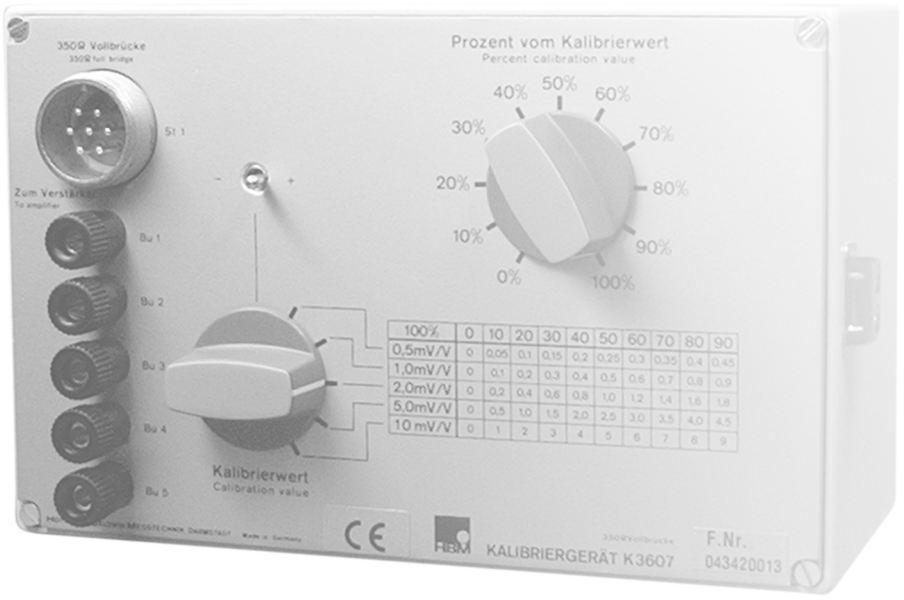
Operating manual

Calibration instrument

K3607



A1057-1.1 en

Contents **Page**

Safety instructions

Appropriate use

The K3607 calibration instrument is to be used exclusively for measurement tasks and directly related control tasks. Use for any purpose other than the above shall be deemed to be not in accordance with the regulations.

In the interests of safety, the instrument should only be operated as described in the Operating Manual. It is also essential to comply with the legal and safety requirements for the application concerned during use. The same applies to the use of accessories.

General dangers of failing to follow the safety instructions

The calibration instrument is a state of the art unit and as such is fail-safe. The device may give rise to further dangers if it is inappropriately installed and operated by untrained personnel.

Any person instructed to carry out installation, commissioning, maintenance or repair of the device must have read and understood the Operating Manual and in particular the technical safety instructions.

Conditions on site

Protect the device from direct contact with water.

Maintenance and cleaning

The calibration instrument is maintenance free. Please note the following points when cleaning the housing:

- Before cleaning, disconnect the device from the power supply.
- Clean the housing with a soft, slightly damp (not wet!) cloth. You should **never** use solvent, since this could damage the labelling on the front panel.
- When cleaning, ensure that no liquid gets into the device or connections.

Remaining dangers

The scope of supply and list of components provided with the K3607 cover only part of the scope of measurement technique. In addition, equipment planners, installers and operators should plan, implement and respond to the safety engineering considerations of 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 measurement technique.

Any risk of remaining dangers when working with the K3607 is pointed out in this introduction by means of the following symbols:

Symbol:  **WARNING**

Meaning: **Dangerous situation**

Warns of a **potentially** dangerous situation in which failure to comply with safety requirements **can** lead to 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.

Symbols for using advices and helpful information:

Symbol:  **NOTE**

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

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 Declaration of conformity at the end of this Operating Manual).

Conversions and modifications

The device 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 resulting damage.

In particular, any repair or soldering work on motherboards is prohibited. When exchanging complete modules, use only original parts from HBM.

Qualified personnel

This instrument is only to be installed and used by qualified personnel strictly in accordance with the technical data and with the safety rules and regulations which follow. It is also essential to comply with the legal and safety requirements for the application concerned during use. The same applies to the use of accessories.

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

Maintenance and repair work on an open device with the power on must only be carried out by trained personnel who are aware of the dangers involved.

