

Manual

Monitoring Device BS-300-11



## **BRANDES - Safety regulations**

This testing equipment is only designed for use and/or application by special technical staff or trained personnel exclusively in compliance with its technical specifications in connection with the locally valid safety regulations and instructions. The legal and safety regulations for the respective and specific case of application shall also be observed in its application. These shall also apply analogously in connection with the use of equipment produced by other manufacturers.

If no danger-free operation is possible, the equipment must be switched off and protected against unintentional activation.

### **It can be assumed that danger-free operation is no longer possible if the equipment:**

- displays visible damages,
- no longer functions,
- has been stored for a longer period of time under unfavorable conditions (e.g. storage beyond climatic declaration without adaptation to the room climate) or if thawing has occurred,
- has been exposed to intensive transport stress (e.g. drop from extreme height without any visible external damage).

### **During installation or while working at the pipe, special care must be taken to the following:**

- in order to protect the control devices and their cabling against damage and destruction, an equipotential bonding must be created between all pipes and pipe sections by the customer before connecting the equipment in compliance with approved regulations of technology (IEC 64).
- during welding works at the pipe, it is furthermore necessary to observe the valid prescriptions for the avoidance of accidents.
- as a safety precaution measure separate mounted and connected devices from the pipe before carrying out any welding tasks.

BS300-11.DOC

## Safety regulations

Some of the international electrical symbols used in this operating instructions are shown below.

Please read these safety regulations carefully before putting the device into operation.

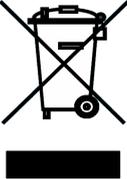
Symbol	Standard	Meaning
	IEC 417 , No. 5031	Direct current
	IEC 417 , No. 5032	Alternating current
	IEC 417 , No. 5033	Direct current or alternating current
	IEC 417 , No. 5017	Earth connection
	IEC 417 , No. 5019	Connection for ground wire
	ISO 3864, No. B.3.6	Warning of dangerous electrical voltage
	ISO 3864, No. B.3.1	Warning of dangerous place (Attention, observe the documentation!)
	DIN 40 008	Pull power plug before opening
	DIN 3084	Observe operating instructions

## **BRANDES** environmental protection

On its way to you, your device has been protected by the packaging. All used materials are environmentally friendly and can be used again. Please by supportive and dispose the packaging compatible with the environment.

Old devices are not worthless waste. This device and its components contain materials which can be recycled. This can be done via the waste disposal trade. You can also send your old device back to us.

The BRANDES GmbH guarantees to take back this device and its environmentally friendly disposal.

Symbol	Norm	Meaning
	Guideline 2002/96/EG <sup>1)</sup>	This device is marked in correspondance to the guideline 2002/96/EG about old electro and electronic devices.  The guideline provides the framework for a EU-wide valid taking back and recycling of old devices.

1) Law about trafficking, the taking back and environmentally friendly recycling of electro- and electronic devices (ElektroG vom 18 März 2005 ).



# Index

<b>1. BRANDES-System</b>	<b>1-1</b>
1.1 General information	1-1
1.2 Sensor loop	1-2
1.3 Assembly check	1-3
<b>2. Monitoring device BS-300-11</b>	<b>2-1</b>
2.1 General Information	2-1
2.2 Display and Operation	2-1
<b>3. Operation of the monitoring device BS-300-11</b>	<b>3-1</b>
3.1 Setting of the signal threshold for humidity reports	3-1
3.2 Operation	3-1
3.3 Measures in case of report	3-1
3.4 Adaptation of the operating parameters	3-1
3.5 Test function	3-2
3.6 Commissioning	3-2
3.6.1 Power supply	3-2
3.6.2 Measurement of the sensor loop/pipe connection	3-2
3.6.3 Setting of the signal threshold	3-3
3.6.4 Alarm relay	3-3
3.7 Maintenance	3-3
<b>4. Technical data</b>	<b>4-1</b>
<b>5. Annex</b>	<b>5-1</b>
5.1 Terminal assignment	5-1
5.2 Dimensional drawings	5-1
5.3 EU conformity declaration	5-1

## Index of figures

Figure 1.1.1: Structure of the sensor wire.....	1-1
Figure 1.2.1: Sensor loop .....	1-2
Figure 1.3.1: Measuring range of the BS-MH .....	1-3
Figure 2: BS-300-11 General view.....	2-1

# 1. BRANDES-System

## 1.1 General information

The BRANDES measuring procedure has been developed specifically for pipe network monitoring and is characterized as a

### Resistance-Comparison-Measuring procedure

A patent was applied for and issued for this procedure.

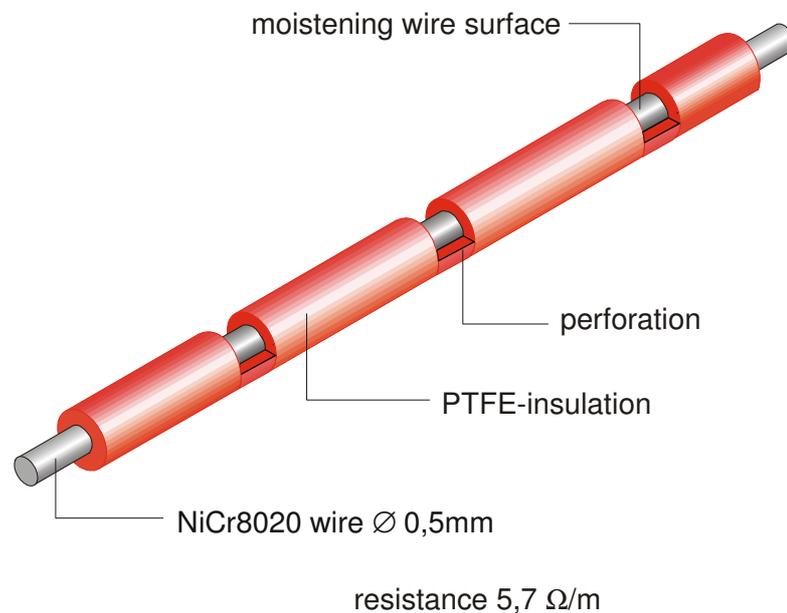
The system is presented in the following and possible applications are shown.

In order to facilitate comprehension a few technical terms should be explained:

The heart of the system is the

### Sensor wire

The sensor wire is of NiCr with an electrical resistance of approx. 5.7 Ohm/meter and Teflon insulation perforated at short, defined intervals (resistant to temperatures of up to approx. 200°C). This wire is used to monitor preinsulated pipes.



**Figure 1.1.1: Structure of the sensor wire**

In the case of fiber-insulated pipes a

### Sensor cable

is used. It has the same technical values as the sensor wire, but it is additionally protected by a fiber glass casing in order to withstand the rough use on construction sites.

These technical values allow the monitoring of mixed laying procedures.

