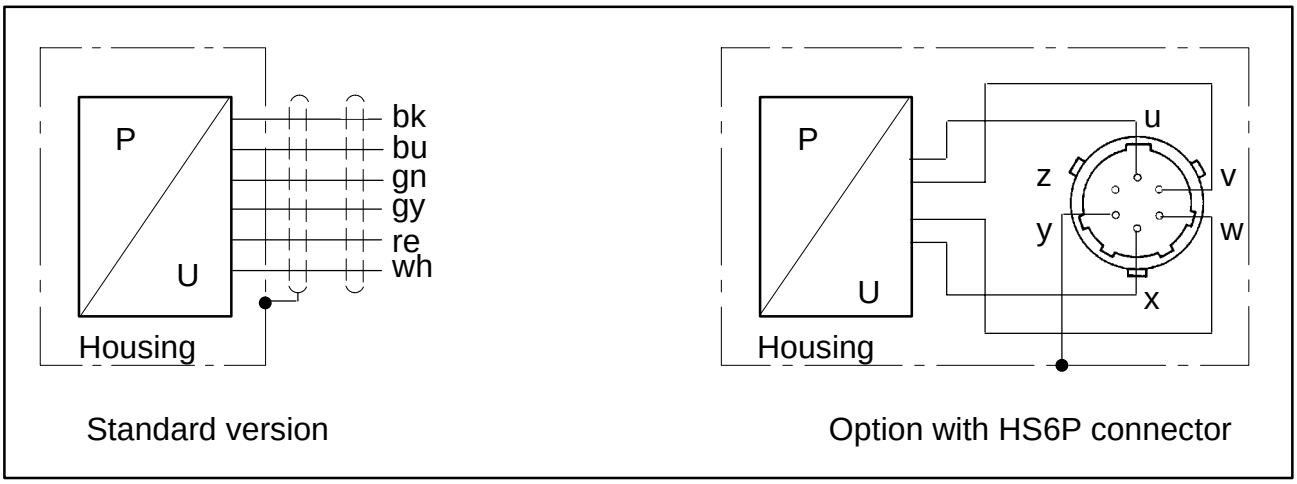
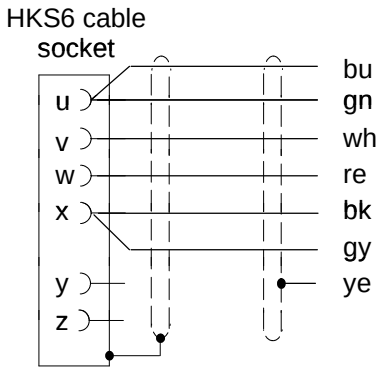


Fig. 5.1: Electrical connection of the P6A pressure transducer. Standard version with unterminated connector cable, and option with HS6P connector

Pin assignment is shown in Table 5.1. The cable shielding is connected to the transducer housing (see ”Greenline shielding design”).

Pin assignment		Standard version	HS6P connector (Option)
Bridge excitation voltage	U_B (+)	blue (bu)	U
Bridge excitation voltage	U_B (–)	black (bk)	X
Measuring signal pressure	U_A (+)	white (wh)	V
Measuring signal pressure	U_A (–)	red (rd)	W
Sensor circuit	(+)	green (gn)	–
Sensor circuit	(–)	grey (gy)	–
Housing / Ground		Cable shielding	Y

Tab. 5.1: Pin assignment for P6A pressure transducer with connector cable and HS6P connector



u	Bridge excitation voltage	(+)	bu, gn
v	Measuring signal pressure	(+)	wh
w	Measuring signal pressure	(–)	rd
x	Bridge excitation voltage	(–)	bk, gy
y	Not assigned		–
z	Not assigned		–
–	Cable shielding		ye

Fig. 5.2: Pin assignment for connector cable 1-KAB405.30A-3 for the P6A pressure transducer with HS6P device connector

NOTE

If the measuring system has no other connection to ground, earth or mains supply, its zero potential can be connected to the transducer ground by soldering an insulated flexible stranded wire into the HK6S cable socket from the cable shielding to jack Y.

Opening the HK6S cable socket:

- unscrew clamping screw (size 14) from the sleeve (size 15)
- pull jack assembly and cable backwards out of the sleeve
- The cable complete with gasket can then be moved forwards with the split clamping sleeve and spacer until the soldering tags and cable shielding are accessible.

When dismantling the cable socket, please do not pull on the white jack assembly.