1 Fields of application

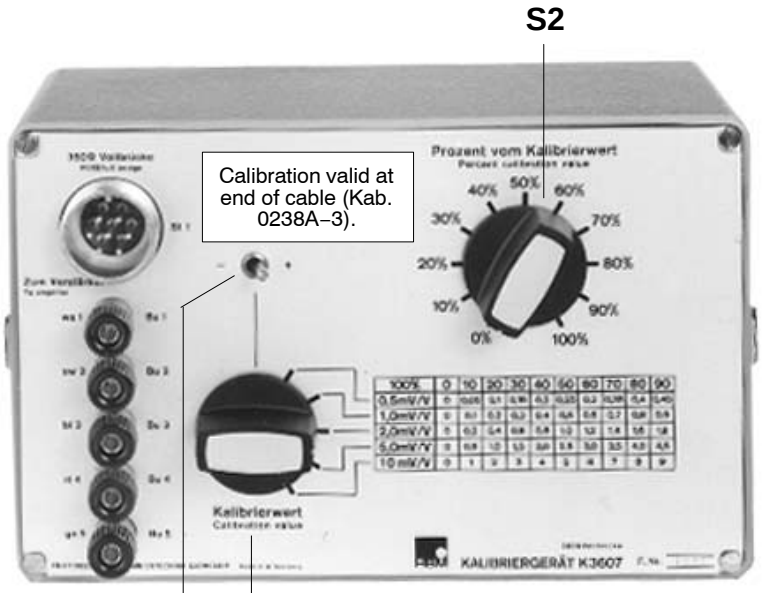
The K 3607 calibration instrument can be used to calibrate measuring amplifiers or measurement chains without imposing a mechanical quantity on the SG transducers belonging to the measurement chain.

For this purpose the calibration instrument is equipped with a high-precision resistance network in star configuration, designed to simulate 350-Ω SG full-bridge transducers.

The extremely low self-capacitance and self-inductance of the inbuilt precision resistors place the calibration instrument in accuracy class 0.025.

When an appropriate measuring amplifier is used, the calibration instrument can be operated in six-wire circuit for balancing the ohmic and capacitive effects of long measurement cables.

K 3607 front panel



S1 = polarity switch
S2 = calibration step switch
S3 = calibration value switch

2 Connections

The connector cable between the calibration instrument and the measuring amplifier is connected either to the 7-pin Amphenol connector MS 3102 A16S-1P (St1) or to the 5-pin S3 (Bu 1 . . . Bu 5).

The contact assignment is shown in Fig. 6.1. The Amphenol connection is provided for a six-wire circuit. If the intention is to connect a six-wire circuit to the pin terminals, connections C and F on the measuring amplifier must both be connected to Bu3 on the calibration instrument, and connections B and G must both be connected to Bu2.

3 Calibrating the measurement chain

- Connect the calibration instrument to the measurement chain you wish to calibrate in place of the 350-Ω SG transducer. If there is an extension cable on the measuring amplifier, leave it in place in order to capture the ohmic and capacitive cable effects.
- Use S1 to preselect the desired polarity of the measurement signal.
- Set S2 (calibration step switch) to zero.
- If necessary switch the measuring amplifier to full bridge (K 3607 operates as a full bridge).
- Balance the measuring amplifier and subsequent instruments to zero in accordance with their operating manuals and if necessary carry out capacitance adjustment.
- Use the calibration value switch S3 and the calibration step switch S2 to set the desired calibration signal:

Calibration value in mV/V	**Calibration step*) in %**										
	0	10	20	30	40	50	60	70	80	90	100
0.5	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
1.0	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
2.0	0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
5.0	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
10.0	0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0

Tab 3.1: Calibration signal in mV/V as a function of the switch settings on the K3607

- Set the measuring amplifier to the desired output signal in accordance with its operating manual. In principle the measuring amplifier should be calibrated in the measuring range you intend to use for measurement. If the measuring range of the amplifier is changed, the switching error needs to be taken into consideration.

*) Effect of the calibration step switch (S2):

The grading error for the percentage steps as set out in the specifications will be maintained for every step if the internal resistance Ri of the bridge excitation source plus cable is $\leq 1\Omega$. For an internal resistance Ri $\leq 4\Omega$ the error in the calibration steps is kept at between 0 and 50 %.
For a six-wire circuit the tolerances are maintained if the excitation voltage to the K 3607 is readjusted precisely enough.

4 Works calibration of the K3607

The K 3607 is calibrated in the factory under the following conditions:

- Ambient temperature: + 23 °C
- Connector cable:

  Kab 0238A–3 (included in the list of components supplied), cable length = 3 meters

  Cross-section of each bridge excitation wire 1.5mm^2
- Internal excitation voltage resistance: $\leq 1\Omega$

5 Effect of cable resistance

The cable effect for KAB0238A-3 cable is calibrated in at the factory. This applies to four- and six-wire circuit at the end of the 3-meter long cable.

On subsequent connection in four-wire circuit, the output signal is reduced by the K factor due to the resistance of the excitation wires.