#### Note!

If a rapid spread of damage is to be expected, only devices with immediate automatic locating facilities, e.g. BS-501 etc. or the range of BS-1-devices may be used, otherwise the cause of damage cannot easily be determined later.

## 1.2 Sensor loop

The requirement of "Monitoring from one single point" is met by the sensor loop. The loop is formed by the sensor wire and a Teflon-insulated return wire, both foamed in the thermal pipe insulation.

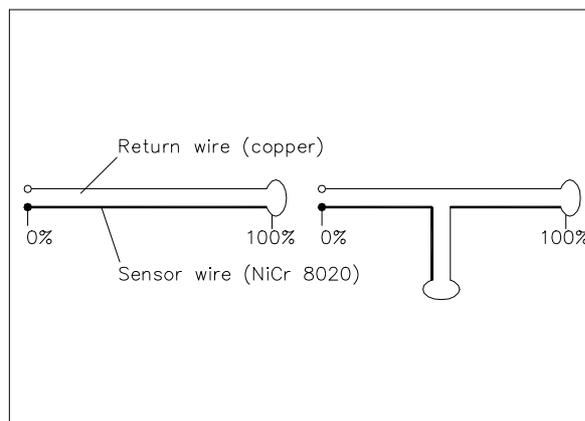
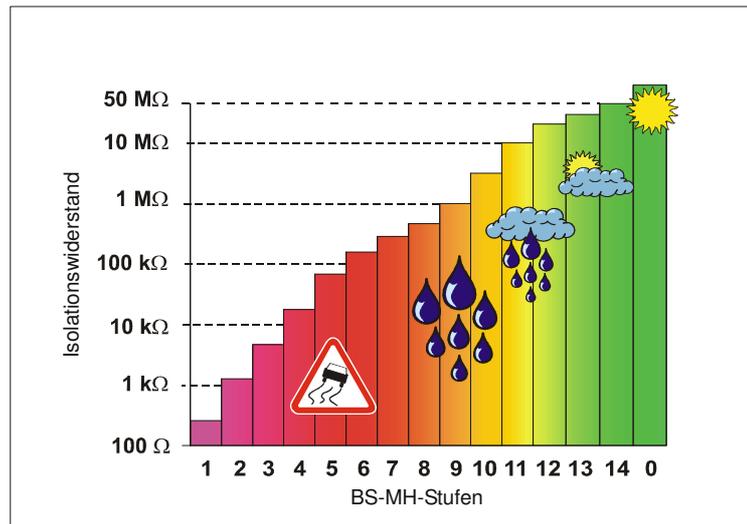


Figure 1.2.1: Sensor loop

A monitoring section can be up to 1000 m long.

### 1.3 Assembly check

The quality of the thermal insulation with regard to moisture must already be checked during the assembly. It can be determined and displayed in 15 levels by means of the portable tester BS-MH. Highest laying quality can thus be achieved.



**Figure 1.3.1: Measuring range of the BS-MH**

The operator of a district heating system therefore has the possibility of

**determining and monitoring**

**the quality of the thermal insulation**

during installation or acceptance.

The following checks are made:

- **Dampness** in the thermal insulation (residual or construction moisture)
- Correct **connection** of the sensor loop
- **Contact** between the sensor loop and pipe
- **Interruption** of the sensor loop
- Approx. **length** of the sensor loop

Hence, installation faults are discovered early, preventing them from turning into leaks some years later.

In addition, the electrical function of the sensor loop and the wire connections are always checked.





The **BS-300-11** monitoring device

- **monitors** a BRANDES sensor loop with a max. length of 1000 m
- **checks** the current insulation resistance, the longitudinal resistance of the loop and the pipe contact.
- **displays** and **stores** fault conditions.

Current moisture conditions are displayed on a **LED row** (1). The measured moisture condition is compared with the signal threshold (2). The operator can modify the signal threshold with the step **switch 'Level'** (8).

Basic setting for NiCr: 1 MOhm.

Loop resistance and pipe contact are also checked.

A fault is only signaled if it still exists after a **measurement cycle** of approx. 4 minutes (**plausibility test**), set by the manufacturer. This is to avoid false messages.

Faults are signaled by red **indicator lights** (3-5) and by a floating alarm contact. The alarm contact can be reset by the **acknowledger 'Q'** (10). In addition, a LED (6) indicates the activation of the alarm relay.

Should several fault reports (insulation, sensor resistance, pipe contact) occur successively, all reports are displayed.

A test function can be triggered with the **test key 'T'** (9), allowing a check of the entire function.

The connections for power supply, sensor loop and alarm relay are located behind the cover of the **terminal section** (11).

The screw connections (included) are to be used as **cable glands** (12).

## 3. Operation of the monitoring device BS-300-11

### 3.1 Setting of the signal threshold for humidity reports

The signal threshold can be set on six levels using the step switch 'Level'. The set value is monitored by the LED-line "signal threshold insulation".

### 3.2 Operation

Operation of the monitoring device is only made using the 2 keys situated on the side of the housing:

**Acknowledger 'Q'** = reset alarm relay  
**Test key 'T'** = trigger test function

### 3.3 Measures in case of report

If a fault occurs (moisture/contact, loop resistance or pipe contact) the alarm relay and the corresponding LED-display "report" (insulation, loop or pipe) will be activated after the measurement cycle set by the manufacturer.

The alarm relay and the LED-display "report" can be reset with the acknowledger 'Q'. If the fault still exists at the time of acknowledgment the corresponding LED-display remains activated and only turns off after removal of the fault.

If insulation values of a NiCr sensor loop fall below the threshold of 1 Mohm, you should start out from a damage which must be removed.

#### **Peculiarities of CU loops:**

Locating of damages by time domain reflection is generally only possible if the insulation resistance falls clearly below 30 kOhm.

**Failure to take notice of reports can result in considerable damages to the pipelines or the shaft installations of the monitoring section, for which the manufacturer of the monitoring system accepts no responsibility.**

### 3.4 Adaptation of the operating parameters

It is useful to adapt the **signal threshold for moisture reports = limit value of the insulation** if the measurement value „insulation“ decreases: i.e. if **moisture intensity increases**.

The new „**limit value insulation**“ should be the following level below the indicated measured value "**insulation**". A report is triggered if values fall below the set limit value.

### **3.5 Test function**

The measuring system is checked with the test function.

For this purpose press the test key 'T' until the alarm relay and the LED-display "insulation" are activated.

Depending on the measurement cycle fixed by the manufacturer, this can take up to approx. 4 minutes.

### **3.6 Commissioning**

Commissioning can be carried out by one of Brandes' authorized contractual partners.

#### **3.6.1 Power supply**

If the power is properly available, the lines L1, N and PE can be connected.

