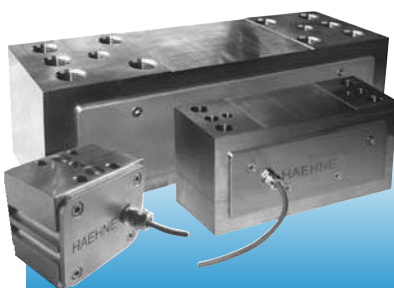
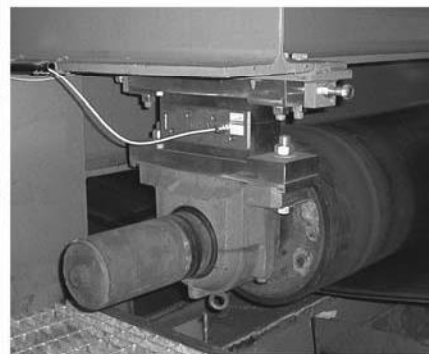


Web Tension Measurement and Control

for
Plastics
Foil, Paper
Textile Industries
Strip Processing
Lines
Rolling Mills



www.haehne.com

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Absolutely consider characterized passages in the text with this reference!

1. General

All steps regarding transport, installation, commissioning as well as maintenance of force measurement systems have to be performed by qualified personnel. The qualified persons must be authorized by the supervisors responsible for safety measures to perform these functions. All safety measures and instructions for the prevention of accidents at the work place have to be observed.

2. Transport and Storage

All electrical systems and sensors must be stored in dry places free of dust. The storage temperature should not exceed the operating temperature described in the corresponding product description. Transportation should be made with proper equipment in order to safeguard the systems against damage.

3. Installation and Mounting

The installation of systems has to be made according to the instructions in the corresponding documentation. All work steps on electrical equipment such as mounting, connection, opening of the system should be performed only when the system

- is disconnected from electrical power
- is guarded against inadvertent application of power
- all drives are in their stop position

Before starting the installation all equipment should be checked with proper instrumentation for the presence of any electrical power.

4. Electrical Connection

The electrical installation has to be made according to country specific instructions.

5. Purposeful Use

The safety of the delivered system is only warranted if used as intended. The limit values described in the documentation should not be exceeded. Commissioning (that means start of the ordinary operating process) is only allowed in conformity with the Electromagnetic Interference instructions.

If the sensors are exposed to forces beyond the specified absolute maximum force, then mechanical defects cannot be excluded. If in doubt contact *HAEHNE* to calculate the absolute maximum force based on the customer specific mounting situation.

6. Operation

Equipment containing HAEHNE measurement systems and sensors have to conform the valid national safety instructions, e.g. laws about technical tools, accident prevention instructions, etc. according to the Directive 98/37/EG.

7. Maintenance and Repair

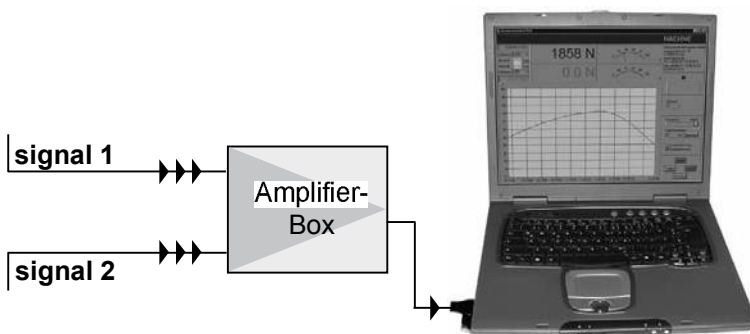
This work should be performed according to the documentation of the appropriate HAEHNE product.

Force Measurement with Strain Gauges

Technical Information

The strain gauge technology is the major method to measure forces. Various mechanical designs of compression or bending type sensors are being used to measure strain. The translation of the elongation proportional to the force into a voltage signal is generally made with a full Wheatstone bridge in conjunction with appropriate amplifiers. Several sensors can be connected in parallel to obtain average values. The amplifiers are available as DIN rail mount versions or field enclosures to be mounted close to the point of measurement.

In addition to permanently mounted amplifiers a specifically designed portable analysis system is available for the continuous monitoring of force measurement values. The hand-held system PAD can e.g. capture compression forces and transmit them via an interface. The PC based portable FAS system can be used for comprehensive analyses. The software runs on a standard PC. Additional hardware components have been designed for the continuous measurement and storage of one or two force signals.



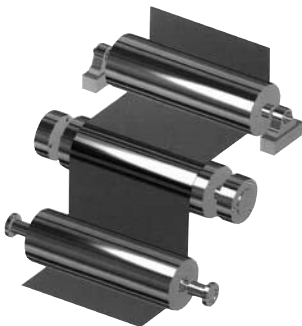
The value of each measurement is stored together with the corresponding measurement time. Thus it is possible to perform additional analyses with such standard software as MS Excel®

Web Tension Measurement Systems

Functional Principle and Circuitry Versions

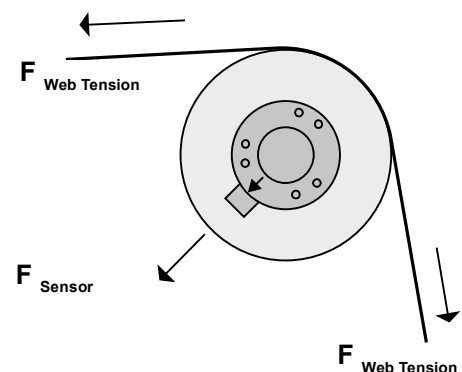
In processes where running webs of material are continuously manufactured with increasing process speeds and higher demands on quality it is necessary to measure and control the tension forces in the material.

This applies equally well to the production and converting of plastic foil, textiles, paper, and metal as well as wires and cables.

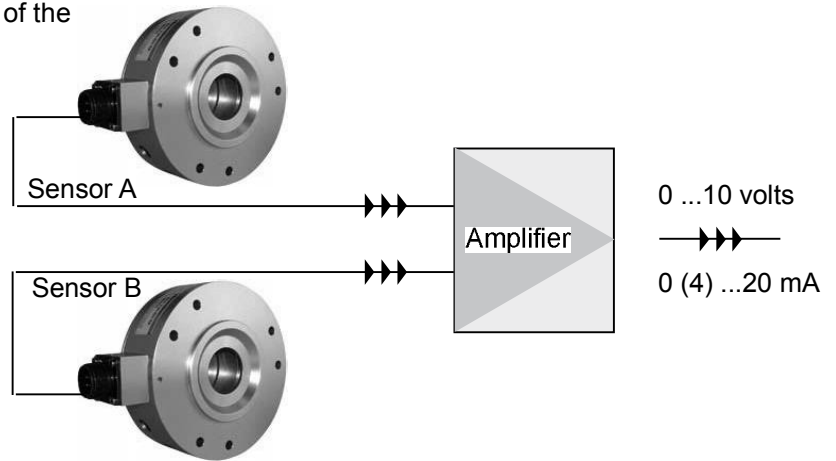


Because the forces cannot be measured directly in those in running webs it is necessary to measure the forces acting on the bearings of idler rolls. The measured values are proportional to web tension if the systems are correctly dimensioned. Because of possible nonsymmetrical load distribution over the rolls it is customary to measure the forces in both bearings of the idler roll. The core of the web tension sensors are strain gauge transducers measuring the acting forces.

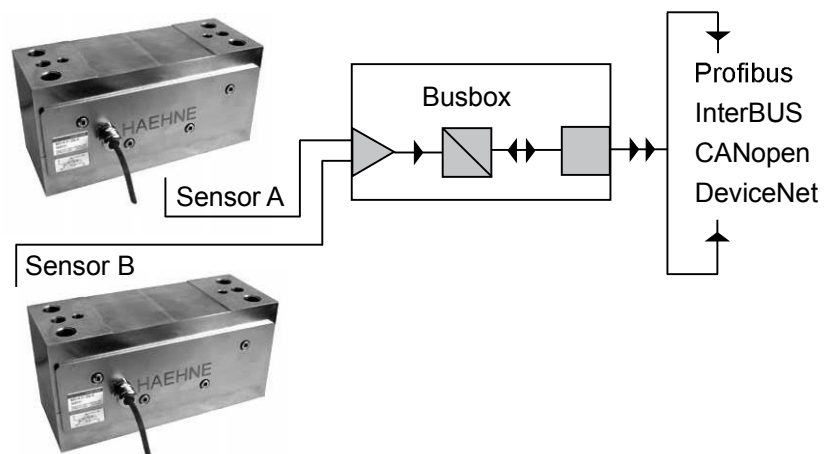
Amplifiers, increasingly common with digital bus interfaces, raise the very low sensor signals to be appropriate levels.



The „standard“ measuring system consists of two sensors and one amplifier. The second sensor is not necessary if the web runs steady in the middle of the rolls and the process does not require high precision web tension measurement. The analog output of the amplifier can be either voltage or current signals. Depending upon in the sensor cable length the amplifiers are housed in field enclosures either mounted close to the sensors. Alternatively DIN rail enclosures are available for mounting in electrical cabinets. If fieldbus amplifiers are used, then the force values can be send directly onto the fieldbus.

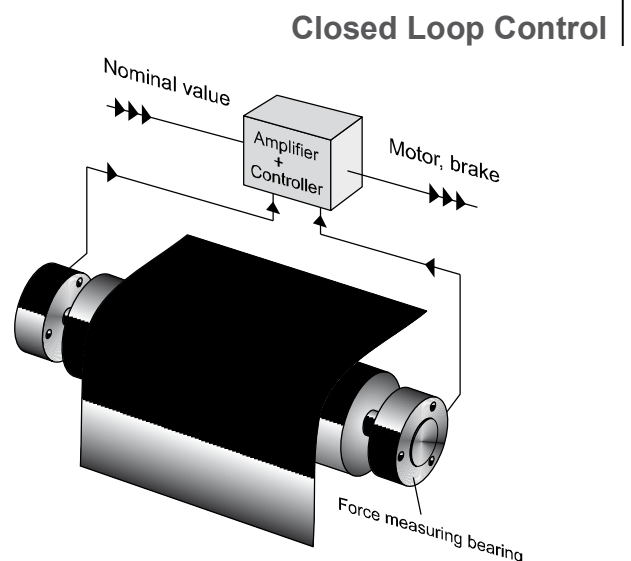


The picture shows an example of the transmission of averages. However, when using an additional fieldbus amplifier the force values of each sensor can be used to determine e. g. the differential web tension of the system.



Web Tension Measurement Systems

Constant web tension is the most frequent requirement when processing webs. For this purpose the actual value of the amplifier is compared to the set point in the controller and the difference being used to adjust drives or act directly e.g. on brakes. The available amplifier controller combination MAC minimizes the number of required components and reduces also circuit design and wiring effort.



Web Tension Measurement Systems

Force Sensor Design and Areas of Application

In case of measurement at both ends of the idler roll, three basic design versions are available depending on the type of machinery and equipment environment:

Flange Design

For vertical machine frames this design offers mounting advantages. The measurement direction of the sensor can be moved to any angle in order to adjust it optimally to the web geometry and nominal force rating of the sensor. In general, however, the horizontal force measurement direction offers the advantage of eliminating the force component of the roll weight. In case of other geometries the force component of roll weight can be eliminated with the amplifier. The sensors are symmetrical and can measure tension as well as compression forces. Therefore, it is possible to use these sensors also e. g. for roll pressure measurement.



Pillow Block Design

For process lines with larger forces pillow block bearings are frequently used. The under pillow block sensor are specifically designed to fit the space between the actual pillow block bearing and the mounting frame. Horizontal mounting frames are most frequently used for pillow block bearings. There are two sensor versions available measuring either horizontal or vertical to assure the best fit for the varying web geometries.



Hub Design

The force sensor ZAK and the mounting accessories flange ring and clamping block allow mounting to both horizontal and vertical machine frames. For this reason the sensor is especially well suited for single-sided narrow web and wire applications.



Measuring Idler Rolls

Complete measuring rolls are available for dual bearing support as well as single-sided bearing support e.g. for narrow web printing machines. The web tension measuring rolls MES and MWF contain integrated force sensors



Web Tension Measurement Systems

Establishment of Nominal Force Rating

The HAEHNE web tension sensors are generally designed for a specific measuring direction marked in most cases by a red dot. Web forces in that measuring direction generate positive force signals. If the forces do not act exactly in the measuring direction, the sensor will display a lower force according to the angles of the acting forces.

The measuring ranges follow a geometrical progression and enable a sensor selection most suitable for the actual web tension force situation. The necessary measuring range is determined by the largest expected web tension force and the web tension geometry (compare diagrams).

The machine design determines the entering and exiting web angles. This specifies also the direction of the force vectors F_1 and F_2 . For the calculation it is assumed that the measuring roll is neither driven nor braked and that the bearing friction is negligible. Under this condition the values of the vectors are equal to the maximum web tension force. Trigonometric functions and the actual mounting situation of the sensors enable the calculation of the web tension force in the measuring direction. The sum of the two parts F_{M1} and F_{M2} acts on the roll and half of the total on each sensor. In case of horizontal measurement it is not necessary to account for the roll weight, because it acts only vertically. However, in case of horizontal measurement the maximum permitted transverse force according to the product specification has to be observed.

Roll weight forces in the measuring direction can be zero adjusted at the amplifier.

Beispiel

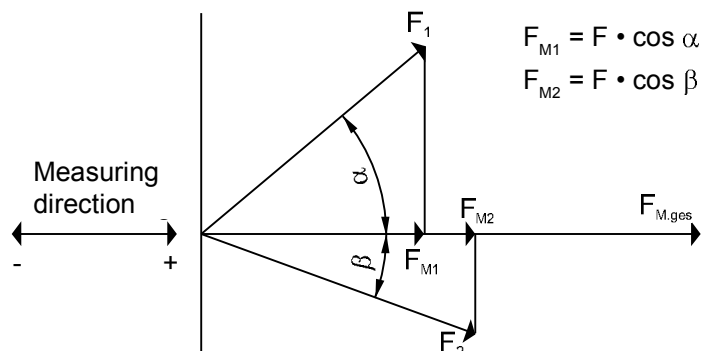
Web tension $F = 1000\text{N}$
 Feeding angle $\alpha = 40^\circ$
 Run-out angle $\beta = 20^\circ$
 Measuring direction $M = \text{horizontal}$
 Force per sensor:

$$F_M = \frac{1}{2} (F_{M1} + F_{M2})$$

$$F_M = \frac{F}{2} (\cos \alpha + \cos \beta)$$

$$= \frac{1000\text{N}}{2} (0,766 + 0,94)$$

$$\underline{\underline{F_M = 853\text{ N}}}$$



Information

Web Tension Measurement Software

Please use the HAEHNE MKB Software for calculating the forces acting on the sensor and thereby size the sensor. The software can be downloaded with the link: <http://www.haehne.de/support-en.html> or can be emailed to the requester.

Electrical Engineering of HAEHNE Force Measurement Systems

Instructions for Electrical Devices

The HAEHNE force measuring systems consist of sensors and electronics to amplify low millivolt signals. In order to enable trouble free operation and adherence to electromagnetic interference precautions the following points have to be observed:

Electronic Modules

Mounting instructions:

1. Units that have been designed for DIN rail enclosure mounting, have to be placed in metal enclosures such as electrical cabinets.
2. The modules should be mounted away from strong noise generating sources such as power switches, frequency transformers or chokes.
3. Noise suppression measures should be used in the place of mounting for such components as alternating or direct current coils, contactors, relays or brakes.
4. Electronic modules should not be mounted on top of each other in order to prevent heat accumulation.

Wiring instructions:

1. Between electrically conducting equipment parts, a potential equalization cable with sufficient cross section has to be provided. Electrically conducting mounting frames and DIN rails should be included in the potential equalization of the machine.
2. Use shielded cables for control and signal leads.
3. All signal inputs that are not used should be connected to a defined potential or ground earth.
4. Cable shields should be connected only single-sided and to the PE of the amplifier.

* In case of field enclosures the cable shield should be connected within the EMI glands to the metal enclosure.



* Electronic modules in DIN rail enclosures should be mounted in such a way that the cable shield is connected to the DIN rail via a PE terminal next to the module.

5. Cable lengths between sensors and amplifier should be kept to a minimum.
6. By connecting components of a fieldbus system use only the specified cables and connectors of the respective bus system.
7. Do not place signal cables adjacent to power cables or signals with high edge steepness. A cross over at an 90° angle is permissible.
- 8 In order to avoid grounding problems it is useful to connect GND and PE at a defined point within the equipment. Additional connections (e.g. internal in individual modules) can lead to functional interference.

Electrical Engineering of HAEHNE Force Measurement Systems



Safety Instructions

1. If damage is visible or the unit malfunctions switch off power immediately.
2. Before opening a unit switch off the power supply.
3. Opening of the unit and carrying out adjustments within the unit should be made only by trained personal.
4. Touching printed circuits and electronic components should be avoided because of the danger of destruction by electrostatic energy.
5. All applicable guidelines and safety instructions relating to electrical and electronic systems as well as country specific safety instructions should be observed.

Electrical Engineering of HAEHNE Force Measurement Systems

Technical Instructions for Sensors

Electrical connections:

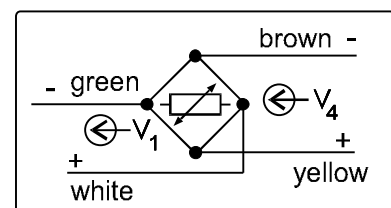
Depending on the sensor type (see product description) various versions of electrical connections are offered as options.

The standard cable length for all options is 5 m.

Cable lengths up to 20 m are available on request.

Sensor Cable Lead Colors

V_1 : Signal voltage
 V_4 : Supply voltage



Electrical Cable for HAEHNE Sensors

Standard

Technical Information

HAEHNE sensors are equipped with PVC or PUR cable depending on the sensor design. For exact specification refer to the product description. The standard cable length is 5 meters.

PVC Cable, grey

Special PVC signal cable, shielded, in 2 different sizes depending on the sensor size		
Type	LIYCY 4 x 0,14; 4 x 0,34	
Color	grey (according to DIN color code DIN 47100)	
Cross Section	size 1:	4 x 0,14 mm ²
	size 2:	4 x 0,34 mm ²
Outer Sheath	material	special PVC
	outer diameter	size 1: 4,5 mm size 2: 5,1 mm
Design	plain copper wires, fine strands acc. to VDE 0295 class 5 cores twisted, foil wrapping special-PVC-lead insulation, shielded braiding tinned copper wire	
Technical Characteristics	nominal voltage	size 1: 0,14 mm ² = 350 volts size 2: 0,34 mm ² = 500 volts
	test voltage	lead/lead 1200 volts lead/shield 800 volts
Temperature Range	moving	- 5 ... + 80 °C
	permanently placed	- 30 ... + 80 °C
Mechanical Values	minimum bending radius approx. 15 x cable diameter, oil and petrol-resistant to VDE 0250 and 0472, PVC self extinguishing and flame retardant	

PUR Cable, grey

Robust, shielded line for pillow block sensors. Suitable to the use in wet and oily areas.		
Type	Unitronic PUR CP 4 x 0,34	
Color	pebble grey (according to DIN color code DIN 47100)	
Cross Section	4 x 0,34 mm ²	
Outer Sheath	material	special compound based on PUR
	outer diameter	5,7 mm
Makeup	plain copper wires, fine strands, shielded braiding tinned copper wire, core insulation based on PVC	
Technical Characteristics	inductance	0,65 µH/m
	capacitance	160 nF/km
	test voltage	1500 V
Temperature Range	permanently placed	- 30 ... + 80 °C
Mechanical Values	minimum bending radius approx. 15 x cable diameter, permanently placed: 6 x cable diameter, notch and oil-resistant, hydrolysis and mikrobe-resistant, flame retardant according to VDE0482, part 265-2-1/IEC	

Electrical Cable for HAEHNE Sensors

Variations

Technical Information

HAEHNE supplies according to the customers' specification the following cable versions listed below.
Cable lengths up to a maximum of 20 meters differing from standard length have to be specified in the order.

Teflon Cable, white

for extreme environmental condition (High temperature, chemicals)		
Type	LITCT 4 x 0,38	
Color	white (according to DIN color code DIN 47100)	
Cross Section	4 x 0,38 mm ²	
Outer Sheath	material teflon FEP 6Y, ø 4 mm	
Design	silvered strands 19 x 0,16 mm, teflon lead insulation, cross section of conductor 0,34 mm ² , silvered shielded braiding	
Technical Characteristics	capacitance	16,50 A to 25° C ambient temperature > 53 Ohm/km to 25° C ambient temperature
Temperature Range	conductor wrapping, sheath	-100 ... 200 °C
Mechanical Values	flexible, oil and petrol-resistant, break-resistant, flame retardant, heat, cold and weather-resistant, UV-resistant,	

Halogen Free Cable, pebble grey

for special environment condition		
Type	Unitronic LIHCH 4x0,34	
Color	pebble grey (according to DIN color code DIN 47100) RAL 7001	
Cross Section	4x0,34 mm ²	
Outer Sheath	material halogen free compound VDE 020, ø ca. 5,7 mm	
Design	plain copper wires, fine strands according to VDE 0207, halogen free lead insulation, wrapping of plastic foil, shielded braiding of tinned copper wire	
Technical Characteristics	nominal voltage 250 volts test voltage 1200 volts	inductance approx. 0,65 µH/m capacitance 120 nF/km
Temperature Range	permanently placed	- 30 ... + 80 °C
Mechanical Values	minimum bending radius, permanently placed 15 x cable-ø, flexible 6 x cable-ø, petrol-resistant, self extinguishing, flame retardant VDE 0472 Part 804,	

PVC Cable, grey, UL-Style

UL-Style 1061, UL-Style 2404, Approbation UL & CSA, recommended for EMC-compatible application conforming to Directive 73/23/EC („Low Voltage Directive“) CE		
Type	LIYCY UL/CSA 4 x AWG 22/7 0,34	
Color	grey (according to DIN color code DIN 47100) Ral 7001	
Cross Section	4x0,34 mm ²	
Outer Sheath	material PVC, ø 6,1 mm	
Design	leads twisted in layers, PVC lead insulation, shielded braiding of tinned copper wire, coverage approx. 85 %	
Technical Characteristics	nominal voltage 250 V test voltage 1500 V	inductance ca. 0,65 µH/m capacitance 120 nF/km
Temperature Range	flexing: - 5 ... + 70 °C	permanently placed: - 30 ... + 80 °C
Mechanical Values	minimum bending radius, permanently placed 10 x cable-ø, flexible 5 x cable-ø, self extinguishing and flame retardant according to IEC 332-1, extensively resistant against acids, base and specific oils	

Mounting of Web Tension Sensors

General Mounting Instructions

Installation Position

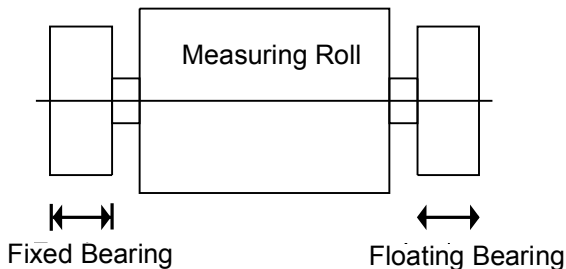
The sensors must be mounted according to the calculated web geometry and used only as intended. See also "General Safety Instructions of HAEHNE Tension Force Measurement System". Use for the calculation the HAEHNE Web Tension Measurement Software MKB.



The measuring direction of the sensors is indicated with a red dot or marked by an arrow. At the installation this marking must point towards the measuring direction. Mount the sensors at measuring rolls in such a way, that the arrow or red dot of both sensors point in the same direction.

Bearing

Measuring rolls must have a fixed and a floating bearing and should be equipped only with self-aligning ball bearings. Temperature-dependent expansion of the shaft must be possible. Expansion does not effect the measuring accuracy.



Mounting of Web Tension Sensors

Maintenance and Fault Notices

Maintenance

The systems do not require any maintenance under normal operating conditions. In case of overload, however, review the zero force value. The sensors should not be opened. The systems do not contain any parts that can wear out. For critical applications it is recommended to have sensors and electrical modules as spare parts on hand.

Error Notice

When calculating the nominal force rating, the web tension on both sides of measuring roll has been assumed to be of equal value. Additional forces acting on the sensor can result in measuring errors.

Possible Reasons for Measuring Errors:

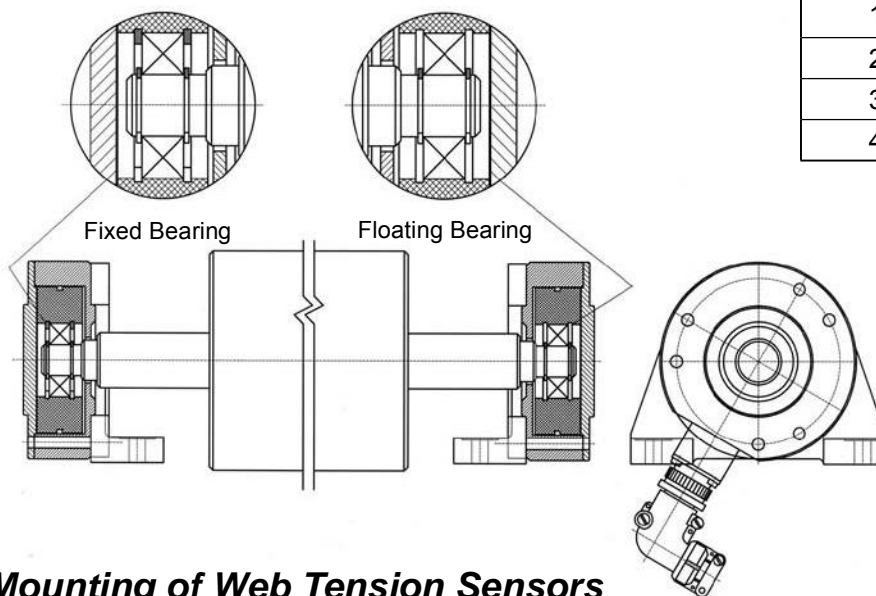
- Higher friction forces in ball bearings and coolant seals. e. g. in chill rolls
- Low friction movement of measuring roll (without web) not possible
- The actual mounting position is different from the design
- Torque of mounting screws not according to specification
- Bearing in the sensor ran hot
- Liquids entered the cavities of the sensors
- Fixed and floating bearing not correctly mounted
- Drives or brakes are connected to measuring roll
- Acceleration and deceleration forces acting at the measuring roll during speed changes
- Bending forces in the web when winding and unwinding
- Contact of the measuring roll with pressure rolls, strippers, or brushes

Mounting of Web Tension Sensors

Flange Design

1. Clean the seat of the bearing of the measuring roll. Inspect the bearing seat tolerance and the cylindrical form
2. Dis-assemble the closed cover.
3. a) **Fixed Bearing Side:** Fix the bearing in the inner part of the sensor with two locking rings (DIN 472). Move optional V-ring gasket and force sensor onto the seat of bearing. The mounting force should be applied only to the inner ring of the bearing. Fix bearing with locking ring (DIN 471). Check axial play. If necessary insert shim ring (DIN 988) between bearing and locking ring. Mount closed cover, Refer to table.
3. b) **Floating Bearing Side:** Move optional V-ring gasket and force sensor onto the roll shaft. Mount bearing onto the seat of bearing and lock with locking ring (DIN 471) on the shaft. Move the inner part the sensor onto the bearing. This bearing must **not** be fixed with locking rings. The engineering design of the shaft end must allow for an expansion movement. Mount closed cover, see table

Installation Example Flange Design



Torque M_A [Nm]

Sensor Size	Fixing-screws	Cover screw
1	7	hand-tight
2	7	hand-tight
3	16	5
4	32	5

Mounting of Web Tension Sensors

Pillow Block Design

1. The surfaces of the upper and lower mounting surface must be clean and free of foreign material. The minimum requirement for surface roughness is Rz16.
2. Mount the sensor only with the designated boreholes
3. Under no circumstance should the side covers be damaged. The gaskets are integrated in these covers! Use ring bolts for safe transport (see pic.)



Screw Size	Torque M_A [Nm]
M16	210
M20	410
M30	2000

Web Tension Calibration

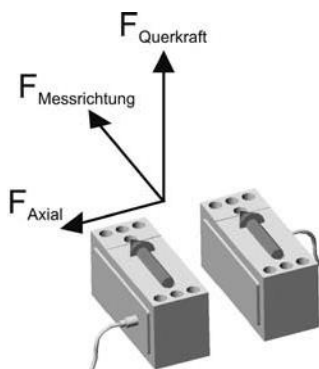
Adjustment Instruction

Preview

The accuracy of web tension measurement should be examined regularly. Use a rope, belt or tape to create a loop as under normal operation conditions and apply the load in the middle of the measuring roll. The output signal of the web tension sensor is now compared to the measurement values of a reference sensor. If a single sensor has to be examined or if the application of the total web tension force is not possible, then the sensors should be charged individually with the load.

Preparation

- Selection of a reference sensor with analysis and display. The accuracy of this reference sensor must be higher than the mounted web tension sensor, because



the accuracy of the reference sensor determines the total accuracy

- Use a stroke cylinder to apply gradually at least the nominal force to the sensor
- Use a digital multimeter with high resolution and a high input resistance
- Remove web material from the rolls.
- Attach a reference sensor to the cylinder and mount both into the machine in such a way that the force direction corresponds to the measuring direction. Transverse and axial acting forces must be excluded. Consider the warm up period of the amplifier components.
- Uncover the amplifier terminals to record the measuring signals.

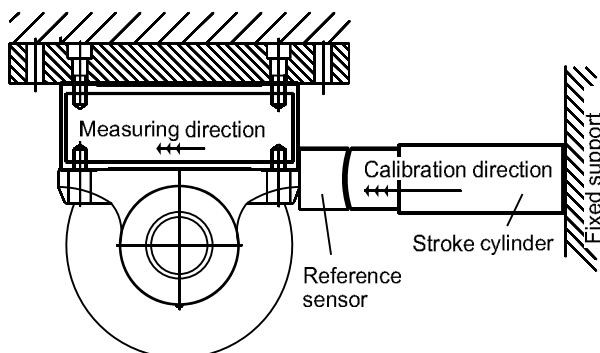
Operation Procedure

- Note zero signal (see next page)
- Load the web tension sensor in steps of 10 % up to the nominal force
- Apply the force in the measuring direction to the pillow block bearing
- Store the individual values
- Unload the sensor and record the values.

Attention! Danger of Accident



Absolutely consider the measuring direction!!



It is not so important to perform this procedure exactly in steps of 10 %. Important is the simultaneous capture of the corresponding values:

- Measuring force of reference sensor
- Output signal of sensor in mV
- Web tension force displayed on the machine controls

Possible Causes of Error

- Wrong direction of force application
- Rigidly mounted bearings in the measuring rolls (e. g. no fixed and floating seat)
- Yielding of stroke cylinder support

Web Tension Calibration

Protocol

Reference Sensor	
Nominal force	
Combined error	
Manufacturer	

Web Tension Sensor	
Supply voltage* (V_{4+} , V_{4-})	
Mounting area	
Serial number	

* Digital multimeter with resolution and input resistance as high as possible

Measured Force Reference Sensor [in % of nominal force]	Measured Force Reference Sensor [kN]	Output Voltage Web Tension Sensor V_{1+} , V_{1-} [mV]	Display of Web Tension [kN]
0			
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
90			
80			
70			
60			
50			
40			
30			
20			
10			
0			

Date

Tester:

Declaration of Conformity, CE Designation

for HAEHNE Measurement Systems

The HAEHNE Company declares hereby, that all of their manufactured force measurement systems conform to the requirements of the

Machinery Directive (98/37/EC) and are in accordance with the marking obligation in order to receive the **CE- Designation**

HAEHNE force measurement devices should be regarded as "interchangeable equipment which can modify the function of a machine", according to the Machine Directive chapter 1, article 1, section (2).

All force measurement systems of the HAEHNE company function according to the principle of an elastic deformation body, with weakened areas applied with full bridge strain gauges to determine the force acting on the deformation body. Force measurement systems of the HAEHNE company are **NOT** considered as safety-relevant machine elements.

The use of HAEHNE force measurement systems in conjunction with other machine components results in a change of properties and characteristics of the whole assembly. Before start-up of such a machine a declaration of conformity must be issued.

Manufacturer Declaration, Machinery Directive (98/37/EC)

for HAEHNE Measurement Systems

The HAEHNE company declares that those in the following designated machine components which are intended for installation into a machine and their planned start-up is not allowed until it has been determined that the machine containing these components corresponds to the regulations of the Machinery Directive (98/37/EC), Annex II, B.

This declaration loses its validity if the component was modified without prior approval of the HAEHNE Company

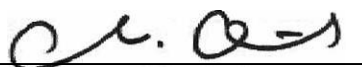
Designation of the machine: **Sensor for measuring forces and torque**

Applied harmonized standards:

EN ISO 12100	Safety of machinery; basic concepts, general principles of design
EN 294	Safety of machinery; safety distances to prevent danger zones from being reached by the upper limbs
EN 349	Safety of machinery; minimum gaps to avoid crushing of parts of the human body
EN 811	Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs

Dipl.-Ing. Manfred Quiel,
General Manager

Erkrath



Declaration Concerning UL Standards (To Whom It May Concern)

for HAEHNE Measurement Systems

According to UL-Standards, power supplies with voltages higher >30 Volts require their own UL-Certification. Products which are used in secondary electrical circuits with a supply voltage of < 30 Volts do not require an individual UL-certification.

This applies to all HAEHNE products.

It is the obligation of the user, however, to ensure that the power supplies that are used to power HAEHNE products conform to UL-standards.

Accordingly no additional restrictions apply to the use of HAEHNE Elektrische Messgeräte GmbH products, because they are SELV-circuits (Safety-Extra-Low-Voltage-Circuits) according to IEC 60950. This standard includes the corresponding North America Standards CAN/CSA No. 60950/UL 60950 (older designation: CAN/CSA C22.2 No. 950 and UL 1950). Separate UL-certifications apply to the use PBC's (printed circuit boards).

In addition, during the R&D and the manufacturing of the HAEHNE products the requirements of UL and CSA Standards are observed to the outmost extent. During the selection of electrical and electronic components preference is given to UL certified components, such as cables, enclosures, connectors, terminals, printed circuit boards (PCBs) and even many internal electronic components.

The HAEHNE amplifiers, for example, contain, depending on the type, components according to the following safety standards:

UL1950, UL508,
UL 94, UL50, UL796,
IEC6095, EN 60950

and the following safety approvals:

cUL/UL File Nr. E188913,
UL-recognized File: E153698,
UL-recognized File: E63093,
UL-File-Nr.: E161212,
UL-File-Nr.: E203339

In conjunction with the CE declaration the HAEHNE products are manufactured according to the following standards and guidelines:

EN 50081-1
EN50082-2
98/37/EG and conform therefore to standards similar to CSA/UL.

The connecting cables of the sensors can be supplied with UL certification on a request basis.

HAEHNE products must only be operated for their intended use.

In addition to the above fulfils HAEHNE the requirements of the Quality Management System according to ISO 9001: 2000 and is certified to BVS 05 ATEX E 091 for explosion protection products.

Erkrath, 20th August, 2004

Dr. Friedhelm Goronzy
President

Dip.-Ing. Manfred Quiel
General Manager

CERTIFICATE



The Certification Body
of TÜV Management Service GmbH
certifies that

HAEHNE Elektronische Messgeräte GmbH
Heinrich-Hertz-Str. 29
D-40699 Erkrath

has established and applies
a Quality Management System for

**Development, manufacturing, maintenance, service and sales
of force measuring systems and electronic measuring devices
as well as calibration services**

An audit was performed, Report No. **70056354**

Proof has been furnished that the requirements
according to

ISO 9001: 2000

are fulfilled. The certificate is valid until **2007-02-16**

Certificate Registration No. **12 100 21548 TMS**

Munich, 2004-02-18




Certification Body
of TÜV Management Service GmbH
Unternehmensgruppe TÜV Süddeutschland
Ridlerstraße 65
D-80339 München



TGA-ZM-07-92

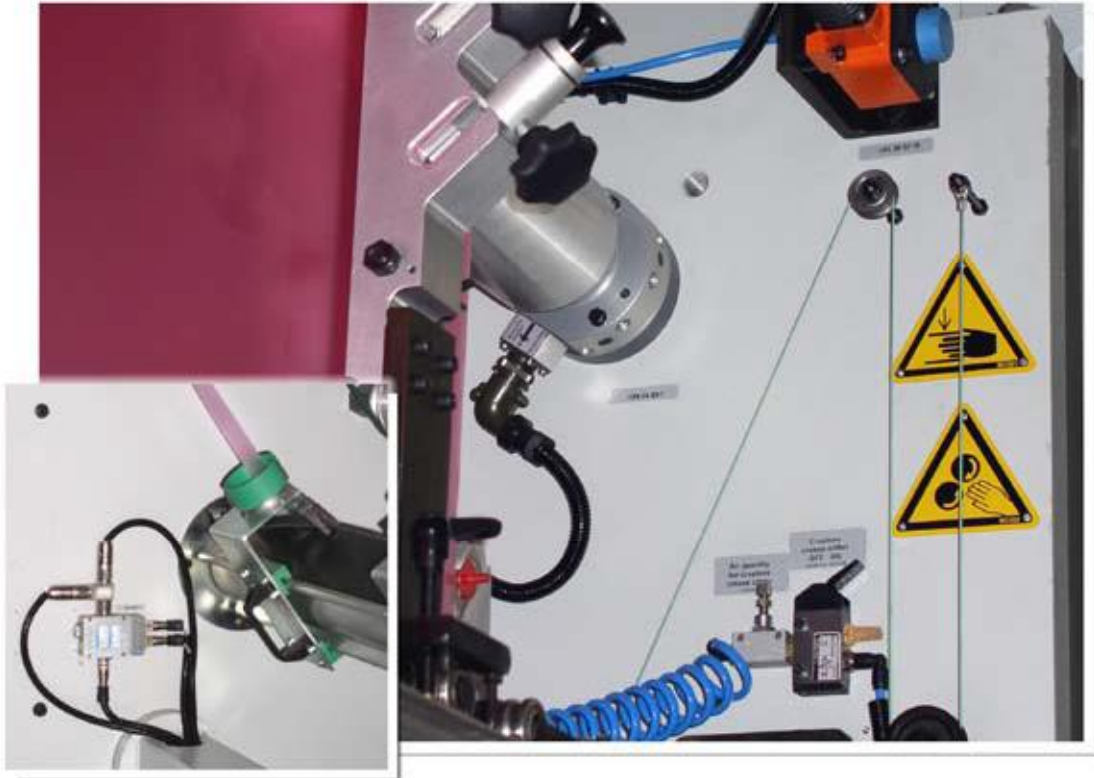
Terms and Definitions of Characteristics

for HAEHNE Force Measurement Devices

Terms	Unit	Definition
Nominal Force (F _{nom})	N / kN / MN	The force for which the sensor has been designed.
Measuring Range	N / kN / MN	The force range for the intended use of the sensor. The accompanying error limits should not be exceeded within the range.
Operating Force	%	The maximum force in the measuring direction that a sensor with overload protection can be exposed to without losing its measuring properties. The operating force of sensors without overload protection equals the absolute maximum force.
Absolute Max. Force	%	The maximum permissible force for the sensor which does not damage its measuring characteristics. The specified error limits do not apply to this force.
Nominal Rating	mV/V	The nominal rating of a sensor describes the output signal of that sensor under the application of the nominal force in relation to the bridge alimentation voltage. A force sensor with a nominal rating of 1,5 mV/V with 10 V bridge alimentation voltage and an application of nominal force (100%) generates an output signal of 15 mV.
Combined Error	%	The largest single error of the sensor output is smaller than the error value of this combined error class.
Reproducibility	%	Deviation of the output signal after repeated application of the same force or after an extended period of time or variations of the applied force.
Linearity Deviation	%	Maximum deviation of the output signal from the straight line of best fit under continuously increasing force in relation to the final value of the measuring range.
Hysteresis	%	Relative difference of the measurement values between increasing and decreasing application of the load.
Nominal Ambient Temperature	°C	The temperature range in which the sensor functions within the limits of specified technical data and the error limits.
Operational Temperature Range	°C	The temperature range in which the sensor functions without permanent damage to the measurement properties. The specific error limits do not apply, however, to this temperature range.
Nominal Resistance of Strain Gauge	Ω	The ohmic resistance of the total full bridge is used to determine the load of the supply voltage resulting from the force sensor.
Supply Voltage	V DC	Alimentation voltage of the force sensor to ensure error and fault free operation. The highest value specified for the force sensor should not be exceeded to avoid excessive increase in temperature of the strain gauge.
Enclosure Protection Ratings	IP	1 st number: 2 = protect against objects greater than 12 mm 5 = dust protected 6 = dust tight ; 2 nd number: 0 = not protected 4 = protection against splashing water, 5 = against water jets, 6 = against powerful water jets, 7 = against effects of immersion, 8 = against submersion.