The K factor is calcultated as follows:

$$K = \frac{1}{1+\frac{2r}{350\ \Omega}} \qquad (1)$$

(r in Ω)
(350 Ω = Bridge resistance)

The resistance value of an excitation wire is used for the r term. In the case of KAB0238A-3 cable this resistance r = 0.0118 Ω. According to the formula (1) this gives a value of 0.99993 for the K factor. This means an absolute calibration error of 0.007% if KAB0238A-3 is not used.

A switching step error also occurs. Depending on the position of switch S2 the internal resistance of the K 3607 alters slightly, as does the effective excitation voltage due to the cable resistance r.

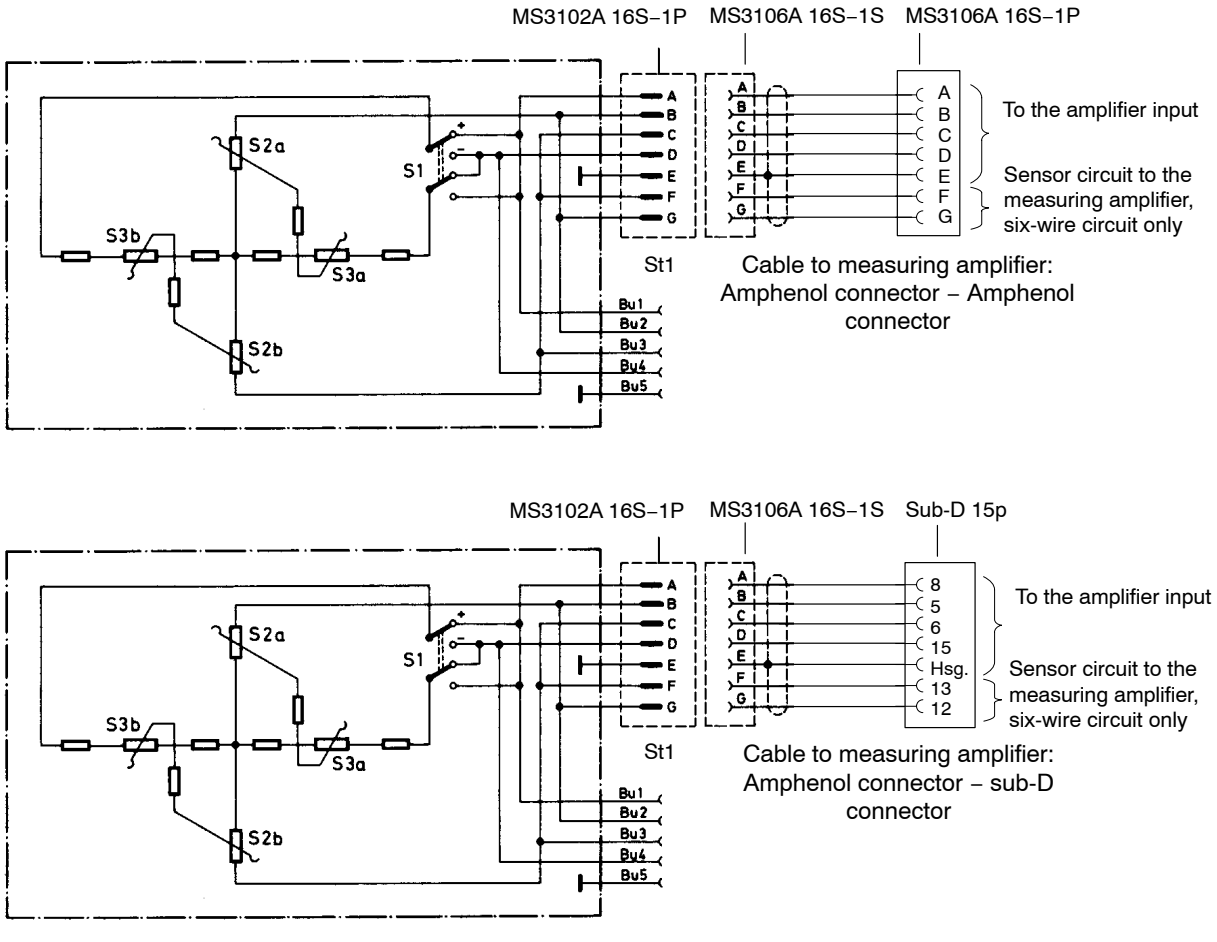
The grading error of the percentage steps increases by some 0.02% at 10 Ω of cable conductor resistance.

When connecting a six-wire circuit the cable effect is corrected and the K factor = 1. No additional grading error occurs (internal excitation voltage resistance < 1 Ω).

If KAB0238A-3 cable is not used, an absolute calibration error of the corresponding size occurs. This means the output signal is increased by a factor of K = 1.00007.