#### **3.6.2 Measurement of the sensor loop/pipe connection**

The following loop parameters are to be recorded with the BRANDES devices BS-MH, BS-POK and a digital voltmeter:

- Sensor loop resistance  
Measurement of resistance with the digital voltmeter between 0% and 100%.
- Measurement of external voltage  
Measurement of direct and alternating voltage with the digital voltmeter between 0% and 100%, 0% and pipe, 100% and pipe.
- BS-MH measurement  
Determining the moisture level
- BS-POK measurement, if necessary  
In the case of a moisture level below or equal MH-level 11, the moisture center must be located.
- Testing the pipe contact  
Measurement of resistance between the two pipe connections and between pipe connection and medium pipe.

These values must join the commissioning report.

If measurement values are beyond the specifications, the sensor loop wires may not be connected. The cause of faults is to be removed!

If this is not observed the BS-300-11 possibly will not function correctly.

### 3.6.3 Setting of the signal threshold

Using a suitable screwdriver, the step switch 'Level' is to be set on a signal threshold determined by the operator. The LED-line signal threshold "insulation" provides information on the currently set threshold.

### 3.6.4 Alarm relay

If you want to connect an external alarm, conductors shall be connected to the floating contact (refer to the enclosed drawing "Connections and terminal assignments"). Test function is triggered pressing the test key 'T' as described under 3.5.

## 3.7 Maintenance

Wear and aging of installation materials due to all kinds of environmental influences have been minimized by selecting good material, but can never be completely excluded, as is always the case with electronic components.

Regular testing for damages and factors which can favor damages, such as deterioration of housing and cable sealing, moisture, dirt and corrosion etc. is the absolute minimum of preventative maintenance.

We recommend regular service for the system, e.g. by a maintenance contract, which will also facilitate your access to possible further system improvements.

**Please request our offer "Maintenance contract" for your system.**



## 4. Technical data

<b>Function</b>	<p>Measurement:</p> <ul style="list-style-type: none"> <li>- Insulation resistance</li> <li>- Sensor wire resistance</li> <li>- Pipe contact</li> </ul> <p>Display of the insulation resistance by LED row</p>
<b>Power supply</b>	
Voltage supply	230 V AC / 50 Hz
Power consumption	6 VA
Power fuse	T 1,6A L 250V
	SI-automatic 1.6 A with release characteristic "Z" for wire protection and overload protection. (e.g. Stotz S281-Z 1.6).
<b>Measurement inputs</b>	
Loop consisting of NiCr sensor wire and Cu return wire or Cu loop	1 x 1.000 m
<b>Display</b>	<p>Two 6-stage LED rows for display of measurement (3 kOhm - 1 MOhm)</p> <p>1 x display of insulation measurement value</p> <p>1 x display of insulation signal threshold</p> <p>Four LED displays for "messages":</p> <ul style="list-style-type: none"> <li>- Insulation</li> <li>- Loop resistance</li> <li>- Pipe contact</li> <li>- Alarm relay active</li> </ul>
<b>Floating contact</b>	230 V AC / 1,5 A (external alarm-generator)
<b>Galvanic isolation</b>	Power / Loop
<b>Ambient conditions</b>	
Storage temperature	-25°C to + 75°C
Operating temperature	0°C to + 40°C
Type of enclosure	IP 54
<b>Housing dimensions</b>	120 mm wide, 266 mm high, 60 mm deep
<b>Weight</b>	Approx. 1.1 kg



## 5. Annex

### 5.1 Terminal assignment

#### Terminal assignment for the monitoring device BS-300-11

The terminal board of the monitoring device BS-300-11 is located in a separate terminal box. Disconnect the power supply before opening the device.  
(Please refer to drawing KP 42 030 8011 )

**\*\*\* Attention ! 230 Volt power supply accessible \*\*\***

**Connection of a BS-300 to two pipes**  
( e.g. flow and return with a total length of max. 1000m ).  
( Please refer to drawing TH0090 )

**Connection of a BS-300 to one pipe**  
(e.g. one flow pipe or one return pipe with a maximum length of 1000m).  
(Please refer to drawing TH0091 )

#### **NORDIC SYSTEM**

**Connection of a BS-300 to two pipes**  
( e.g. flow and return with a total length of max. 1000m ).  
( Please refer to drawing TH0245 )

#### **NORDIC SYSTEM**

**Connection of a BS-300 to one pipe**  
(e.g. one flow pipe or one return pipe with a maximum length of 1000m).  
(Please refer to drawing TH0246 )

### 5.2 Dimensional drawings

#### Dimensional drawing monitoring device BS-300-11

(Please refer to drawing MB 42 030 8011 )

### 5.3 EU conformity declaration

#### EU conformity declaration monitoring device BS-300-11

(Please refer to sheet 71 006 0003A /E)

# Connections and terminal assignments

Power supply 230V 50/60 Hz

Terminal Connection

- L External conductor
- N Neutral conductor
- PE Protective earth

Floating contact

Terminal Connection

- 1 Center contact
- 2 Opening contact
- 3 Closing contact

Connection Sensor

Terminal Connection

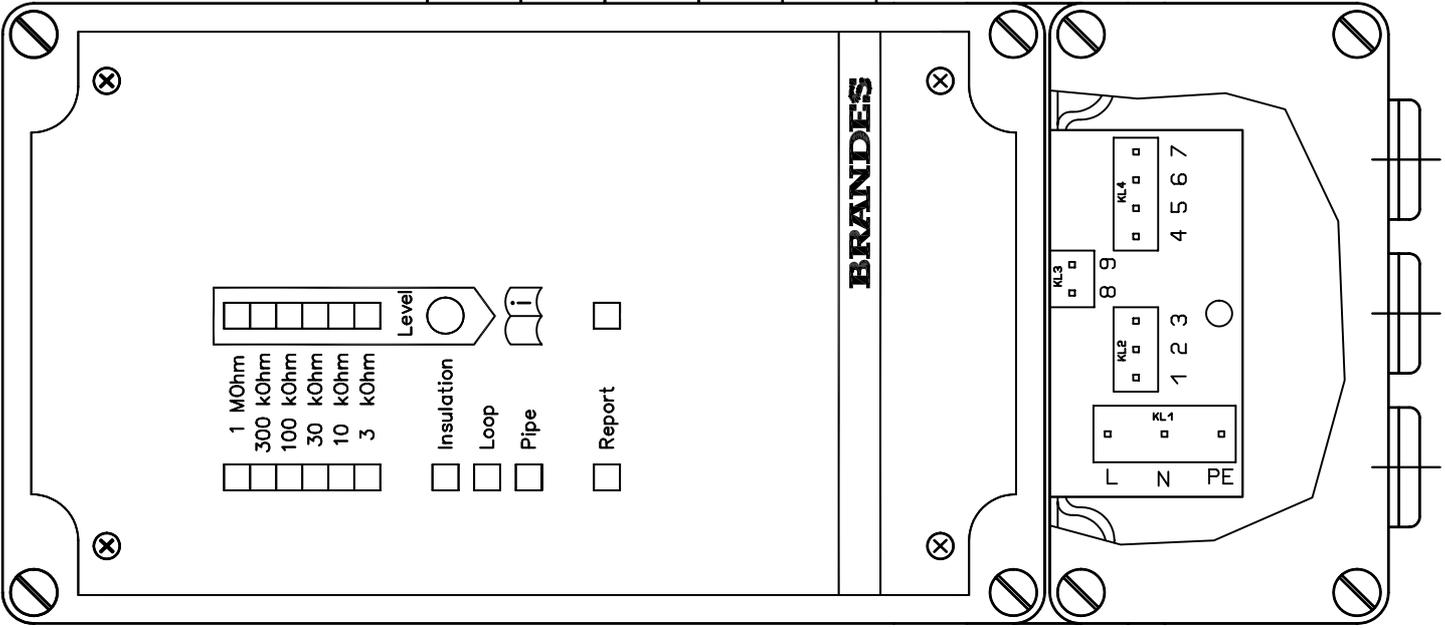
- 4 Sensor loop 0%
- 5 Sensor loop 100%
- 6 Pipe
- 7 Pipe-check