Application Example

Blown Film Line



Product Description

Force Sensor BZA

Special Features

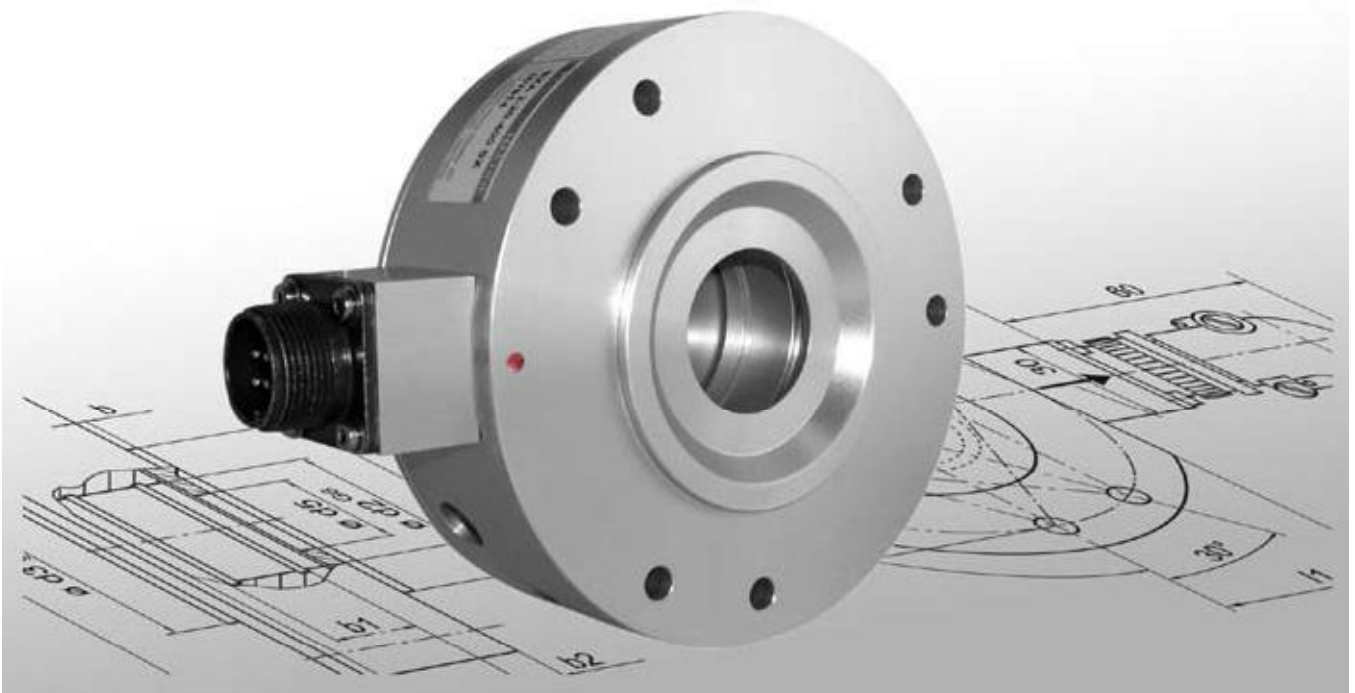
- ☐ Very cost effective solution
- ☐ Light weight design made of special aircraft aluminium
- ☐ Nominal force ranges follow the geometric progression
- ☐ Tenfold overloading

Scope of Supply

Force sensor with quick disconnect cable, receptacle with cable 5 meters in lengths

Additional Accessories

- **Option F:** use in potentially explosive atmospheres with J-Box



Application

The force sensors of the **BZA** series are suitable for the direct measurement of front tension forces which occur in the manufacturing and further processing of webshaped materials.

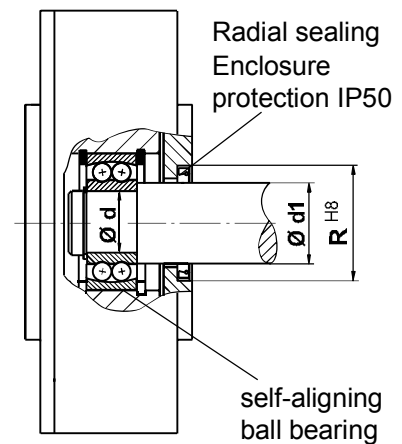
The sensors are used like any common flange house bearings for the measurement of tension forces. Depending on the flow of the web and the distribution of the load, the sensors can be used single sidedly or as a pair of sensors.

The **radial force sensors of the series BZA** are manufactured very cost effectively in a proprietary process. They consist primarily of three parts: a flange housing, the inner seat of bearing, and a closed cover disk. The inner seat of bearing serves also as double beam measuring element of high linearity and stiffness. The strain gauges wired as full bridges deliver a signal proportional to the force.

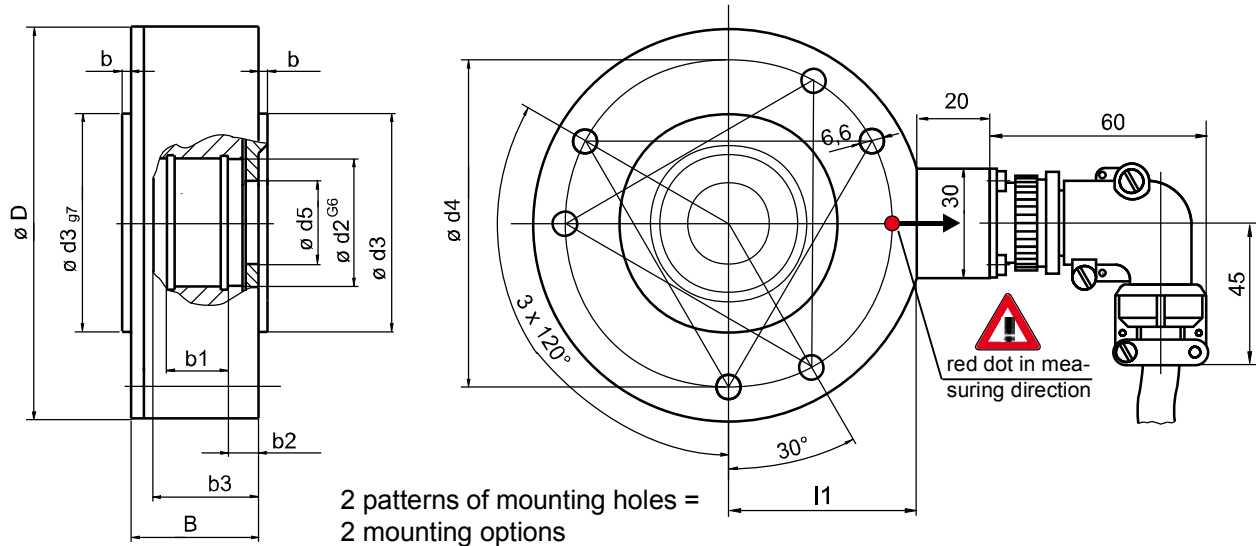
HAEHNE offers for all its sensors a corresponding range of amplifiers to condition the measuring signal and deliver the bridge voltage supply.

Technische Daten	Values based on nominal force
Nominal force (measuring range)	
Size 1:	100, 160, 250, 400, 630, 1000 N
Size 2:	160, 250, 400, 630, 1000, 1600 N
Max. operating force	160 %
Absolute max. force	1000 %
Nominal rating: (with option F: J-Box necessary)	1,5 mV / V
Combined error	0,5 %
*Nominal ambient temperature	+ 10 ... + 60° C
*Operational temperature range	- 10 ... + 70° C
Nominal resistance of strain gauge bridge	700 Ω
Max. bridge supply voltage	10 VDC
*) A cable in motion reduce the value to 50° C	

Installation example (with special accessories)

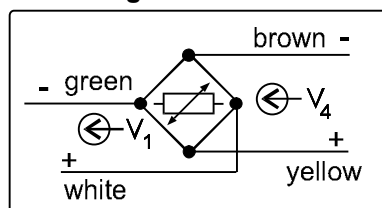


Option F: Connector blue anodized



Size	d	d1	d2	d3	d4	d5	D	B	b	b1	b2	b3	I1	R	recom. bearing
1	15	20	35	60g7	90	22,5	108	35	2,5	14,2	10,4	30	51,9	26H8	1202
	17	22	40			25,0				15,8	9,6			28H8	1203
2	20	25	47	70f7	105	25,5	125	42	3,0	17,7	12,7	36,5	60,6	32H8	1204
	25	32	52			32,5				19,3	11,9			42H8	1205

Measuring cable lead colors



V₁: bridge output signal
V₄: bridge supply voltage

Ordering example:

BZA 1 - 15 - 250 SF

— Connection / option
— Nominal force
— Shaft diameter
— Size
— Type

Product Description

Radial Force Sensor BZE

Special Features

- ☐ Made of stainless steel with enclosure meets IP 67
- ☐ High overload protection - due to mechanical stops
- ☐ Small space requirement

Scope of Supply

Force sensor with cable (PVC),
5m in length and right angle plug

Additional Accessories:

- Shaft sealing ring
- Option T: Cable gland
- Option F: For use in potentially explosive atmospheres with J-Box



Standard Variant S:

The plug is adjustable in 4 angle positions,
also after mounting.



Option T:

Cable gland with flexible spring cable shield

Application

The radial force sensors of the **BZE** series work like flange bearing housings and measure thereby the forces acting at the roller ends. Thus the tension force in the web can be determined.

Major fields of application are machines and equipment processing paper, textile, plastic and metal web.

Radial force sensors of the series BZE are of a compact flange design and suitable for a variety of applications.

The sensors basically consist of the seat of the bearing, the measuring elements and the housing with cover disks. The acting forces are captured by strain gauges applied to the measuring elements. The full bridge strain gauge are designed for maximum signal usage and temperature compensation. **HAEHNE** offers for all its sensors a corresponding range of amplifiers to condition the measuring signal and deliver the bridge voltage supply.

Technical Data

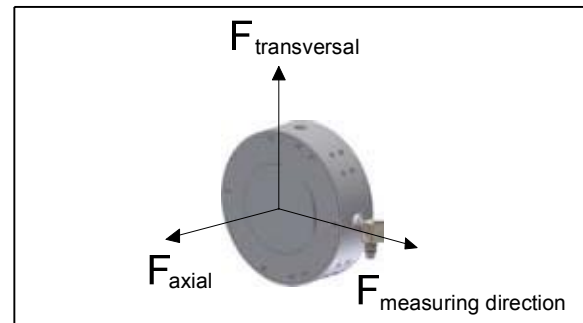
Sizes	1; 2; 3; 4
Nominal force F_{nom} (Measuring range)	0,2 ... 15 kN
Max. operating force based on F_{nom}	150 %
Absolute max. force based on F_{nom}	1000 %
Max. axial force based on F_{nom}	50 %
Max. transversal force based on F_{nom}	100 %
Nominal rating (with option F: J-Box necessary)	1,5 mV/V
Combined error based on F_{nom}	0,5 % ¹⁾
Reproducibility based on F_{nom}	0,1 %
Nominal ambient temperature	+10...+60 °C ²⁾
Operational temperature range	-10...+70 °C ²⁾
Nominal resistance of strain gauge bridge	350 Ω
Bridge supply voltage	10 V DC
Enclosure protection	IP 67

¹⁾ To size 4 with 10 and 15 kN an combined error of 1 % applies

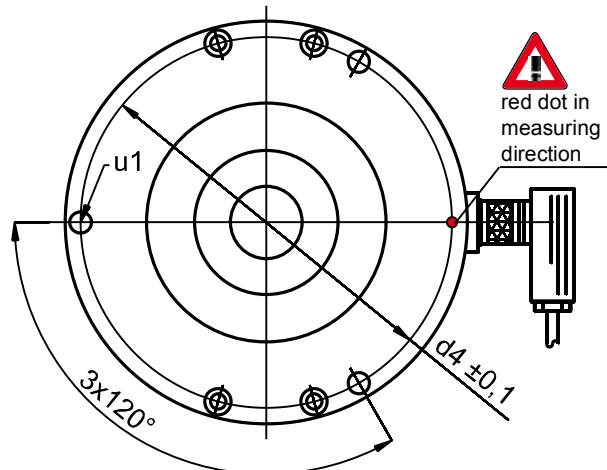
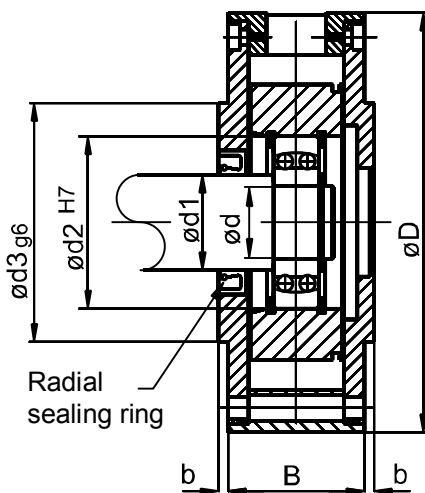
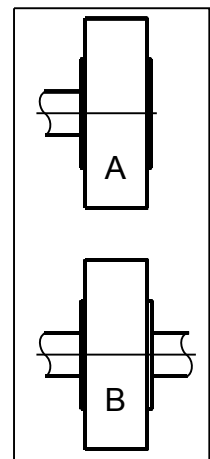
²⁾ A cable in motion reduce the value to 50° C

Ordering Data

BZE 1 - 17 A 0,2k S	
Option	
Nominal Force in kN	
Design	
Shaft diameter	
Size	
Type	



Design



Size	Nominal Force in kN	d	d1	d2	d3	d4	D	b	B	u1	recom. Bearing
1	0,2; 0,5; 1	15	20	35	60	90	105	3	32	6,6	1202 ³⁾
		17	22	40							1203 ³⁾
		20	24	35							GE 20 ⁴⁾
2	0,2; 0,5; 1; 1,5	20	25	47	70	105	125	4	40	6,6	1204 ³⁾
		25	32	52							1205 ³⁾
		30	34	47							GE30 ⁴⁾
3	0,5; 1; 2; 5	30	40	72	100	155	175	4	57	9	1306 ³⁾
		35	45	80							1307 ³⁾
		40	50	80							1208 ³⁾
4	1; 2; 5; 10 ¹⁾ ; 15 ¹⁾	40	50	90	130	200	225	4	67	11	1308 ³⁾
		45	60	100							1309 ³⁾
		50	65	110							1310 ³⁾
		55	68	100							2211 ³⁾
		60	70	110							2212 ³⁾

³⁾ Pendelkugellager

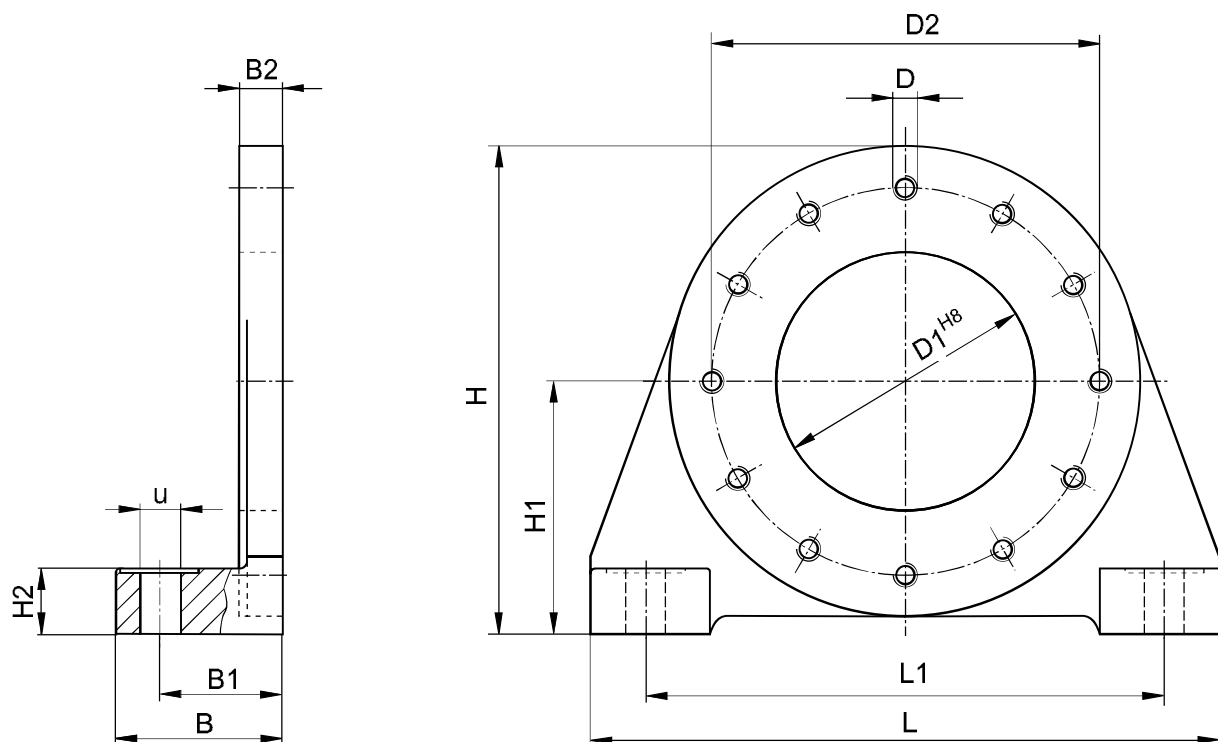
⁴⁾ Radial-Gelenklager für starre Achsen

Data Sheet

Bearing Support Blocks LBZR

Special features

- ☐ Bearing support blocks for force sensors of the BZA/BZE-series
- ☐ 12 drilled holes for sensor mounting equally spaced at a 30° pitch
- ☐ Surface protection with multiple metallic layer coating

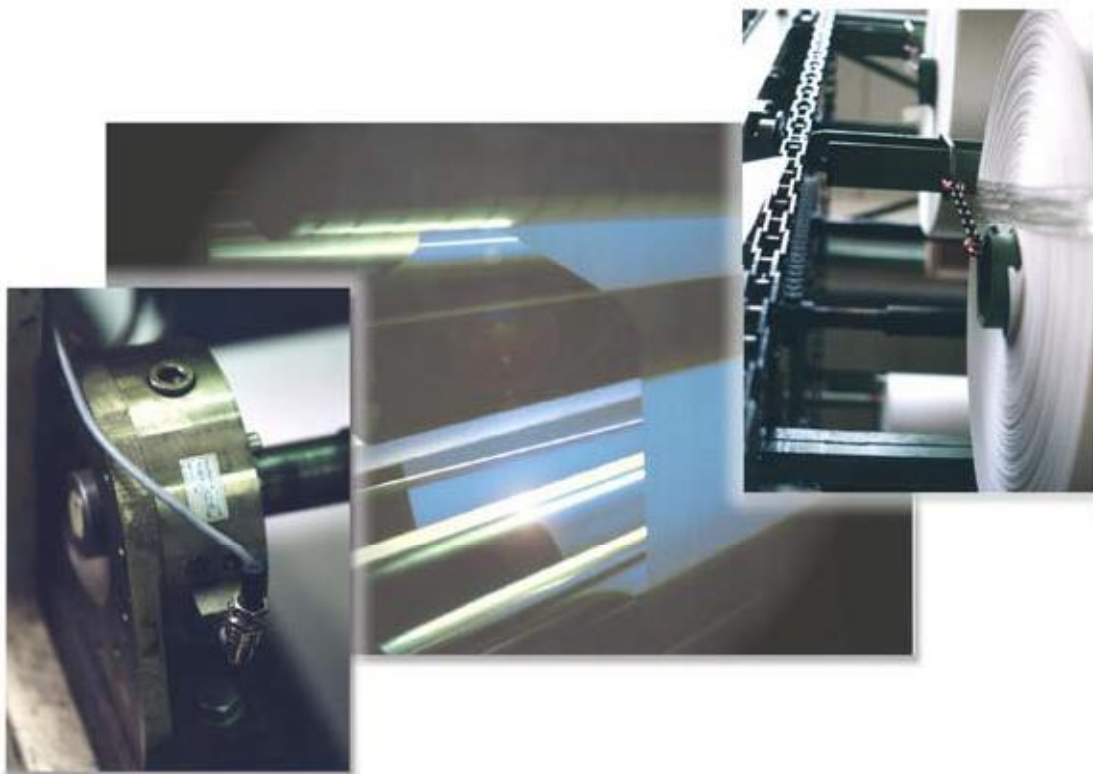
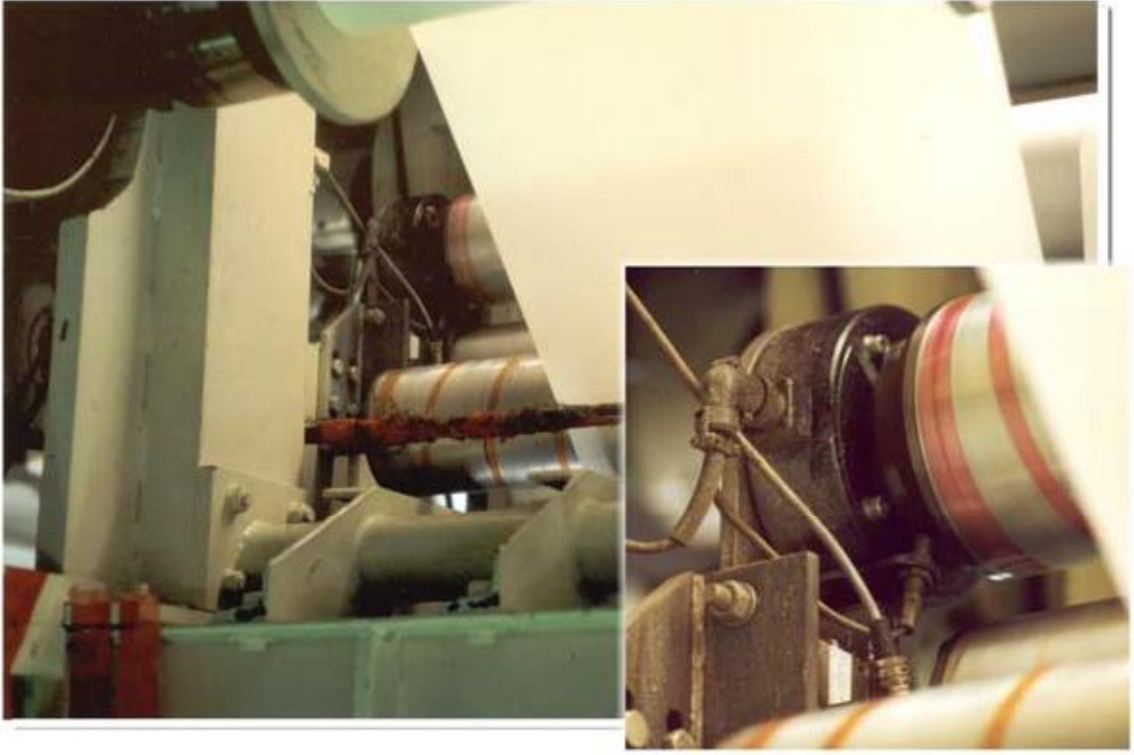


Dimensions

Size	B	B1	B2	D1H8	D2	D	H	H1	H2	L	L1	u
LBZR 1	40	25,5	10	60	90	M6	109	56	14	140	115	9
LBZR 2	45	33,0	13	70	105	M6	130	67	18	170	140	11
LBZR 3	70	47,5	19	100	155	M8	178	90	24	240	195	18
LBZR 4	90	57,5	24	130	200	M10	232	118	30	290	240	22

Application Example

Paper Coating



Product Description

Web Tension Sensor BZH

Special Features

- ☐ Compact design
- ☐ Easy modification to different bearing designs and sizes
- ☐ High overload protection utilising mechanical stops
- ☐ High resonant frequency

Scope of Supply

Web tension sensor with fixed cable, 5 m in length with straight receptacle (connection variant T)

Additional Accessories

- **Option L:** Right angle receptacle
- **Option S:** Right angle plug
- **Option F:** Use in potentially explosive atmospheres with J-Box (connection variant T)



Application

Direct measurement of web tension forces, e.g. in moving webs of paper, textile, plastic, metal

The web tension sensors of the series BZH are of a compact pillow block design and suitable for a variety of applications.

The sensors basically consist of two mounting plates which are connected by measuring elements. The mounting plates are designed to accommodate pillow block bearings of the following manufactures: INA, FAG, SKF and NSK.

The measuring elements function according to the double beam principle. The acting forces are captured by strain gauges applied to the measuring elements.

HAEHNE offers for all its sensors a corresponding range of amplifiers to condition the measuring signal and deliver the bridge voltage supply. The signals at the output terminals of the amplifier are proportional to the acting radial force. They can be digitally displayed or used as instantaneous values in a closed control loop.

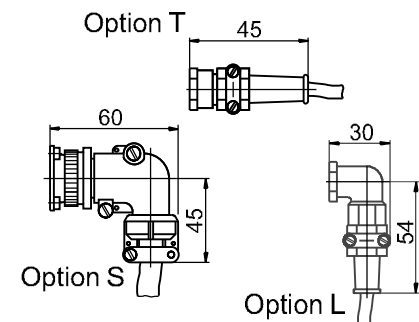
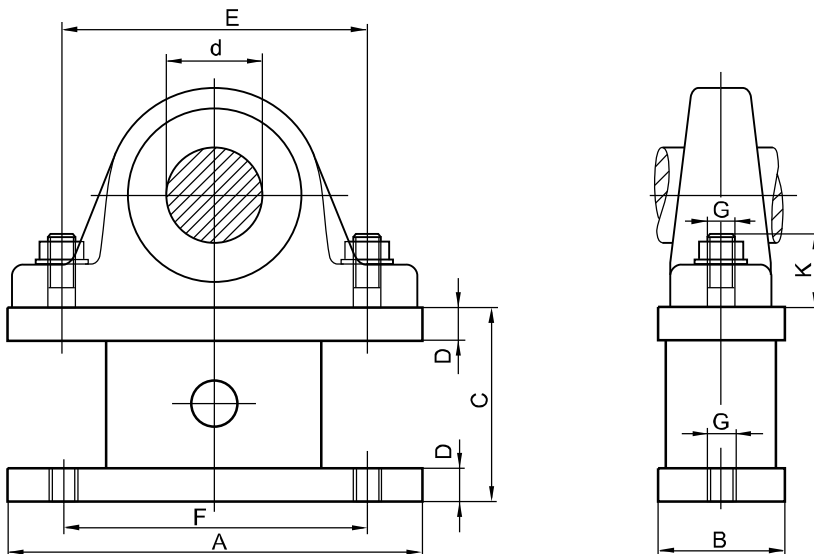
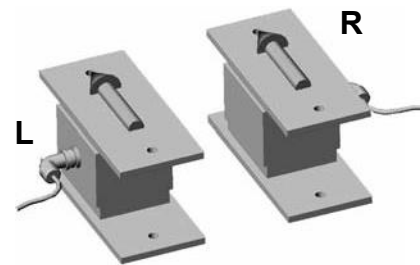
Technical Data	Values based on nominal force		
Sizes 15 to 40	160 N to 1600 N		
Sizes 50 to 75	630 N to 6300		
Max. operating force	160 %		
Absolute max. force	1000 %		
Nominal ratings (with option F: J-box necessary)	1,5 mV / V		
Combined error	0,5 %		
Reproducibility	max. $\pm 0,1$ %		
Non-linearity	max. $\pm 0,3$ %		
Hysteresis	max. $\pm 0,3$ %		
Zero drift	max. 50 ppm / °C		
Nominal ambient temperature	+10 ... + 60 °C		
Operational temperature range	- 10 ... + 75 °C		
Nominal resistance of the strain gauge bridge	700 Ω		
Bridge supply voltage	10 VDC		
Special enclosure protection	IP 67		
Enclosure protection	Standard T IP 52	Option S IP 50	Option L IP 54

Ordering Example:

BZH 15 R 160 SF

└─ option
└─ nominal force
└─ design
└─ size
└─ type

When ordering please specify „L“ (left) or „R“ (right) in order to determine unequivocally the measurement direction and the cable connector exit.

***Examples of suitable bearings**

FAG - SG2xxS

INA - ASExx

NSK - P2xx

SKF - SY5xxM

SKF - SYJ5xx

Size	Nominal force F_{nom} [N]	Axis d [mm]	Bearing- typ*	Dimensions [mm]							
				A	B	C	D	E	F	G	K
15	160 250 400 630 1000 1600	12/15/17	xx=03	130	55	80	10	95	115	M10	30
20		20/25	xx=04/05	140	55	80	10	100	120	M10	30
30		30/35	xx=06/07	170	60	90	15	124	124	M12	35
40		40/45	xx=08/09	195	60	90	15	142	142	M12	35
50	630 1000 1600 2500 4000 6300	50	xx=10	210	70	117	16	155	155	M16	35
55		55	xx=11	225	70	125	20	175	175	M16	45
60		60	xx=12	245	70	125	20	185	185	M16	45
70		65/70	xx=13/14	270	80	135	25	205	205	M20	55
75		75	xx=15	280	80	135	25	215	215	M20	55

Product Description

Force Sensor BZHB

Size 01 and 02

Special Features

- ☐ Measuring range from 160 to 6300 N
- ☐ Compact design
- ☐ Overload protection up to 10fold of nominal load
- ☐ Transverse forces permitted up to the nominal load

Scope of Supply

Web tension sensor with fixed
PUR cable, 5 m in length with straight
receptacle
(connection variant T)

Additional Accessories

- **Option L:** Right angle receptacle
- **Option S:** Right angle plug
- **Option F:** For use in potentially
explosive atmospheres with J-Box
(connection variant T)



Application

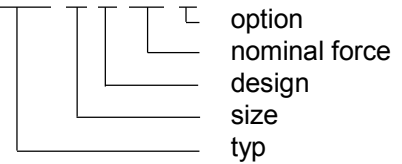
The sensors capture the tension forces parallel to the mounting plane. Threaded holes in the base and cover plate enable an easy integration into existing machinery and equipment. The symmetrical design is suitable to measure tension as well as compression forces.

The web tension sensors of the series **BZHB** are of a compact pillow block design and suitable for a variety of applications. The measuring elements function according to the double beam principle. **HAEHNE** offers for all its sensors a corresponding range of amplifiers to condition the measuring signal and deliver the bridge voltage supply. For the application in the field bus system the sensor can be attached also to a busbox.

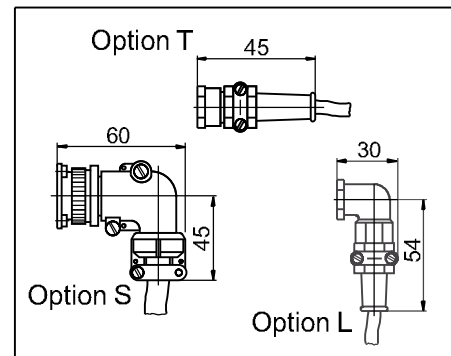
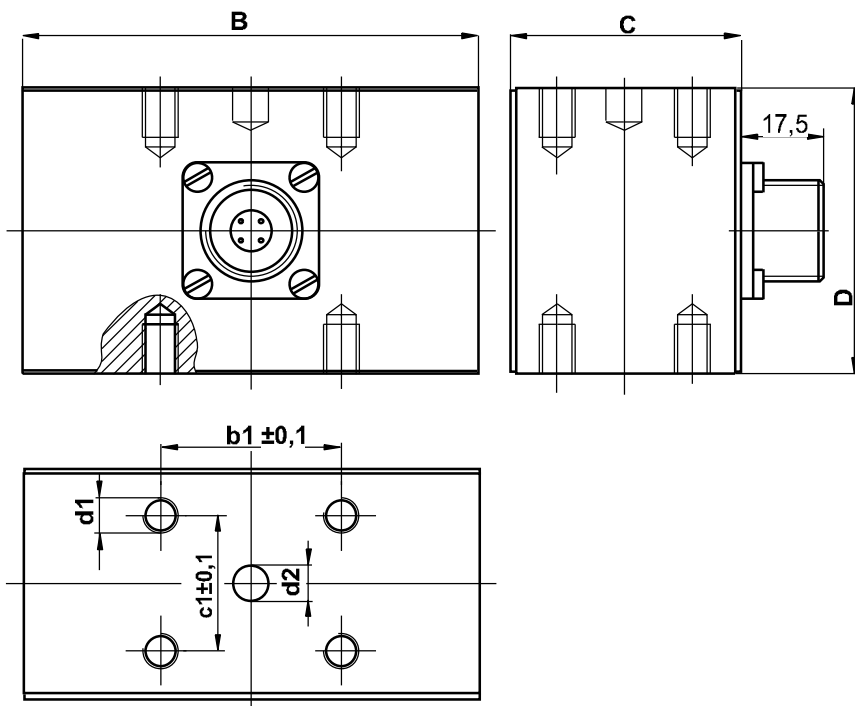
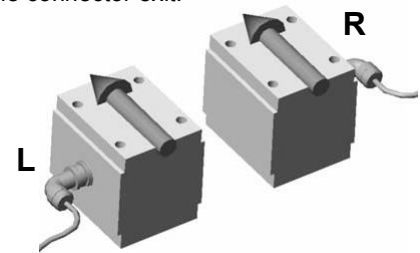
Technical Data	Values based on nominal force
Measuring ranges	Size 01: 160 N bis 1600 N
	Size 02: 630 N bis 6300 N
Max. operating force	160 %
Absolute max. force	1000 %
Nominal ratings: (with option F: J-box necessary)	1,5 mV / V
Combined error	0,5 %
Reproducibility	max. $\pm 0,1$ %
Non-linearity	max. $\pm 0,3$ %
Hysteresis	max. $\pm 0,3$ %
Zero drift	max. 50 ppm / °C
Nominal ambient temperature:	+10 ... +60 °C
Operational temperature range	-10 ... +75 °C
Nominal resistance of the strain gauge bridge	700 Ω
Max. bridge supply voltage	10 VDC
Enclosure protection meets	Standard T: IP 52
	Option S: IP 50
	Option L: IP 54
	Special protection: IP 67

Ordering Example:

BZHB 01 R 160 S



When ordering please specify „L“ (left) or „R“ (right) in order to determine unequivocally the measurement direction and the cable connector exit.



Tolerances as per DIN 7168m

Size	Measuring Range [N]	B	C	D	c1	b1	d1	d2
01	160, 250, 400, 630, 1000, 1600	100	50	60	30	40	M8 x 15	-
02	630, 1000, 1600, 2500, 4000, 6300	120	68	84,5	44	36	M12 x 25	12 ^{H7} x10

Product Description

Web Tension Sensor BZH - K Size 00

Special Features

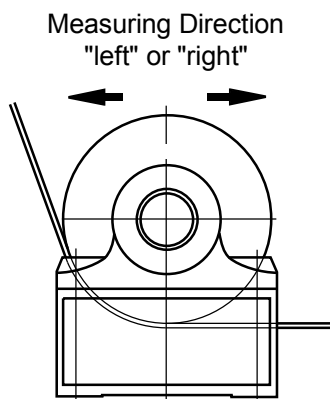
- ☐ Nominal force from 1 up to 5 kN
- ☐ Compact design
- ☐ Easy modification to different bearing designs and sizes
- ☐ High overload protection utilising mechanical stops
- ☐ Torsion resistant measuring block made of stainless steel

Scope of Supply

Web tension sensor with fixed
PUR cable, 5 m in length with straight
receptacle

Additional Accessories

- **Option F:** For use in potentially
explosive atmospheres with J-Box



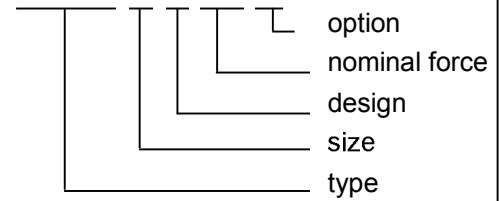
The **web tension sensors of the series BZH - K** are of a compact pillow block design and suitable for a variety of applications. The sensor is mounted in between the pillow block bearing and the machine frame.

All BZH - devices capture the horizontal forces of web tension. The voltage supply to the full bridge and the processing of the measuring signals is effected by way of a suitable amplifier of the standard **HAEHNE** product program. The signals at the output terminals of the amplifier are proportional to the acting radial force. They can be digitally displayed or used as instantaneous values in a closed control loop.

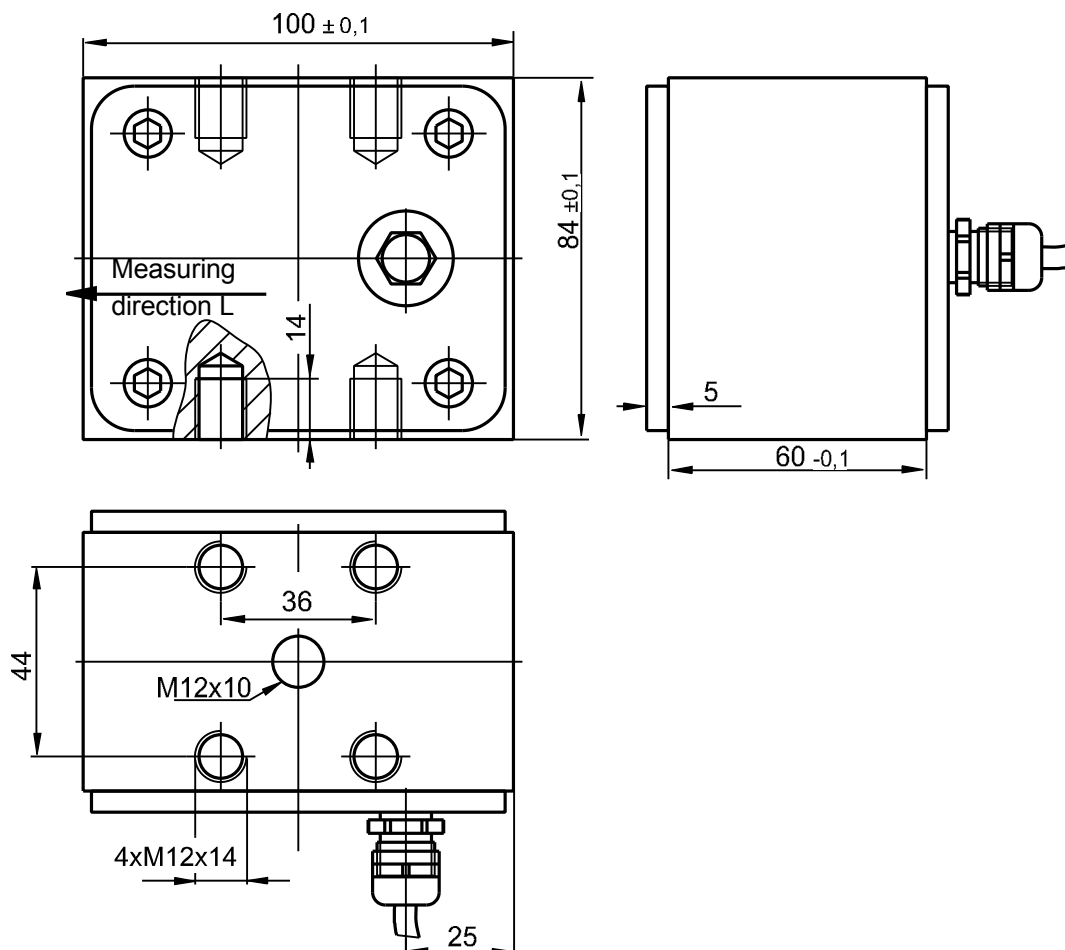
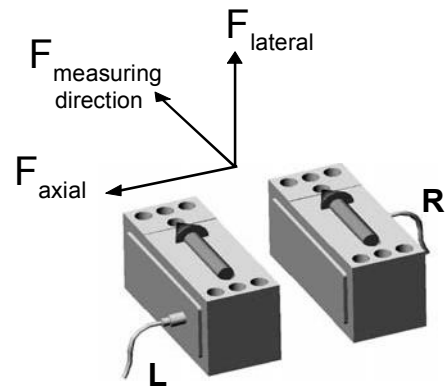
Technical Data	Values based on nominal force
Measuring range	1; 2; 5 kN
Max. operating force	160 %
Absolute max. force	1000 %
Nominal rating (with option F: J-Box necessary)	1,5 mV / V
Combined error	0,5 %
Reproducibility	max. $\pm 0,05$ %
Linearity	$\pm 0,2$ %
Nominal ambient temperature	+10 ... +60 °C
Operational temperature range	-10 ... +75 °C
Nominal resistance of the strain gauge bridge	700 Ω
Max. bridge supply voltage	10 VDC
Enclosure protection	IP 67

Ordering Example:

BZH - K 00 R 1k - F



When ordering please specify „L“ (left) or „R“ (right) in order to determine unequivocally the measurement direction and the cable connector exit.



Product Description

Web Tension Sensor BZH - K Size 01 and 02

Special Features

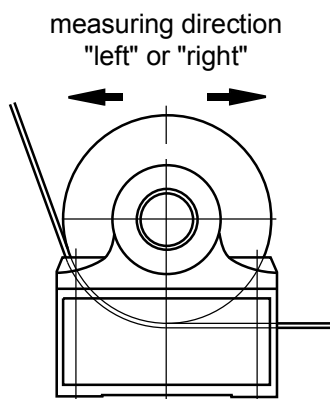
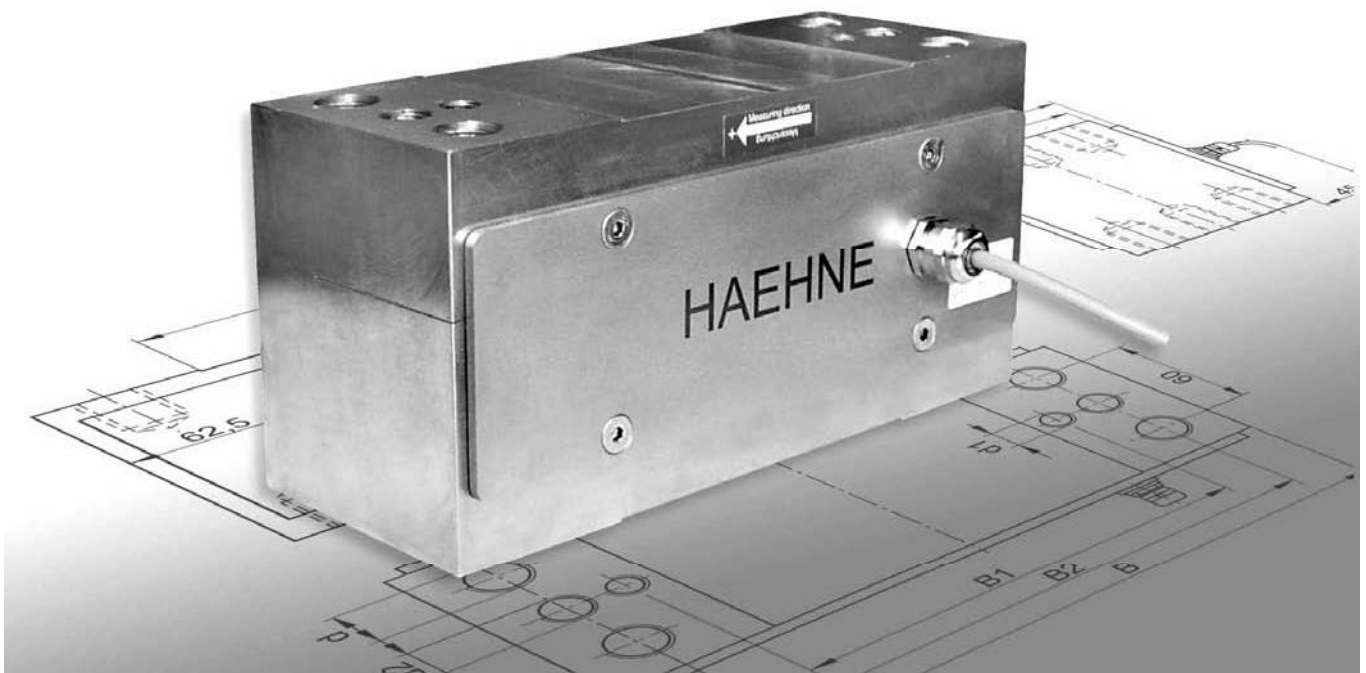
- ☐ Nominal force from 10 up to 100 kN
- ☐ Compact design
- ☐ Easy modification to different bearing designs and sizes
- ☐ High overload protection utilising mechanical stops
- ☐ Torsion resistant measuring block made of stainless steel

Scope of Supply

Web tension sensor with fixed
PUR cable, 5 m in length with straight
receptacle

Additional Accessories

- **Option F:** For use in potentially
explosive atmospheres with J-Box



The **web tension sensors of the series BZH - K** are of a compact pillow block design and suitable for a variety of applications. The sensor is mounted in between the pillow block bearing and the machine frame.