5.1 Cable extension

Use shielded, low-capacitance extension cable. Above all the excitation circuits must have large cross-sections. HBM supplies its recommended extension cable and measuring cable by the metre.

When extending cable, ensure perfect connection with lowest possible contact resistance and good insulation between the circuits and ground. For this reason all connections must be soldered, or at least made with safe, stable terminals, and installed so that they are watertight. In the open air and/or in a damp environment, terminal boxes must be sealed.

If the order includes a longer cable to be factory-fitted to the transducer, this is taken into account in the calibration just as for the 3m length of standard cable.

Measuring cables should not be laid parallel to high-tension and control circuits (e.g. in common cable shafts). If this cannot be arranged, protect the measuring cable with steel conduit and keep it at least 50cm away from other cables. Stray fields from transformers, motors and protective contacts are to be avoided.

6 Differential pressure measurement circuit

Two transducers with the same final scale value can be connected together without any problem in order to determine the corresponding differential pressure signals. For this purpose the excitation voltage contacts are connected in parallel and the measurement voltage contacts are connected in crossover. The resulting resistance is then 175Ω.

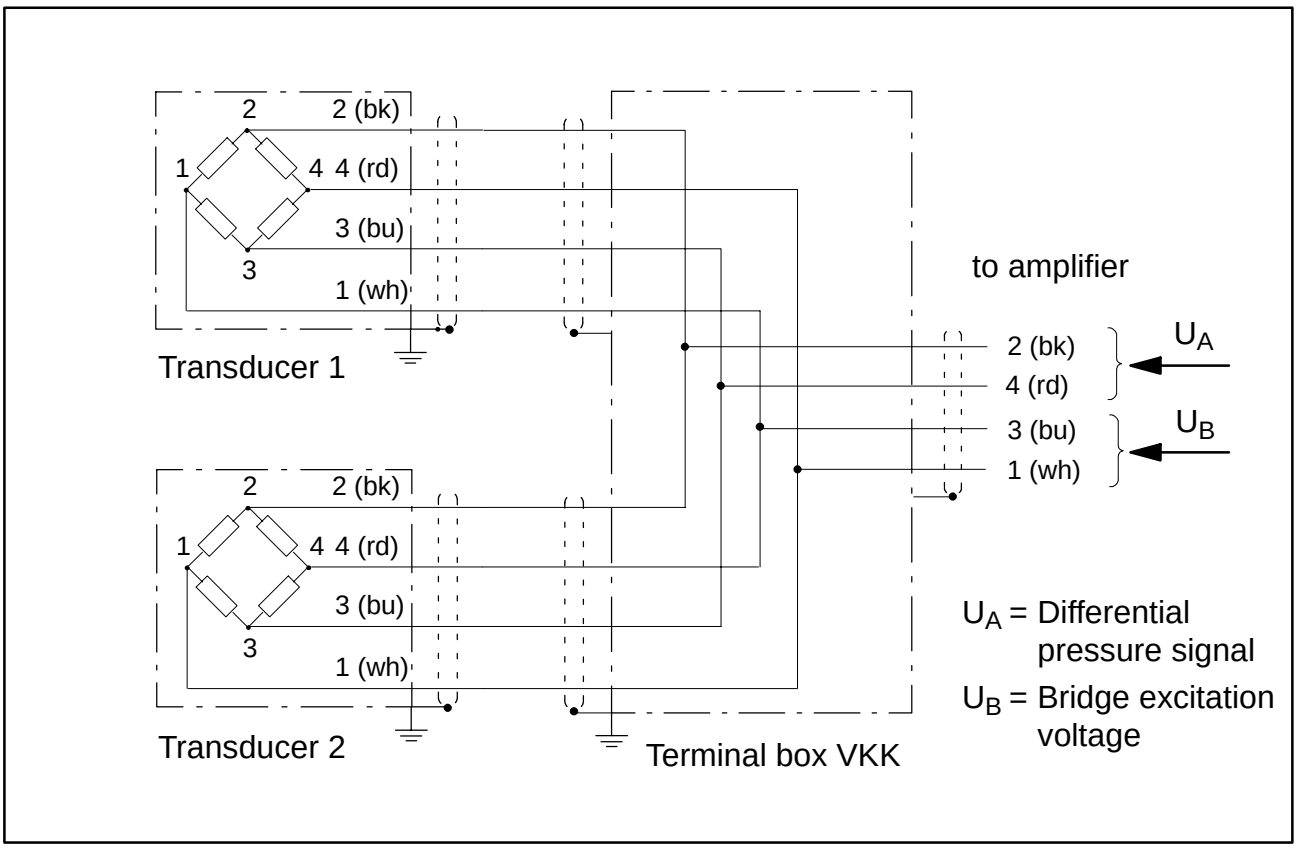


Fig. 6.1: Circuit diagram for differential pressure measurement

	Excitation voltage		Measurement voltage	
Transducer 1	2 / wh	3 / bu	1 / wh	4 / rd
	with	with	with	with
Transducer 2	2 / wh	3 / bu	4 / rd	1 / wh