T 1,6 A L 250V

External acknowledgement

Terminal Connection

- 8/9 Floating contact ( closing contact )



(Verwendungsbereich)	Maße ohne Toleranzangaben nach ISO 2768-m...	Maßstab	1: 1	(Gewicht)
	Datum	Werkstoff:		
	22.03.96	Mat.-Sach-Nr.:		
	Gepr.	(Benennung)	Terminal sketch	
Norm		BS-300-11		
<b>BRANDES</b>		(Zeichnungsnummer)	KP 42 030 8011/E	Blatt 1
		(Ers.f.:		1 BI
A 42 030 8011 F 16.5.03 Be	Datum	Urspr.)		(Ers.d.:

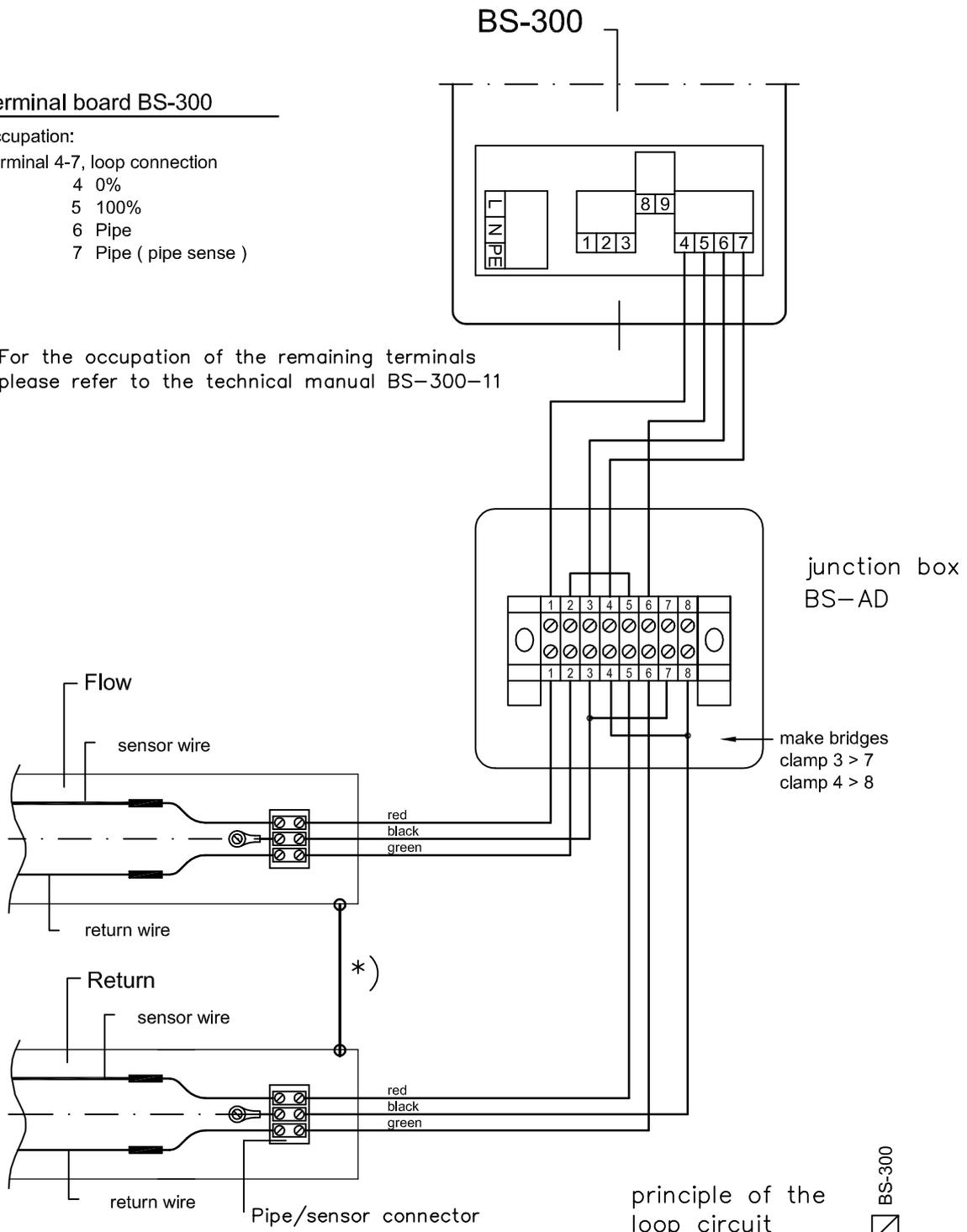
### Terminal board BS-300

Occupation:

Terminal 4-7, loop connection

- 4 0%
- 5 100%
- 6 Pipe
- 7 Pipe ( pipe sense )

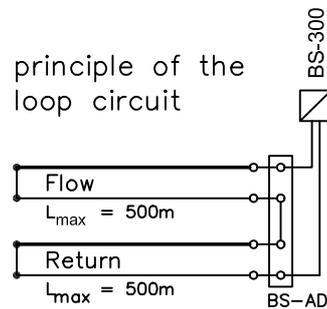
For the occupation of the remaining terminals please refer to the technical manual BS-300-11



\*)

**Attention:**  
equipotential bonding between supply and return pipe to be provided by the client in accordance to IEC 64

principle of the loop circuit



Schutzvermerk nach DIN 34 beachten

				Datum	Name	Connection of a monitoring device BS-300 for continuous monitoring of 2 pipes (e.g. flow and return with a total length of max. 1000m )	Blatt 1
			Bearb	20.04.95	Be		
			Gepr.				
			Norm				
B	Klemmen Beleg.	26.5.99	Be			TH0090/E	1 Bl
A	Pot.-Ausgleich	13.12.97	Be				
Zust.	Aenderung	Datum	Name	(Urspr.)	(Ers.f.): 4054A	(Ers.d.):	