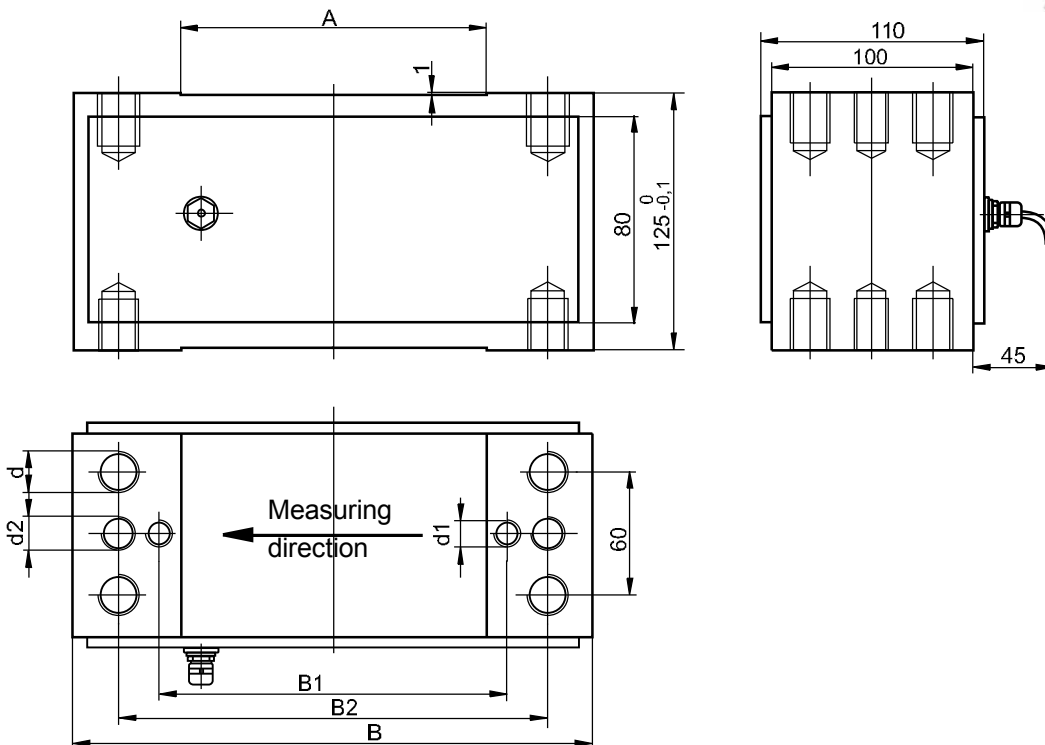
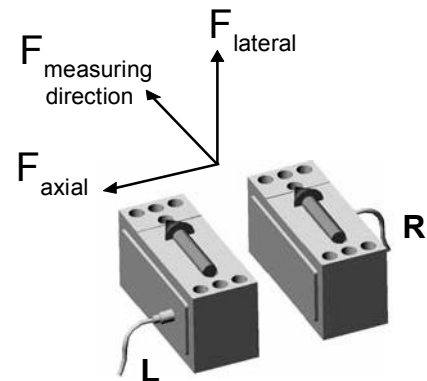
All BZH - devices capture the horizontal forces of web tension. The voltage supply to the full bridge and the processing of the measuring signals is effected by way of a suitable amplifier of the standard **HAEHNE** product program. The signals at the output terminals of the amplifier are proportional to the acting radial force. They can be digitally displayed or used as instantaneous values in a closed control loop.

Technische Daten	Werte bezogen auf die Nennkraft
Measuring range	10; 20; 50; 100 kN
Max. operating force	160 %
Absolute max. force	1000 %
Nominal rating (with option F: J-Box necessary)	1,5 mV / V
Combined error	0,5 %
Reproducibility	max. $\pm 0,1$ %
Non-linearity	max. $\pm 0,3$ %
Hysteresis	max. $\pm 0,3$ %
Zero drift	max. 50 ppm / °C
Nominal ambient temperature	+10 ... +60 °C
Operational temperature range	-10 ... +75 °C
Nominal resistance of the strain gauge bridge	700 Ω
Max. bridge supply voltage	10 VDC
Enclosure protection	IP 67
Weight Size 01; 02 in kg	25; 33

Ordering Example:**BZH - K 02 R 50k - F**

option
nominal force
design
size
type

When ordering please specify „L“ (left) or „R“ (right) in order to determine unequivocally the measurement direction and the cable connector exit.



Size	Measuring Range	A	B	d*	B1	d1	B2	d2
01	10; 20 kN	130	255 ⁰ _{-0,2}	M20x30	170 ±0,2	M12x20	210 ±0,2	M16x24
*available for fixing additional mounting plates					for pillow block ø 35 ... 45 mm		for pillow block ø 40 ... 55 mm	
02	50; 100 kN	150	345 ⁰ _{-0,3}	M20x30	230 ±0,2	M16x24	290 ±0,2	M20x30
*available for fixing additional mounting plates					for pillow block ø 50 ... 65 mm		for pillow block ø 65 ... 85 mm	

Product Description

Web Tension Sensor BZH - K Size 03

Special Features

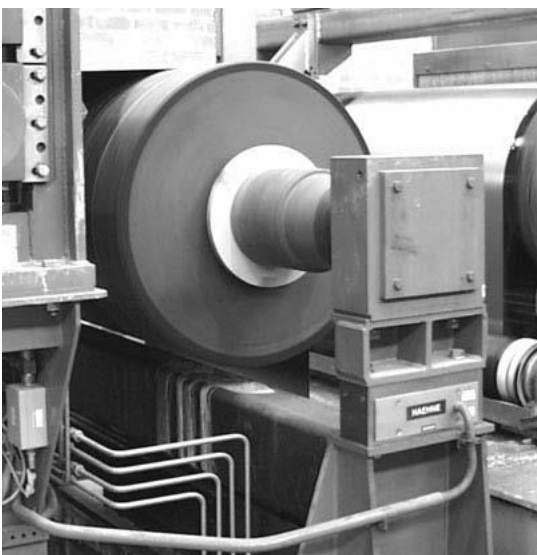
- ☐ Nominal force 200 kN
- ☐ Compact design
- ☐ Easy modification to different bearing designs and sizes
- ☐ High overload protection utilising mechanical stops
- ☐ Torsion resistant measuring block made of stainless steel

Scope of Supply

Web tension sensor with fixed cable, 5 m in length with straight receptacle

Additional Accessories

- **Option F:** Use in potentially explosive atmospheres with J-Box



The **web tension sensors of the series BZH - K** are of a compact pillow block design and suitable for a variety of applications. The sensor is mounted in between the pillow block bearing and the machine frame.

All BZH - devices captures the horizontal forces of web tension.

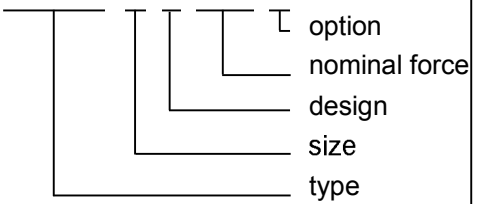
The voltage supply to the full bridge and the processing of the measuring signals is effected by way of a suitable amplifier of the standard **HAEHNE** product program. The signals at the output terminals of the amplifier are proportional to the acting radial force. They can be digitally displayed or used as instantaneous values in a closed control loop.

Technical Data

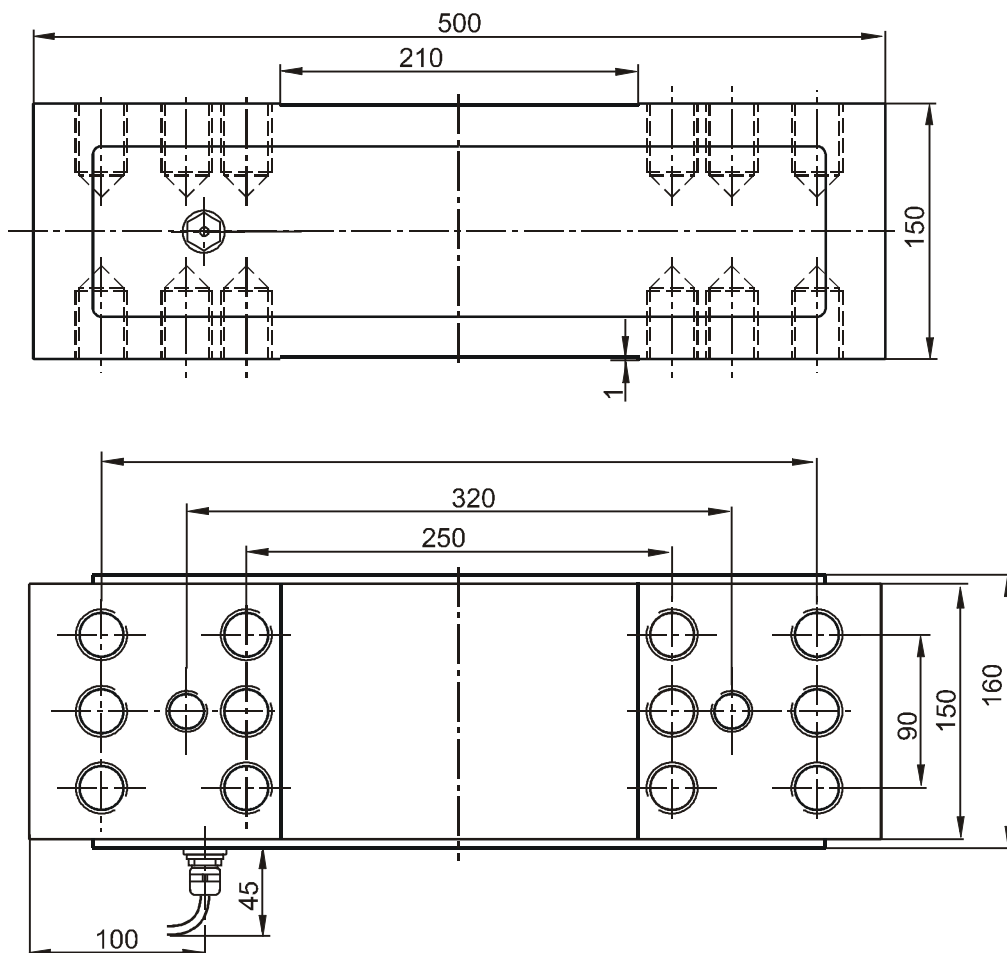
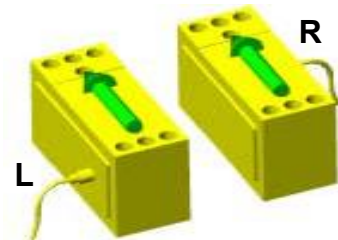
Standard enclosure protection:	IP 67
Measuring range (nominal force)	200 kN
Max. operating force based on nom. force F_{nom} :	160 %
Absolute max. force based on nom. force F_{nom} :	500 %
Combined error:	0,5 %
Non-linearity (based on F_{nom}):	$\pm 0,3 \%$
Reproducibility (based on F_{nom}):	$\pm 0,1 \%$
Hysteresis (based on F_{nom}):	$\pm 0,3 \%$
Zero drift	max 50 ppm / °C
Nominal rating:	1,5 mV/V
(with option F: J-Box necessary)	
Nominal resistance of the strain gauge bridge:	350 Ω
Max. bridge supply voltage:	10 VDC
Nominal ambient temperature:	+10...+60 °C
Operational temperature range:	-10...+75 °C

Ordering Data:

BZH - K 03 R 200k - F



When ordering please specify „L“ (left) or „R“ (right) in order to determine unequivocally the measurement direction and the cable connector exit.



Product Description

Web Tension Sensor BZV - K Size 01 and 02

Special Features

- ☐ Nominal force from 5 up to 100 kN
- ☐ Compact design
- ☐ Easy modification to different bearing designs and sizes
- ☐ High overload protection utilising mechanical stops
- ☐ Torsion resistant measuring block made of stainless steel

Scope of Supply

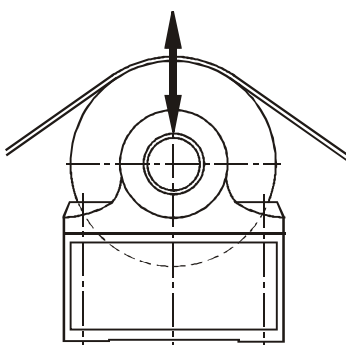
Web tension sensor with fixed PUR cable, 5 m in length with straight receptacle

Additional Accessories

- **Option E:** Design for flatness measuring roll, pairwise manufactured
- **Option F:** For use in potentially explosive atmospheres with J-Box (connection variant T)



Measuring direction
of sensor

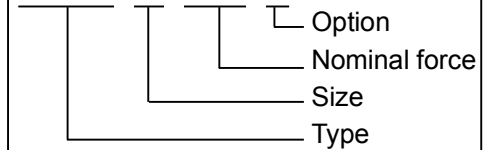


The **web tension sensors of the series BZV - K** are of a compact pillow block design and suitable for a variety of applications. The sensor is mounted in between the pillow block bearing and the machine frame. All BZH - devices captures the vertical forces of web tension. The voltage supply to the full bridge and the processing of the measuring signals is effected by way of a suitable amplifier of the standard **HAEHNE** product program. The signals at the output terminals of the amplifier are proportional to the acting radial force. They can be digitally displayed or used as instantaneous values in a closed control

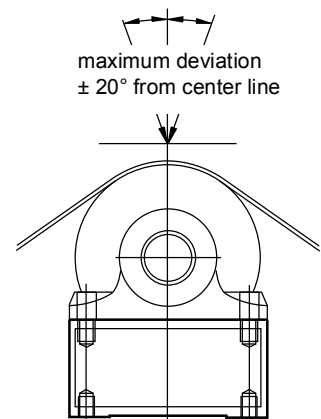
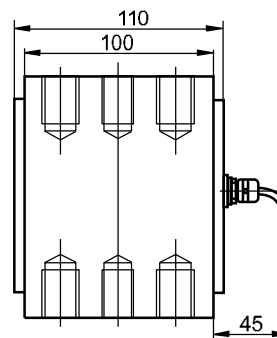
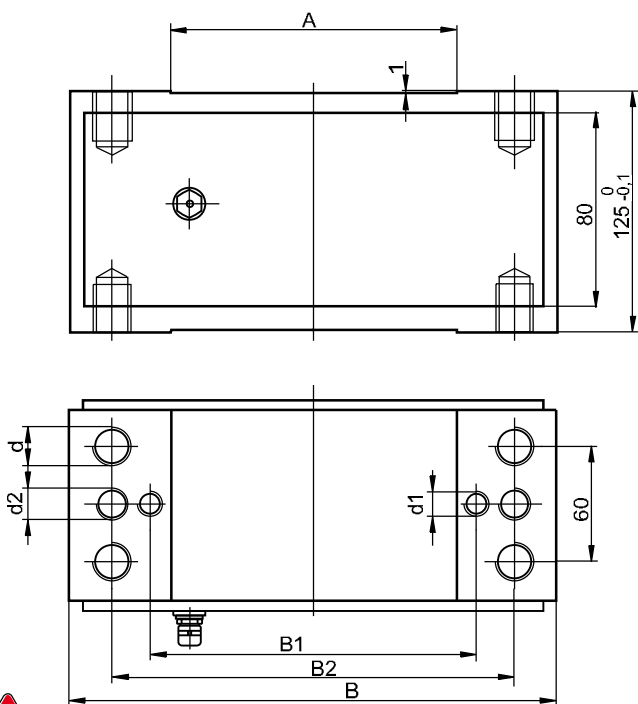
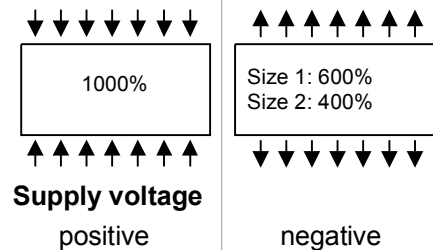
Technical Data		Values based on nominal force
Measuring Range		5; 10; 20; 50; 100 kN
Max. operating force		160 %
Absolute max. force		1000 %
Nominal ratings:	Standard Option E Option F	1,0 mV / V 0,5 mV / V J-Box necessary
Combined error		0,5 %
Reproducibility		max. $\pm 0,1$ %
Non-linearity		max. $\pm 0,3$ %
Hysteresis		max. $\pm 0,3$ %
Zero drift		max. 50 ppm / C°
Nominal ambient temperature		+10 ... +60 °C
Operational temperature range		-10 ... +75 °C
Nominal resistance of the strain gauge bridge		700 Ω
Max. bridge supply voltage		10 VDC
Enclosure protection		IP 67
Weight size 01; 02 in kg		25; 33

Ordering Data:

BZV - K 02 - 50 k - F



Absolute max. force



Option E: Dimensions and tolerances as attached drawing

Size	Measuring Range	A	B	d*	B1	d1	B2	d2
01	5; 10; 20 kN	130	255 ⁰ _{-0,2}	M20x30	170 ±0,2	M12x20	210 ±0,2	M16x24
*available for fixing additional mounting plates					for pillow block ø 35 ...45 mm		for pillow block ø 40 ...55 mm	
02	50; 100 kN	150	345 ⁰ _{-0,3}	M20x30	230 ±0,2	M16x24	290 ±0,2	M20x30
*available for fixing additional mounting plates					for pillow block ø 50 ...65mm		for pillow block ø 65 ...85mm	

Product Description

Web Tension Sensor BZV - K Size 03

Special Features

- ☐ Nominal force 200 kN
- ☐ Compact design
- ☐ Easy modification to different bearing designs and sizes
- ☐ High overload protection utilising mechanical stops
- ☐ Torsion resistant measuring block made of stainless steel

Scope of Supply

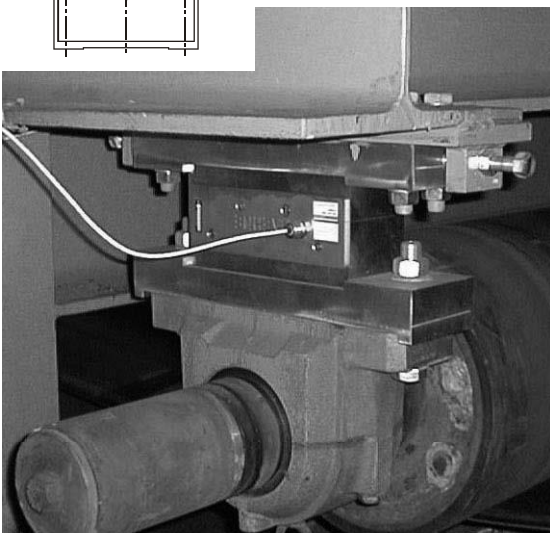
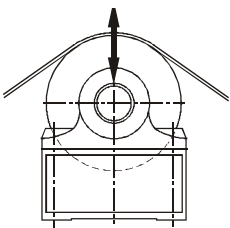
Web tension sensor with fixed
PUR cable, 5 m in length with straight
receptacle

Additional Accessories

- **Option E:** Design for flatness measuring roll, pairwise manufactured
- **Option F:** For use in potentially explosive atmospheres with J-Box (connection variant T)



Measuring
direction



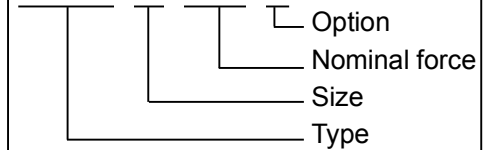
The **web tension sensors of the series BZV - K** are of a compact pillow block design and suitable for a variety of applications. The sensor is mounted in between the pillow block bearing and the machine frame. All BZH - devices captures the vertical forces of web tension.

The voltage supply to the full bridge and the processing of the measuring signals is effected by way of a suitable amplifier of the standard **HAEHNE** product program. The signals at the output terminals of the amplifier are proportional to the acting radial force. They can be digitally displayed or used as instantaneous values in a closed control loop.

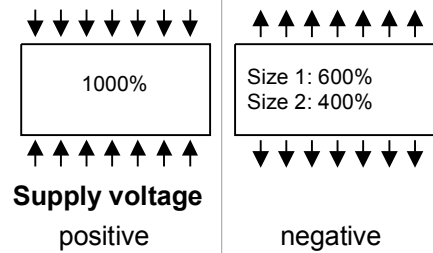
Technical Data	Values based on nominal force
Measuring Range	200 kN
Max. operating force	160 %
Absolute max. force	500 %
Nominal ratings: (with option F J-Box necessary)	1 mV / V J-Box necessary
Combined error	0,5 %
Reproducibility	max. $\pm 0,1$ %
Non-linearity	max. $\pm 0,3$ %
Hysteresis	max. $\pm 0,3$ %
Zero drift	max. 50 ppm/C°
Nominal ambient temperature	+10 ... +60 °C
Operational temperature range	-10 ... +75 °C
Nominal resistance of the strain gauge bridge	350 Ω
Max. bridge supply voltage	10 VDC
Enclosure protection	IP 67

Ordering Data:

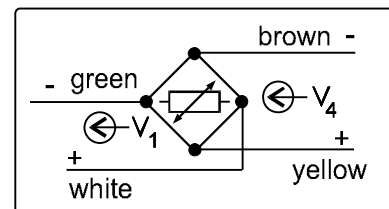
BZV - K 03 - 200 k - F



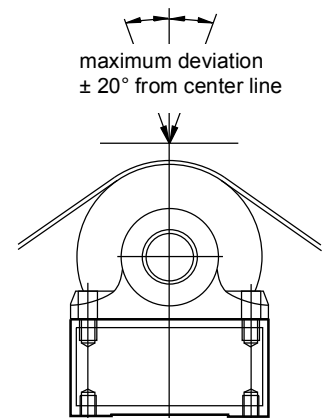
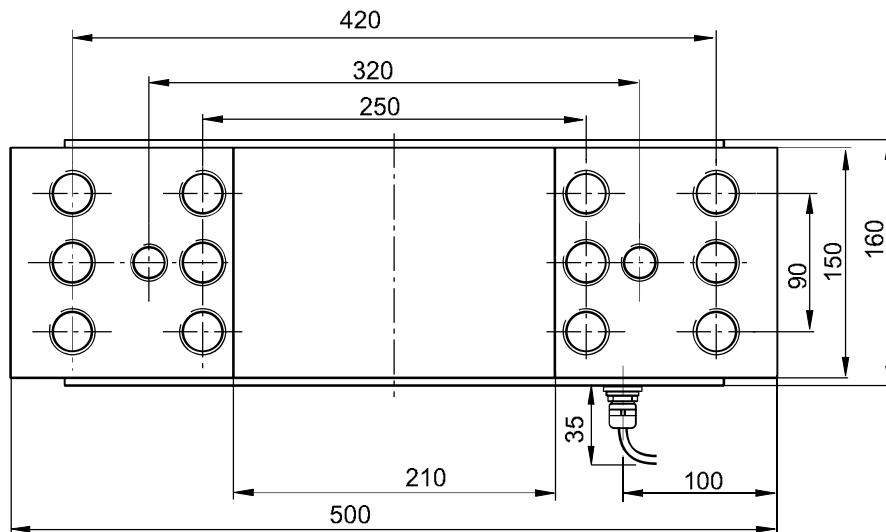
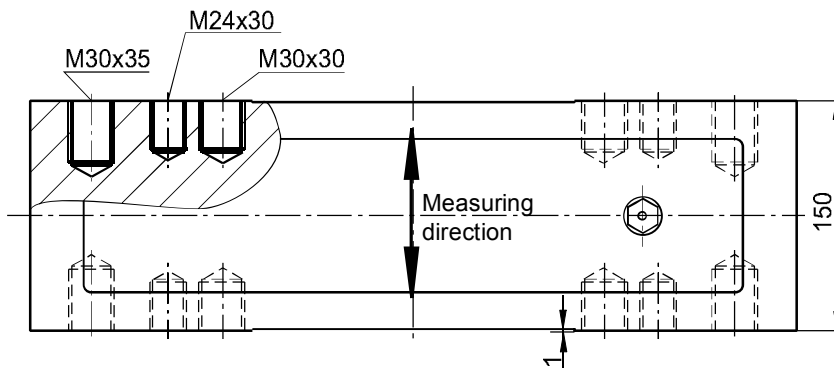
Absolute max. force



Sensor cable lead colors



V_1 : bridge output signal
 V_4 : bridge supply voltage



Application Example

Pickling Annealing 1



Application Example

Pickling Annealing 2



Product Description

Force Sensor ZAK

Special Features

- ☐ Stainless steel design
- ☐ Measuring range from 10 to 2000 N
- ☐ Easy assembly and small space requirement
- ☐ Overload protection utilising mechanical stops
- ☐ Flange mounting and clamp version available

Scope of Supply

- Force sensor with cable, 5m in length

Available for Delivery

- **Mounting flange**
with feather key and screw
- **Clamping block**
- **Option P: enclosure protection IP54**
- **Option F:** Use in potentially explosive atmospheres with J-Box



Application

Tension force sensors of the type ZAK

were specifically developed for direct measurement of forces acting in cables, wires, ropes, or tapes. They can best be installed in places where the design of the machine already requires the use of deflection rollers or guide rollers. This is e.g. the case in situations such as

- cable making machines
- stranding machines
- foil capacitor manufacturing
- label printing machinery etc.

By using a screw instead of a roller to lead the force into the shaft, the **force sensor ZAK** can also be used to measure compression forces.

The sensor is designed according to the double beam principle. This results in high precision measurement even in off center load situations. Mechanical stops limit the measuring deflection and provide overload protection. Strain gauges applied to the active surfaces of the cantilever beam measure the acting forces.

The strain gauge bridge is supplied with stabilized DC voltage from a strain gauge amplifier such as the **Measuring Amplifier MV 125** for further processing of the measuring signals.

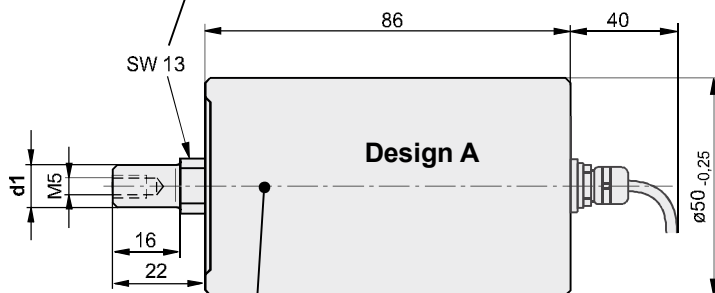
The signals at the output terminals of the amplifier are proportional to the tensile force in the material. The signals can be digitally displayed or used as actual values in closed loop controls.

In conjunction with a busbox the sensor signal can be processed in such fieldbus technologies as Interbus, CAN, Profibus, and DeviceNet.

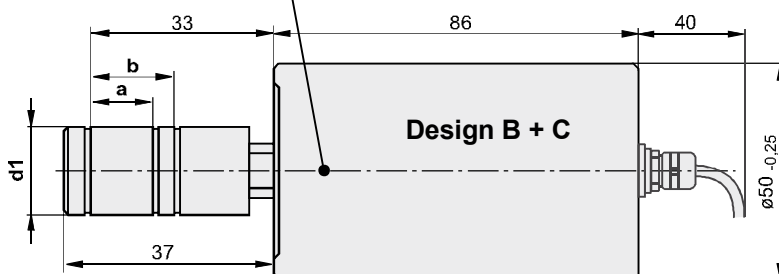
Technical Data	Values based on nominal force
Nominal force (Measuring range)	10; 20; 50; 100; 200; 500; 1000; 2000 N
Overload protection	1000% , aber max. 3200 N
Max. operating force	160 %
Max. lateral force	100 %
Nominal rating Sensors from 5 to 20 N Sensors from 50 N Option F	1 mV/V 1,5 mV/V J-Box necessary
Combined error	0,5 %
Nominal ambient temperature	+10...+60°C
Nominal ambient temperature	-10...+70°C
Nominal resistance of strain gauge bridge	700 Ω
Bridge supply voltage	10 V DC
Enclosure Protection (Standard) (Option P)	IP65 IP54



Attention! When assembling axes adapters, pulleys or similar devices no torque should act on the internal measuring elements. For this reason assembly should be made before installation into a machine; use wrench for countering.



Absolutely pay attention:
Red dot in measuring direction!



Fastening possibility



Clamping block material: aluminium alloy



variabel



Mounting flange material: stainless steel

Design	d1	Version of bearing	a	b
A	10 j6	6000 / 6300	-	-
B	15 f7	6002 / 6302	9	13
C	17 f7	6003 / 6303	10	14

Ordering data:

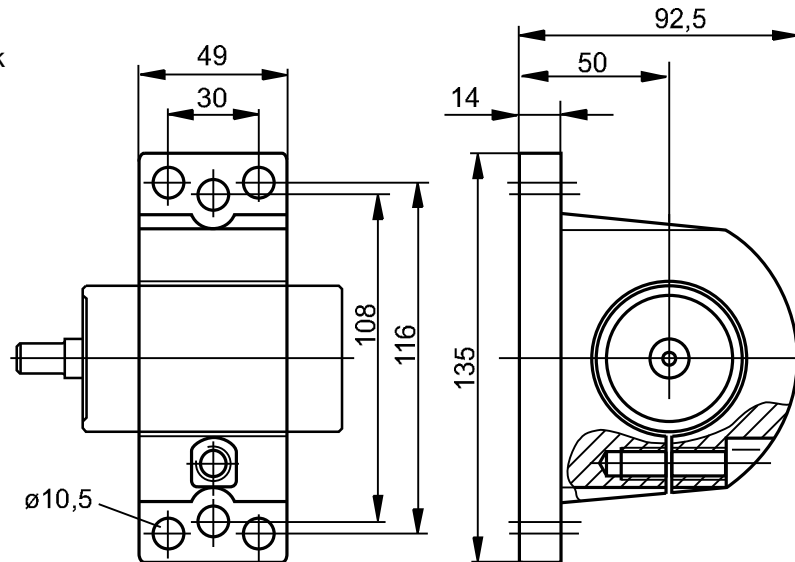
ZAK - A 200 P

Option
Nominal force in N
Design
Typ

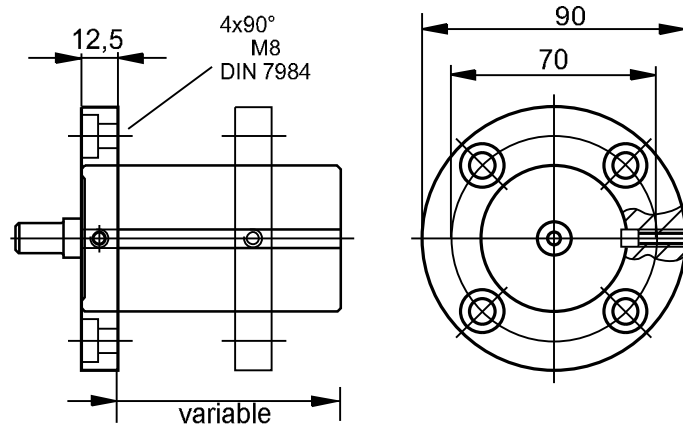
Technical Information

Force Sensor ZAK

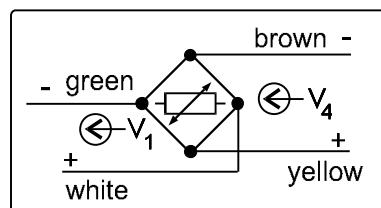
Clamping block
material:
aluminium alloy



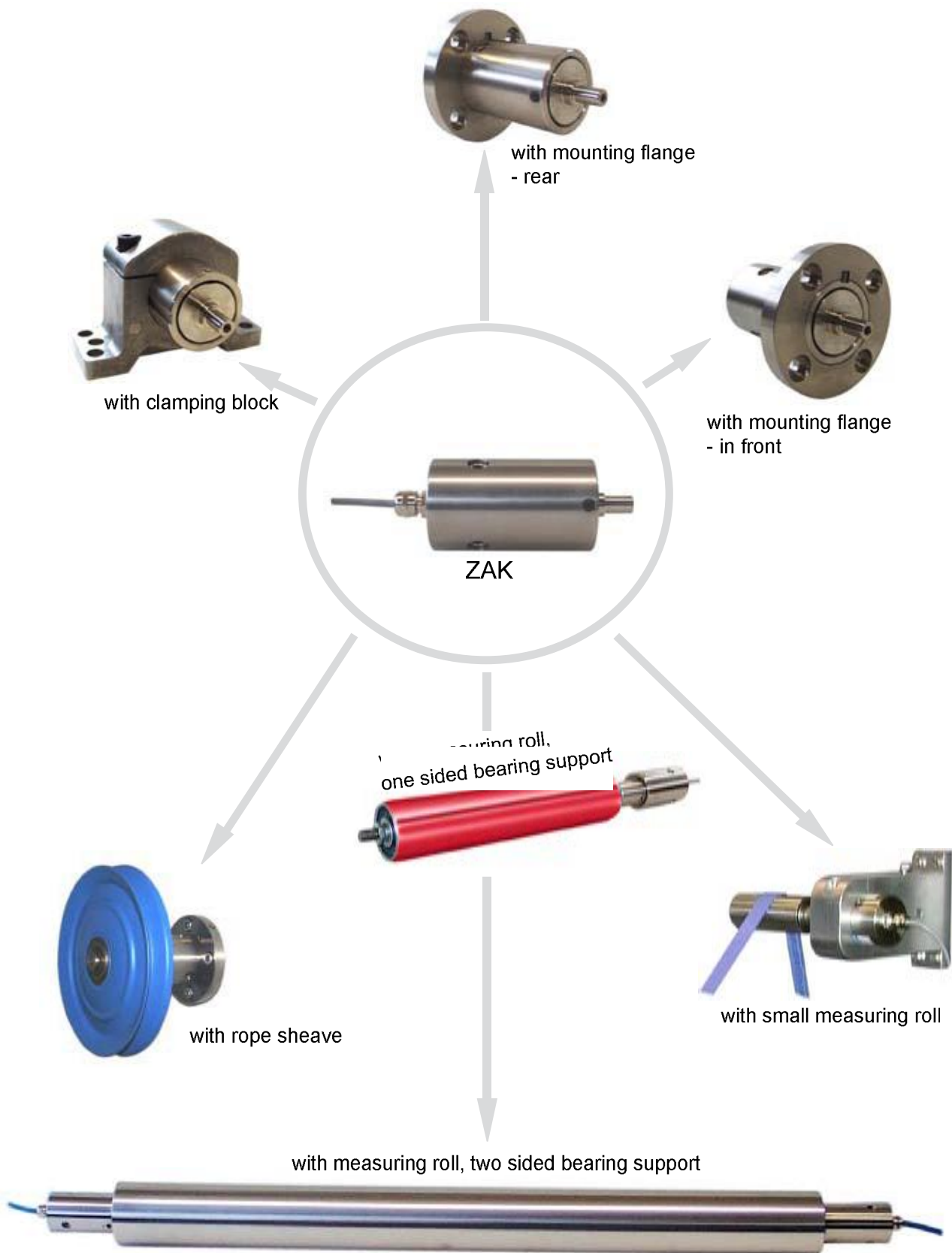
Mounting flange
material:
stainless steel



Sensor cable lead colors

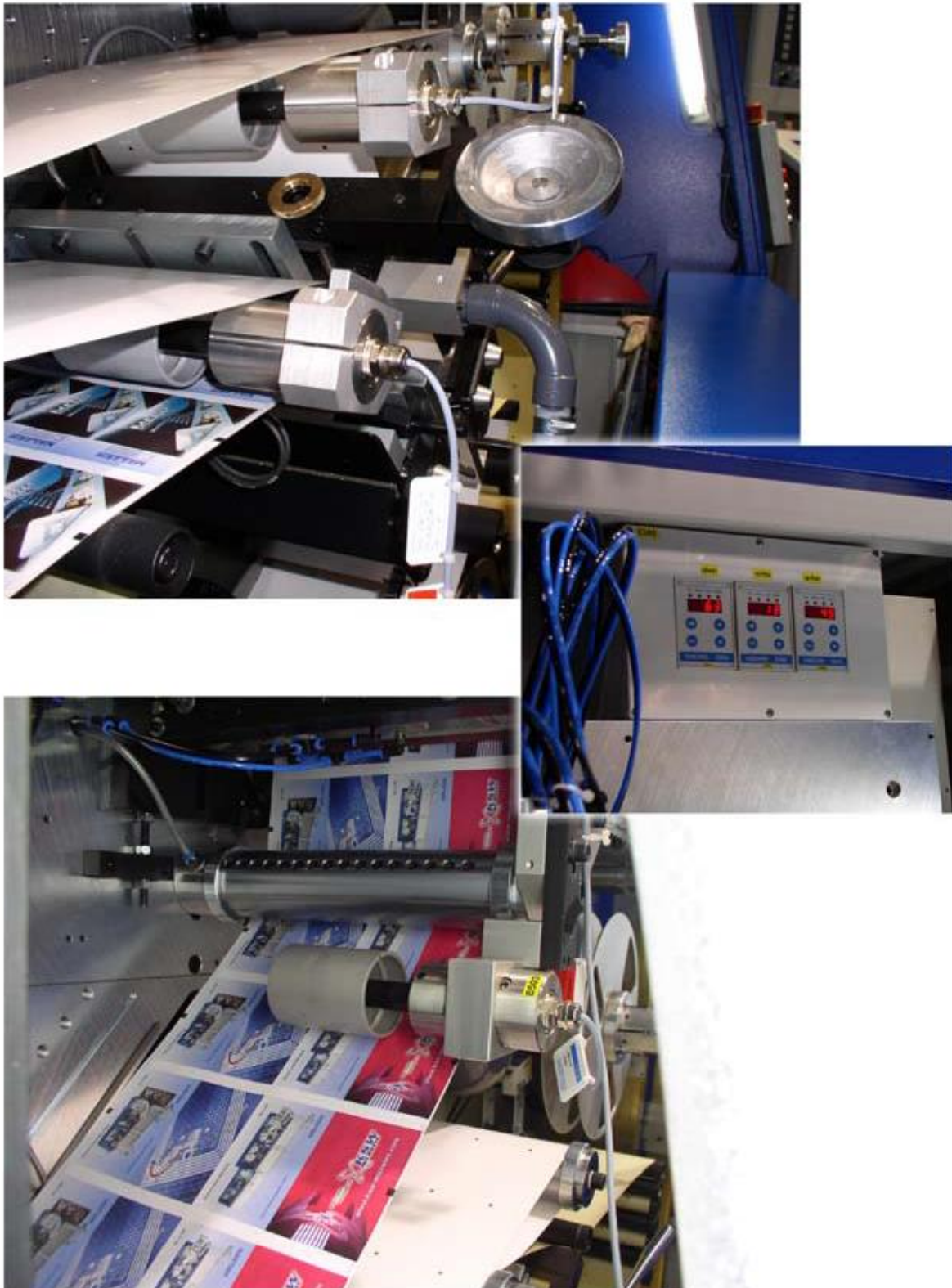


V_1 : bridge output signal
 V_4 : bridge supply voltage



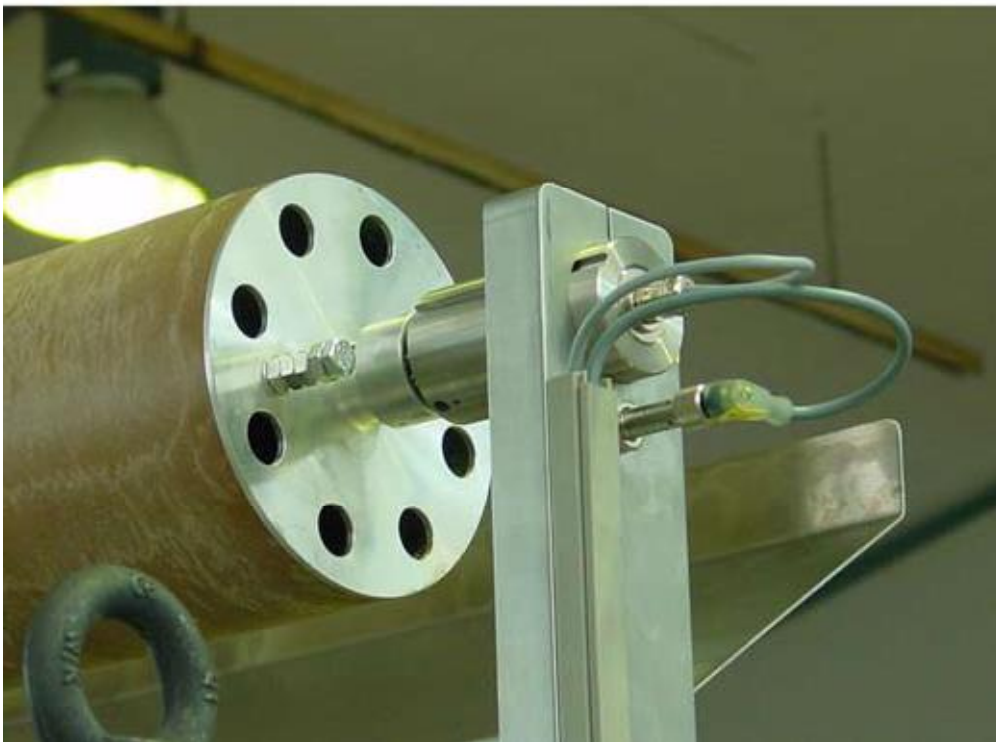
Application Example

Force Sensor ZAK



Application Example

Weaving of Elastic Textiles



Product Description

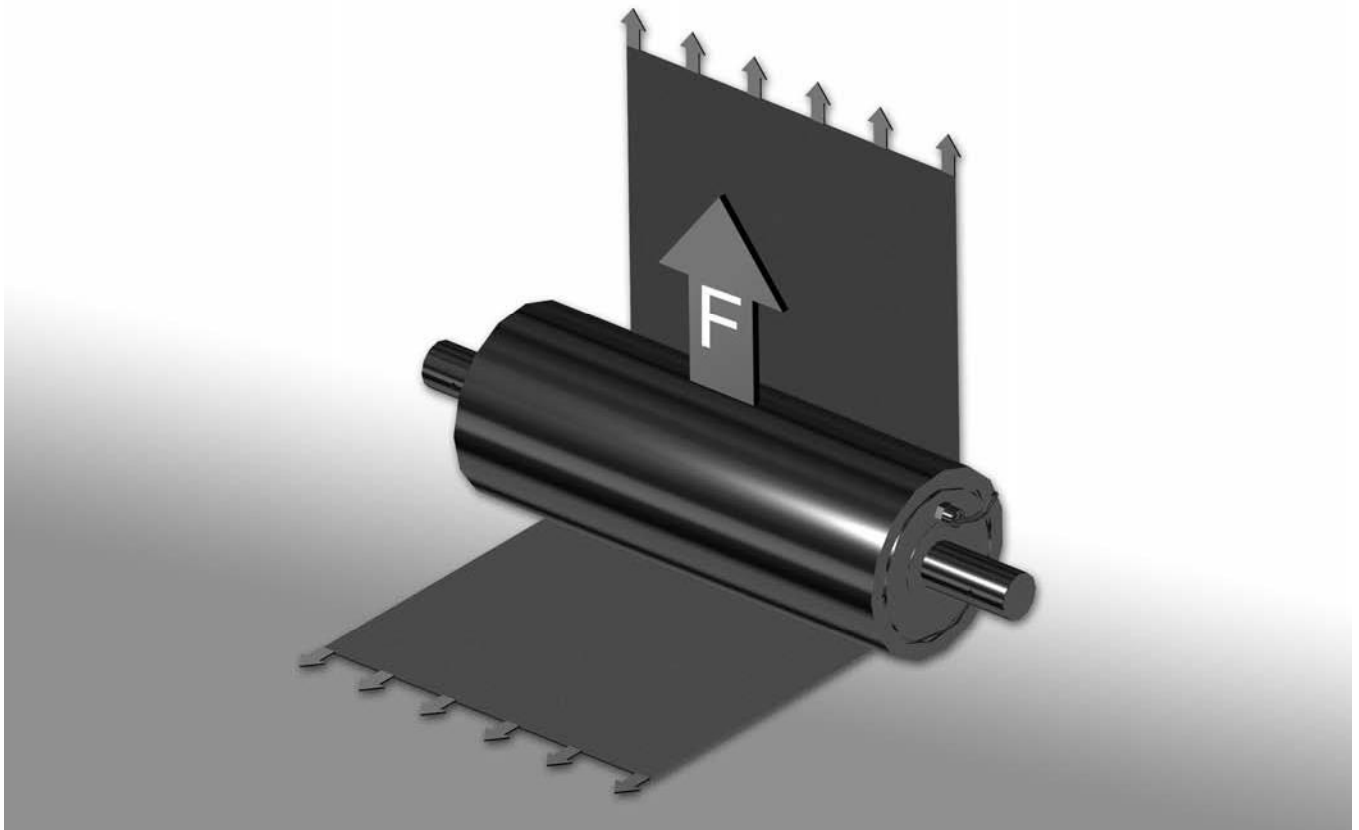
Measuring Roll MES

Special Features

- ☐ Complete measuring roll with integrated measuring sensors
- ☐ Simple installation
- ☐ Nominal force range from 100 to 800 N

Scope of Supply

Measuring roll MES
with fixed cable (PVC);
5 m in length



Application

The measuring roll **MES** is designed for measuring web tension forces, e.g. in moving webs of paper, textile, plastics, metal without additional force sensors.