The differential pressure signal is close to: $U_A = 1/2 \cdot (U_{A1} - U_{A2})$

7 Measuring

To get perfect results whenever you are measuring pressure, the correlation between **absolute pressure, gauge pressure** and **atmospheric pressure** must be taken into account without fail when setting up the measuring system.

The transducers are **pressure transducers** which, due to their mechanical construction with the hermetically sealed reference chamber, measure absolute pressure only. Under certain conditions it is also possible to measure gauge pressure with an absolute pressure transducer. The atmospheric pressure is then compensated electrically.

Dead volume and any fluid or gas volume present on the user side can also lead to a false measurement result.

7.1 Measuring dynamic pressures

Calibration by reference to static pressures also applies when measuring dynamic pressures. Please note that in the case of measurement frequencies in the natural frequency range, amplitude reinforcements have to be taken into account.

When there is dynamic loading, maximum pressure must not exceed the rated pressure. The oscillation bandwidth (peak-to-peak) of the permitted pressure fluctuation must not exceed 70% of the final scale value.

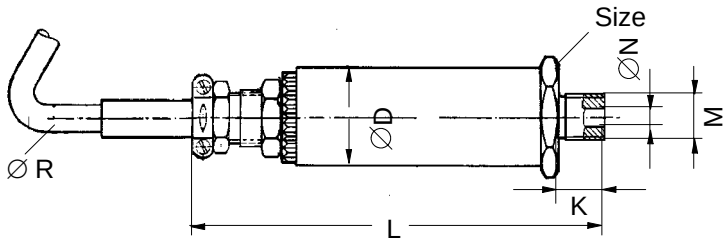
8 Technical Data (in accordance with DIN 16 086)

Type **Accuracy class**		**P6A** **0.2**					
Measuring range, 0 bar -	bar	10	20	50	100	200	500
Natural frequency of the membrane, approx.	kHz	13	15	26	38	65	>100
Mechanical values in accordance with VDI/VDE 2600, by reference to final scale value							
Operating range at +23°C	%	0...200					0...150
Overload cutoff at +23°C	%	250					200
Test pressure	%	250					200
Destructive range	%	>250					>200
Materials of the							
internal interface (threaded connector/measuring chamber)		1.4301/1.4542					1.4542
external interface (threaded connector/housing)		1.4301, 1.4541, nickel-plated brass, polyamide, silicone rubber (cable)					1.4542/ 1.4541
Rated range of the excitation voltage	V	0.5...12					
Input resistance at +23°C	Ω	350± 5					
Output resistance at +23°C	Ω	350± 5					
Rated sensitivity	mV/V	2					
Sensitivity tolerance (variance of sensitivity from rated sensitivity)	%	≤ ±0,2					
Influence of temperature on sensitivity in the rated range of the excitation voltage per 10K, with reference to actual value		≤±0,1					
in the rated temperature range	%	≤ ±0,2					
in the operating temperature range	%						
Influence of temperature on the zero signal in the rated range of the excitation voltage per 10K, with reference to rated sensitivity		≤±0,15					
in the rated temperature range	%	≤ ±0,2					
in the operating temperature range	%						
Linearity variation including hysteresis	%	≤ ±0,2					
Repeatability in accordance with DIN 1319	%	≤ ±0,05					
Rated temperature range	°C	-10...+80					
Service temperature range	°C	–40 ... +100 (... +120°C up to 24 hours)					
Storage temperature range	°C	–40 ... +100 (... +120°C up to 24 hours)					
Weight without cable, approx.	g	200					