BS-300

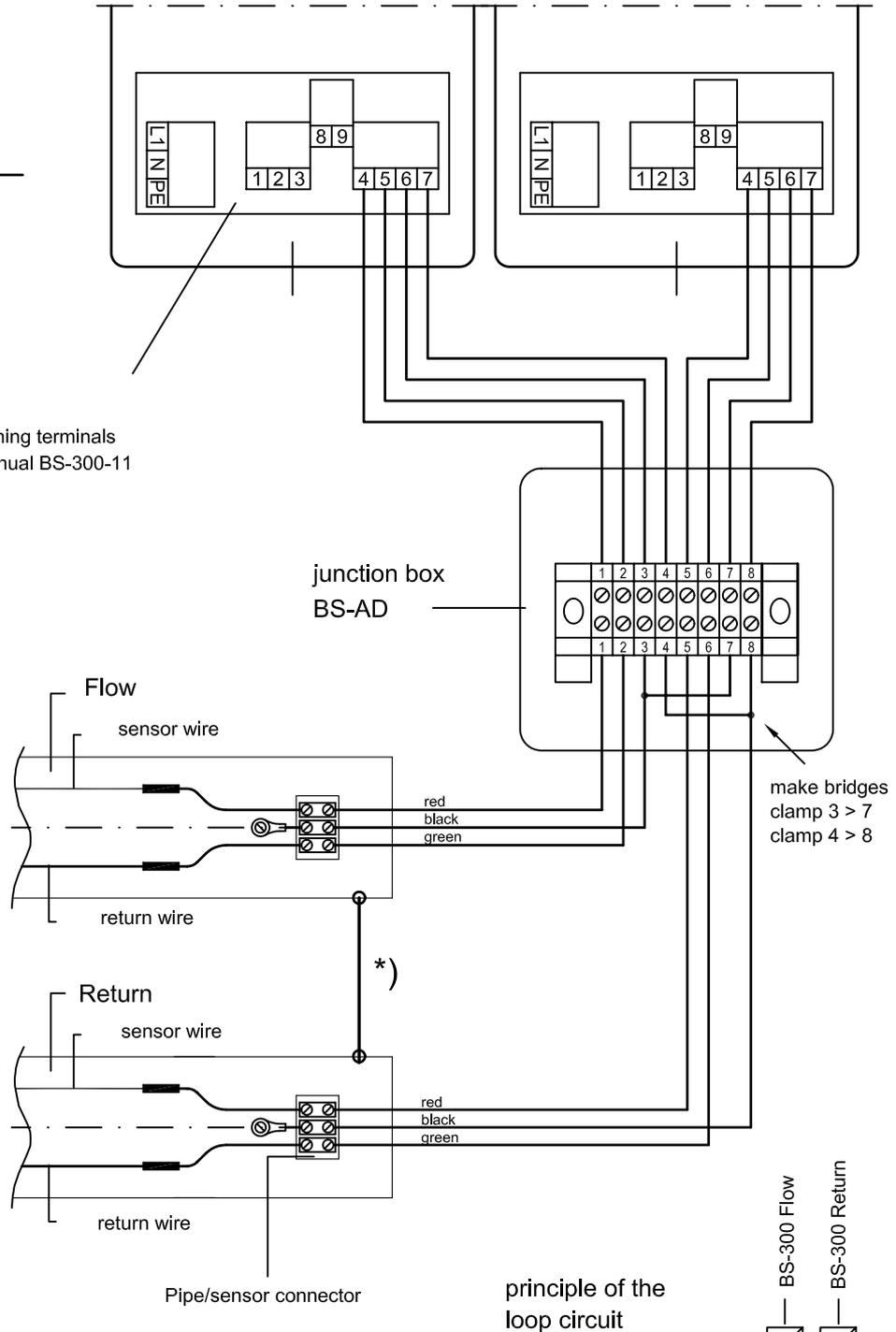
BS-300

**Terminal board BS-300**

Occupation:

- Terminal 4-7, loop connection
- 4 0%
- 5 100%
- 6 Pipe
- 7 Pipe ( pipe sense )

For the occupation of the remaining terminals please refer to the technical manual BS-300-11



\*)

**Attention:**  
 equipotential bonding between supply and return pipe to be provided by the client in accordance to IEC 64

Schutzvermerk nach DIN 34 beachten

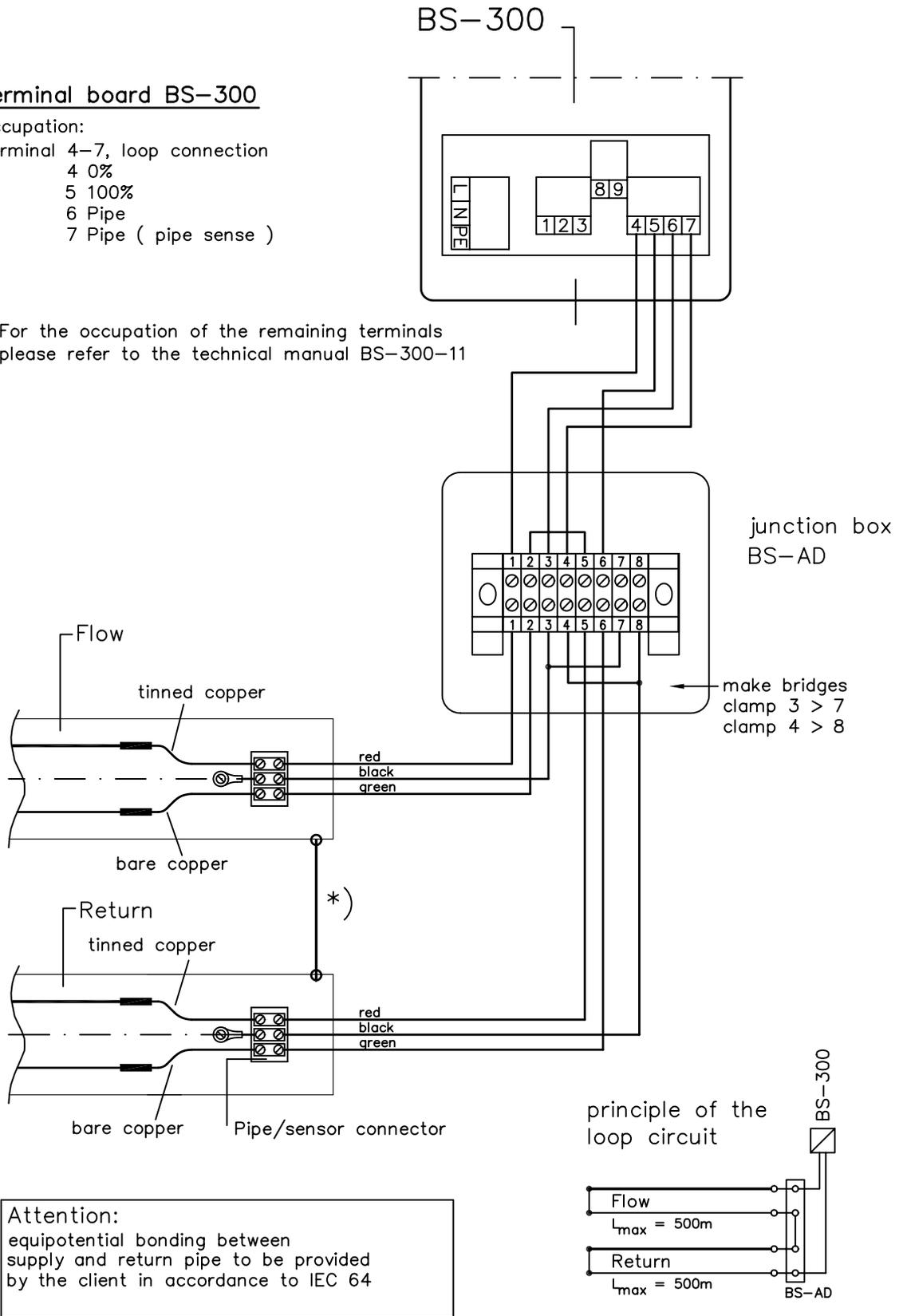
										Connection of a monitoring device BS-300 for continuous monitoring of 1 pipe (e.g. one flow pipe or return pipe with a maximum length of 1000m each)	
				Datum	Name						Blatt 1
			Bearb.	20.04.95	Be						
			Gepr.								
			Norm								
B	Klemmen Beleg.	26.5.99	Be							TH0091/E	
A	Pot.-Ausgleich	13.12.97	Be								1 Bl
Zust.	Aenderung	Datum	Name	(Urspr.)			(Ers.f.):	4055A	(Ers.d.):		