The compact design enables quick and cost effective integration into OEM machines or retrofitting into existing equipment.

The measuring roller MES has a continuous shaft, and can be supplied with either one or two web tension sensors. Mechanical stops provide overload protection of the sensors. The ball bearings with a fixed and a floating bearing are maintenance-free. Tapped holes at both ends of the shaft offers optimal mounting to machine frames.

The shaft length is specified by the customer.

The HAEHNE Program offers optimal amplifiers to process the sensor signals and supply the analog and digital values for all common fieldbus variants.

Deviation of cyclic running/ cylinder form max 35 μm

HAEHNE Elektronische Messgeräte GmbH · Heinrich-Hertz-Str. 29 · D-40699 Erkrath Germany · Telefon 0211/92591-0 · Fax 0211/92591-20
http://www.haehne.de Email: info@haehne.de

Product Description

Measuring Roll MEZ

Special Features

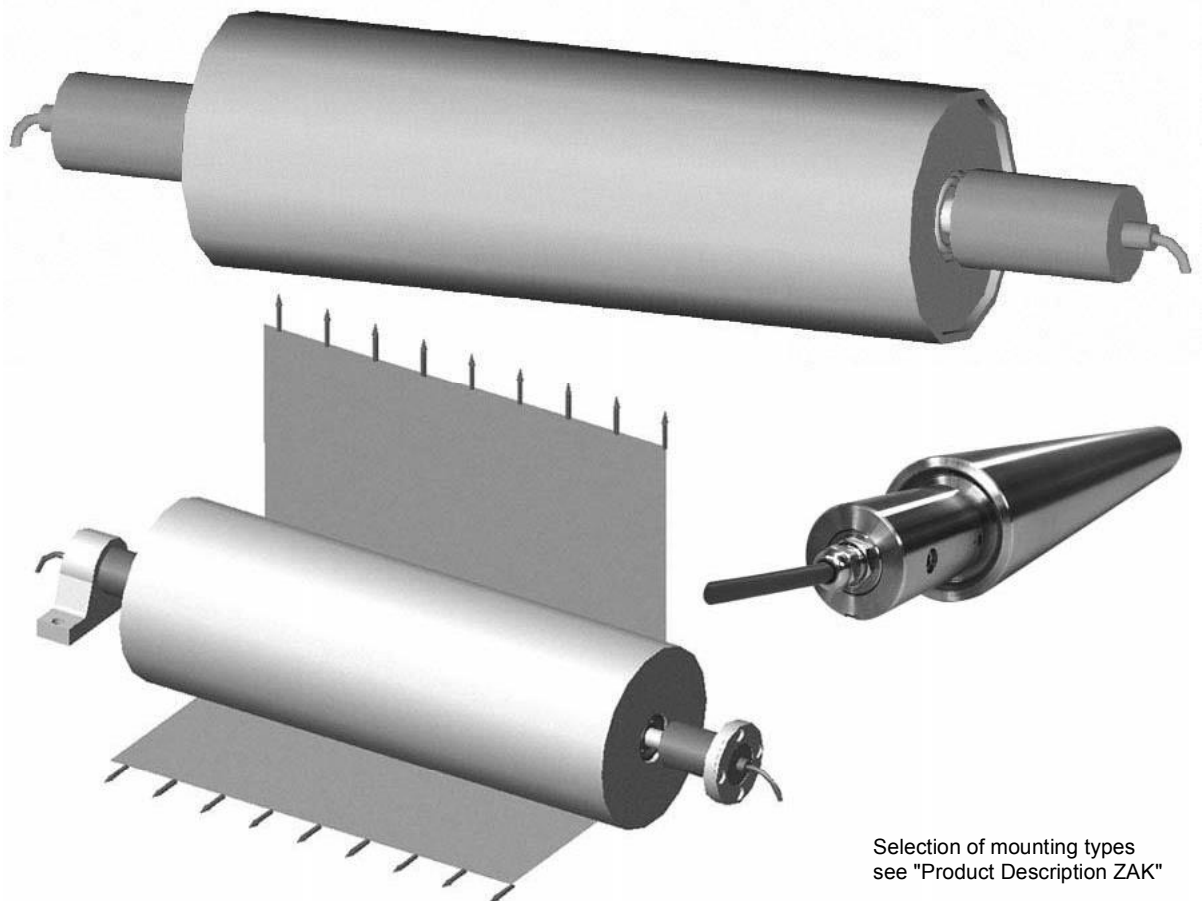
- ☐ Complete measuring roll with measuring sensors
- ☐ Simple installation
- ☐ Separate or joint measurement of bearing forces
- ☐ Sensors made of stainless steel
- ☐ Cost effective compact design

Scope of Supply

- **Measuring roll**
with two strain gauge
force sensors ZAK
- **Fixed cable (PVC)**,
5 meters in length

Available for Delivery

- **Clamping block**
- **Mounting flange** with
feather key and screw



Selection of mounting types
see "Product Description ZAK"

Application

The **measuring roll MEZ** is used to measure web tension forces, e.g. in moving webs of paper, textile, plastic, metal.

The compact design enables quick and cost effective integration into OEM machines or retrofitting into existing machines.

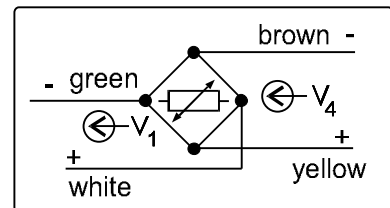
The **measuring roll MEZ** is made up of the hull, the bearings, and the two force sensors, which are directly integrated in the roll. The measuring roll comes ready assembled for electrical connection and immediate use.

The measuring sensors can be fixed with the mounting flange directly to the machine frame or mounted with clamping blocks (available as accessories).

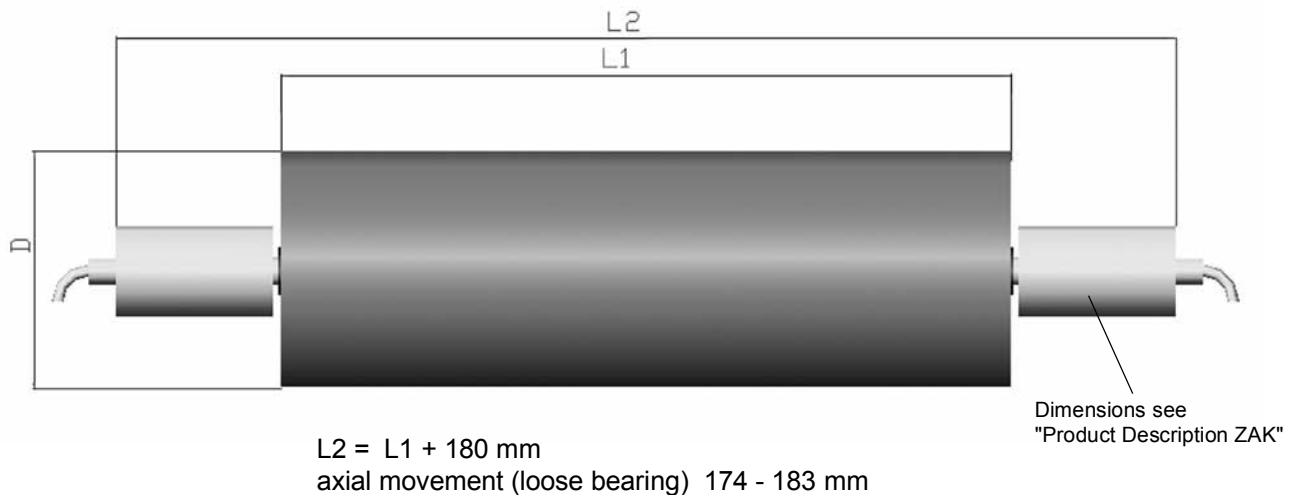
The length of the roll is custom designed. The hull of the measuring roll is made of aluminium as a standard. Other materials are available on request.

Technische Data	Values based on nominal force
Nominal force (measuring range) - Total force onto the roll in N -	20, 40, 100, 200, 400, 1000, 2000, 4000 N
Max. operating force	160 %
Overload protection	1000 %, max. 6400 N at symmetrical load of both sensors
Nominal rating (with Option F: J-Box necessary)	Roll 20 and 40 N: 1 mV / V Roll ≥ 100 N: 1,5 mV / V
Combined error	0,5 %
Nominal ambient temperature	+ 10 ... +60° C
Operational temperature range	- 10 ... +75° C
Nominal resistance of the strain gauge bridge	700 Ω
Max. bridge supply voltage	10 VDC
Enclosure protection	54 IP
Roll diameter	from 40 mm up
Standard material	aluminium
Standard surface	hard anodised
Standard roughness	Rz 8 μ m
Balance quality	Q 6,3; Q 2,5; Q1 (as VDI 2060)

Sensor cable lead colors (for each sensor)

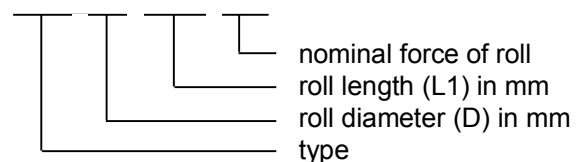


V₁: bridge output signal
V₄: bridge supply voltage



Ordering Data:

MEZ 129 - 5678 - 100



Produkt Description

Measuring Roll MWF

Special Features

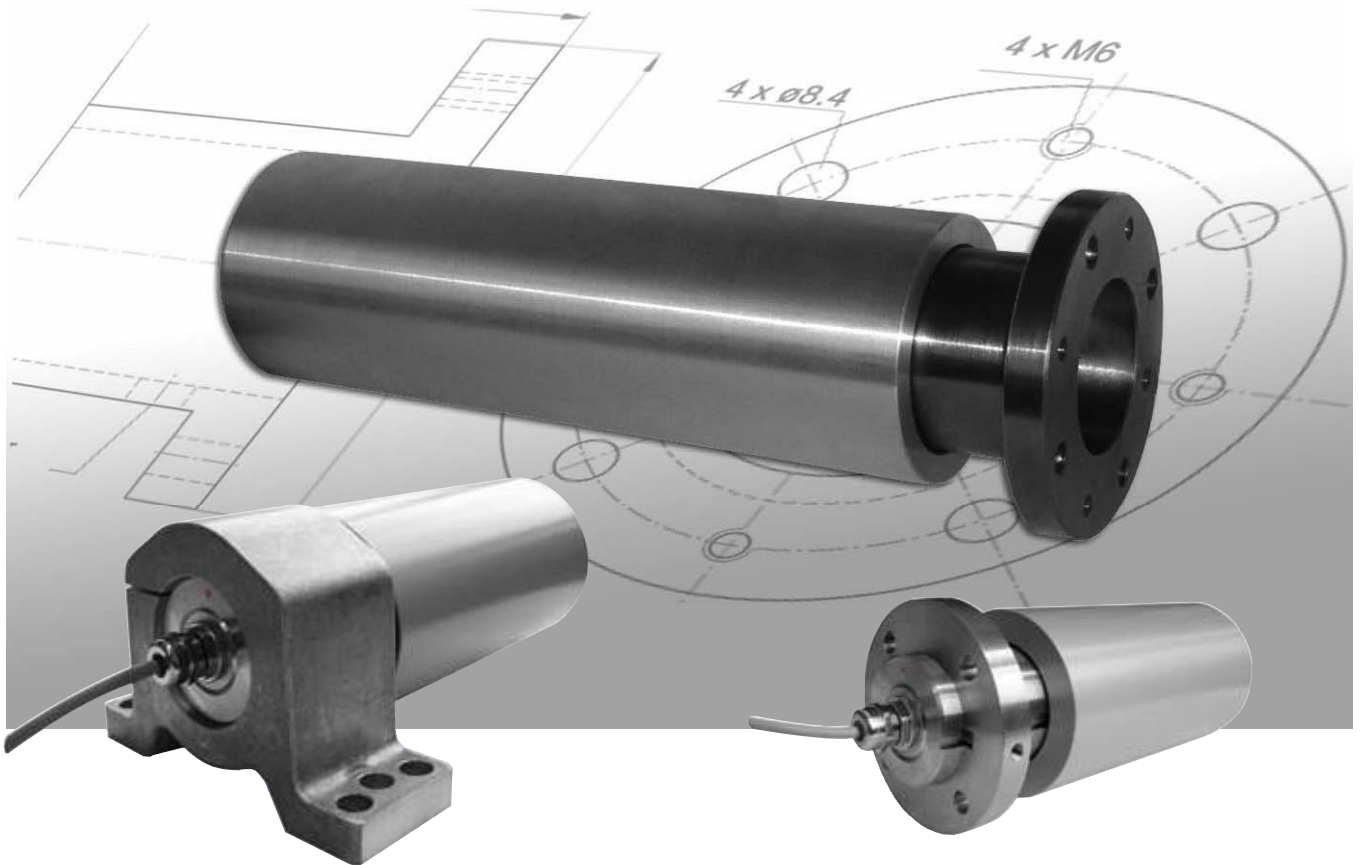
- ☐ Nominal forces from 50 up to 2000 N
- ☐ Simple installation, supplied ready for connection
- ☐ Cost effective compact design

Scope of Supply

- Complete measuring roll
- with integrated force sensor
- with fixed PVC cable (5 meters)

Additional Accessories

- **Option F:** For use in potentially explosive atmospheres with J-Box



Application

This single-sided measuring roll is used for tension controls of narrow webs such as lables, tapes and similar webs:

The single sided bearing design has several advantages such as

- good visibility of the web path
- easy access to the material
- simplified maintenance

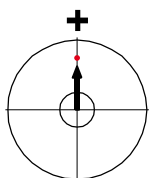
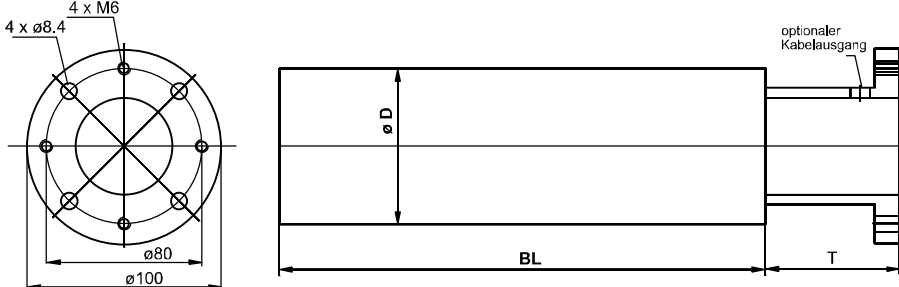
The narrow web measuring roll consist of the

- roll shell
- the force sensor ZAK
- several types of mounting fixtures

For roll length up to 150 mm (6.0 in.) standard clamping blocks or mounting flanges can be used. For roll length over 200 mm (8.0 in.) a special mounting flange is required.

Nominal force F_{nom} (measuring range)	50, 100, 200, 500, 1000, 2000N
Max. operating force based on F_{nom}	160%
Absolute max force based on F_{nom}	300%
max. lateral force based on F_{nom}	100%
Nominal rating	1,5mV/V
Combined error	0,5%
Nominal ambient temperature	+10... +60°C
Operational temperature range	-10 ... +70°C
Nominal resistance of strain gauge bridge	700Ω
Bridge supply voltage	10V DC
Enclosure protection	IP54

Available Sizes		Length of Roll (BL) in mm			
D	Fnom	100	150	200	250
80	50				
	100				
	200				
	500				
	1000				
	2000				
Design		A + B		C	



The mounting position of the red dot depends on the application. If the force works from the center of the sensor towards the red dot, a positive measuring value results.

Nominal force
Roll length
Roll diameter
Type

Product Description

Measuring Roll MWFI

Special Features

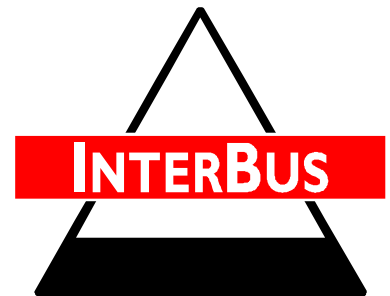
- ☐ Integrated amplifier with InterBus-interface
- ☐ 200, 500, 1000 and 2000 N nominal force ratings
- ☐ Onesided fastened measuring roll
- ☐ Max operating force 160 % of F_{nom}
- ☐ 10fold overload protection
- ☐ Two transducer application to minimize vibrations
- ☐ Insensitive to lateral and bending forces

Scope of Supply

- Complete measuring roll with interface electronic

Available for Delivery

- Bus plug



MWFI with InterBus-interface

The MWFI was developed to measure web tension. Its special feature is the one-sided fastened bearing. This results in the following advantages:

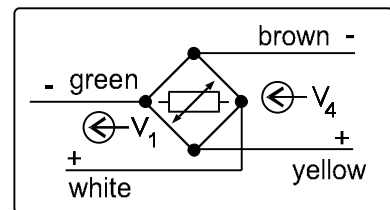
- easy monitoring of the web
- comfortable access to the web
- simplified maintenance

The special design of the shaft and its measuring elements leads to a minimum deflection of the flying roll, only < 0.5 mm at nominal force.

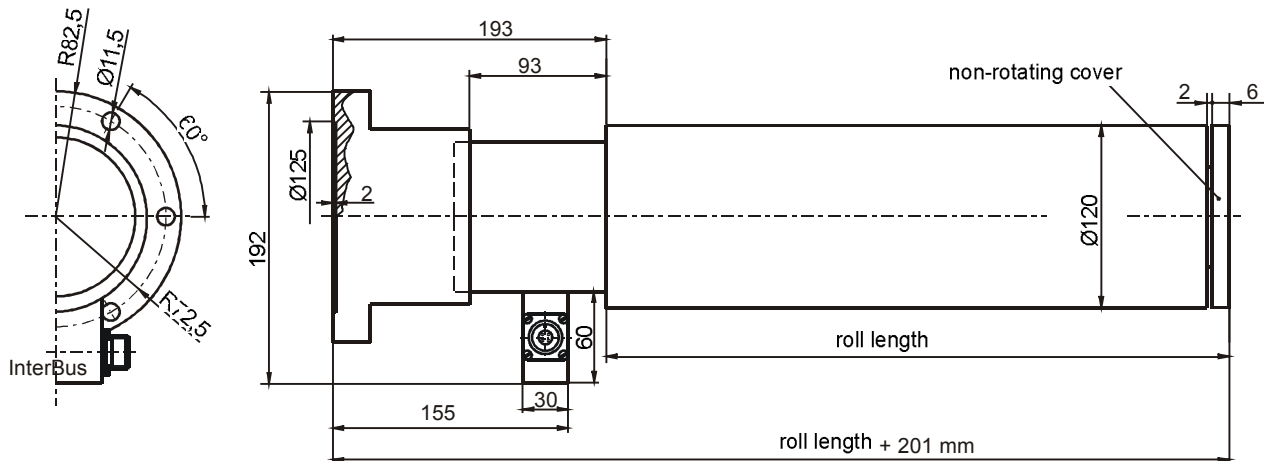
The measurement roll acts like a parallel bending beam.

Due to this principle the web stays in the centerline of the roll. The value of roll deflection is less than 0.2 mm.

Technical Data	Values based on nominal force
Nominal force (measuring range)	200, 500, 1000, 2000 N
Max. operating force	%
Absolute max. force	800 %
Comined error	0,5 %
Nominal ambient temperature	+10 ... +60° C
Operational temperature range	- 10 ... +60° C
Enclosure protection	IP 54
Roll length (L)	300... 540 mm
Roll diameter (D)	120 mm
Max. speed (n)	2700 min ⁻¹
InterBus-S	
Connection	installation remote bus
Participant ID	32 hex analog remote bus participant with input addresses
Data width	1 Word
Resolution	12 bit
Power supply	20,5...30V, 150mA (max.)

Sensor cable lead colors

V₁: bridge output signal
V₄: bridge supply voltage

**Measured value**

The operating range of the sensor is within 160 % of nominal rating. The output signal for zero point and the force maximum are depending on the measuring range, the web geometry, the installation plane and the roll weight. These factors are accounted for in the master controls e.g. the PLC.

Ordering Example:

MWFI 120 - 430 - 500

Nominal force
Roll length
Roll diameter
Type

Product Description

Measuring Roll MUW

Special Features

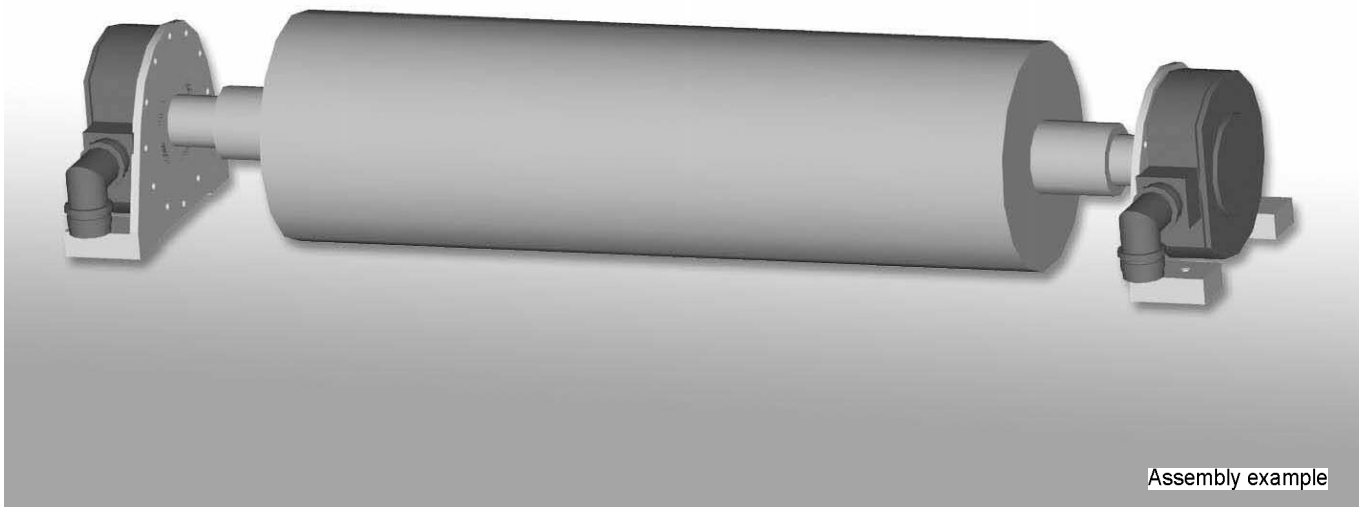
- ☐ Measuring roll with mounted web tension sensors
- ☐ Measuring range from 320 up to 12600 N
- ☐ Separate or joint measurement of bearing forces
- ☐ Cost effective compact design, simple installation
- ☐ Roll diameter and surface treatment according to customer specification

Scope of Supply

- Measuring roll
with two radial force sensors
each with 5 m cable (PVC)
with plug or fixed

Option

- two bearing support blocks



Assembly example

Application

The **measuring roll MUW** is used to measure web tension forces, e.g. in moving webs of paper, textile, plastics, metal.

The compact design enables quick and cost effective integration into OEM machines or retrofitting into existing machines.

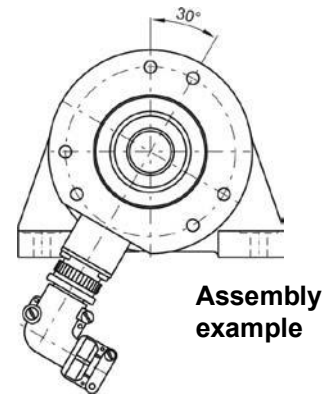
The **measuring roll MUW** consists of the roll with shafts and the radial force sensors BZR or BZA. Bearing support blocks LBZR are supplied on request.

The roll can be delivered according to customer requirements with regard to dimensions, type of material and surface treatment. Rolls can be ordered in steel, stainless steel or aluminium, also with coating.

The measuring sensors can be mounted directly onto the machine frame or with mounting brackets (available as accessories).

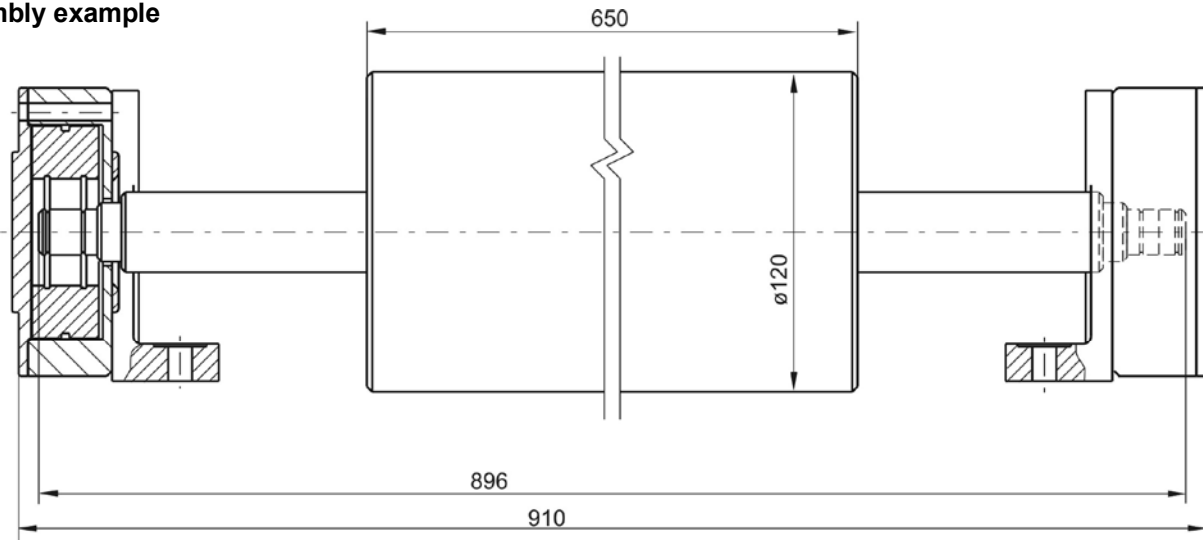
Technical Data

Standard enclosure meets:	IP 50
Special protection:	on request
Ratings (see product description BZR / BZA)	
Max. operating force :	160 %
Combined error:	0,5 %
Nominal ratings:	1,5 mV / V
Nominal resistance of strain gauge bridge:	700 Ω
Max. bridge supply voltage:	10 VDC
Nominal ambient temperature:	+10 ... +60°C
Operational temperature range:	-10 ... +75°C



*) based on F_{nom}

Assembly example



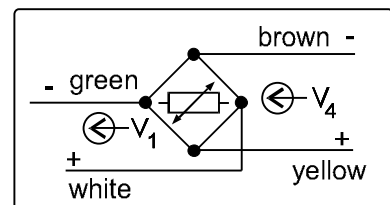
Maintenance

The system does not require any maintenance under normal operating conditions. In case of overload, however, review the zero force value. The devices may not be opened. No wear and spare parts result.

Available models of the measuring roll:

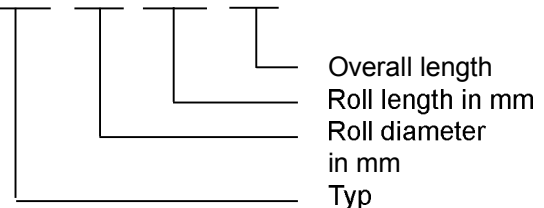
Dimensions:	made to order
Material:	steel, stainless steel, aluminium,
Surface coatings:	chromium, nickel, teflon, rubber,
Surface structure:	fluted, grooved, rombic, etc.
Surface roughness:	standard : Rz 8 μ m or customs made
Balance quality:	Q 6,3 ; Q 2,5 ; Q1 (according to German standard VDI 2060)

Sensor cable lead colors



Ordering example:

MUW 120 - 650 - 910



Product Description

Measuring Pillow Block Bearing MDL

Special Features

- ☐ Vertical or horizontal measuring direction
- ☐ Nominal force 5 kN

Scope of Supply

- Measuring pillow block bearing
- 5 m cable (PVC)

Options:

- Measuring direction
- different connections



Picture similar

Application

Specifically designed for machines where re-grinding of rolls, a surface treatment of rolls, or a quick exchange of rolls is essential.

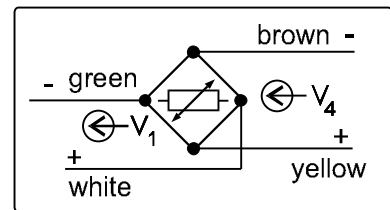
The measuring pillow block bearing **MDL** is designed for quick installation and removal of rolls. Only a few bolts are necessary for the exchange of rolls. The extremely narrow design is especially suited for mounting the bearings in confined spaces in machinery.

The integrated measuring element function according to the double beam principle with applied full bridge strain gauges. The measuring amplifier e. g. the **HAEHNE MV 125** is available for the voltage supply to the full bridge and the processing of the measuring signals.

Mechanical stops prevent overload conditions.

Technical Data	%-Values based on nominal force
Nominal force (measuring range)	5 kN
Max. operating force	120 %
Absolute max. force	200 %
Overload protection	1000 %
Nominal rating	1 mV / V
Comined error	0,5 %
Nominal ambient temperature	+ 10 ... + 60° C
Operational temperature range	- 10 ... + 75° C
Bridge supply voltage	10 VDC
Option H	Horizontal measuring direction
Option V	Vertical measuring direction
Material	Tool steel

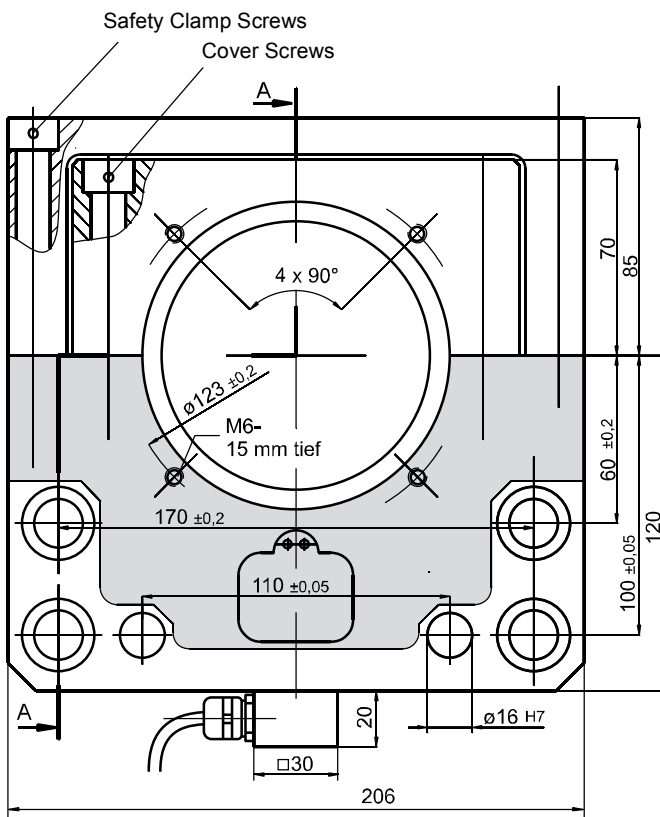
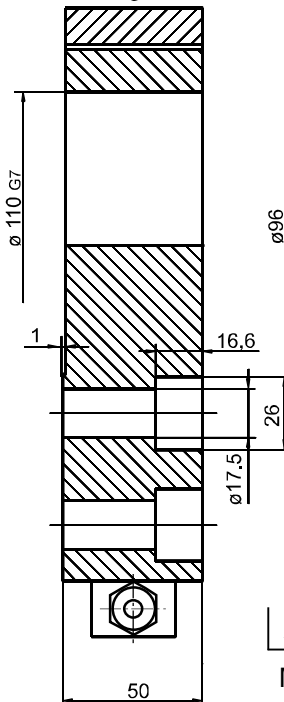
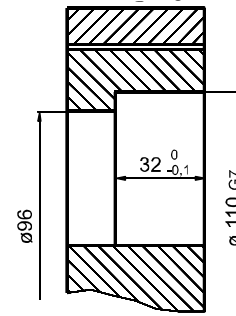
Sensor cable lead colors



V_1 : bridge output signal

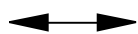
V_4 : bridge supply voltage

Example of application

A - A
Floating Bearing H1A - A
Fixed Bearing H2**Achtung!**

Measuring rolls must have a fixed and a floating bearing and should be equipped only with self-aligning ball bearings. Temperature-dependent expansion of the shaft must be possible. Expansion does not effect the measuring accuracy.

Option H, V



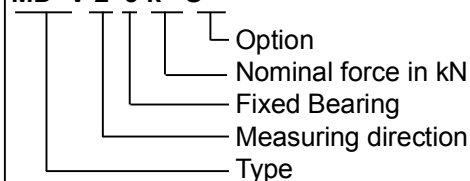
Measuring
direction
H



Measuring
direction
V

Ordering Example:

MD- V 2 5 k - S



Product Description

Force Measurement Bolt KMB

Special Features

- ☐ Simple mounting even in confined spaces
- ☐ Easy retrofitted into existing machinery
- ☐ Measuring range from 0,4 to 250kN
- ☐ Ø 12, 16, 20, 35 and 50 mm
- ☐ Fit in commercially available standard fork heads

Scope of Supply

Force sensor with PVC-cable, grey, 5 meters in length

Options:

- Option T: straight receptacle
- Option S: right angle plug
- Option F: **II2G EEx ia IIC T4**

Use in potentially explosive atmospheres (consider table)

Accessories:

- Supplier of fork heads:
mbo Oßwald GmbH & Co KG
Steingasse 13
D-97900 Kilsheim
Tel. (+49) 0 9345-670-0
Fax (+49) 0 9345-62 55



KMB35-25k-S
with fork head

Application

The **force measurement bolt KMB** was specifically developed to capture tension and compression forces in machine parts equipped with standard fork heads, e.g. in conjunction with pneumatic and hydraulic cylinders.

The **KMB** can be used in all applications where such fork heads are either already available or can be easily retrofitted.

Simple and cost effective mounting of the **KMB** make it especially suitable for up-grading existing equipment.

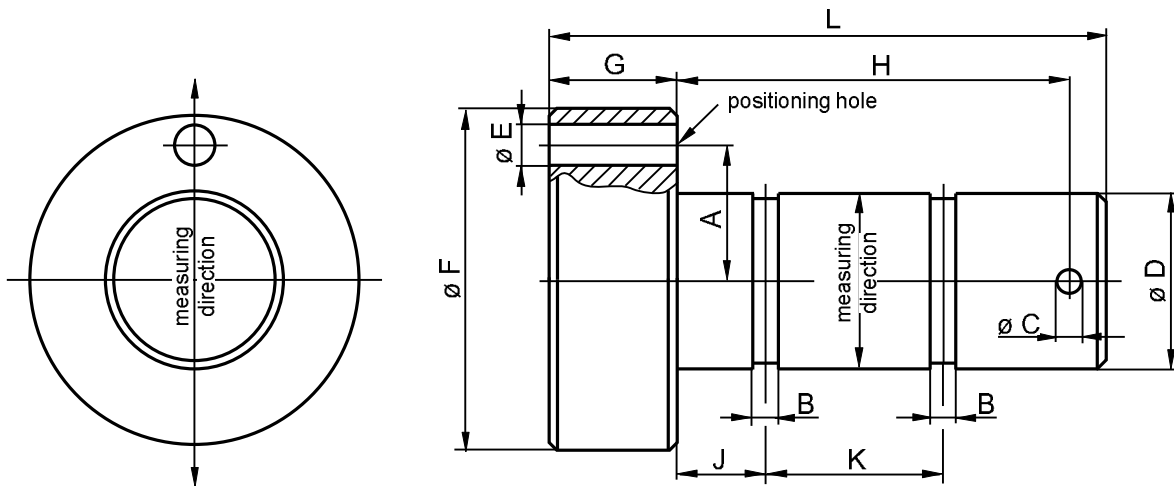
Strain gauges applied to the active surfaces of the double shearing beam measure the acting forces.

HAEHNE offers for all its sensors a corresponding range of amplifiers to condition the measuring signal and deliver the bridge voltage supply, eg. the **MV 125** unit.


The signals at the output terminals of the amplifier are proportional to the acting shearing force. The signals can be digitally displayed or used as actual values in closed loop controls.