9 Dimensions (in mm)

Version with cable connection

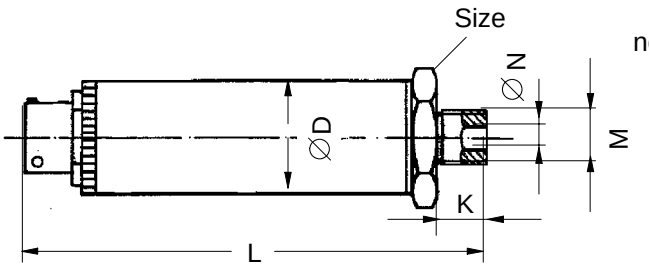
Cable, 3m, unterminated



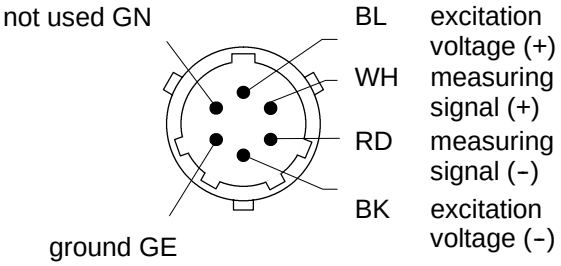
Assignment of the cable

2 – BK (black)	}	excitation voltage U_B
3 + BL (blue)		
2' – GR (grey)	}	sensor circuits
3' – GN (green)		
1 + WH(white)	}	measuring signal U_A
4 – RD (red)		
5 YE (yellow)		cable shielding (ground)

Version with connector



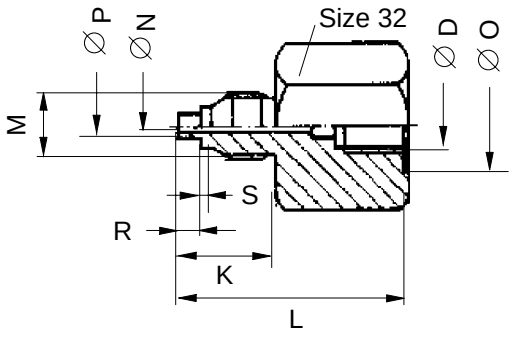
Assignment of the connector (optional)



P6A		∅D	K	L	M	∅N	∅ R	Size
with cable connection	**10 bar - 500 bar**	25	12	approx. 112	M12x1.5	5	6.5	27
with connector	**10 bar - 500 bar**	25	12	approx. 97	M12x1.5	5	–	27

M12/M20 adapter

Material:
1.4305 high-grade steel



Type	∅ D	K	L	M	∅ N	∅ O	∅ P	R	S
P3M/500/M20	M12x1.5	25	50	M20x1.5	4	20.2	5	5	3
P3M/500/R1/2	M12x1.5	20	50	G1/2	4	20.2	5	5	3

10 Options

Option 1:

Code	Effective range
010B	10bar
020B	20bar
050B	50bar
100B	100bar
200B	200bar
500B	500bar

Option 2:

Code	Electrical connection
K	with cable, 3 m, unterminated
Y	With cable, ≤20m, unterminated[1)]
M	With cable, 3m, MS-connector
D	With cable, 3m, D15 connector
N	With cable, ≤20m, MS-connector[1)]
F	With cable, ≤20m, D15 connector[1)]
P	with HS6P connector[2)]

1) Please state length of cable required

2) Corresponds to PT06E-10-6S, supplied by Bendix
UPT06J-10-6S, supplied by Cannon

Order no.: P6A [ ][ ][ ][ ] - [ ]

Typical order P6A– [0][1][0][B] - [D]

Typical order for 10 bar with D15 connector

Order numbers:

HK6S cable socket, order no. 3-3312.0095
MS3106A16S-1P connecting plug, order no. 3-3312.0027
15-pin D-connector, order no. 2-9278.0321
Kab 405.30-3 connector cable (for variant with HS6P connector)

11 Copy of Declaration of Conformity

HOTTINGER BALDWIN MESSTECHNIK

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Konformitätserklärung ***Declaration of Conformity*** ***Déclaration de Conformité***

Document: ***071/05.1996***

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

Absolutdruckaufnehmer der Typenreihe P3MB (P6A, P31AP)

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 produktspezifischen 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 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 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

OV1051A1.03

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Document: ***071/05.1996***

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 charactère. 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:

prEN 50082-2 : 1992 ***Elektromagnetische Verträglichkeit (EMV); Fachgrundnorm Störfestigkeit;*** Teil 2: Industriebereich; Deutsche Fassung

EN 50082-2 : 1995 ***Elektromagnetische Verträglichkeit (EMV); Fachgrundnorm Störfestigkeit;*** Teil 2: Industriebereich; Deutsche Fassung

GV1051A1.03

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