## Terminal board BS-300

Occupation:

- Terminal 4-7, loop connection
- 4 0%
- 5 100%
- 6 Pipe
- 7 Pipe ( pipe sense )

For the occupation of the remaining terminals please refer to the technical manual BS-300-11



\*)

**Attention:**  
equipotential bonding between supply and return pipe to be provided by the client in accordance to IEC 64

Schutzvermerk nach DIN 34 beachten

				Datum	Name
				Bearb 07.10.99	Be
				Gepr.	
				Norm	
<b>BRANDES</b>					
Zust.	Aenderung	Datum	Name	(Urspr.)	(Ers.f.:

Connection of a monitoring device BS-300 for continuous monitoring of 2 pipes (e.g. flow and return with a total length of max. 1000m )

TH0245/E

Blatt 1

1 Bl

(Ers.f.:

(Ers.d.:

# Nordic System

BS-300

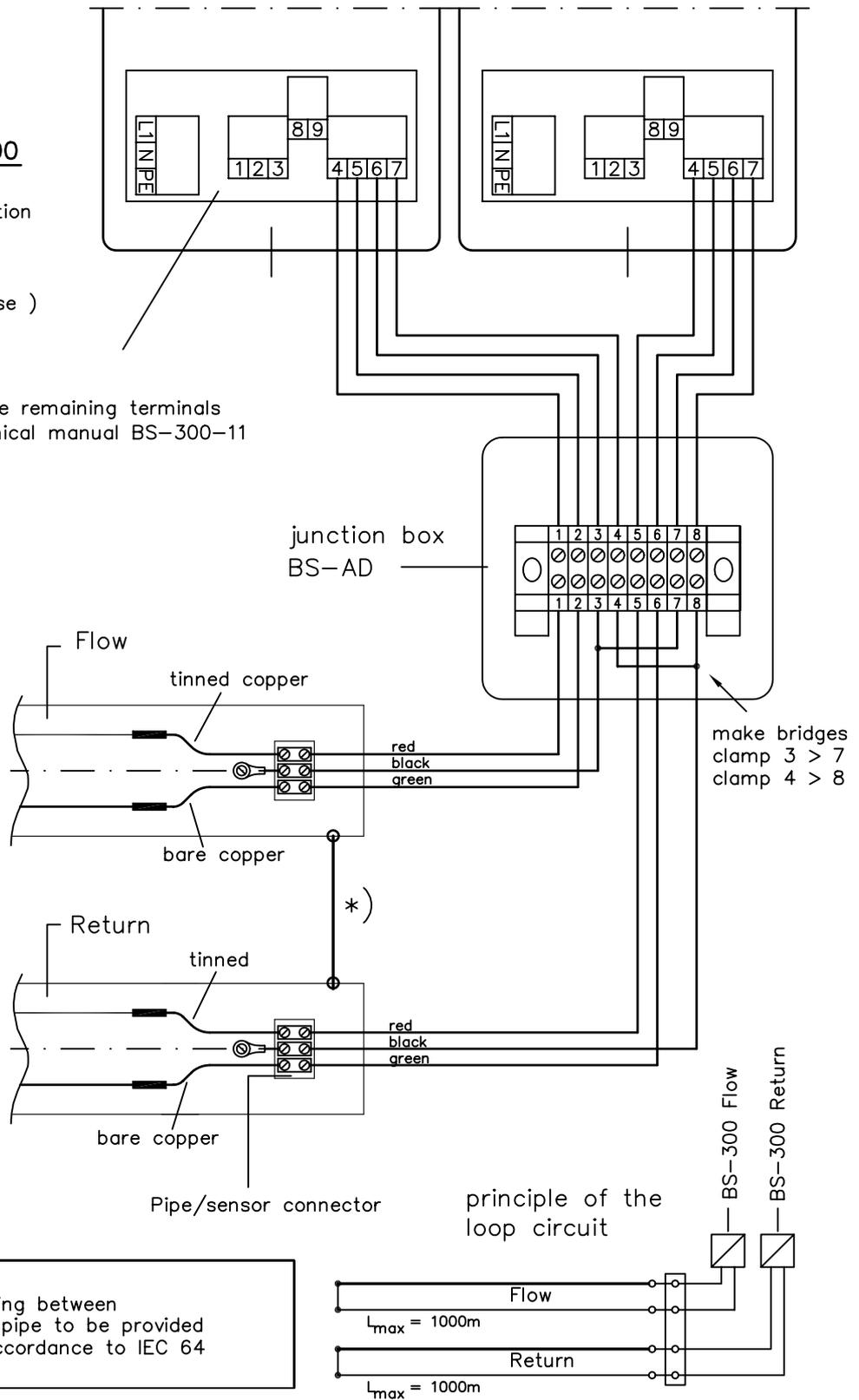
BS-300

**Terminal board BS-300**

Occupation:

- Terminal 4-7, loop connection
- 4 0%
- 5 100%
- 6 Pipe
- 7 Pipe ( pipe sense )

For the occupation of the remaining terminals please refer to the technical manual BS-300-11



\* )

**Attention:**  
equipotential bonding between supply and return pipe to be provided by the client in accordance to IEC 64

## Nordic System

Schutzvermerk nach DIN 34 beachten

			Datum	Name
			Bearb. 07.10.99	Be
			Gepr.	
			Norm	
<b>BRANDES</b>				
Zust.	Aenderung	Datum	Name	(Urspr.)