Technische Daten	Values based on nominal force
Max. operating force	160 %
Absolute max. force	300 %
Lateral force	100 %
Combined error	1 %
Max. bridge supply voltage	10 V DC
Nominal ambient temperature	+10 ... +60 °C
Operational temperature range	-10 ... +70 °C (applications with fix mounted cable)

KMB	Nominal Force [kN]						Nominal Rating [mV/V]	Fracture Force [%]	Nominal Resistance [Ω]	Material
12	0,4	0,63	1	1,6			1	800	350	aluminum
16	0,4	0,63	1	1,6	2,5	4		400		
20	1,6	2,5	4							
16	6,3	10					1	800	350	stainless steel
20	6,3	10	16					700		
35	10	16	25	40	63					
50	100	160					1,5	600	700	
50	250									
Standard: calibration in positive range										



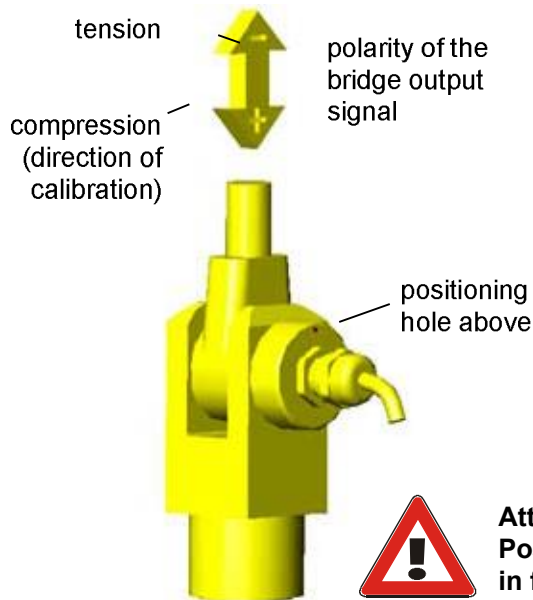
Dimensions in mm

KMB	ø D	ø F	G	ø E	A	ø C	H	L	J	K	B	Suitable Fork Head 
12	12f7	27	26	3	11,5	3	26	56	6	12	2	G12 x XX
16	16h7	32	20	3,2	13,2	3	35,5	60	9,5	16	6	G16 x XX
20	20f7	34	24	3,3	14	3	42,0	72	9,75	20,5	5,5	G20 x XX
35	35g6	65	25	8,2	25	5	77,5	110	17,5	35,0	8,0	G35 x XX
50	50g6	100	37	10,2	37,5	6,0	101	145	23	50	5,0	G50 x XX

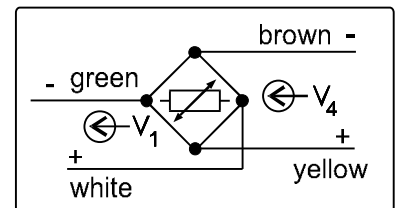
Product Description

Force Measurement Bolt KMB

Calibration Direction



Sensor cable lead colors



V_1 : bridge output signal
 V_4 : bridge supply voltage

Ordering Example:

KMB 35-25k-T

- option
- nominal force in kN
- size
- type

Connections and Enclosure Protections

Option T	Option S
straight receptacle,	right angle plug
Protection IP 67	Protection IP 50
Protection as per DIN 40050	

KMB	Option T	Option S
12	T	-
16	T	-
20	T	-
35	T	S
50	T	S

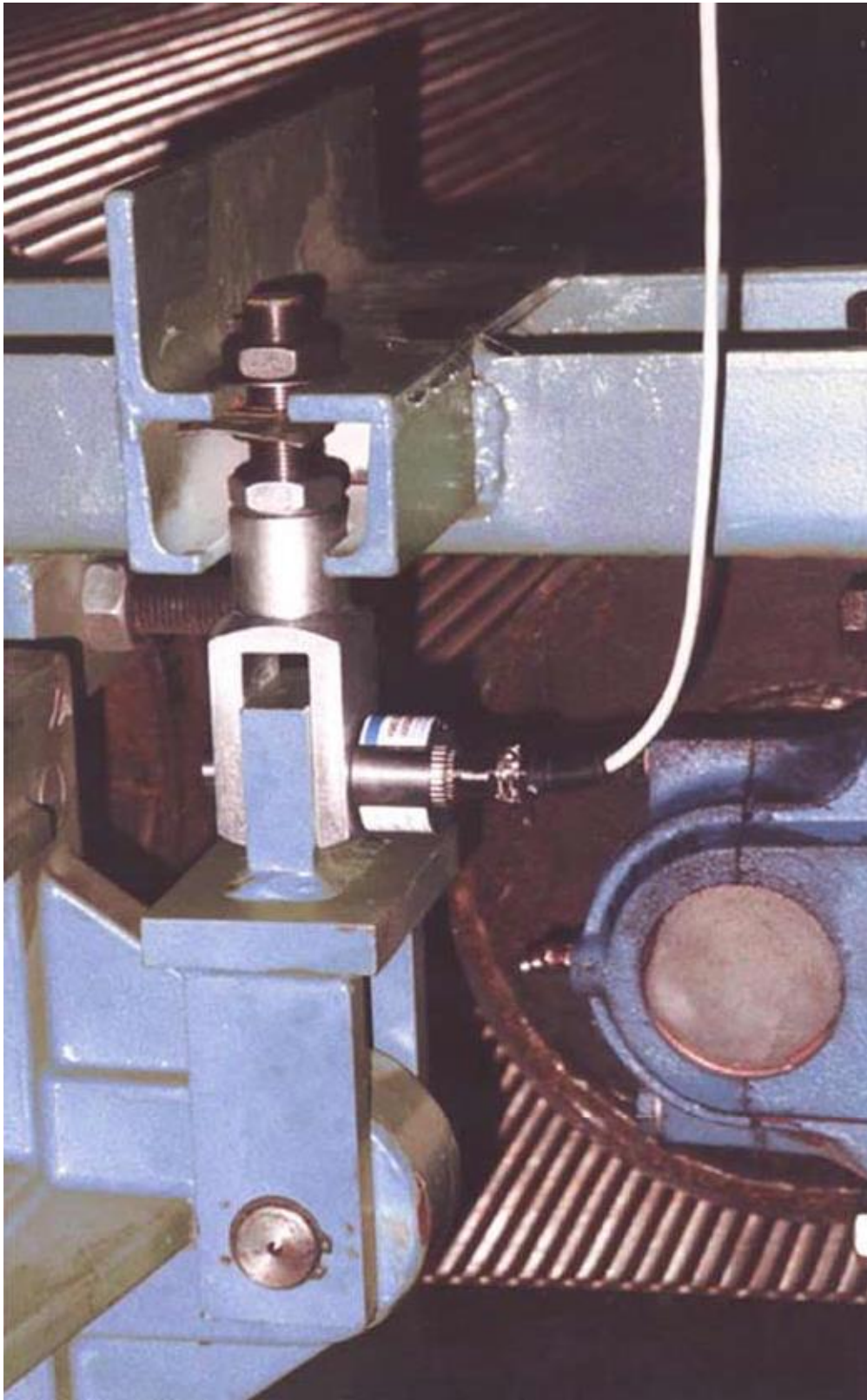
Exposion Protection

Option F
Use in potentially explosive atmospheres
with straight receptacle, (T) and blue sensor cable
Protection IP 67
Protection as per DIN 40050

KMB	Nominal Rating [mV/V]	
-	0,75 ... 1	Use J-Box for adjustment of zero point and nominal rating.
-		
20		
35		
50		

Application Example

Textil Treatment (Force Measurement Bolt)



Product Description

Compression Force Load Cell DK2

Special Features

- ☐ Minimum space requirement due to compact design
- ☐ Simple mounting
- ☐ Nominal force ratings 0,5; 1; 2; 5 and 10 kN
- ☐ Made of stainless steel with protection class IP67
- ☐ With and without overload protection

Scope of Supply

- Compression force load cell with fixed cable (PVC), 5 meters in length

Available for Delivery

- Self aligning pad
 - Load button
- starting from 1 kN nominal force:
- **Option F:** Use in potentially explosive atmospheres with J-Box



Application

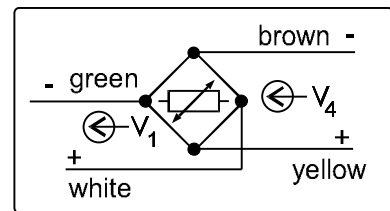
The compression force load cells of the **DK2** series are characterized by their very compact design. They have been especially developed for applications where large forces must be measured accurately within confined spaces - diameter and height.

The compression force load cell of the **series DK2** consist of a cylindrical membrane, whose special form was optimized with Finite Elementes Analysis (FEA). Strain gauge elementes on the membrane surface capture the acting forces. The amplifier **DMA** of the **HAEHNE** product program provide the voltage supply to the full bridge and is also processing the measuring signals. The signals at the output terminals of the amplifier are proportional to the acting compression force. They can be digitally displayed or used as actual values in closed loop controls.

The radial cable entry facilitates simple mounting of the load cell to machine frames. In order to optimize the transmission of force the use of a load button or a pendular pad is recommended.

Technical Data	Values (%) based on nominal
Nominal Force	0,5; 1; 2; 5; 10 kN
Max. operating force	160 %
Absolute max. force	
Design A	250 %
Design B	1000 %
Nominal rating (Option F: J-Box necessary)	1,5 mV / V
Combined error	0,5 %
Nominal ambient temperature	+10...+60° C
Operational temperature range	- 10...+75° C
Max. bridge supply voltage	700 Ω
Bridge supply voltage	10 VDC
Enclosure protection	IP67

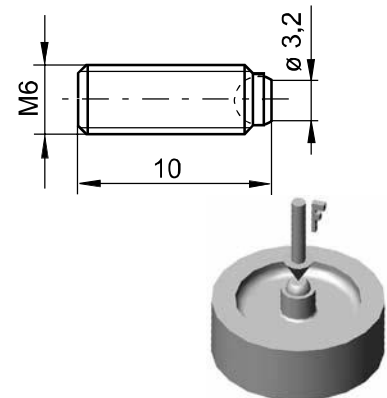
Sensor cable lead colors



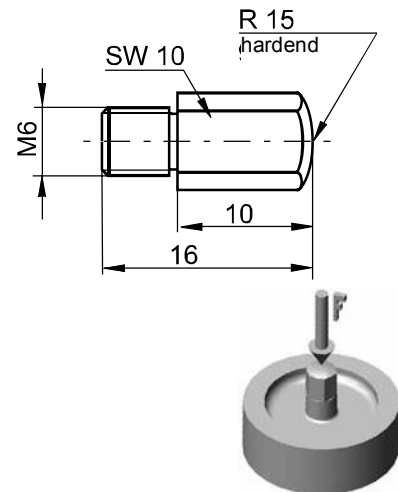
V_1 : bridge output signal

V_4 : bridge supply voltage

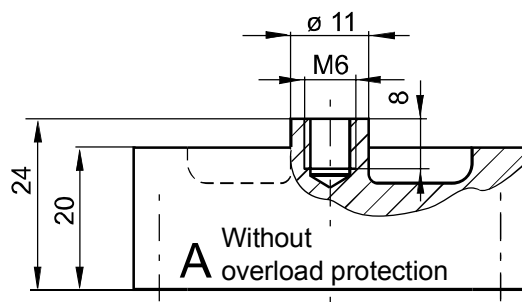
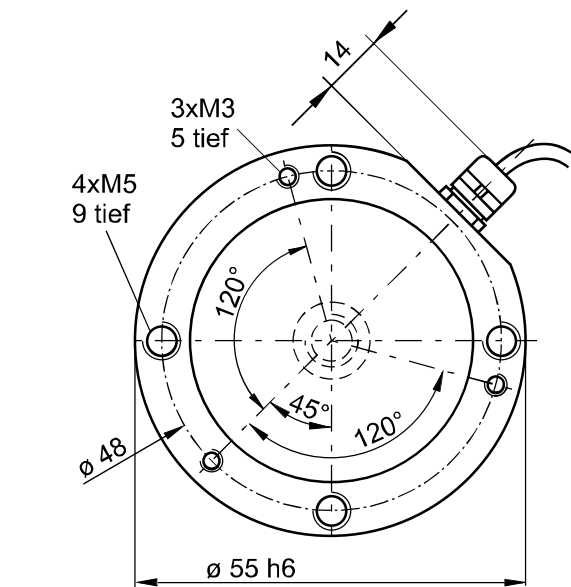
Assecoires for power flow



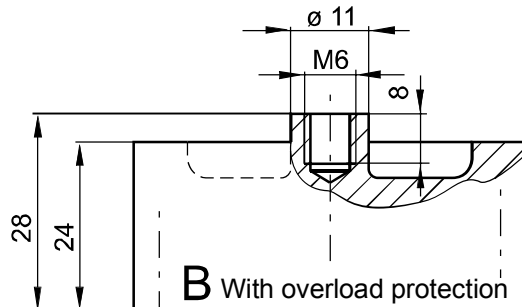
Pendular pad (up to 9 kN)



Load button



A Without overload protection



B With overload protection

Ordering Example:

DK2 A 5k - F

Option
Nominal Force
Design
Type

Product Description

Compression Force Load Cell DK 3

Special Features

- ☐ Minimum space requirement due to compact design
- ☐ Simple mounting
- ☐ Design in stainless steel
- ☐ Nominal force ratings from 1 up to 100 kN

Scope of Supply

- **Compression force load cell** with fixed cable, 5 m in length
- **Load button** M6 or M10

Additional Accessories

- **Option F:** Use in potentially explosive atmospheres with J-Box (connection variant T)



Application

The cylindrical form and small dimensions of the compression force load cell series DK 3 make them especially suitable for confined spaces. The completely enclosed stainless-steel design with the protection class IP 67 is able to withstand wet conditions in machinery and equipment. The screw top ensures an optimal force path.

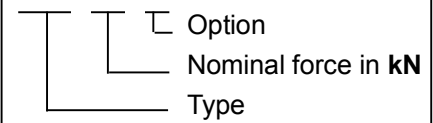
The compression force load cell of the DK series consists primarily of a single sensor element designed and optimized with finite element analysis. As a result all sensors up to a nominal force range of 50 kN have the same dimensions. The load cells with nominal force ratings of 1 and 2 kN function according to the shearing principle, the other according to the compression principle. Strain gauges applied to the active areas of the sensor body capture the acting forces. A measuring amplifier e. g. the **HAEHNE MV125** is available for the voltage supply to the full bridge and the processing of the measuring signals.

The signals at the output terminals of the amplifier are proportional to the acting compression force. They can be digitally displayed or used as instantaneous values in a control loop. The radial cable entry facilitates simple mounting of the load cell to machine frames.

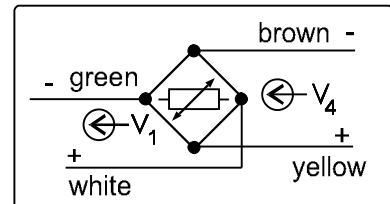
Technical Data	Values based on nominal force	
Nominal force	1; 2; 5; 10; 20; 50; 100 kN	
Max. operating force	160 %	
Nominal rating (with Option F: J-Box necessary)	1,5 mV / V	
Comined error	0,5 %	
Nominal ambient temperature	+ 10 ... +60° C	
Operational temperature range	- 10 ... +75° C	
Nominal resistance of the strain gauge bridge	DK 3 - 1 ... 2 kN	350 Ω
	DK 3 - 5... 100 kN	700 Ω
Bridge supply voltage	10 VDC	
Enclosure protection	IP 67	

Ordering example:

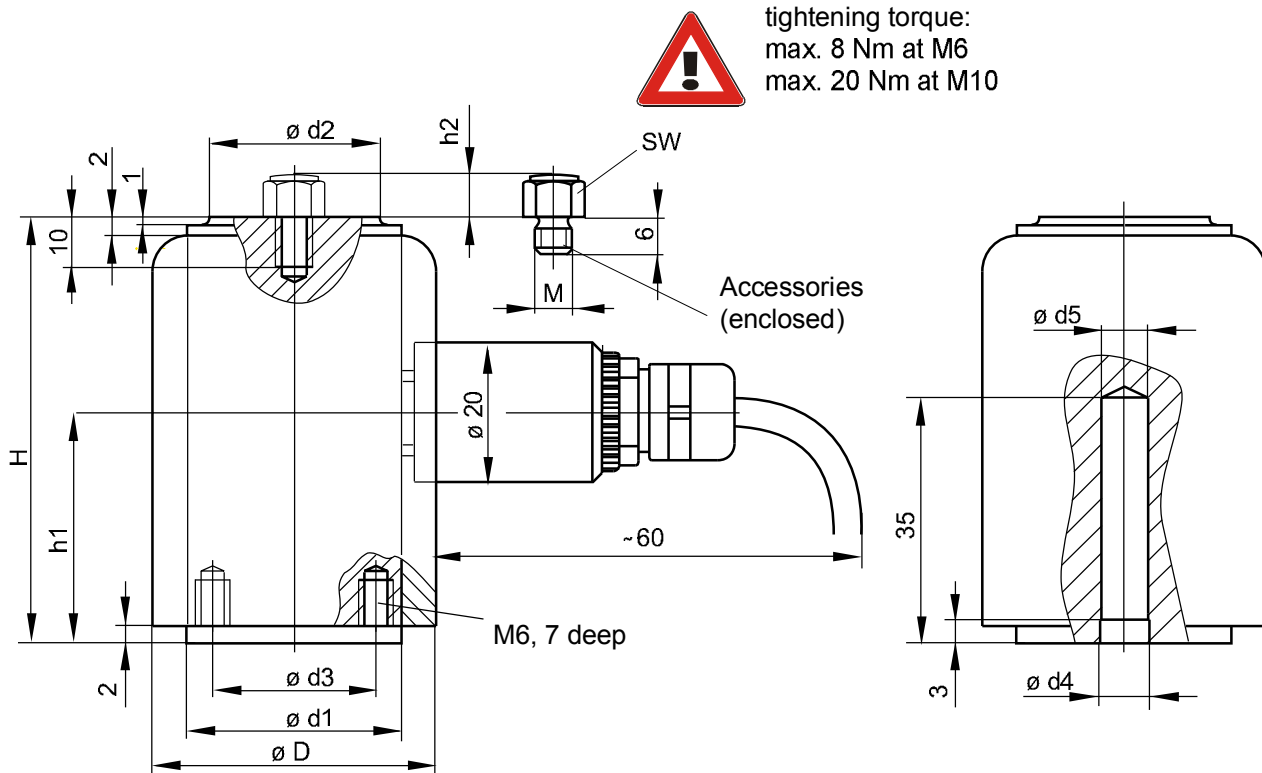
DK3 - 1k - F



Sensor cable lead colors



V_1 : bridge output signal

 V_4 : bridge supply voltage

Nennkraft [kN]	D	d1	d2	d3	H	h1	h2	M	SW	d4	d5
1; 2	40	30,2 f7	22	21	60	32	10	6	10	14 H7	14
5; 10; 20; 50										12 H7	11,5
100	50	40 f7	20	26	70	40		10	17	12 H7	11,5

Product Description

Compression Force Load Cell DK4

Special Features

- ☐ Minimum space requirement due to compact design
- ☐ Various fixed cables designs are available
- ☐ Nominal force ratings from 200 to 1000 kN

Scope of Supply

Compression force load cell with fixed cable, 5 m in length with straight receptacle (connection variant T)

Additional Accessories

- **Option L:** Right angle receptacle
- **Option S:** Right angle plug
- **Option F:** Use in potentially explosive atmospheres with J-Box (connection variant T)



DK4 - 650 - TX

Application

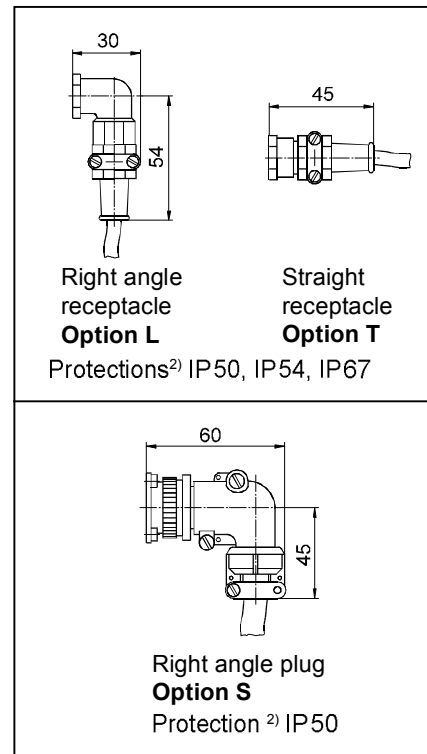
The compression force load cells of the DK series are characterized by their very compact design. They have been especially developed for applications where large forces must be measured accurately within confined spaces - diameter and height - . Typical applications are calenders but also other machines and equipment that require the measurement and control of forces.

The compression force load cell basically consists of a cylindrical compression body. Its shape has been optimized through calculations made according to the finite element method.

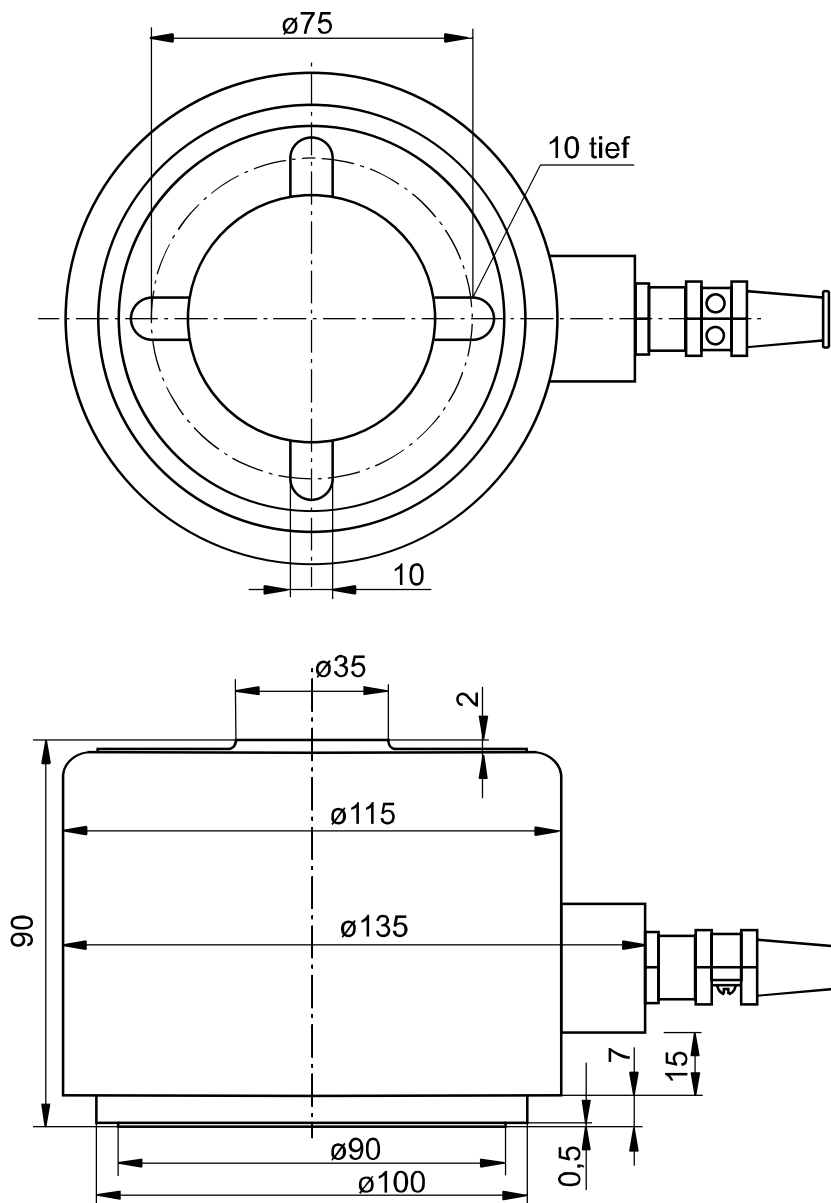
Strain gauge elements on the active circumference of the compression cylinder captures the acting forces. The voltage supply to the full bridge and the processing of the measuring signals is effected by way of a suitable amplifier from the HAEHNE program

The signals at the output terminals of the amplifier are proportional to the acting compression force. They can be digitally displayed or used as instantaneous values in a control loop.

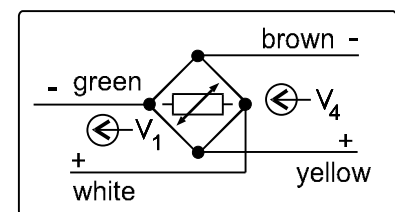
Technical Data	Values based on nominal
Nominal force (measuring range)	200; 500; 650; 1000 kN
Max. operating force	150 %
Absolute max. force	250 %
Nominal rating	1,25 m V / V
Comined error	1,0 %
Nominal ambient temperature	+10 ... +60° C
Operational temperature range	- 10 ... +75° C
Nominal resistance of the strain gauge bridge	1400 Ω
Bridge supply voltage	10 VDC



²⁾Protections to DIN40050



Measuring Cable Lead Color



V_1 : bridge output signal
 V_4 : bridge supply voltage

Ordering Data:

DK4 - 650 k S

option
nominal force
type

Product Description

Force Sensor RKS 01 Design B and D

Special Features

- ☐ For dynamic and statical force measurement
- ☐ Made of stainless steel
- ☐ Designed for compression and tension force direction

Scope of Supply

- Force Sensor
with fixed cable, 5 m in length

Available for Delivery

- Option F: Use in potentially
explosive atmospheres with J-Box



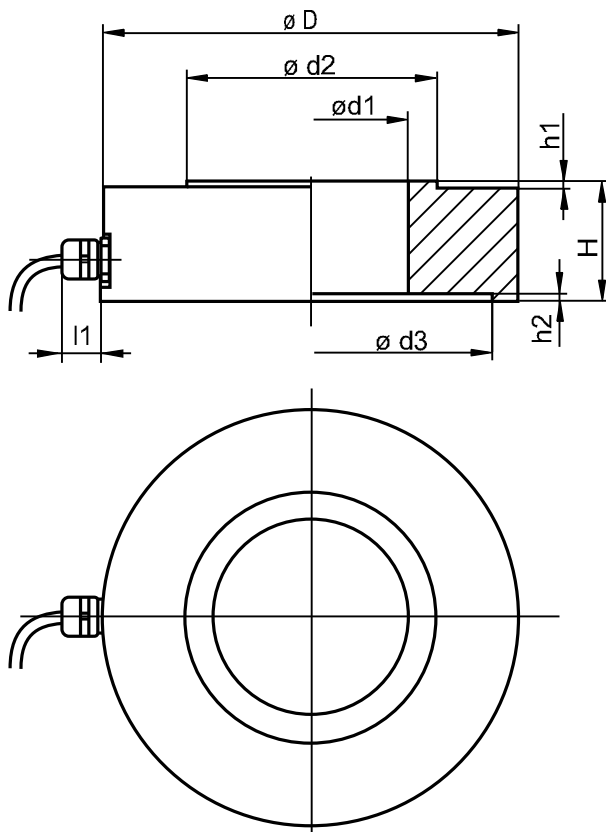
Application

The force sensors **RKS** are optimally suited for the precise measurement of forces acting in axial direction. In most cases the outer ring is placed onto a support or screwed to it and the force is acting on the inner ring, e. g. via a linear actuator. A typical application is the force measurement at spindle drives of coating machinery.

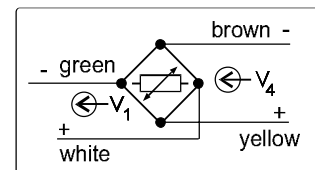


The membrane design principle is especially well suited for the design of high precision low silhouette sensors. This splitting of the full bridge strain gauge into 8 separate strain gauges makes the sensor less sensitive to a nonsymmetrical application of force.

Technical Data	Design B	Design D	
Nominal Force F_{nom} :	5; 10; 20 kN	10; 20; 30; 40; 50 kN	100 kN
Max. operating force (based on F_{nom})	160%		
Absolute max. force (based on F_{nom})	200 %	300 %	300 %
Fragility force (based on F_{nom})	500 %		
Nominal rating	1,5 mV/V	1,5 mV/V	1,0 mV/V
Combined error	0,5 %		
Nominal temperature range	+10 ... +60 °C		
Operational temperature range	-10 ... +70 °C		
Nominal resistance of strain gauge bridge	700 Ω	700 Ω	1400 Ω
Max. bridge supply voltage	10 V DC		
Enclosure protection (as DIN 40050)	IP 52	IP 52	IP 67



Measuring Cable Lead Colors



V_1 : Signal voltage

V_4 : Supply voltage

Ordering Data

RKS 01 B 5k - F

Option
Nominal force in kN
Design
Typ

Design	D	d1	d2	d3	H	h1	h2	l1
B	74 f7	34 H8	44	64	21	1	1	14
D 10... 50 kN	110 f7	46 +0,1	61	89,5	26	1	1,25	20
D 100 kN	120	40,5	0	68	40	0	1	40

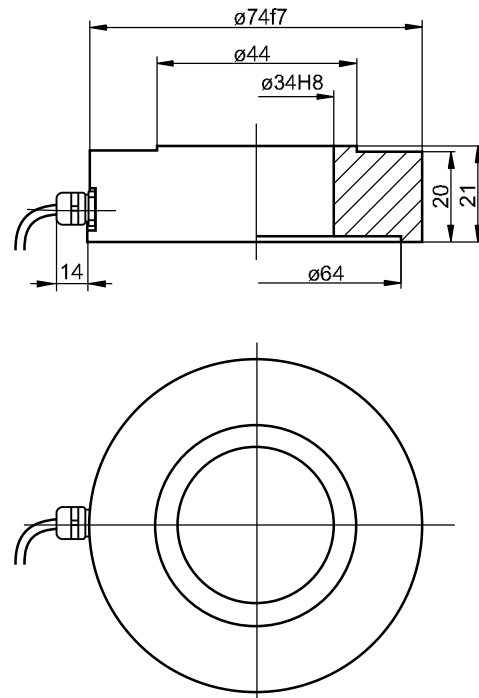
Product Description

RKS 01 Design B and D

Force sensor RKS with its different dimensions and boreholes

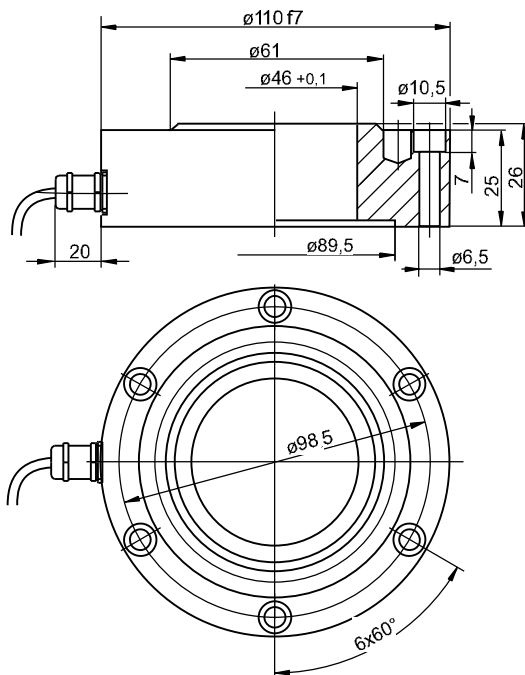
Design B

Nominal force 5; 10; 20 kN



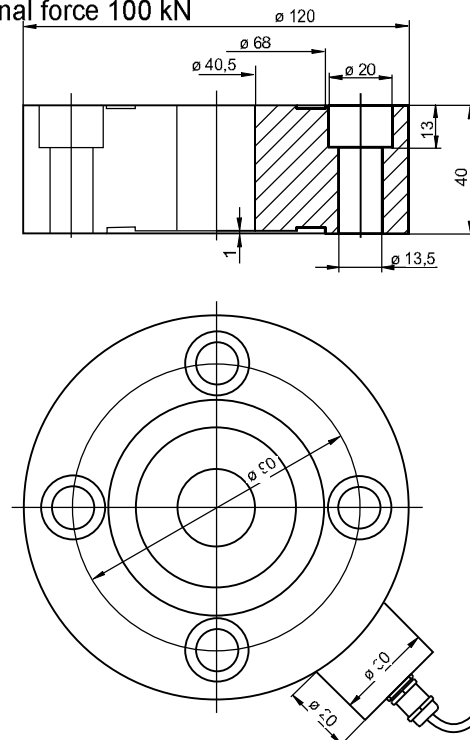
Design D

Nominal force 10; 20; 30; 40; 50 kN



Design D

Nominal force 100 kN



Application Example

Printing Machine (Single sided measuring roll)



Product Description

Force Sensor RKS 02

Special Features

- ☐ Compact design
- ☐ Great nominal forces up to 10 MN
- ☐ Stainless steel design

Scope of Supply

Force sensor with fixed cable (PVC), 5 m in length

Additional Accessories

- **Option T:** straight receptacle
- **Option F:** Use in potentially explosive atmospheres with J-Box (connection variante T)



Pic. similarly

Application

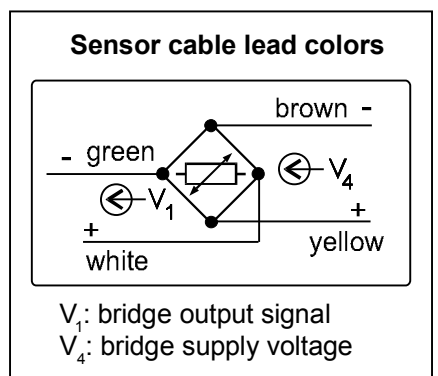
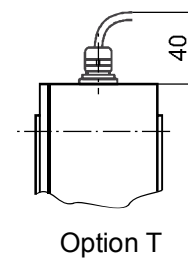
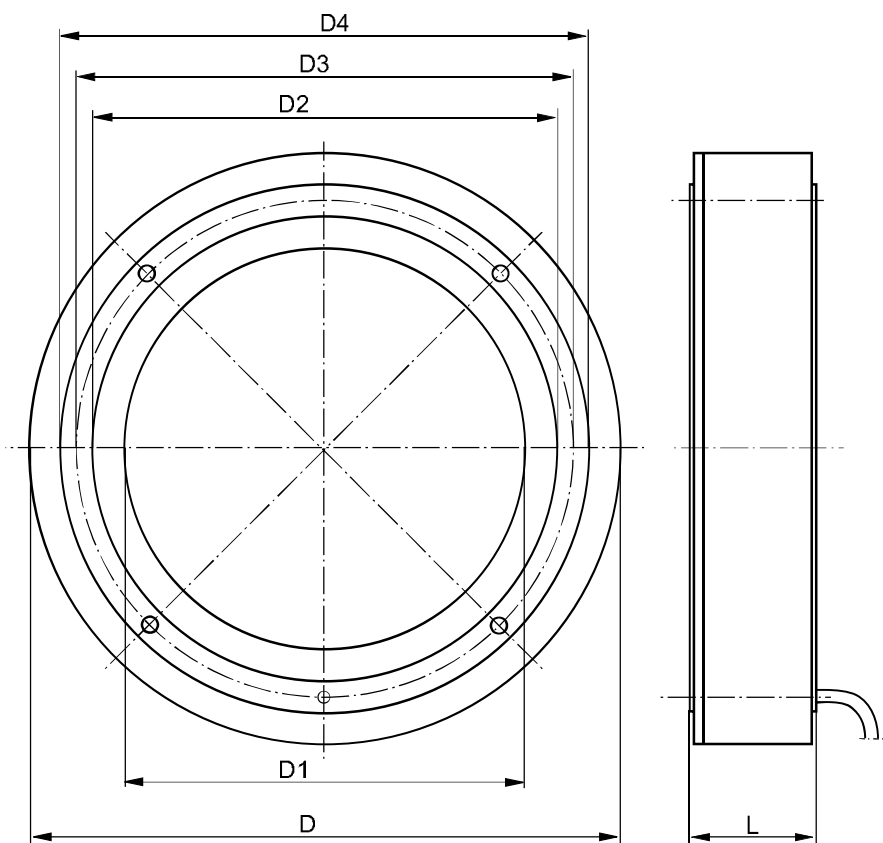
The RKS compression tension sensors were developed for the precise measurement of great forces that take effect in an axial direction.

To do this, the external ring is attached to the assembly surface with screws and the force is introduced via the contact surface.

The sensors are equipped with full bridge strain gauges and work according to the principle of a compressive force body. In this context the relevant bridge sections are repeatedly broken down into single strain gauges and distributed along the circumference in order to increase the overall accuracy.

HAEHNE offers for all its sensors a corresponding range of amplifiers to condition the measuring signal and deliver the bridge voltage supply, eg. the **MV 125** unit.

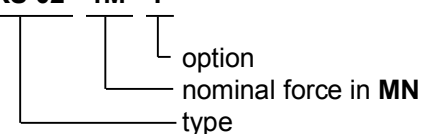
Technical Data	Values based on force nominal	
Nominal Force F_{nom}	1 MN; 2 MN; 5 MN	10 MN*
Max. operating force	160 %	120 %
Absolute max. force	200 %	150 %
Fragility	250 %	200 %
Combined error	$\pm 1 \%$	$\pm 1 \%$
Nominal rating (Option F: J-Box necessary)	1 mV/V	presumably 1,5 mV/V only uncalibrated possible*
Nominal resistance	350 Ω	
Ma. bridge supply voltage	10 V DC	
Nominal ambient temperature	+10...+60 °C	
Operational temperature range	-10...+70 °C	
Enclosure protection (as DIN 40050)	IP 67	
	* Sensors over 5 MN become delivered uncalibrated. Normally the comparing measurement is accomplished by an external calibration service at the customer under the condition that locally the essential test load can be applied.	



Nominal Force [MN]	D	D1	L	D2	D3	D4
1 und 2	268	180	57	210	224	238
5	320	214	74	244	270	290
10	370	220	170	250	300	350

Ordering example:

RKS 02 - 1M - T



Product Description

Compression-Tension-Sensor CTS 02

Special Features

- ☐ Low profile
- ☐ Insensitive against eccentric forces
- ☐ For dynamic and static force measurement in compression-tension range
- ☐ Design with nickel plated surface

Scope of Supply

Force sensor with right angle plug and cable, 5 meters in length



Picture: CTS 02-300k S (pic. without right angle plug)

Application

The **compression-tension-sensors CTS** was developed for the precise measurement of large forces, which works in axial direction.

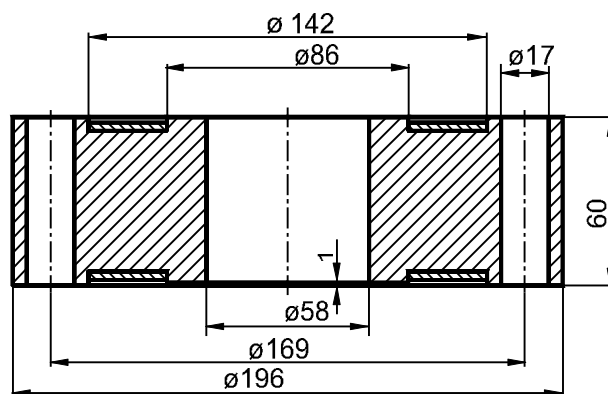
For this purpose, the outer ring is flanged to the mounting surface and the force passes into the centre bore.

The force sensors function according to the shearing force principle and are applied with fullbridge strain gauges. The force acts under 45° at the four measuring elements of the load cell.

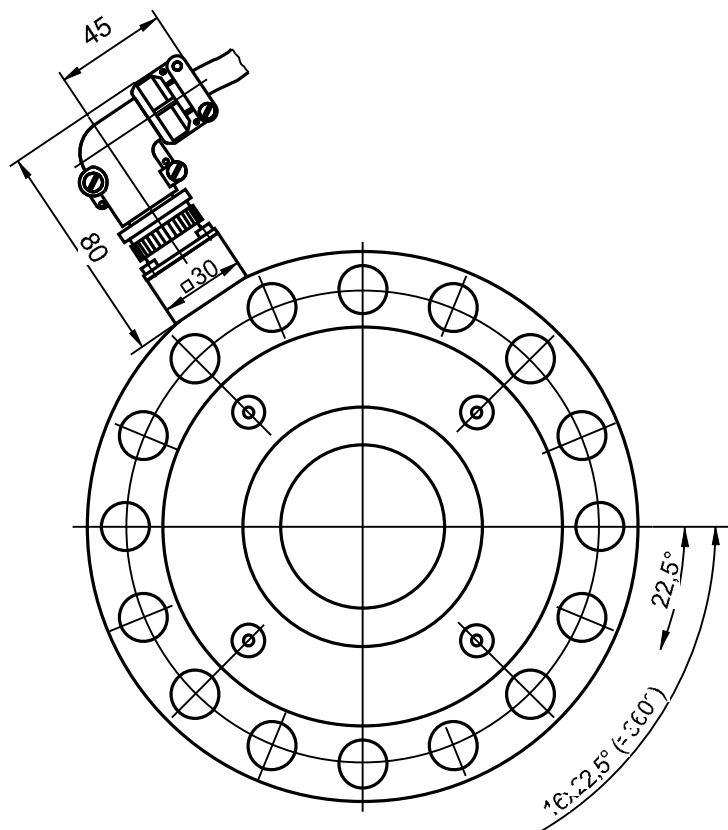
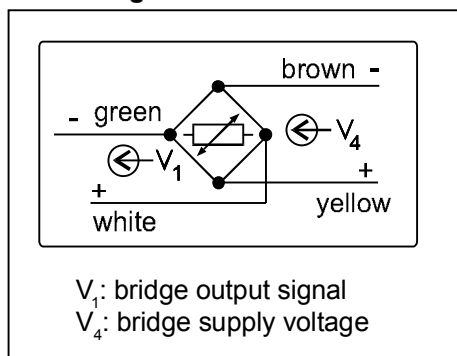
HAEHNE offers for all its sensors a corresponding range of amplifiers, e.g. the measuring amplifier **MV125**, to condition the measuring signal and deliver the bridge voltage supply.

Due to the design principle applied the measuring errors remain negligibly small even in case of extreme eccentrically acting forces.

Technical Data	Values based on nominal force
Nominal force	300 kN
Max. operating force	160 %
Nominal rating	1,5 mV/V
Combined error	1 % v. E.
Nominal ambient temperature	+10...+60 °C
Operational temperature range	- 10...+70 °C
Nominal resistance of strain gauge bridge	700 Ω
Max. bridge supply voltage	10 V DC
Enclosure protection	IP 50



Measuring cable lead colors



Ordering Data:

CTS 02 - 300k S

— option
 — nominal force in **kN**
 — type

Product Description

Portable Force Measurement Instrument FCS

Special Features

- ☐ Extremely flat design
- ☐ Nominal force ratings from 100 N to 2 kN
- ☐ Combined error 0,5 %

Scope of Supply

- Force sensor
with cable, 5 m in length
- Available sensor height
either 6, 8 or 10 mm



Application

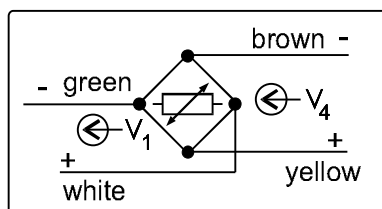
The portable system FCS was designed for the measurement of compression forces in confined spaces and in narrow gaps, specially for the nip forces between rolls.

The special design of the sensor element with strain gauges in full bridge circuit is the core of the force sensor.

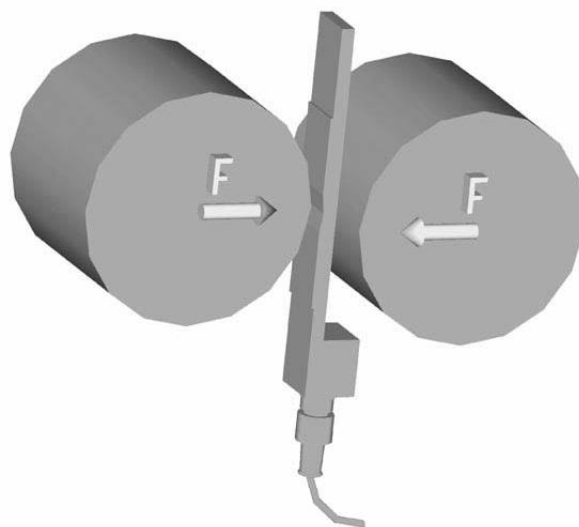
The amplification of the measurement signal to standardized levels is accomplished with amplifiers of the HAEHNE product programm. This enables stationary solutions with DIN rail or field enclosures, as well as portable systems.