6 Pin assignment

Connection to 7-pin Amphenol connector St1



Connecting to pin terminals

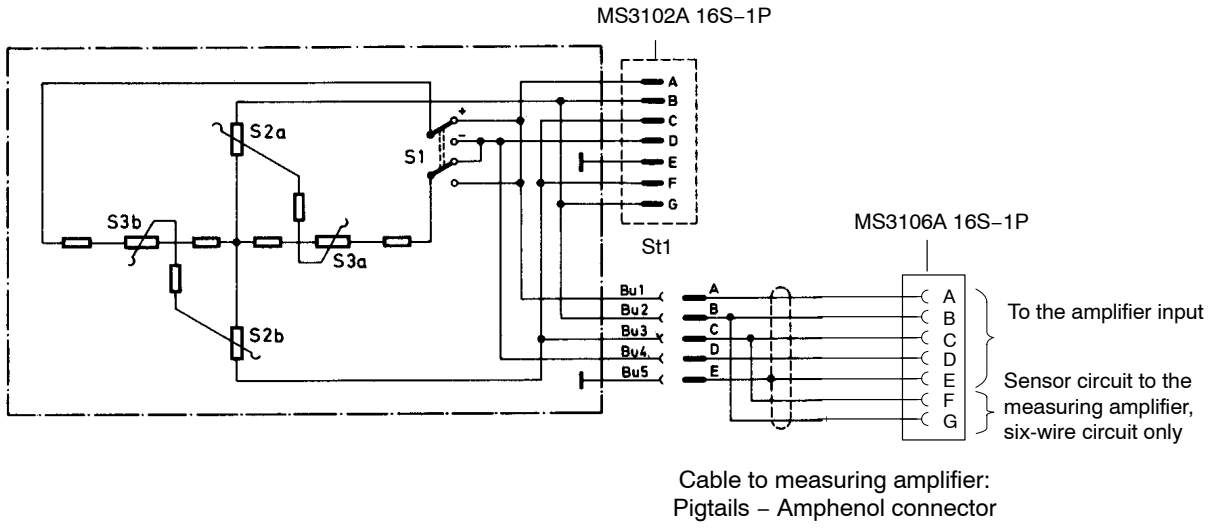


Fig. 6.1: General pin assignment

7 Specifications

Type		**K3607**
Accuracy class		0.025
Calibration steps		
5 range steps	mV/V	0.5; 1; 2; 5; 10
11 percentage steps within the range step concerned	%	0; 10; 20...100
Polarity switch		Choice of positive[1] or negative output signals
Grading error of range steps		
relative to the full-scale value concerned	%	$< \pm 0.025$
Grading error of percentage steps		
relative to the full-scale value concerned	%	$< \pm 0.01$
Calibration tolerance of full-scale value (absolute)		
at 2mV/V calibration value setting (100%) (at reference temperature, 3 meters of connection cable [2])	%	$< \pm 0.02$
Temperature effect of absolute calibration per 10K		
in the operating temperature range	%	< 0.03
in the nominal temperature range	%	< 0.01
Reference temperature	°C	+23
Nominal temperature range	°C	+10...+50
Operating temperature range	°C	+10...+60
Storage temperature range	°C	–25...+70
Frequency range of the excitation voltage	Hz	(DC)...5000Hz[3]
Nominal range of the excitation voltage	V	0.5...12
Maximum permissible excitation voltage	V	18
Weight	kg	1
Dimensions (w x h x d)	mm	200 x 110 x 120

1) In this case ”positive” means a reduction in bridge branch resistance between Bu 1 and Bu 3 (between A and C on the Amphenol connector)

2) Kab 0238A–3

3) At reduced precision up to 50 kHz (accuracy class 0.5)

8 Declaration of Conformity

Hottinger Baldwin Messtechnik GmbH

Im Tiefen See 45 - D-64293 Darmstadt
Tel. ++49/6151/803-0, Fax. ++49/6151/803-9100

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

Document: ***92/11.2004***

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

Kalibriergerät zur Simulation von DMS-Aufnehmern

K 3607

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 produktspezifischen 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-000001). 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-000001). 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-000001).
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, 2004-11-12

Roland Seebauer

Dr. Wolfgang Bauch

Seite 2 zu	Page 2 of	Page 2 du
	Document: ***92/11.2004***	
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:

EN 61326 : 1997 + A1 : 1998 + A2 : 2001 ***Elektrische Betriebsmittel für Leittechnik und Laboreinsatz*** - EMV-Anforderungen; Deutsche Fassung

Hottinger Baldwin Messtechnik GmbH

Postfach 10 01 51, D-64201 Darmstadt
Im Tiefen See 45, D-64293 Darmstadt
Tel.: +49/61 51/ 8 03-0; Fax: +49/61 51/ 8039100
E-mail: support@hbm.com www.hbm.com

HBM
measurement with confidence

A1057-1.1 en