Connection of a monitoring device BS-300 for continuous monitoring of 1 pipe (e.g. one flow pipe or return pipe with a maximum length of 1000m each)

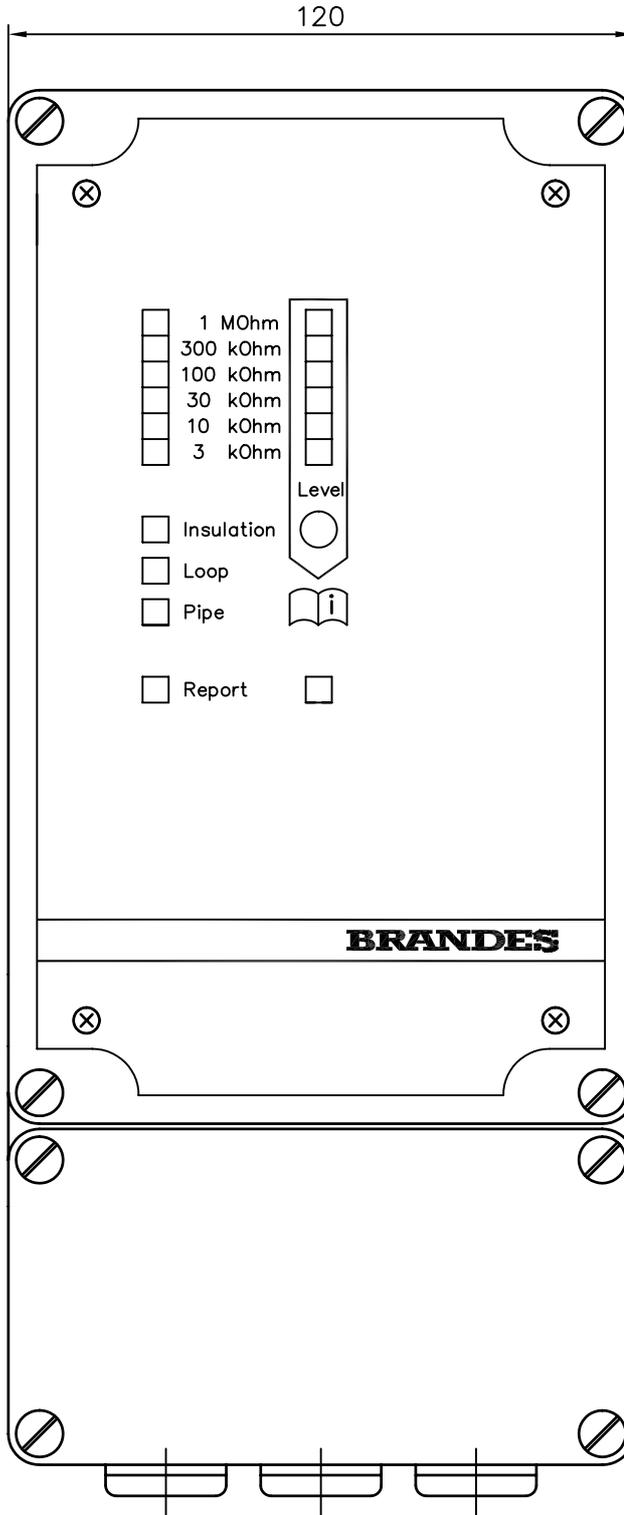
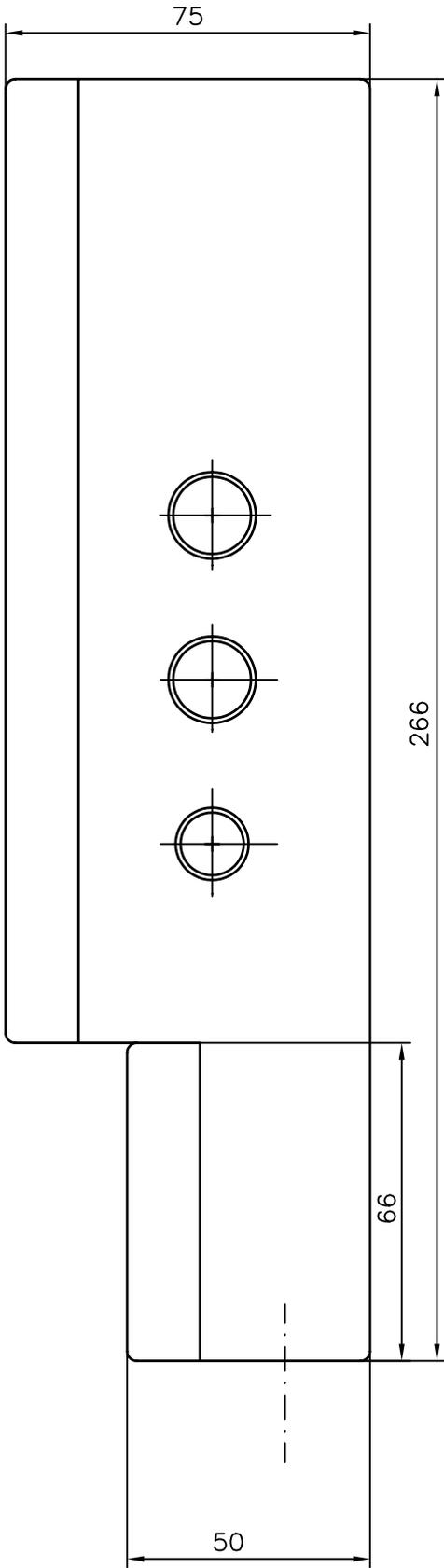
TH0246/E