Technical Data	Values based on nominal force	
	Size 1	Size 2
Nominal force (measuring range)	100, 200, 300, 500 N	1 and 2 kN
Max. operating force	120 %	160%
Absolute max. force	200 %	
Nominal rating	1,5 mV / V	
Genauigkeitsklasse	0,5 %	
*Nenntemperaturbereich	+10...+60° C	
*Gebrauchstemperaturbereich	- 10...+70° C	
*) Reduction to 50° C in case of moving cable.		

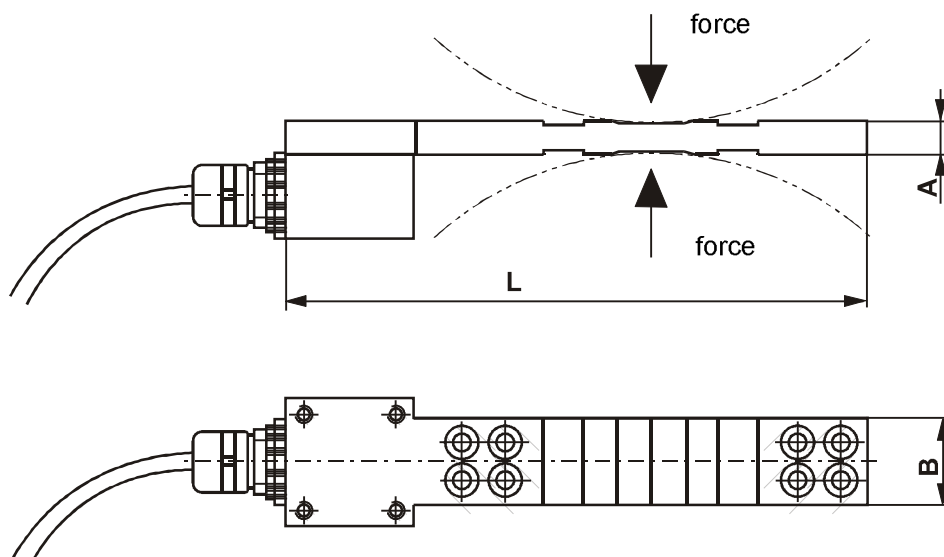
Sensor cable lead colors



V_1 : bridge output signal
 V_4 : bridge supply voltage



Design for compression forces of rolls
ranging from 40 to 140 mm diameter



Size	L	B	A
1	137	20	6 / 8
2	150	30	10

Ordering Example:

FCS 6 - 200

FCS 10 - 1k

Nominal force
Sensor height A
Type

Product Description

Portable Strain Gauge Amplifier PAD

Special Features

- ☐ Programable for 4 different sensors
- ☐ Up to 5 linearization points per sensor available
- ☐ Peak value memory, overload display (also in the minus range)
- ☐ Digital output via serial interface

Scope of Supply

- Strain gauge amplifier with digital display incl. 2 batteries (AA)
- Transducer connector
6-pol. circular connector DIN

Also Available

- Force sensor with cable
- Retaining magnet
- Socket for serial interface



Application

The PAD can be connected to all force sensors of the HAEHNE product program and other full bridge strain gauge sensors to form a mobile force measurement system.

For use:

- in roll pressure applications,
- service and process improvement,
- calibration of web tension control systems

The **PAD** is a portable strain gauge amplifier with digital display.

The analog force values are converted in 100 milli seconds cycles for the serial interface. The digital display is a result of the mean of 5 measurements. The peak value can be retrieved from memory. The selection of operating modes, the retrieval of values and the input of parameters is performed via the foil covered keyboard.

The zero adjust function compensates zero over the whole display range. The nominal rating, calibrating and full scale values for up to four sensors can be entered and stored. The linearity of each sensor can be improved clearly by the additional points on the curve.

The force measurement system has an independent power supply with regular (1.5) or rechargeable batteries (1.2V). The enclosure of the PAD is made of durable plastic.

Technical Data	
Combined error	0,5 %
Enclosure protection	IP40
Input	for up to 2 strain gauge full bridge sensors (350 Ohm) switched in parallel
Display	4 1/2 digits
Display range	dependent on calibration and scaling display range -19999 to 19999, position of decimal point user selectable
Modes of display	instantaneous value (= average over 0,5 sec.) peak hold display of overload, underload and low voltage
Display rate	2/s
Scaling points of linearization	up to 5
Serial Interface RS 232	8 bit data capacity, 1 stop bit, Baud rate 2400 ...9600 10 measured values per sec.
Power Supply	
Supply voltage	2,4...3 VDC (2 NC rechargeable/primary batteries (size AA))
Current consumption	app. 35 mA
Operating time (with rechargeable batteries 750mAh)	app. 15 h (RS232 active) / ca.20 (RS232 inactive)
Temperature Range	
Operating temperature range	0...+50 °C
Storage temperature range	-20...+70 °C
Electrical Connections	Transducer connector 6-pin circular connector DIN Output serial interface 9-pin SUB-D-socket

**Dimensions**

158 x 95 x 33 mm (l x w x h)
Weight 200 g

Ordering example:

PAD
+ desired sensor

Product Description

Measuring Amplifier AME

Special Features

- ☐ Two voltage outputs and one current output
- ☐ Galvanically isolated
- ☐ Plug-in terminal blocks
- ☐ Amplifier adjustment from front panel only

Scope of Supply

- Designed into a DIN rail mount enclosure
- Current output
Standard (C): 4 ... 20 mA

Additional Accessories

- **Option N:** Current output 0 ... 20 mA
- **Option F:** Explosion proof in conjunction with safety barriers



Application

The **amplifier AME** has been designed for amplifying small sensor signals of full bridge strain gauges to standardized voltage and current levels.

The narrow design of the **AME** amplifier is exceptionally well suited for DIN rail mounting in electrical cabinets.

The favourable price / performance ratio makes the unit a good choice for cost sensitive applications.

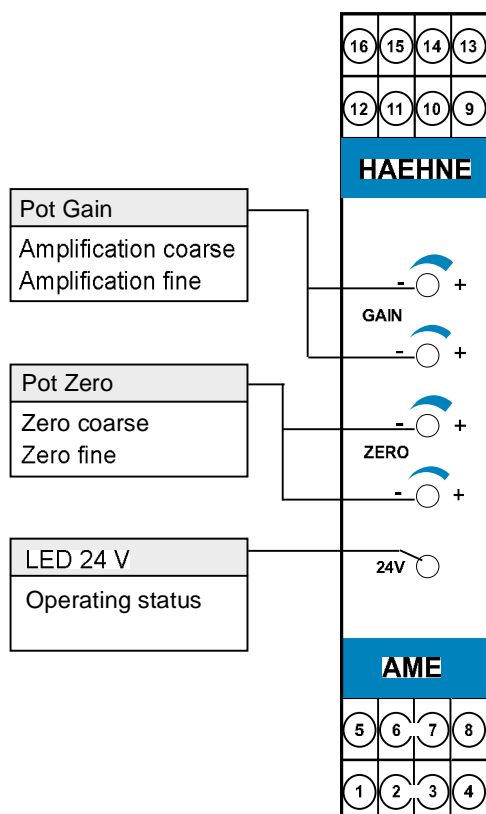
Two pots with 22 turns each (coarse and fine) are available for the zero adjust and gain adjustment.

The amplifier has three outputs:

- a fast reacting direct voltage output for control purposes
- a filtered voltage output for display
- the current signal is assigned to the direct output

The connection of the power supply is short-circuit protected. The outputs are galvanically isolated from the auxiliary power. Plug-in terminal blocks enable pre-wiring and simple trouble shooting.

Technical Data		
Strain gauge excitation supply	Voltage (V_4):	10 V
	Current max.:	60 mA
Zero adjust compensation voltage (in relation to voltage input)		-25...0...+25 mV
Amplification	Adjustment range	400...3200 V/V
	Factory adjustment	667 V/V
Signal output	Voltage (V_2 , V_3)	-10...0...+10 V
	min. load resistance	5 k Ω
	Signal rising time (10...90 %)	V_2 direct: < 5 ms V_3 filter 1: 1,7 s
	Voltage (I_1) Option C Option N	4...20 mA 0...20 mA
	Max. load resistance	700 Ω
Auxiliary power	Voltage (V_5)	24 V DC, \pm 4 V
	Typical current requirements with standard wiring	approx. 75 mA
Standard enclosure protection		IP20
Temperature range		0...60° C



Terminal diagram		
Terminal	Assignment	
1	+24 V	V_5
2	0 V	
3	PE	
4	GND	
5	V_2	Amplifier outputs
6	GND	
7	V_3	
8	I_1	
9	V_4+	Sensor A
10	V_4-	
11	V_1+	
12	V_1-	
13	V_4+	Sensor B
14	V_4-	
15	V_1+	
16	V_1-	

V_1	Output signal of full bridge strain gauge
V_2	Direct voltage output
V_3	Dampened voltage output
V_4	Excitation voltage to the full bridge strain gauge in the sensors
V_5	Supply voltage 24 V DC
I_1	Current output (option C and N)

Dimensions

- DIN rail mount enclosure 99 × 22,5 × 114,5 mm (L × W × H)
- plug-in terminal blocks

Ordering Example:

AME - C F

Options
Type



Amplifier DMA 2



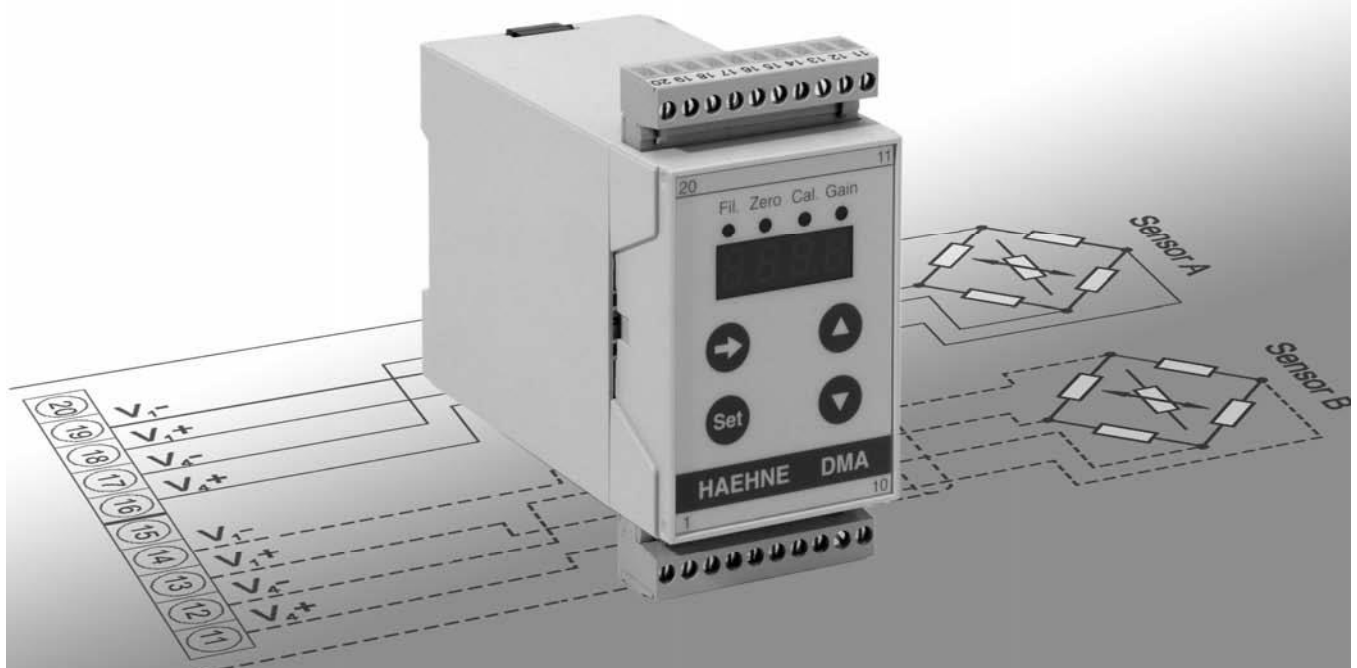
- ☐ 2 voltage outputs (direct / filtered)
- ☐ Percent or actual value display (3½ digits)
- ☐



- Amplifier with additional PCB in field enclosure
- (Option U): 2 voltage outputs (direct / filtered), 10 V strain gauge



- **Option C:** 1 current output 4...20 mA, 2 voltage outputs (direct / filtered),
- **Option N:** 1 current output 0...20 mA, 2 voltage outputs (direct / filtered),
- Option F:**
- **Option J:** voltage 5 V

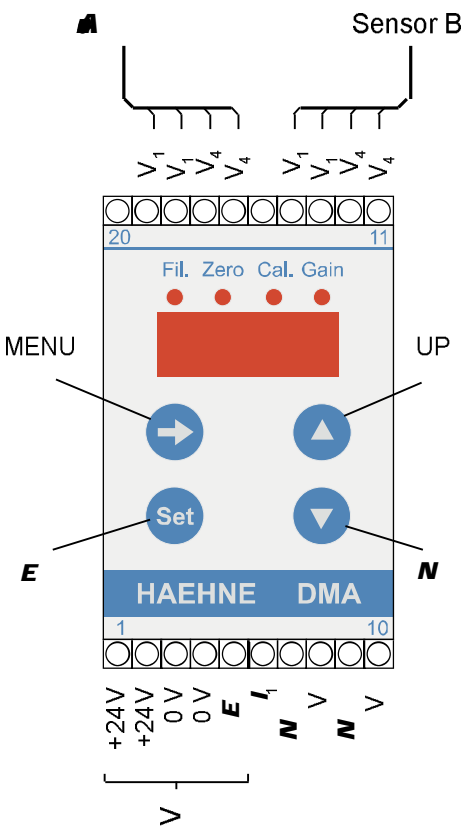


The amplifier A



- offers especially OEM's substantial simplification of commis
- Pre-setting of amplification (to be selected in the MENU)
- Display of actual force (as percent of nominal force or actual value)

Technical Data		
	Voltage (V ₄)	10 V
		5 V
		60 mA
		160 mA
voltage inputs)		
	-25...0...+25 mV	
Total amplification		
		400...2800 V/V
	bei 1,5 mV/V	667 V/V
	bei 1 mV/V	1000 V/V
	bei 0,75 mV/V	1333 V/V
	Voltage (V , V)	-10...0...+10 V
		Ω
	(10...90 %)	V filter 1:2 s
		4...20 mA
		0...20 mA
		700 Ω
	Voltage	24 V DC, ± 4 V
	(Standard)	approx. 90 mA
		IP20
		0...60° C
* The auxiliary power V must be grounded. When using the power supply V a maximum current of 10 Amps should not be exceeded.		



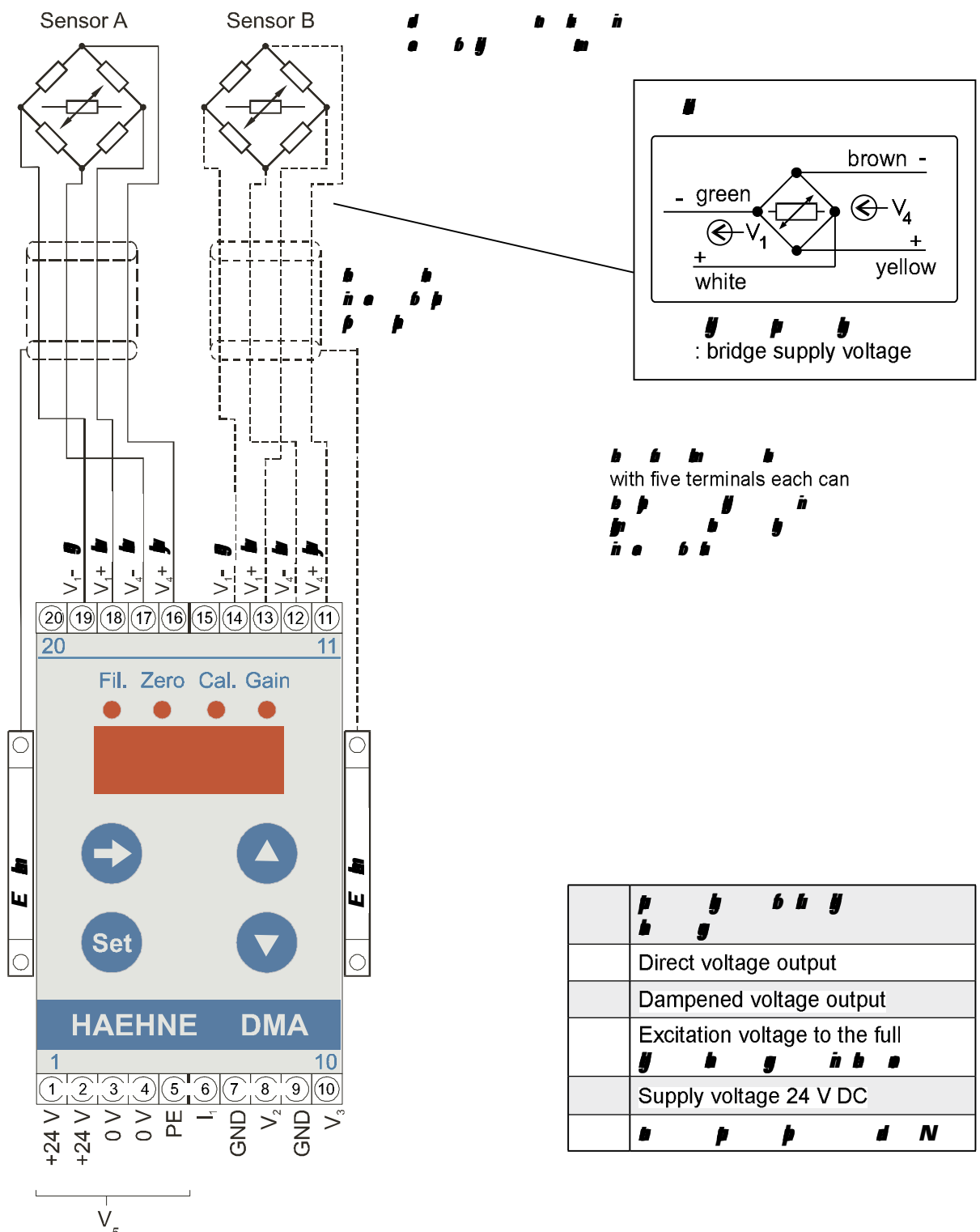
V ₁	
V	
V	
V ₄	
V	Supply voltage 24 V DC
1	Current output (option C and N)

E	DIN rail mount enclosure with LED display (3½-digits)
i	110mm/3 4.3in (L H)
P	Four push buttons: MENU UP DOWN SET

Ordering Data:	DMA 2 U

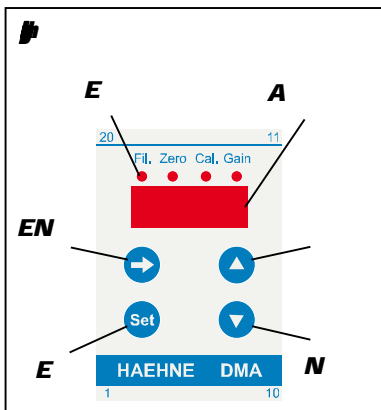


Digital Measuring Amplifier DMA 2



Recommendation: Connect the PE-terminal No. 5 of the amplifier with a

with five terminals each can



Ab

- Apply power and select filter type (filtered/unfiltered), only option C and N.
- After the sensors are completely mounted remove all material exerting an influence on the sensors, e.g. film, paper...
- Apply force or weight of approximately 70 to 110% of nominal value (as available). Adjust to corresponding value on the display and store.
- Remove force or weight and perform zero adjust if necessary.

Technical data applicable starting with version 2.1

To go to menu press **Set** + **→** simultaneously. However, **Set** need to be pushed first.

Select menu			2. Ad-	3. Storing	
Filter behaviour current output		 (direct/filtered)			 is set to „filtered“
		-10.0... 100.0%			Enter a value different from 0 in order to activate
with defined		10.0... 110.0 %			calibration is activated then values higher than first calibration point + 10% can be entered. If „Gain“ appears on the display, then the necessary amplification is out of the possible range. Under menu option „Gain“ the necessary amplification is
amplification		Amplification factor			appears „zero“ on the display, then the effective calibration weight is too small.
adjustments					Actual value: display according to the selected
Peak value					Set key deletes the peak values. A change of the the peak values.

The menu is deactivated if no button is pressed within 20 seconds. Exit from the menu by pressing the key **→** several times. In case of activated two-point calibration and activated unipolar output mode the corresponding calibration procedures takes twice as long. If the maximum output voltage during normal operating conditions is overloaded to approx. (-)13,3 volts the (-)OFL display will appear. Interrupted sensor cables lead to the OFL display.



Measuring Amplifier MV 125



- ☐ Direct signal amplification close to the sensor due to field housing
- ☐ Integrated excitation voltage
- ☐ 24 V DC power supply
- ☐ Power supply and signal outputs galvanically isolated
- ☐ Completely potted version for rotating machine component are also available



- Amplifier in cast



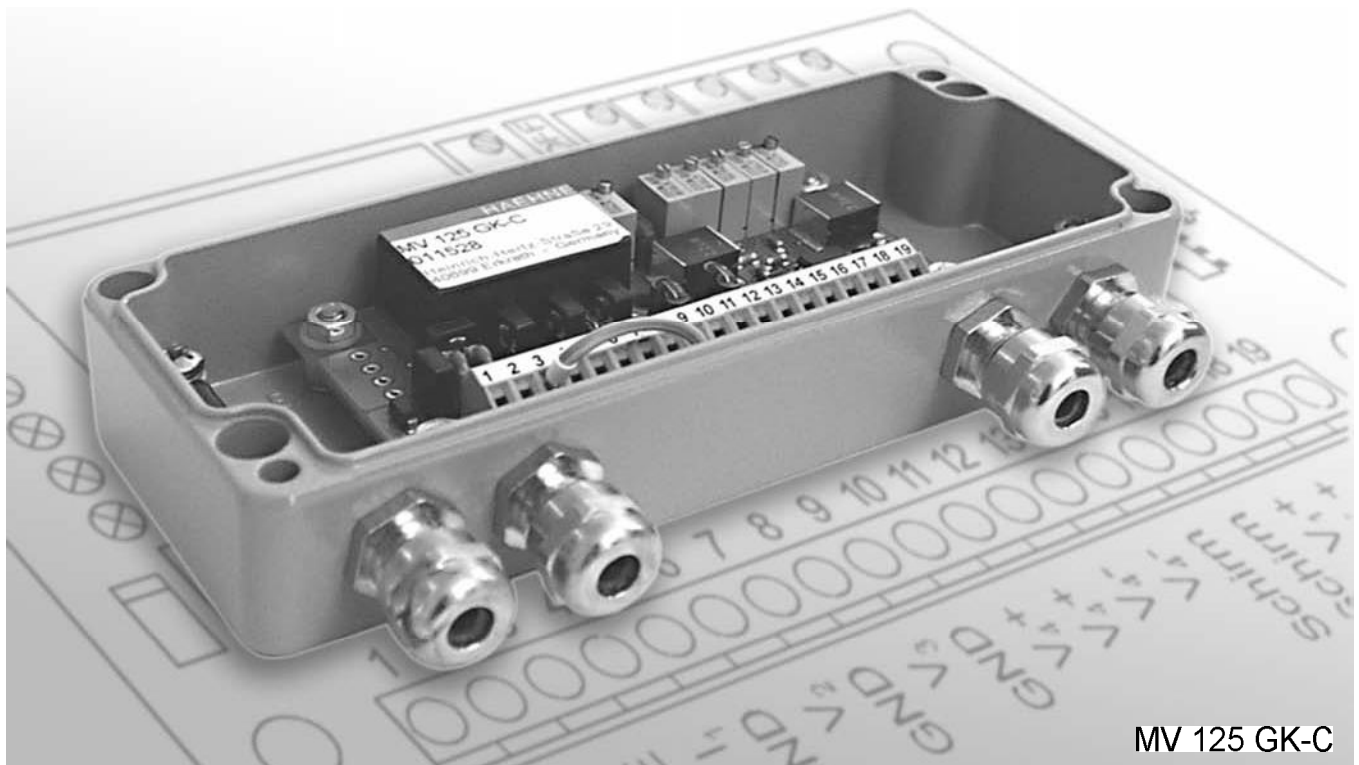
2 voltage outputs (direct / filtered),
no current output



2 voltage outputs (direct / filtered),
1 current output, 4...20 mA



2 voltage outputs (direct / filtered),
1 current output, 0...20mA



MV 125 GK-C



The measuring amplifiers are preferably used in cases when the analog measuring signals of the sensors must be amplified close to their location on machines and equipment in rough environments. The standardised output signals of the amplifier can then be transmitted over long distances or via commutators. A 24 V DC power supply only is needed to operate the amplifier. Due to its compact structural shape and its competitive price, the is an interesting alternative to more complex amplifiers.

All components of the multi-stage amplifier well as the voltage regulator for the strain gauge excitation voltage are on a PCB measuring 95x46 mm.




Two zero adjust potentiometer are available for eliminating offsets (e.g. the roll weight of web tension sensors).

The desired gain can be adjusted with two potentiometer (coarse and fine).

Two voltage outputs with different types of filters are available. The current output can be connected to either one of these outputs (option C and N).

The connection of the auxiliary power supply is reverse polarity protected.

	Voltage (V_4):	10 V
	Current max.:	60 mA
	(in relation to voltage input)	-25...0...+25 mV
Amplification	Adjustment range	400...3200 V/V
	Factory adjustment	667 V/V
	Voltage (V , V)	-10...0...+10 V
	min. load resistance	5 k Ω
	Signal rising time (10...90 %)	V direct: 5 ms V filter 1: 2 s
	Voltage (I) Option C Option N	4...20 mA 0...20 mA
	Max. load resistance	700 Ω
	Voltage	24 V DC, ± 10 %
	Current consumption (at 24 V)	approx. 90 mA
	GM and GK Version	IP65
		0...60° C

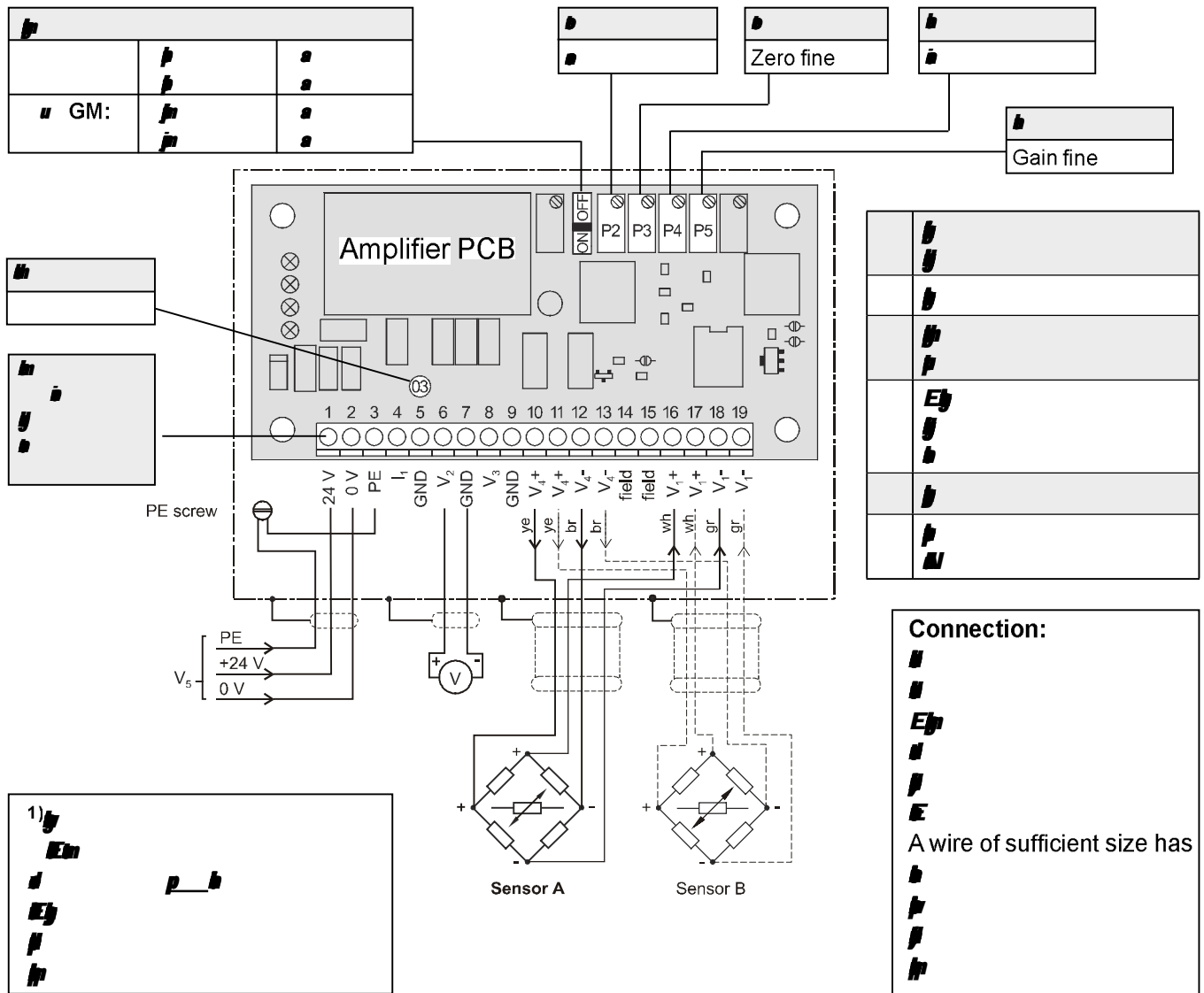
	Amplifier (terminal connection) in cast aluminium enclosure 150 × 64 × 36 mm (l × w × h) with four screwed joints, M12 x 1,5	
	Potted amplifier module 50 x 100 x 25 mm (l × w × h)	
	Potted amplifier module (soldering connection) in cast aluminium enclosure 150 × 64 × 36 mm (l × w × h) with two screwed joints, M12 x 1,5	

g

typ

Technical Information

Measuring Amplifier MV 125



Amplifier



the amplifier.



- Use the zero adjust pots P2 (coarse) and P3 (fine) to set the voltage at the fast output V

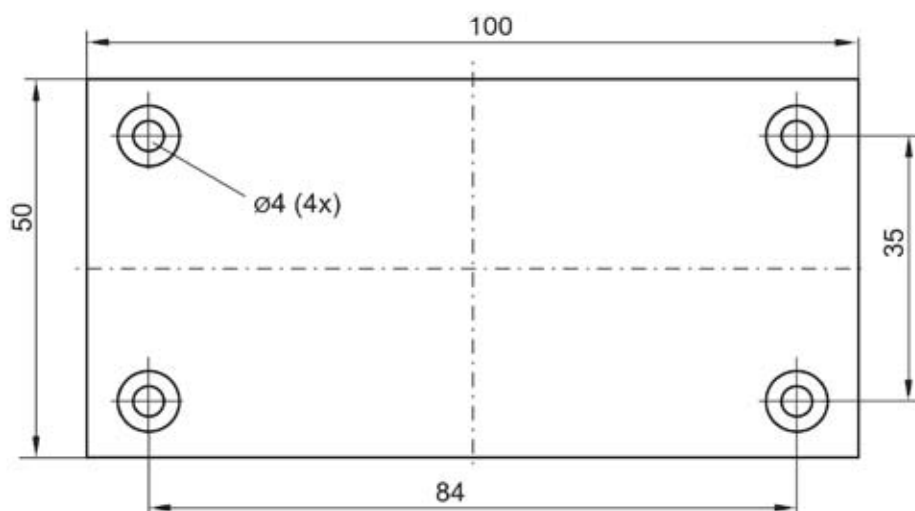
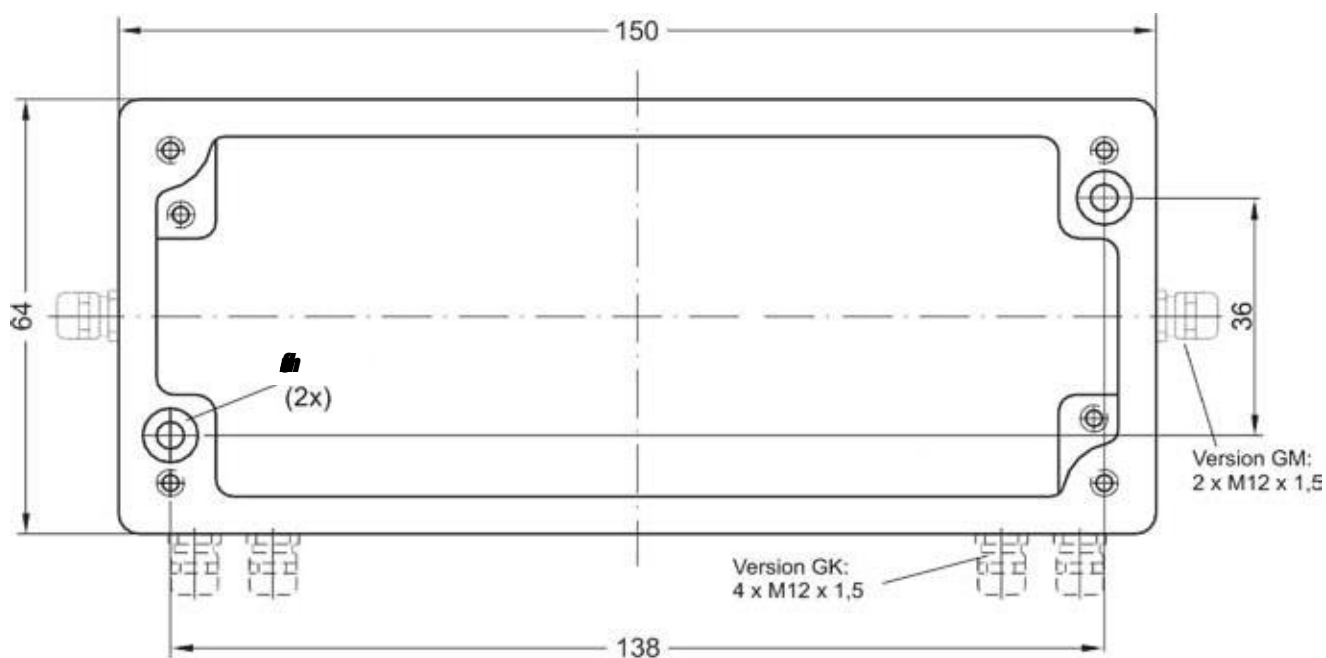


- For the adjustment of the amplification (gain) apply the calibration load. This force should be about



pots P4 (coarse) and P5 (fine).







Measuring Amplifier MV127



- ☐ Amplifier with integrated excitation supply, 2 voltage outputs
- ☐ 2 independent limit switches with adjustable hysteresis
- ☐ Precision adder with weighted inputs to calculate
- ☐ Adjustable filter
- ☐ Signals and power supply galvanically isolated



- Amplifier in field enclosure



2 limit switches, adder, filter



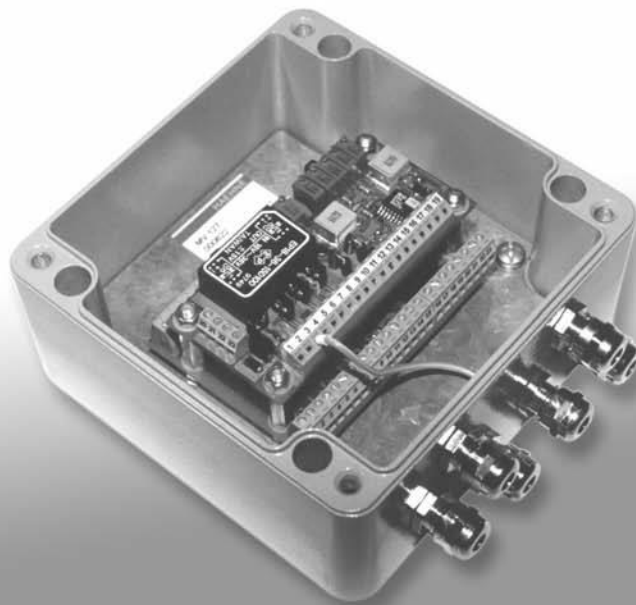
2 voltage outputs (direct / filtered),
no current output



2 voltage outputs (direct / filtered),
1 current output, 4...20 mA



2 voltage outputs (direct / filtered),
1 current output, 0...20 mA



MV127



The amplifier MV 127 with additional functions is offered in a field enclosure. This makes it possible to amplify and analyze sensor signals in rough environments close to machines and equipment.

The amplifier has two potentiometers to compensate pre-coads e.g. the roll weight. The desired gain is adjusted with two additional potentiometers - coarse and fine.

All additional functions including the limit switches work with standardized voltage signals in the range of -10 V ... +10 V. The ON and OFF switching points of the limit switches can be independently adjusted over the total voltage range. This enables the flexible use as two point controller. The inputs and outputs of the adder and both wide range limit switches are placed separately on terminals and can be used for internal or external signals.

**Amplification PCB**Voltage V_4 : 10 V

Current max.: 60 mA



(in relation to voltage input): -25...0...+25 mV

Amplification

Adjustment range: 400...3200 V/V

Factory adjustment: 667 V/V

Voltage (V_2 , V_3): -10...0...+ 10 VMin. load resistance: 5 k Ω

Signal raising delay

(10...90 %):

 V_2 direct: 5 ms V_3 filter1: 2 sCurrent (I_1)

option C: 4...20 mA

option N: 0...20 mA

Max. load resistance: 700 Ω **Additional PCB**

Input voltage range: -10...+ 10 V

Input resistance of input rating 0,5: 36 k Ω Input resistance of input rating 1,0: 16 k Ω Min. load resistance output: 10 k Ω 

Filter: low pass

Input voltage range: -10...+ 10 V

Min. load resistance output: 10 k Ω

Signal raising delay (10...90 %): 0,13 ... 4,8 s



Input voltage range: - 10...+ 10 V

Input resistance: 47 k Ω

Adjustment range of switching point ON: -10...+ 10 V

Adjustment range of switching point OFF: -10...+ 10 V

Hysteresis=ON and OFF switching point: 0... 20 V

Switching response time: 10 ms

Relay contacts: 230 V / 1 A



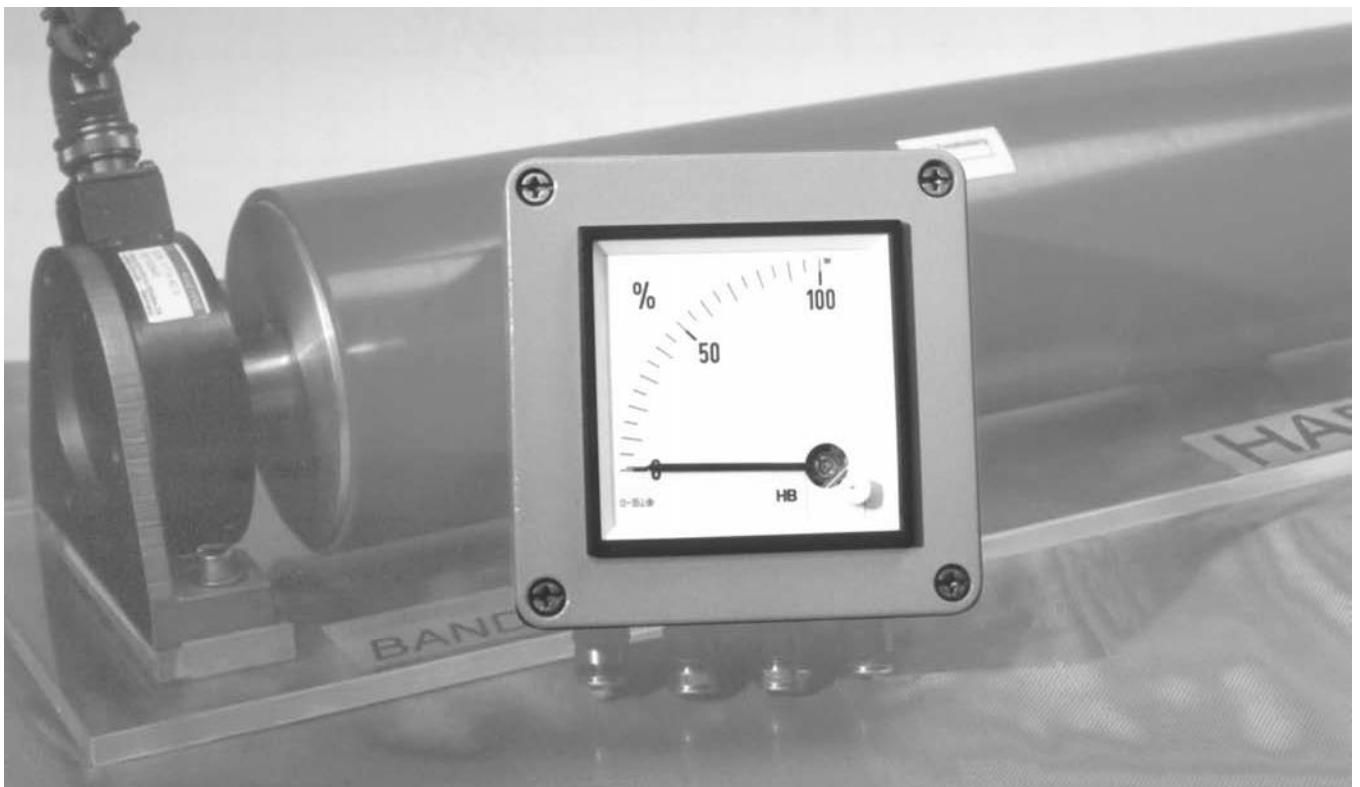
140 x 140 x 91 mm

**MV 127 ZU**modul
optionsThe modul is with
option Z (no basis version), and
with U, C or N.

Measuring Amplifier MV 128

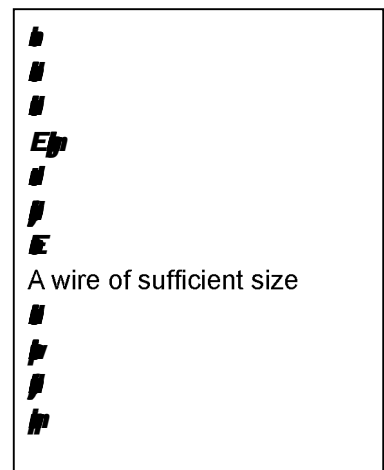
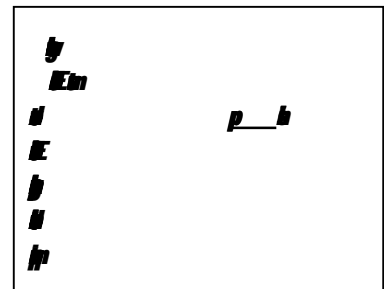
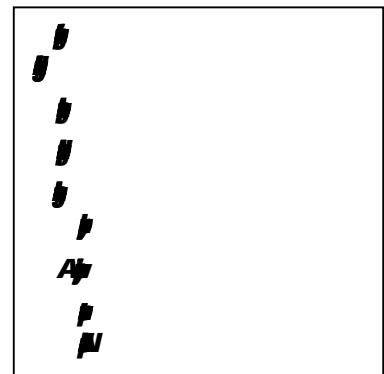
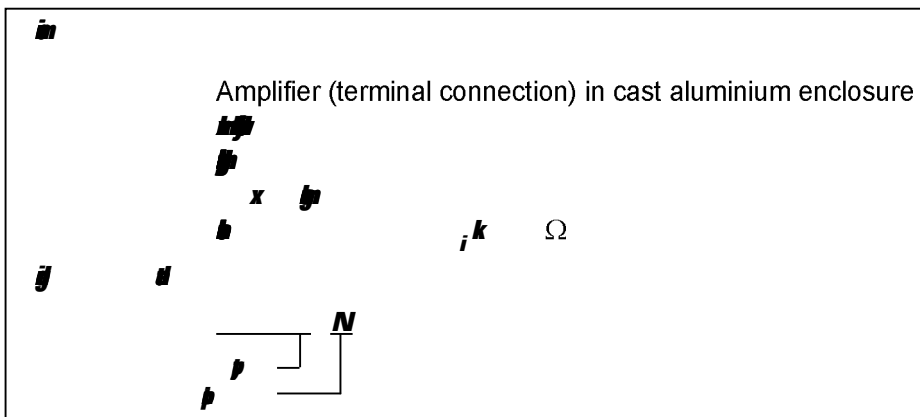
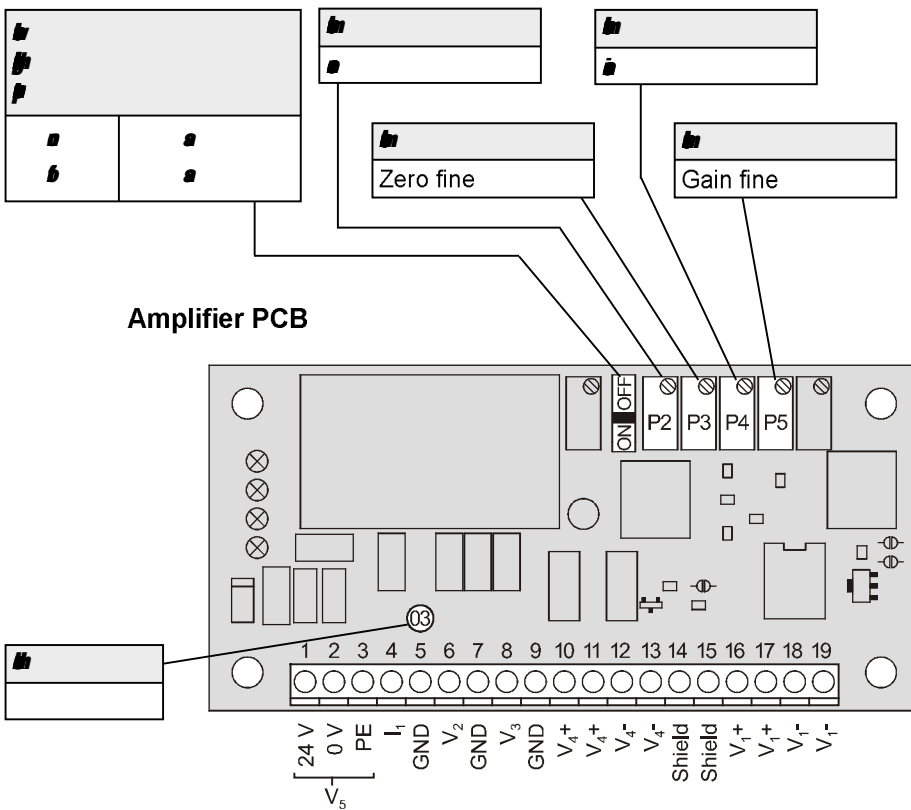
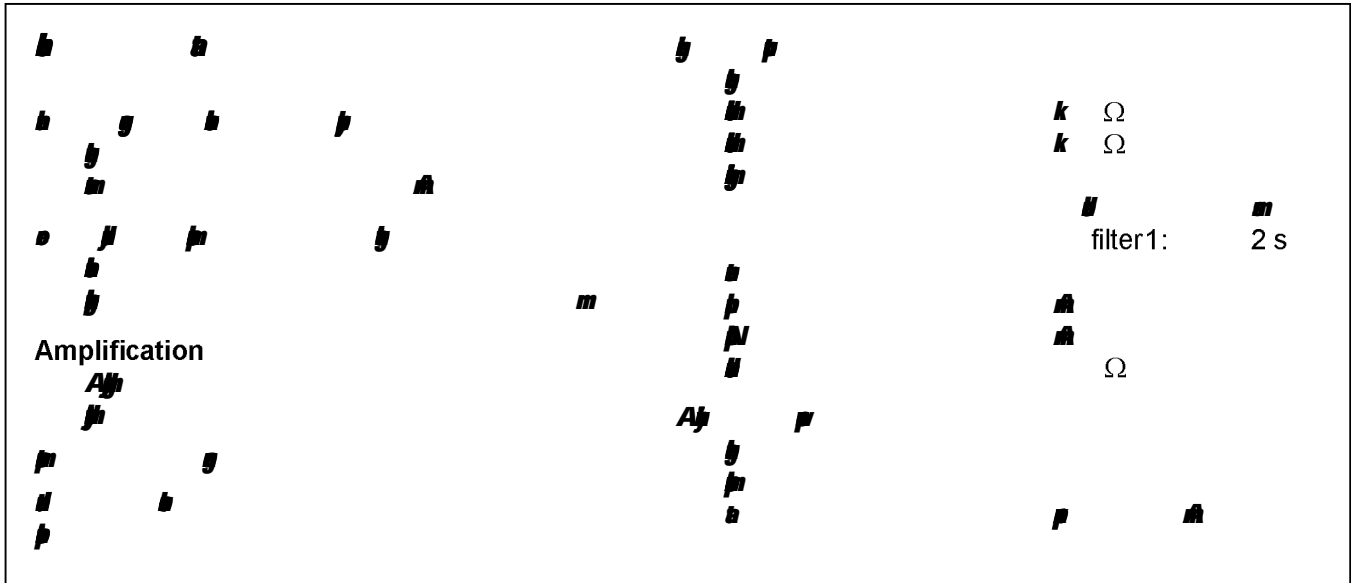
- ☐ Compact design, ideal for retrofitting and test installations
- ☐
- ☐
- ☐
- ☐

- Amplifier in cast aluminium
- 2 voltage outputs (direct / filtered),
- 2 voltage outputs (direct / filtered),
- 2 voltage outputs (direct / filtered),



The measuring amplifiers
amplified close to their location on machines
operate the amplifier.
to more complex amplifiers.

All components of the multi-stage amplifier
with two potentiometer (coarse and fine).
Two voltage outputs with different types of filters are





Profibus-Amplifier Busbox-P 2

Special Features

- ☐ Amplifier with Profibus Interface
- ☐ Designed for one or two strain gauge sensors
- ☐ User friendly commissioning via GSD file
- ☐ Transmission range up to 12 Mbit/s
- ☐ 16 bit resolution

Scope of Supply

- Electronic unit designed into an aluminium enclosure
- GSD file on disk
- 2 Sensor plugs (X3A, X3B)
- 1 Protection cover (X3C)

Available for Delivery

- Cable socket for external power supply (X1)
- Bus T-connector (X2)
- Bus plug
- Terminate resistor



Application

The Busbox-P is used whenever strain gauge sensors are to be connected to the Profibus-DP. The primary use is for web tension measurement. It is possible to connect either each sensor separately to one Busbox and transmit the measurement value of each sensor onto the Bus or connect two sensors to one Busbox. The first alternative can be used to determine the web tension difference, the second results in the average values being transmitted to the Bus.

The system can power two sensors and process the measuring signals. The measurement values are converted into digital signals averaged and transmitted to the interface module every 3 milliseconds. In the interface module they are converted to the appropriate data format for transmission to the Bus.

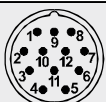
Technical Data

Power supply V_5 :	20,5...30 V, max 150 mA
Supply voltage (sensor A + B):	4,5 V / 18 mA
Signal:	$\pm 10,8 \text{ mV} \approx 0 \dots \text{FFFF}$
Standard protection:	IP 67
Nominal temperature range:	+10...+60 °C
Operational temperature range:	0...+60 °C

Profibus DP:

Participant-ID:	00E7 hex (data standardized in GSD-file HAEH00E7.GSD)
Data width:	1 word
Resolution:	16 bit
Weight:	175 g

Profibus DP Connection (receptacle)



lead color	pin no.	function
	1	GNDI
green	2	line A
	3	n.c.
red	4	line B
	5	n.c.
	6	VCCI
black	7	+24VDC
blue	8	0V
green/yel	9	PE
	10	n.c.
	11	n.c.
	12	RTS
enclosure		PE

Operation display

F	●	Sa
	●	BA

	green	power supply is on
a	green	Slaveaddress changed
BA	geen	profibus Data exchange
F	red	incorrect configuration

Amplifier Power Supply (plug)



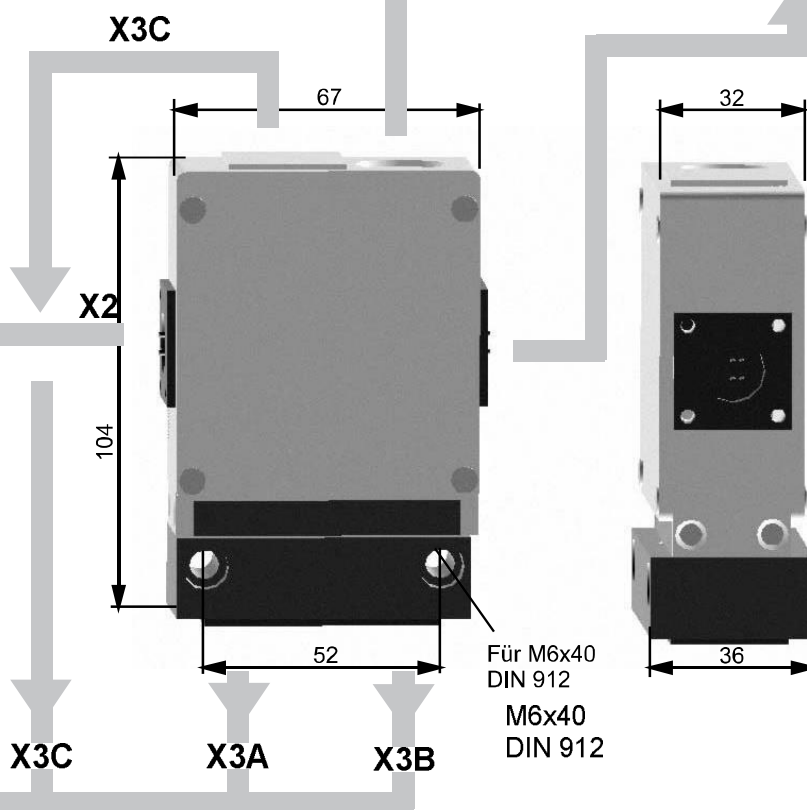
lead color	pin no.	X1
white	1	+24 V (V_5 +))
brown	2	GND (V_5 -)
geen	3	PE
	field	enclosure
V_5 : Amplifier supply 24V		

Connection (receptacle)



lead color	pin no.	X3 A/B/C
white	1	+ V_1
brown	2	- V_4
green	3	- V_1
yellow	4	+ V_4
	field	enclosure

V_1 : bridge output signal
 V_4 : bridge supply signal

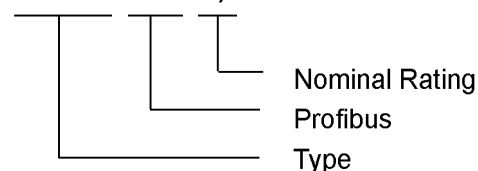


Please consider with the order:

The amplification of the Busbox is presetted and in particular correlation with the nominal rating of the HAEHNE sensor.

Version Busbox	Nominal Rating HAEHNE Sensor
- P 2 - 1,5	1,5 m V/V
- P 2 - 1,0	1,0 m V/V
- P 2 - 0,75	0,75 m V/V
- P 2 - 0,5	0,5 m V/V

Ordering Example Busbox - P 2 - 1,5





Profibus Amplifier Busbox-PS 2

Special Features

- ☐ Amplifier with Profibus interface as DIN railmount version
- ☐ Designed for strain gauge sensors
- ☐ User friendly commissioning via GSD file
- ☐ Transmission range up to 12 Mbit/s
- ☐ 16 bit resolution

Scope of Supply

- **Electronic unit** designed into an aluminium enclosure
- **GSD-file on disk**
- **1 Sensor plug**
- **Cable socket** for external power supply (X1)

Also Available

- **Profibus Sub D-plug**
- **Option F: Safety barrier modul**



Pic. similar design

Application

The Busbox PS is used whenever strain gauge sensors are to be connected to the Profibus DP. The primary application field is the web tension measurement.

A bus box is assigned to each sensor, the addresses are assigned accordingly and the appropriate value is transferred to the bus. The „S“ version is intended for switch cabinet mounting on common DIN mounting rails.

The electronic module consists of an analogue and a digital PCB. It can power one sensor and process the measuring signals.

The measurement values are converted into digital signals, averaged and transmitted to the interfaces module every 3 ms.

The interface module converts the signal to the appropriate data format for transmission to the bus.

Technical Data

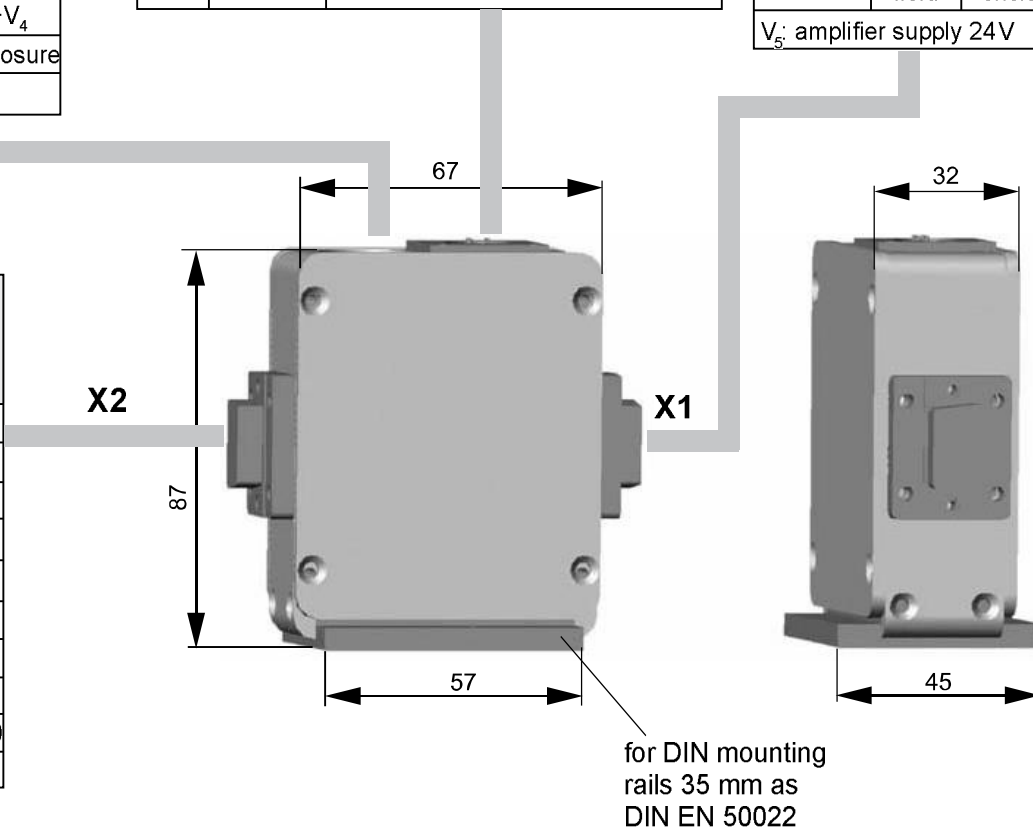
Power supply V_5 :	20,5...30 V, max 150 mA	Profibus DP:	
Supply voltage:	4,5 V / 18 mA	Participant-ID:	00E7 hex (Data standardized in GSD-file "HAEH00E7.GSD")
Signal standard:	$\pm 10,8 \text{ mV} \approx 0 \dots \text{FFFF}$	Data width:	1 word
option F:	$\pm 10,053 \text{ mV} \approx 0 \dots \text{FFFF}$	Resolution:	16 bit
Standard protection:	IP20		
Nominal temperature range:	+10...+60 °C		
Operational temperature range:	0...+60 °C	Weight:	175 g

Sensor (receptacle)		
lead color	pin-no.	
white	1	$+V_1$
brown	2	$-V_4$
green	3	$-V_1$
yellow	4	$+V_4$
	field	enclosure
V_1 : output s. V_4 : supply s.		

Operation display		
	F	Sa
		BA
	green	power supply is on
Sa	green	Slave address will be changed
BA	green	Profibus Data exchange
F	red	Configuration error

Amplifier Power Supply (pin)		
lead color	pin-no.	X1
white	1	+24 V (V_5)
brown	2	GND (V_5 -)
green	3	PE
	field	enclosure
V_5 : amplifier supply 24V		

Profibus DP (Sub D-plug)	
pin-no.	function
1	n. c.
2	n. c.
3	line B (red)
4	RTS
5	DGND
6	VP / VCCI
7	n. c.
8	line A (green)
9	n. c.



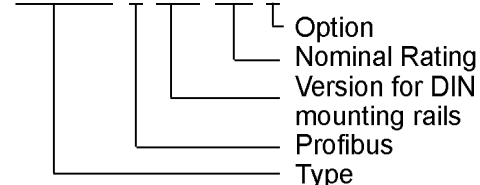
Please consider with the order:

The amplification of the Busbox is presetted and in particular correlation with the nominal rating of the HAEHNE sensor.

Version Busbox	Nominal Rating HAEHNE Sensor
- PS 2 - 1,5	1,5 m V/V
- PS 2 - 1,0	1,0 m V/V
- PS 2 - 0,75	0,75 m V/V
- PS 2 - 0,5	0,5 m V/V

Ordering Example

Busbox - PS 2 - 1,5 F





InterBus-S Amplifier Busbox-I



- ☐ Amplifier with InterBus-S interface
- ☐ Designed for one or two strain gauge sensors



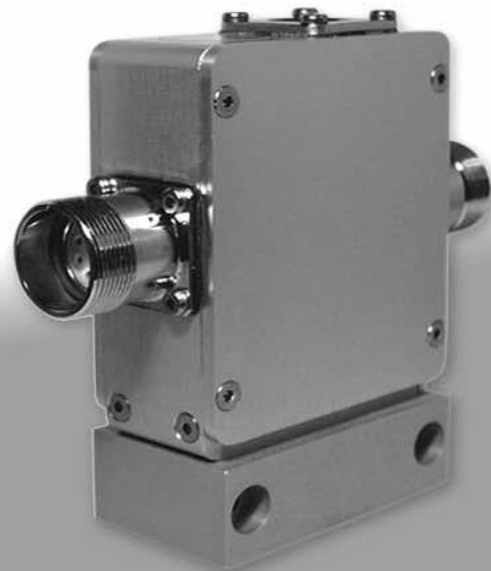
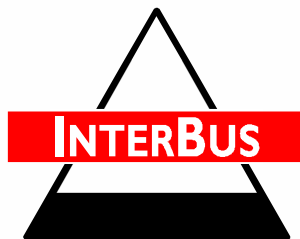
Eb
designed into an
aluminium enclosure



A

Available for Delivery

- Cable socket



The Busbox-I is used whenever strain gauge sensors are to be connected to the Interbus-S. The primary use is for web tension measurement.

It is possible to connect either each sensor separately to one Busbox and transmit the measurement value of each sensor onto the Bus or connect two sensors to one Busbox. The first alternative can be used to determine the web tension difference, the second results in the average values being transmitted to the Bus.

The electronic device consist of an analog and a digital part.

The system can power one or two sensors and process the measuring signals. The measurement values are converted into digital signals. In the interface module they are converted to the appropriate data format for transmission to the Bus.



Power supply V_5 : 20,5...30 V, max 150 mA
 Supply voltage:
 (sensors A + B) 4,5 V / 18 mA
 Signal: $\pm 10,8 \text{ mV} \hat{=} 0...4096 \text{ d}$
 Standard protection: IP67
 Nominal temperature range: +10...+60 °C
 Operational temperature range: 0...+60 °C

Interbus-S:

Participant ID: 32 hex
 Data width: 1 word
 Resolution: 12 bit

Pin Configuration:

	(pin)	(receptacle)
pin-no.	signal	signal
1	DO	DO
2	/DO	/DO
3	DI	DI
4	/DI	/DI
5	Gnd	Gnd
6	PE	PE
7	+24 V	+ 24V
8	0 V	0 V
9	n. c.	/RBST
field		



(LED display):

(BA)

A (RC)

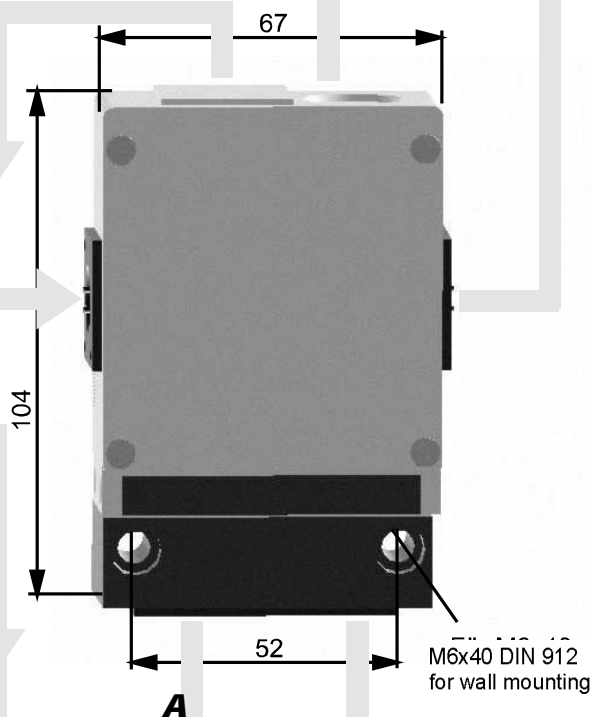
	green	on	power is applied (lights up after 3 seconds)
	green	on	remote bus connection to preceding InterBus participant ok
A	green	on	InterBus data exchange
	red	on	ongoing remote bus switched off

* BA and RC valid starting from Feb. 2006

Pin Configuration

color	pin-no.	A
white	1	+ V_1
brown	2	- V_4
green	3	- V_1
yellow	4	+ V_4
	field	enclosure

V_1 : signal volt. V_4 : supply volt.



Ordering Example:

Busbox - I

InterBus
type



CANopen Amplifier Busbox-C



- ☐ Amplifier with CANopen interface
- ☐ Designed for one or two strain gauge sensors
- ☐ User friendly commissioning via EDS file



- **Electronic unit**
designed into an
aluminium enclosure
- **Disk with EDS-file**
- **2** (X3A, X3B)
- **1 Protection cover (X3C)**

Available for Delivery

- **Cable socket** for external
power supply (X1)
- **Bus-T-connector**
- **Terminal resistance**
- **Bus plug**
(Micro Connector X2)

CANopen



The Busbox-C is used whenever strain gauge sensors are to be connected to the CANopen Bus. The primary use is for web tension measurement.

It is possible to connect either each sensor separately to one Busbox and transmit the measurement value of each sensor onto the Bus or connect two sensors to one Busbox. The first alternative can be used to determine the web tension difference, the second results in the average values being transmitted to the Bus.

The electronic device consist of an analog and a digital part.

The system can power one or two sensors and process the measuring signals. The measurement values are converted into digital signals. In the interface module they are converted to the appropriate data format for transmission to the Bus.

Technical Data

Power supply V_5 : 20,5 ... 30 V, max 150 mA
 Supply:
 (sensor A + B): 4,5 V/ 18 mA
 Signal: $\pm 10,8$ mV 0 ... 7FF8 hex.
 Standard protection: IP 67
 Nominal temperature range: +10...+60 °C
 Operational temperature range: 0...+60 °C

ANP

Protocoll spezifikation: CAN 2.0B passiv
 Transmission rate: 20, 250, 500, 1000kbit/s

Data width: 2 Byte dates
 Resolution: 12 Bit at range $\pm 160\%$ of nominal sensor force
 Converting time: 2ms
 Bus participant: max. 64
 Factory adjustment
 CANopen ID: 64

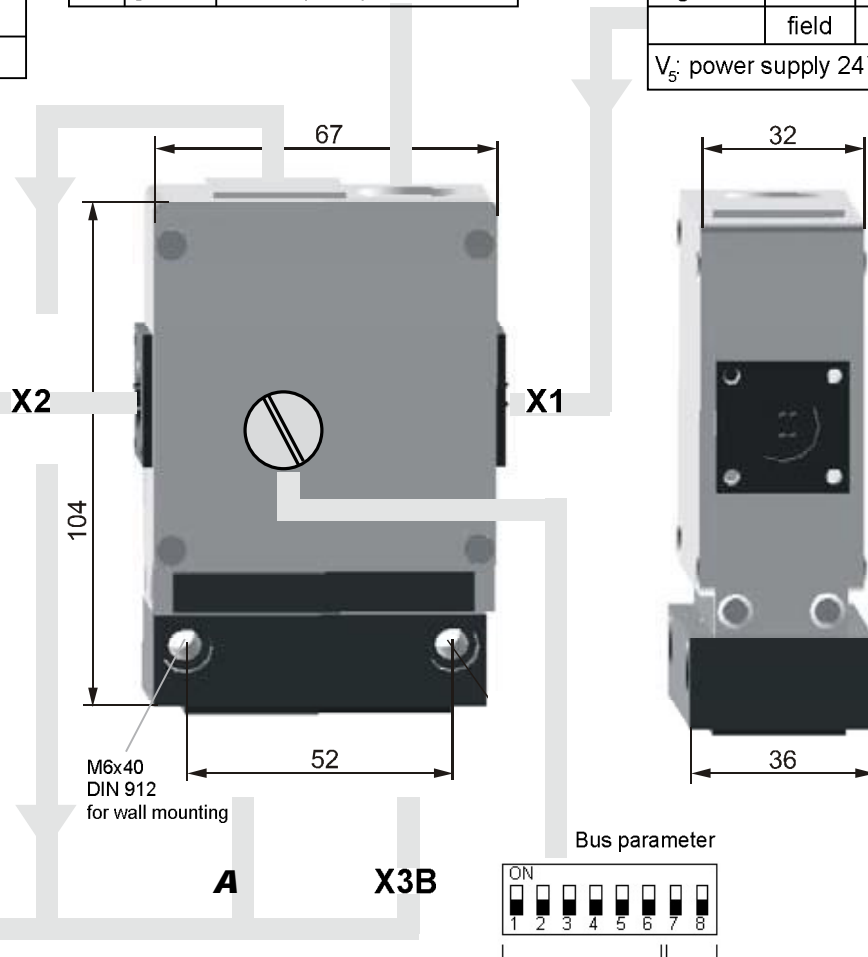
CAN 2.0B passive: The sensor BZAC can receive correct telegrams according to the spezifikation CAN2.0A with 11 bit identifier and CAN 2.0B with 29 bit identifier. Only telegrams accorded to CAN 2.0A will be processed.

CANopen X2 (pin)		
color	pin-no.	function
field	1	field
red	2	+24 V (V_5 +)
black	3	GND (V_5 -)
white	4	CAN_H
blue	5	CAN_L

LED Configuration (LED display):		
1	2	3
green	LED power	
red	LED error	
green	LED operational	
green	LED pre-operational	

Pin Configuration X1 (pIN)		
color	pin-no.	function
white	1	+24 V (V_5 +)
brown	2	GND (V_5 -)
green	3	PE
	field	enclosure
V_5 : power supply 24V		

Pin Configuration X3 A/B/C (receptacle)		
color	pin-no.	X3 A/B/C
white	1	+ V_1
brown	2	- V_4
green	3	- V_1
yellow	4	+ V_4
	field	enclosure
V_1 : signal volt. V_4 : supply volt.		



Ordering Example:

Busbox - C
 CANopen
 Type

Einstellen des Modul-IDs					
Schalter Nr.	1	2	3	4	5
1	2	3	4	5	6
OFF	OFF	OFF	OFF	OFF	OFF
ON	OFF	OFF	OFF	OFF	OFF
...
OFF	ON	ON	ON	ON	ON
ON	ON	ON	ON	ON	ON

Einstellen der Übertragungsrate	
Schalter Nr.	Übertragungsrate
7	8
OFF	OFF
ON	OFF
OFF	ON
ON	ON



DeviceNet-Amplifier Busbox-D



- ☐ Amplifier with CANopen interface
- ☐ Designed for one or two strain gauge sensors
- ☐ User friendly commissioning via EDS file



designed into an aluminium enclosure

- Disk with EDS-file
- 2 Sensor plugs (X3A, X3B)
- 1 Protection cover (X3C)

Available for Devlery

Cable socket for external power supply (X1)

- Bus-T-connector
- Terminal resistance
- Bus plug
(Micro Connector X2)

DeviceNet™



The Busbox-D is used whenever strain gauge sensors are to be connected to the DeviceNet. The primary use is for web tension measurement.

It is possible to connect either each sensor separately to one Busbox and transmit the measurement value of each sensor onto the Bus or connect two sensors to one Busbox. The first alternative can be used to determine the web tension difference, the second results in the average values being transmitted to the Bus.

The electronic device consist of an analog and a digital part.

The system can power one or two sensors and process the measuring signals. The measurement values are converted into digital signals. In the interface module they are converted to the appropriate data format for transmission to the Bus.


Technical Data

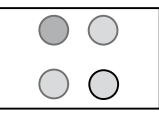
Power supply V_5 : 20,5 ... 30 V, max 150 mA
 Supply (sensor A + B): 4,5 V/ 18 mA
 Signal: $\pm 10,8$ mV 0 ... 7FF8 hex.
 Standard protection: IP 67
 Nominal temperature range: +10...+60 °C
 Operational temperature range: 0...+60 °C

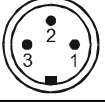
Data width: 2 Byte dates
 Resolution: 12/16 Bit at range $\pm 160\%$ of nominal sensor force
 Converting time: 8 ms
 Busparticipant: max. 64

DeviceNet:


Operation range: Group 2 only Slave (Poll, COS, Cyclic)
 Transmission rate: 125, 250, 500 kbit/s

		
(pin)	color	pin-no. function
field	1	field
red	2	+24 V (V_5^+)
black	3	GND (V_5^-)
white	4	CAN_H
blue	5	CAN_L

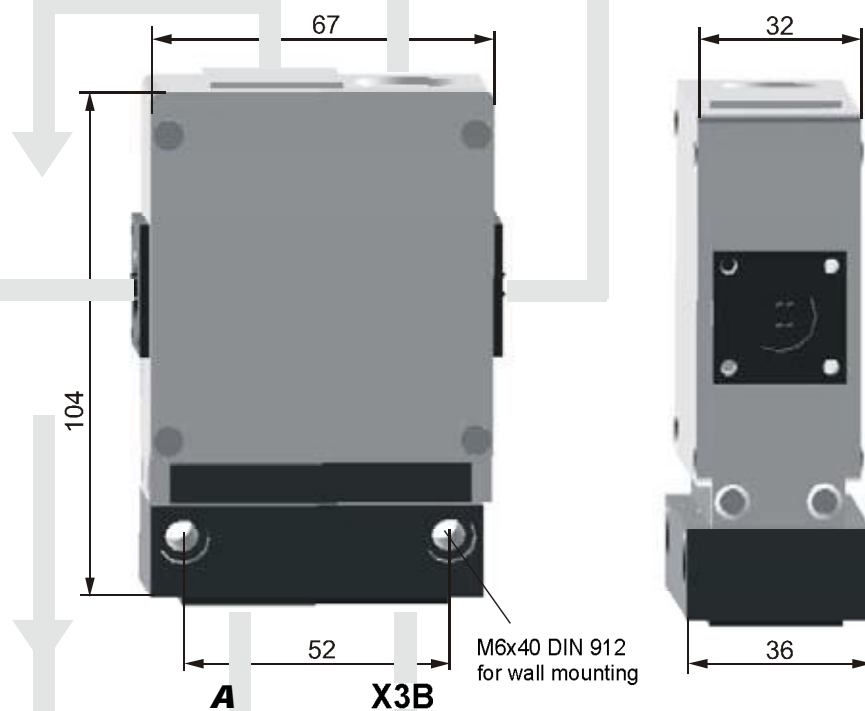
E Configuration (LED-Display): 		
green	LED power	
red	Color of combined LED	
green	module/network/status	
green	—	

Pin Configu 		
(pin)	color	pin-no. function
white	1	+24 V (V_5^+)
brown	2	GND (V_5^-)
green	3	PE
	field	enclosure

V_5 : power supply 24V

Pin Configuration X3 A/B/C (receptacle) 		
color	pin-no.	X3 A/B/C
white	1	+ V_1
brown	2	- V_4
green	3	- V_1
yellow	4	+ V_4
	field	enclosure

V_1 : signal volt. V_4 : supply volt.



Bestellangabe: **Busbox - D**

DeviceNet
Type



AEM



- ☐ 2 independent limit switches with adjustable hysteresis
- ☐ Precision adder to calculate sums or averages
- ☐ Adjustable filter
- ☐ Explosion proof with safety barriers
- ☐ Signals and power supply galvanically isolated
- ☐ DIN-rail mounting or directly to a mounting plate



AEM



- F: filter downstream
- F: Explosion proof sensor
- F: power supply



The extension modul was designed for requirements that go beyond standard force measurement applications.

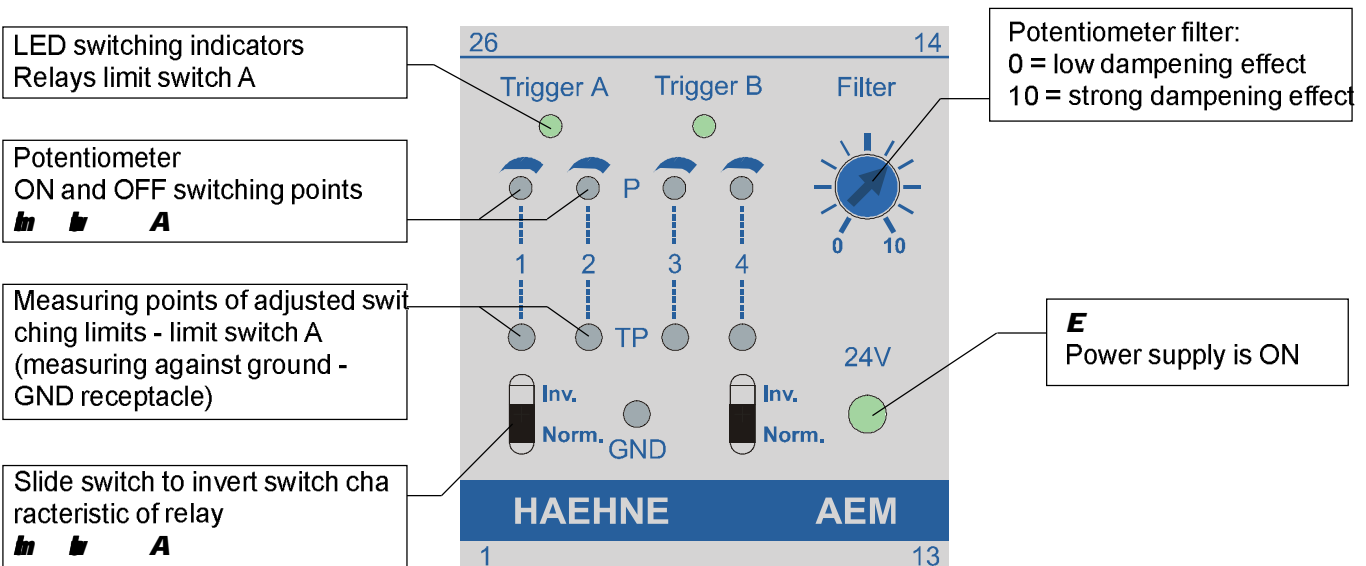
In conjunction with amplifiers of the HAEHNE product range separate measurement of, e. g. web tension forces is possible with subsequent calculation of the average and signal damping. Independently adjustable limit switches with separate inputs can monitor signal levels but also serve as two point controllers.

The extension modul AEM consists of 3 independent of each other functional blocks with the following options:

- Power supply for a strain gauge full bridge in conjunction with safety barriers (Option F)
- Adder with 3 inputs (Option Z), output signal direct or available via an adjustable filter.
- Two limit switches (Option Z). The switching point ON and OFF can be independantly adjusted over the total voltage range enabling very flexible applications. The switching characteristics of the relays can be inverted with switches in the front cover.

	<p>Signal analysis range: -10...+10 V</p> <p>Hysteresis: 0...20 V</p> <p>Input resistance: 47 kΩ</p> <p>Relay contacts: 230 V / 1 A</p> <p>Time delay: 10 ms</p>	<p>output voltage: 10 V symmetrical</p> <p>output current: 60 mA</p>
	<p>Application factor terminal 5; 6: 0,5</p> <p>input resistance: 36 kΩ</p> <p>Application factor terminal 16: 1</p> <p>input resistance: 18 kΩ</p>	<p>output voltage: - 10 ... 0 ... + 10 V</p> <p>min. load resistance: 5 kΩ</p> <p>signal rising delays (10...90 %): direct: 5 ms filter: 0,13...4,8s</p> <p>¹⁾</p> <p>voltage (V₅): 20 ...30 V DC</p> <p>current consumption (at 24 V): appr. 90mA (opt.Z)</p> <p>0 ...60 °C</p> <p>IP20</p>

¹⁾ The voltage between power supply voltage 0 V and shield (PE) must not exceed 50 V. This is achieved if 0 V and PE (as is generally accepted practice) are connected in the equipment.



Power supply for sensors in explosive areas in conjunction with safety barriers.

hysteresis, adder can be configured to calculate averages, adjustable low pass filter.

The modul is available with options F, Z, or FZ .
(no basis version)

- DIN-rail enclosure
75×70×110 mm



Amplifier Controller Combination MAC 4.0

Special Features

- ☐ Amplifier with 2 voltage outputs
- ☐ Current output can be connected to either voltage outputs (Option C and N)
- ☐ PID-Controller with simple adjustment with pointer potentiometers
- ☐ Command signal input/influence of diameter change
- ☐ Smooth start and quick stop function
- ☐ Space saving standard housing



- Designed into a DIN rail



- Plug-in terminal blocks



- 2 voltage outputs (direct / filtered),
no current output

- **Option C:**

- 2 voltage outputs (direct / filtered),
1 current output, 4...20 mA

- **Option N:**

- 2 voltage outputs (direct / filtered),
1 current output 0...20 mA

- **Option F:**

- Explosion proof in conjunction
with safety barriers



Application

As a compact cost effective unit, the **MAC** is designed to provide a closed loop control function for strain gauge transducers (e.g. web tension measurement).

The **MAC** is optimized for use in electrical cabinets. There it can be DIN rail mounted or directly on a mounting plate.

The enclosure of the **MAC** contains an amplifier and controller.


The amplifier supplies the auxiliary power to the strain gauge transducers and conditions the output signals. Two voltage outputs with different filters are available.

The independent function of the current output (option C and N) can be connected either to the high or low damped voltage output. The external use of as 10 Volts / 20 mA signal converter is also possible.

The PID components of the controller can be individually adjusted and also partially switched off. Additional adder and multiplier circuits enable the processing of other signals, e.g. diameter signal.

24 volts control signals can shut off the controller portion or gradually activate or deactivate the output signal.