Blatt 1

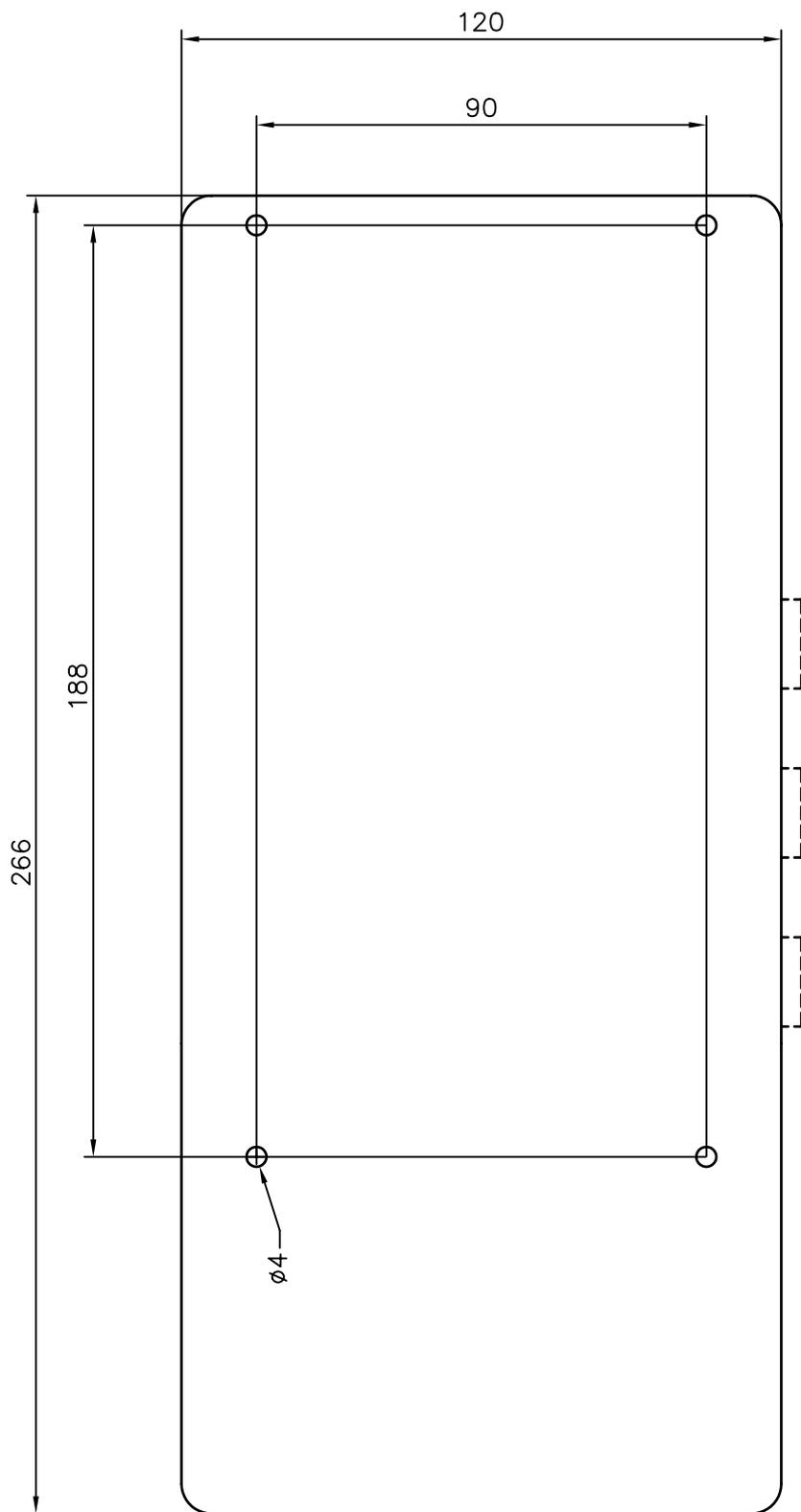
1 Bl

(Ers.f.:

(Ers.d.):



(Verwendungsbereich)		Maßstab	1:1	(Gewicht)	1,1Kg
Maße ohne Toleranzangaben nach ISO 2768-m...		Oberfläche nach ISO 1302	Werkstoff:		
Datum		Mat.-Sach-Nr.:			
Bearb		(Benennung)			
Gepr.		Dimensional drawing			
Norm		monitoring device			
		BS-300-11			
		(Zeichnungsnummer)			
		MB 42 030 8011/E			
		Blatt 1			
		2 Bl			
		(Ers.f.):			
		(Ers.d.):			
Zust. Änderung		Datum			
A 42 030 8011 F 16.5.03 Be					



(Verwendungsbereich)	Maße ohne Toleranzangaben nach ISO 2768-m...	Oberfläche nach ISO 1302	Maßstab 1:1	(Gewicht)
			Werkstoff:	
			Mat.-Sach-Nr.:	
			(Benennung)	Dimensional drawing
				BS-300-11
				(Zeichnungsnummer)
				MB 42 030 8011/E
				Blatt 2
				2 Bl
				(Ers.f.:
				(Ers.d.:

<b><u>BRANDES</u></b>	<b>EG-Konformitätserklärung EU Conformity Declaration Déclaration de conformité CE</b>	<b><u>BRANDES</u></b>
<b>BS - 300</b>		

Für das folgend bezeichnete Erzeugnis  
*We hereby confirm that the following product*  
*Nous confirmons par la présente que le produit suivant*

**Gerätetyp: / Type of device: / Appareil:** BS - 300 - 01 bis 11  
**Sachnummer: / Numbers: / Numéro:** 42 030 8001 bis 8011

wird hiermit bestätigt, daß es den wesentlichen Schutzanforderungen gemäß den folgenden Bestimmungen entspricht:  
*meets the basic protection requirements in accordance with the following regulations:*  
*satisfait les exigences de protection essentielles conformément aux décrets suivants:*

EMV-Richtlinie / EMC guideline / Ligne directrice EMV (compatibilité électromagnétique) (89/336/EWG)  
 Niederspannungsrichtlinie / Low-voltage guideline / Ligne directrice basse tension (73/23/EWG)

Diese Erklärung gilt für alle Exemplare, die nach den gleichen Fertigungsunterlagen erstellt wurden.  
*The present declaration applies for all units which have been produced on the base of the same production documents.*  
*Cette déclaration est valable pour tout exemplaire qui a été construit selon la même documentation de production.*

Zur Prüfung der Konformität wurden folgende Normen herangezogen:  
*Following standards have been applied to check conformity:*  
*La conformité a été vérifiée sur la base des normes européennes suivantes:*

Sicherheitsprüfung: / Safety-check: / Essai de sécurité:

EN 61010-1 / A2 (1998)

EMV-Prüfung: / EMC-check: / Essai EMV (compatibilité électromagnétique):

EN 61000-6-2 (2002)  
 EN 61000-6-3 (2005)

Diese Erklärung wird verantwortlich für den Hersteller abgegeben durch den Geschäftsführer Bernd Brandes.  
*The present declaration is made for the manufacturer by the managing director Bernd Brandes.*  
*Le directeur gérant Bernd Brandes assume la responsabilité de cette déclaration pour le fabricant:*

BRANDES GmbH, Ohmstr. 1, D-23701 Eutin

Eutin, den 20.07.2005