Controlsignal		Description of Functions
ISP	0 V	I portion switched off
	24 V	I portion active
RSF	0 V	Controller disabled ($V_{14} = 0V$)
	24 V	Controller enabled (with smooth start)
RSP	0 V	Controller disabled (V_{14} can be adjusted with level potentiometer)
	24 V	Controller enabled
RW	0 V	Roll change switched off
	24 V	Roll change switched active
COM		Common 0 Volts connection for 24 V control voltage

 in mm (terminal blocks incl.):
L×W×H: 100mm×105mm×110mm



Ordering Data: **MAC 4.0** **N - F**
 options
 type

Technical Data

Amplifier

Strain gauge excitation supply	Voltage (V_4):	10V
	Max. current:	60 mA
Zero adjust compensation voltage	(relative to the voltage outputs)	-25...0...+25 mV
Amplification	Adjustment range:	400...3200 V/V
	Standard factory adjustment:	667 V/V
Signal outputs	Voltage (V_2, V_3):	- 10...0...+ 10 V
	min. load resistance:	5 k Ω
	Signal rising time (10...90 %)	
	V_2 filter1:	7 ms... 145 ms
	V_3 filter2:	130 ms... 4,8s

Voltage/current converter

Signal input	Voltage (V_6):	0...+ 10 V
Signal output	Current (I_1):	option C: 4...20 mA, option N: 0...20 mA
	max. load resistance:	700 Ω

Controller

Signal inputs	Voltage ($V_8, V_9, V_{10}, V_{11}, V_{12}, V_{13}$):	- 10...0...+ 10 V
	Voltage (ISP, RSF, RSP, RW):	24 V at terminal COM
Signal outputs	Voltage (V_{14}):	-10...0...+10V
	min. load resistance (V_{14}):	5k Ω
	Reference voltage (V_7):	10V \pm 0,5%

Temperature range 0...60 °C

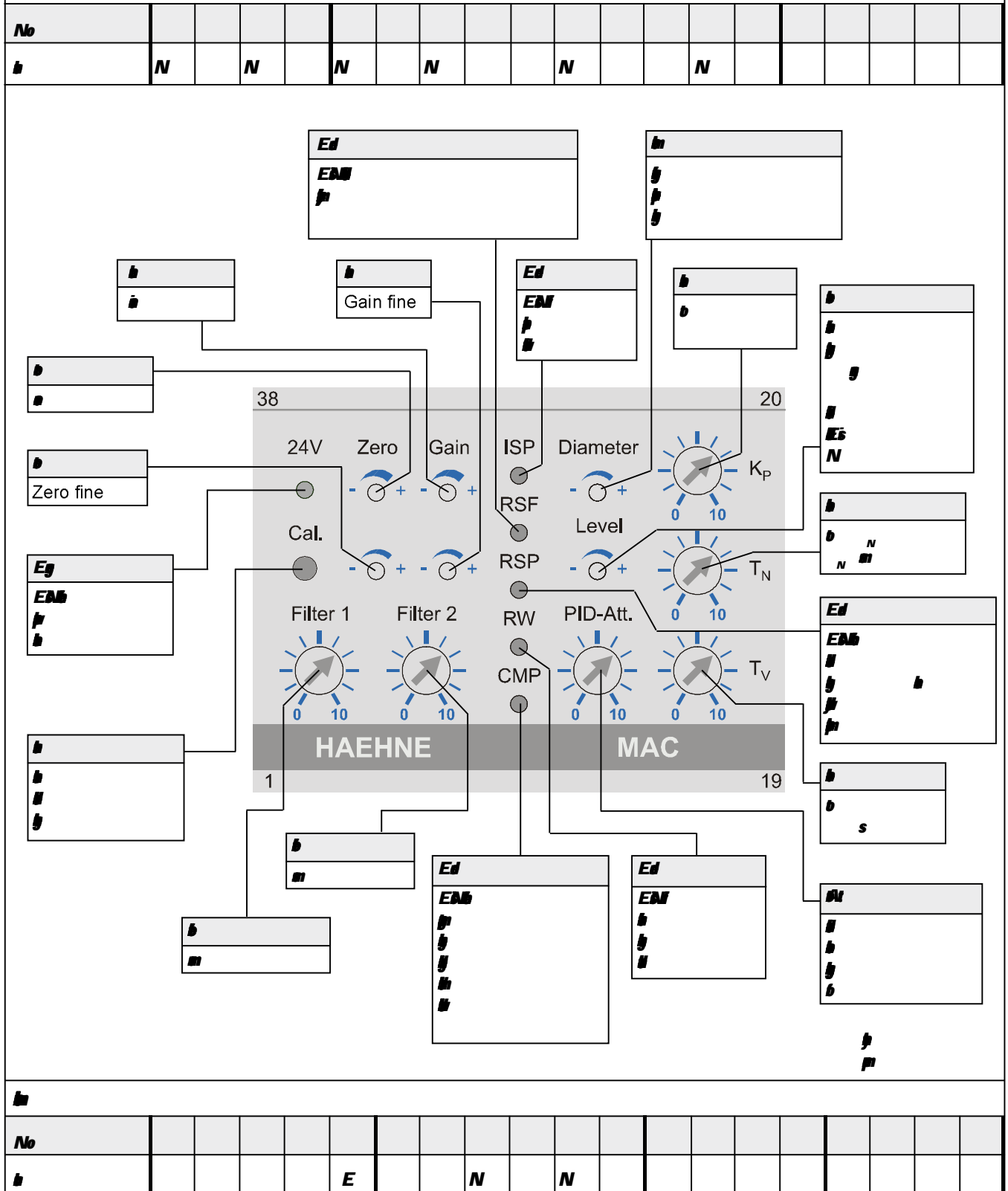
Standard enclosure protection IP 20

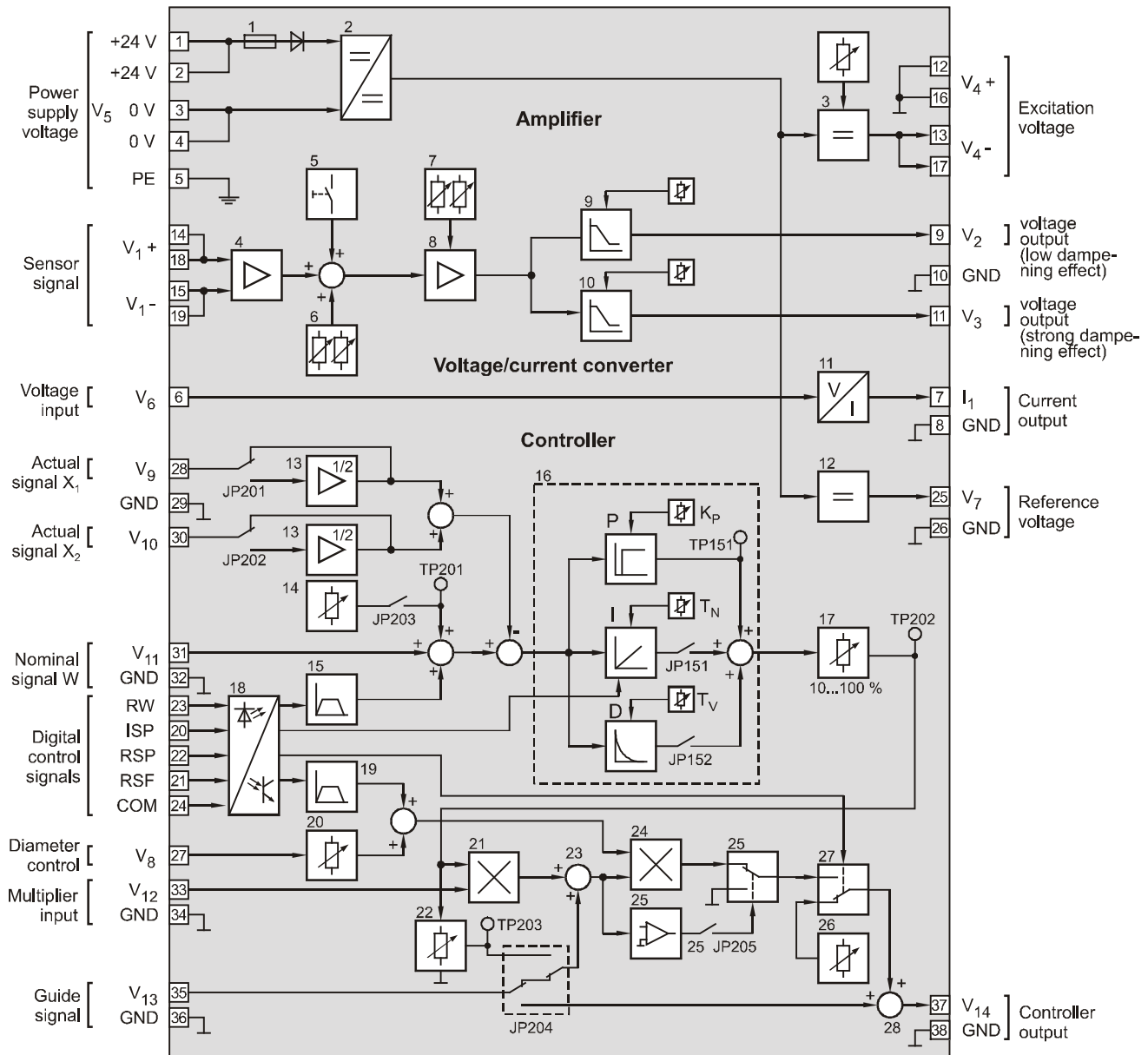
Power supply voltage Voltage (V_5): 24 V DC, ± 10 %
 Current consumption (at 24 V): appr. 150 mA
 Fine-wire fuse: 0,4 AT

*) The power supply voltage V_5 must be grounded. In the power supply loop the current of the supply voltage V_5 should not be exceed 10 Amps.



Amplifier-Controller-Combination MAC 4.0





■

■

■

Input amplifier

■

■

'coarse', 'fine'

■

'coarse', 'fine'

■

Low pass filter

Low pass filter

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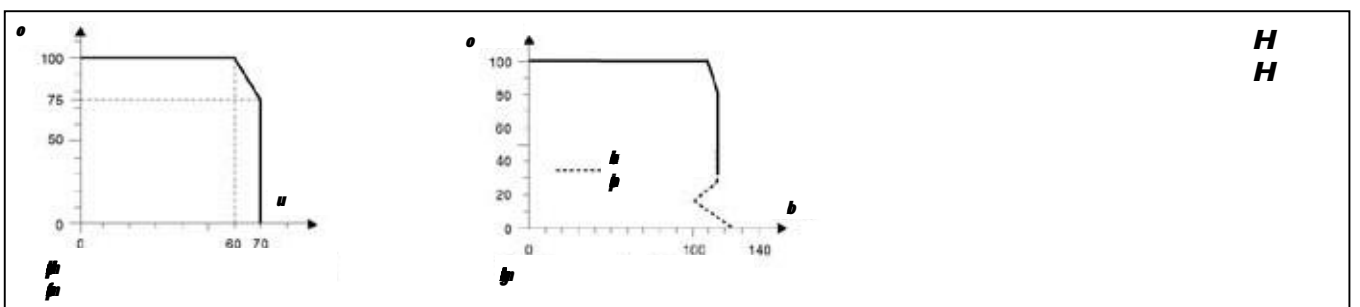
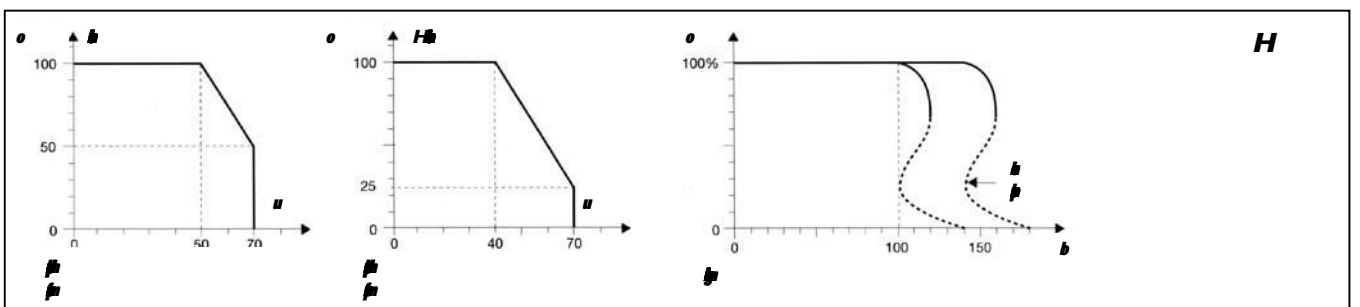
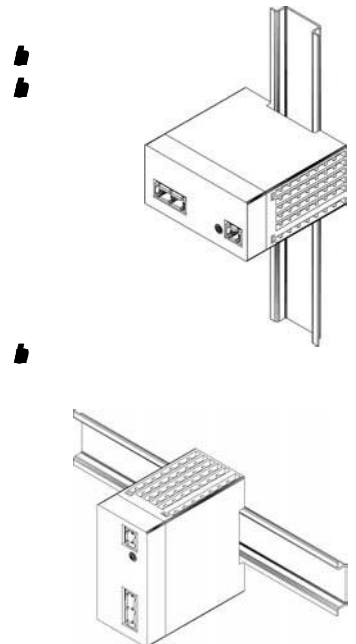
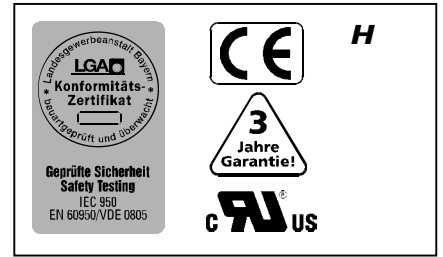
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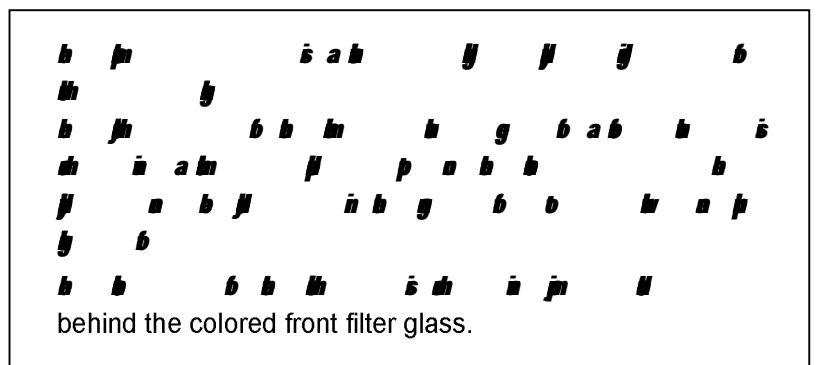
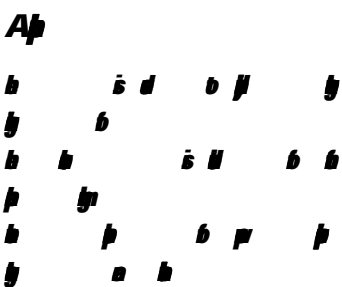
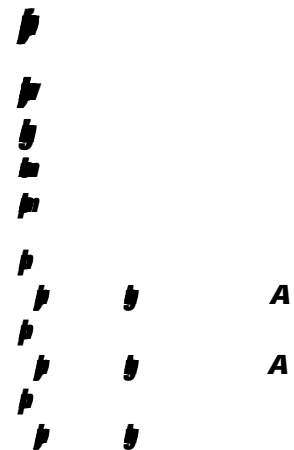
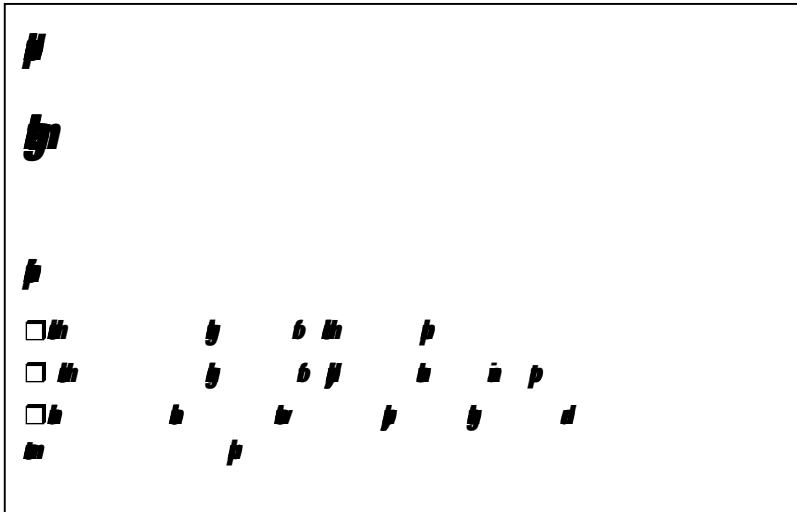
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Influence of diameter

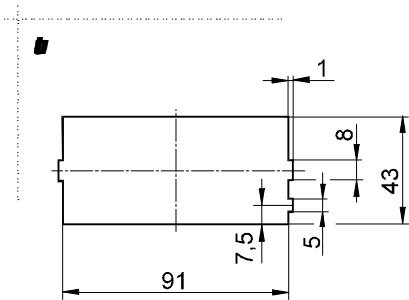
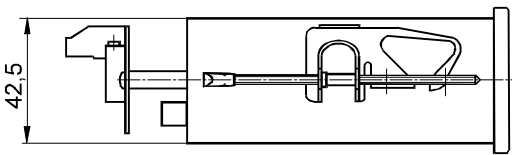
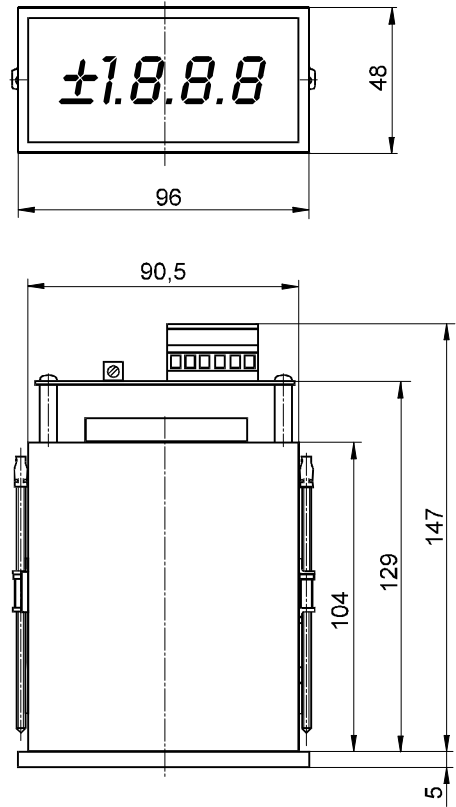
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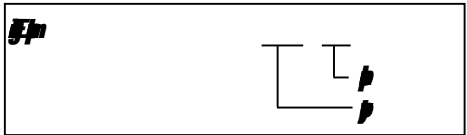


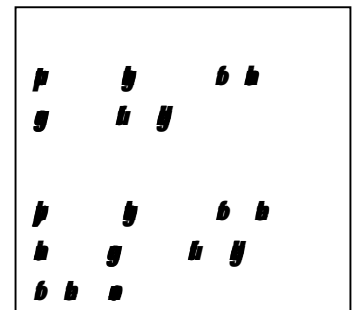
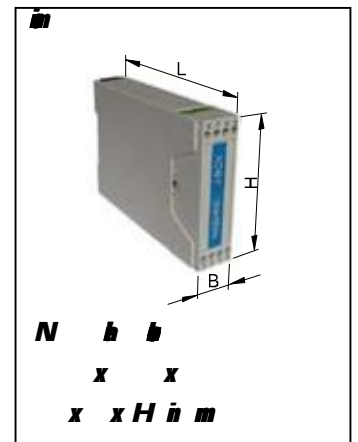
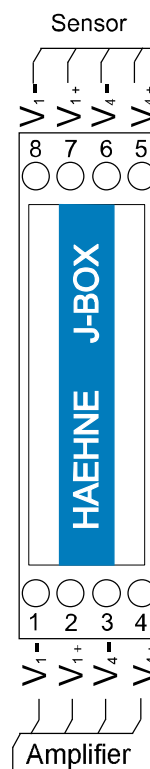
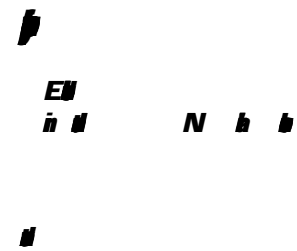
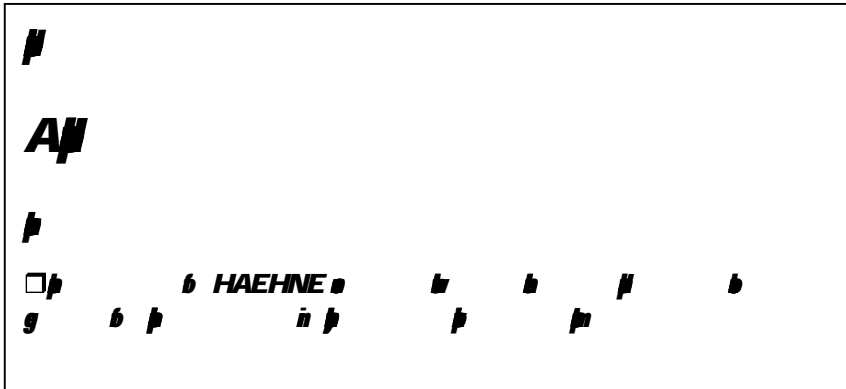
b		
A _b	p b	
	p b	kΩ
A _p	b	y b
	b d	b b b
b	b	
b	E	m d
	b p p	can be configured by jumper on front panel
b	p	A Hz
	p	A
	p	
	n	b p
b		
E _p	b	n y
E	EN	EN

b				
b p				
p p	• • • • •	• • • • •	• • • • •	• • • • •



b					
p	b	b	p		





Ap

measuring amplifiers and force measurement sensors

h p h s d n p h

h h p b

h n o h p b y

h n b

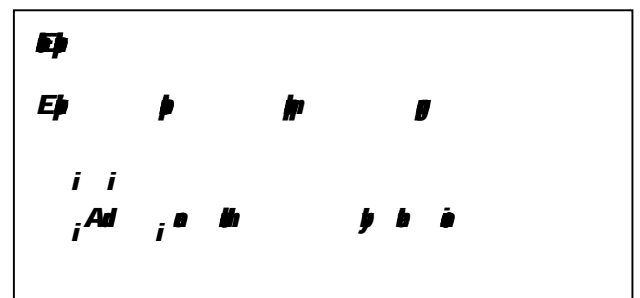
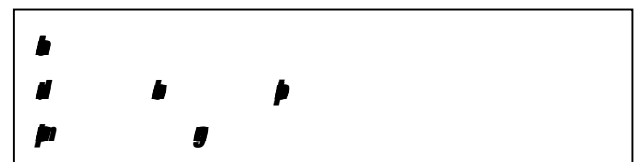
h p g

h p p

h n h b q b b

o p d h y h h s d

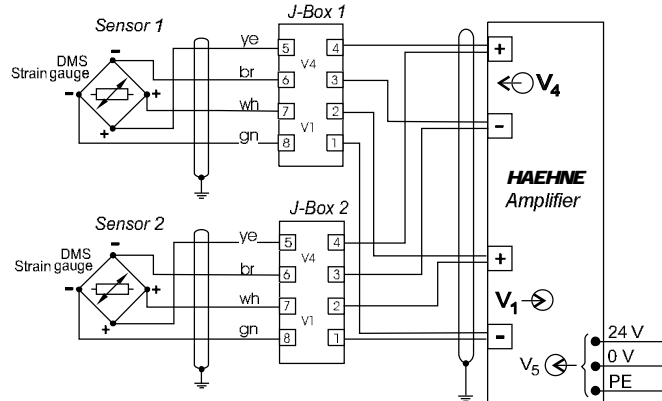
g b N h y n b h



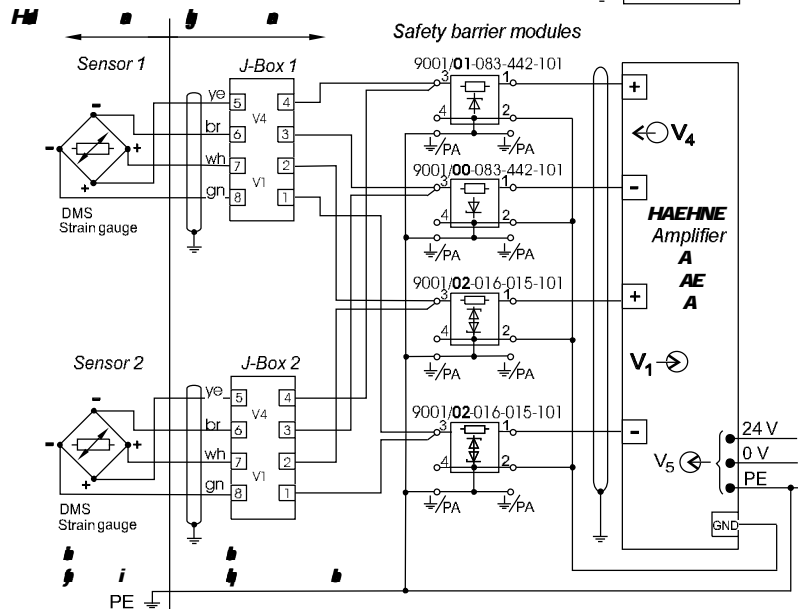


The calibration resistors in the J-Box are specified for the corresponding sensor only and

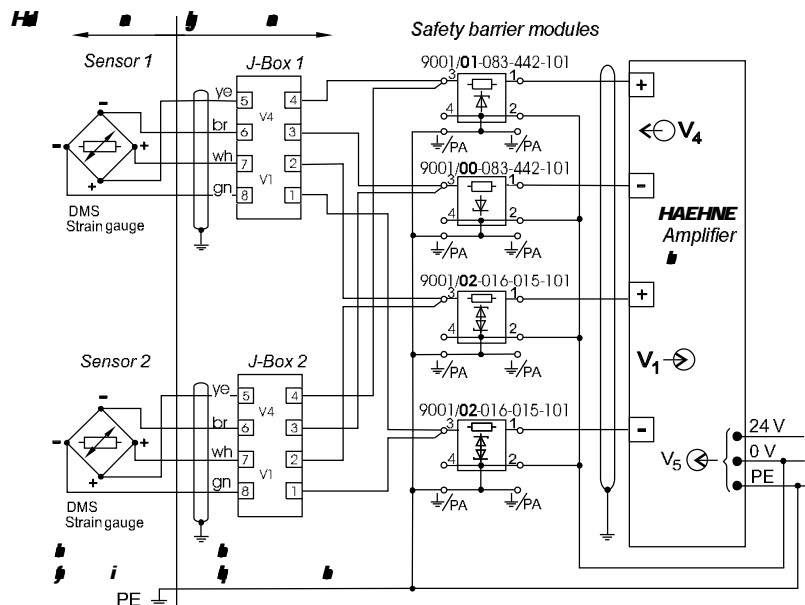
ig
p b

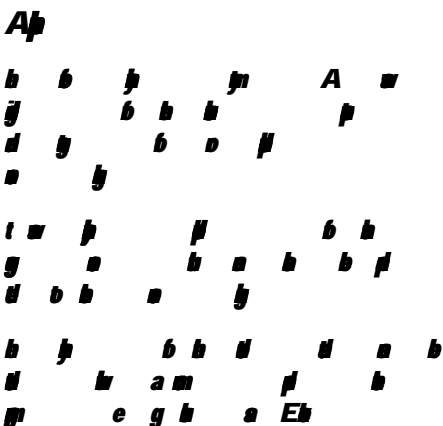
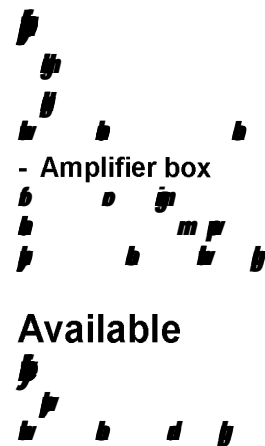
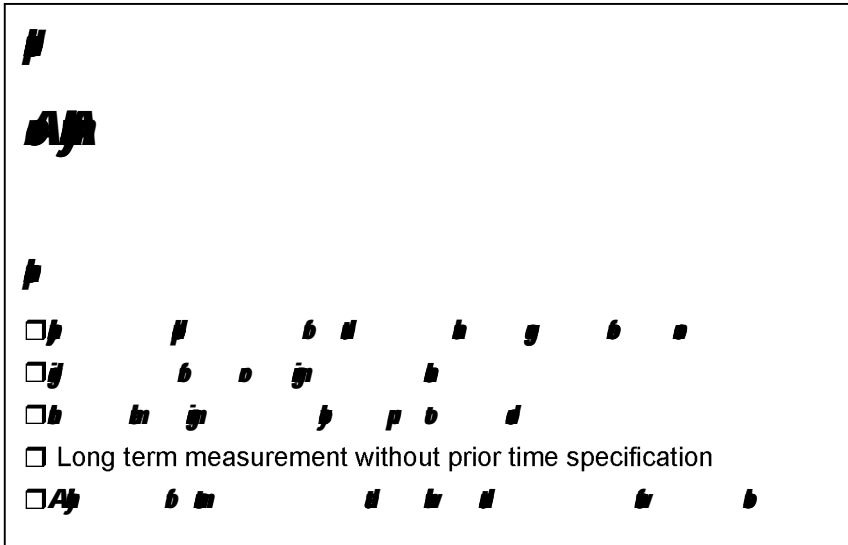


ig
Ep
HAEHNE amplifier
A A AE



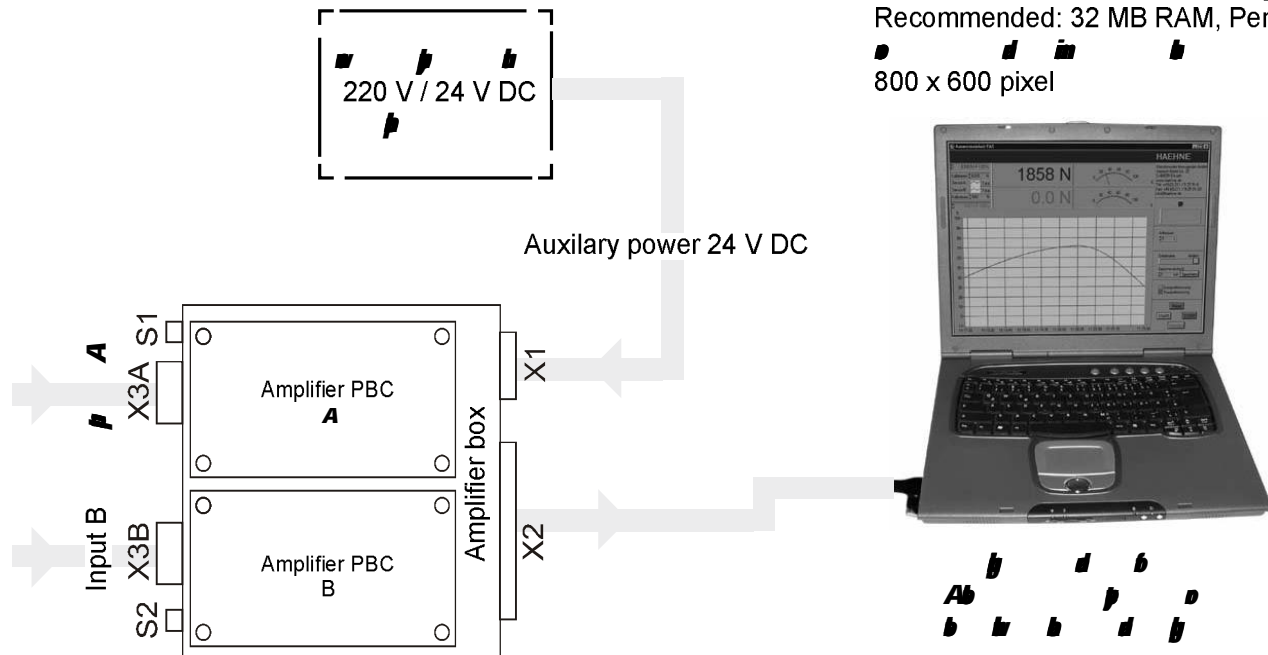
ig
Ep
HAEHNE amplifier
b





course, specific to the measuring task at hand.
 measurements with a PC Laptop directly on the shop floor.

For PC's with WINDOW '95 or higher.
Recommended: 32 MB RAM, Pentium
800 x 600 pixel



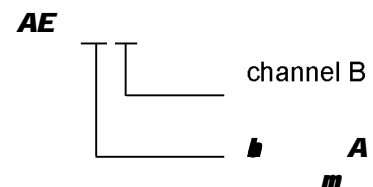
S1 and S2 with option F only

Polystyrol enclosure: 135x132x60 mm



Amplifier		
	<i>m</i>	
	<i>m</i>	
<i>E</i>		
	4 ...	20 mA

Ordering example:



in

Ab

FAH

Ep

h

h

HAEHNE h

It is also absolutely necessary to ensure that the amplifiers and the safety barriers are not within the area with the potentially explosive atmosphere. Alternatively the amplifiers and

h

- Profibus Bus Amplifiers

Ap

h

or in IP 67 field enclosures

- Analog or Digital Amplifiers

h

in field enclosures



El

Profibus Amplifiers





HAEHNE
EX



HAEHNE



HAEHNE

barriers and the associated measuring amplifier. Each measuring system consists of firmly assigned



not adjusted internally, i. e. the zero point and the nominal rating will be adjusted with the amplifier.



User Notification



Ab



HAEHNE - sensors for potentially explosive atmospheres can be used only in accordance with the specific



ENEN

- The sensors must be connected with safety barriers and J-Box to the associated measuring amplifier. It is absolutely necessary to ensure that the amplifiers/J-Box/safety barrier - combinations are not within



connected and wired as described in the appropriate amplifier documentation.

- In the case where amplifiers/safety barriers are used which are not provided by HAEHNE it is necessary





final user are strictly observed.



- Repairs to the sensors can be made only by qualified technical personnel authorized by the



- Under no circumstances are changes allowed to the HAEHNE sensors classified for potentially



- Recalibration should be made according to predetermined fixed periods/intervals.



EC-Type Examination Certificate

AEE

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Teflon explosion <div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>

p

E

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Ep

Ep

EN

Nm

ENEN

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H



Ab
The maximum standard length of the firmly attached sensor cable amounts to 20 m. An extension

p

p

The combination of the HAEHNE products amplifier - force sensor - J-Box - safety barrier modules makes





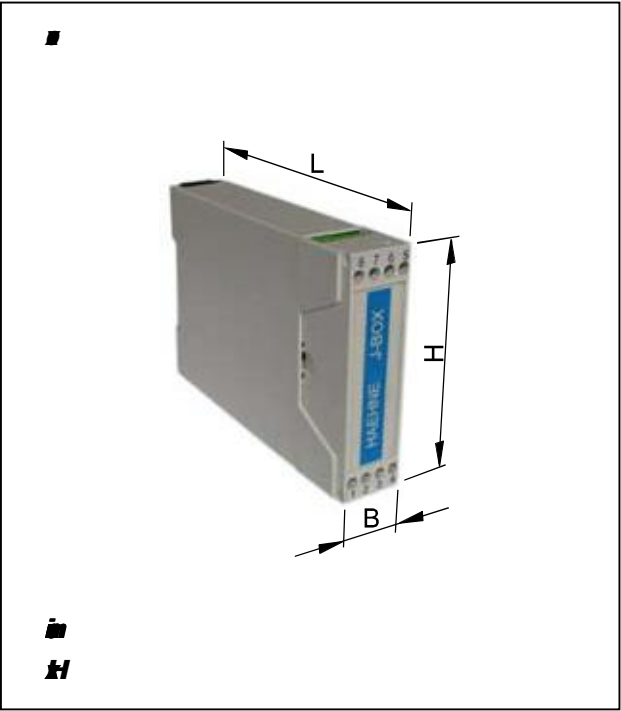
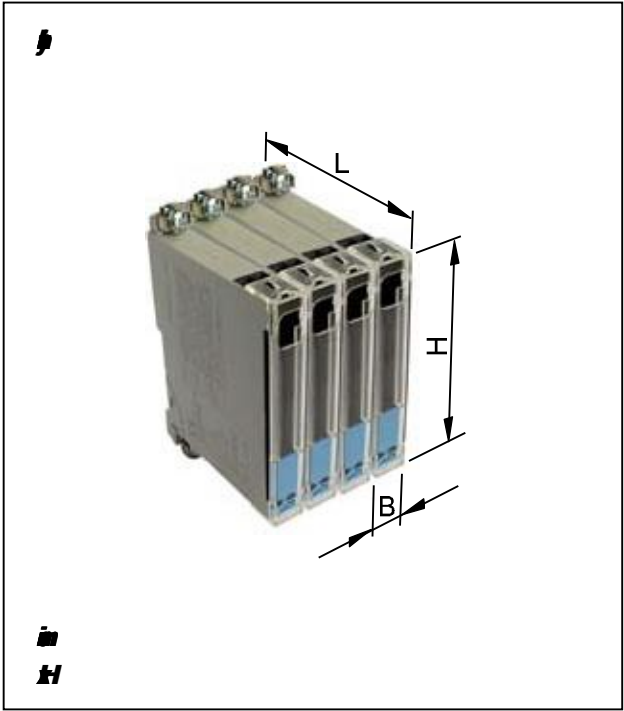






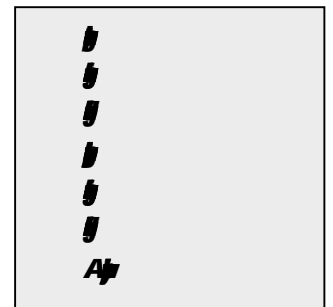
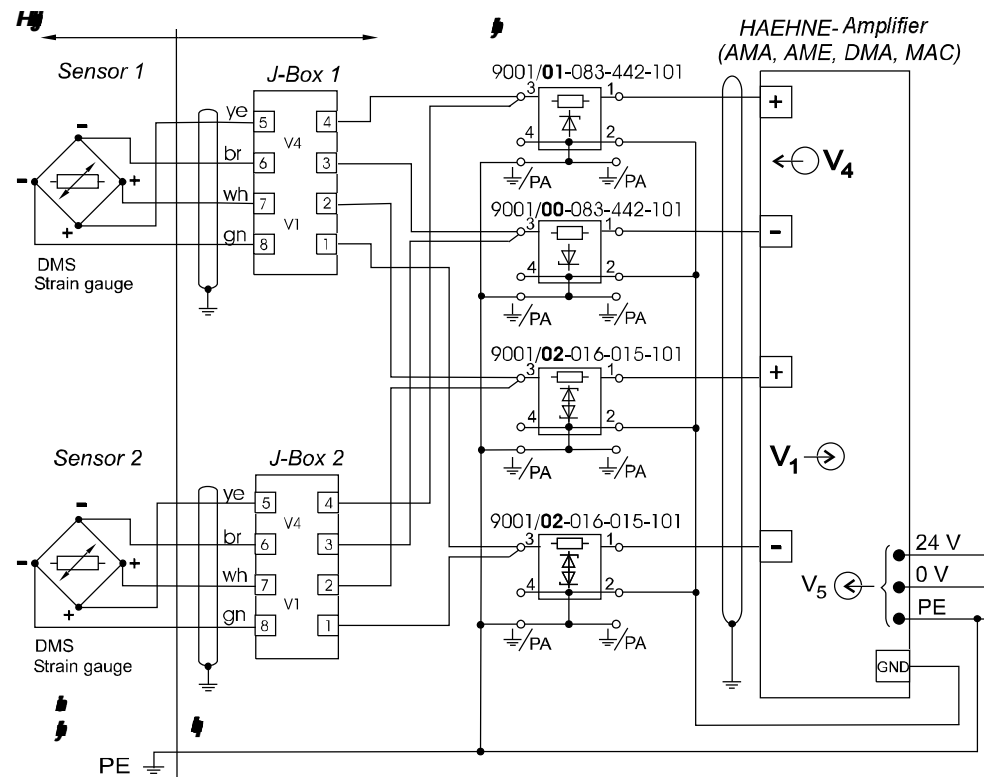




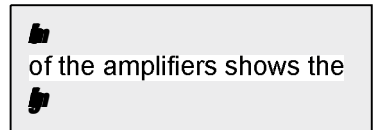
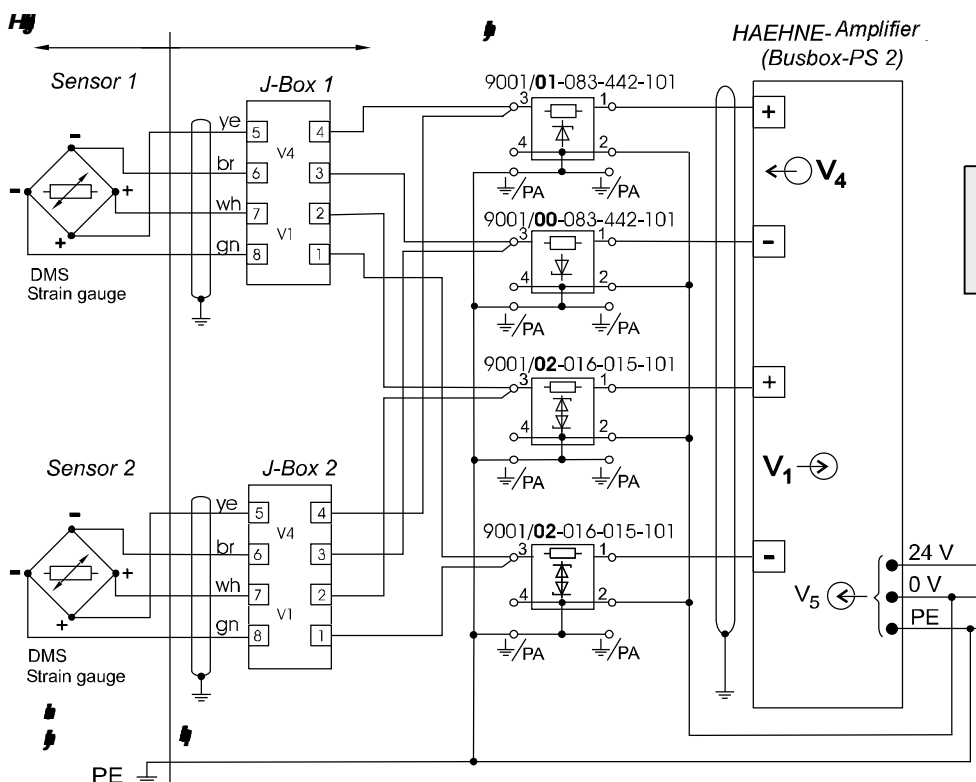




for HAEHNE-Amplifier AMA, AME, DMA and MAC



for HAEHNE-Amplifier Busbox-PS 2



Examination certificate number

1

*i*

1

#

Figure 1

4

Abstract

→

EE

1

→



4

group IIA to IIC, i. e. devices with the explosion group IIC are certified also for IIA and IIB.

1

Equipment is certified for the temperature class T4, i. e. its surface does not get hotter than

A

中

U

Technical modifications reserved

FAX - REPLY FORM



Suitable for use in a window envelope

HAEHNE

Elektronische Messgeräte GmbH
Heinrich-Hertz-Str. 29

D-40699 Erkrath
Federal Republic of Germany

Use the contact forms on our



Additional information regarding our application "web tension measurement" and



Nb

lbf

lb

lb

m

☐

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☐

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Distance: sensor - amplifier > 20 m



Amplifier environment

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yes

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no

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in

☐

in

☐

electrical cabinet

☐

field enclosure

Amplifier and Ensuing Equipment

Strain gauge amplifier (analog)

☐

Amplifier-Controller-Combination

☐

Fieldbus Amplifier

☐

Profibus

☐

CANopen

☐

Interbus

☐

Nb

Web geometry



Sketch

This image shows a full page of blank graph paper. The grid consists of small, equal-sized squares formed by thin black lines. There are no margins, text, or other markings on the page.☐ Proposal

Dept.

Phone



Date