

# HYGROMATIK®

## Electrode Steam Humidifier Type DB4MP - DB90MP For use with tap water

### Operation and Maintenance Instruction

Part 1:	For the User (green)	18	Pages
Part 2:	For the Installer (yellow)	13	Pages
Part 3:	For the Plumber (blue)	3	Pages
Part 4:	For the Electrician (red)	7	Pages
Part 5:	Spare Parts List (white)	7	Pages



**Attention!** All work must be carried out by qualified personnel. All electrical installations and work on electrical components of this unit must be executed by a qualified electrician. Switch power off beforehand!

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# Service Life and Commissioning

All electrode boiler type humidifiers operate and are reliant upon the fact that water contains minerals and is therefore conductive.

- "Normal" tap water is ideal.
- but what is "NORMAL" tap water?

People of all areas believe their tap water to be "NORMAL".

Our table in section 1.1.1 headed "Operating Directions" indicates our idea of normal to be between 200 and 500  $\mu\text{S}/\text{cm}$  (Micro Siemens per Centimeter) at 15 °C.

Some areas, however, have levels well outside our conception of normal and if the internal electronics of any electrode humidifier are not set correctly, then poor overall performance can result, e.g. fast electrode wear or reduced steam output.

In the HYGROMATIK electrode humidifier the preset blow-down parameters can easily be adjusted to the precise requirements of a particular area by a small change within the programme.

In addition a plastic star can be inserted inbetween the electrodes to reduce the fast wear of the electrodes or you can install a super flush to prolonge the maintenance periods.

For this reason, we recommend that any unit fitted should be inspected and monitored early in their installed life, to ensure that the unit is set up correctly so the most efficient operation is obtained.

By contacting the Service Department of your HYGROMATIK dealer, the commissioning can be taken out of your hands. They can arrange for a site visit to test the water conductivity, advise on the particular settings required and set the unit to operate at the optimum level for the system installed.

## HYGROMATIK Electrode Steam Humidifier for use with tap water

Type DB4MP - DB90MP

### Operation and Maintenance Instruction

#### Part 1: For the User

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## 1.1 Introduction

Dear customer,

The HYGROMATIK steam humidifier is our answer to today's technical requirements. It satisfies them by means of its operational safety, its operational comfort and its economic efficiency.

**To be sure to expertly and efficiently run your HYGROMATIK steam humidifier, please read this Operation and Maintenance Instruction.**

Use the steam humidifier only in good and safe condition, paying attention to all notes in these instructions.

**If you still have questions...please turn to us:**

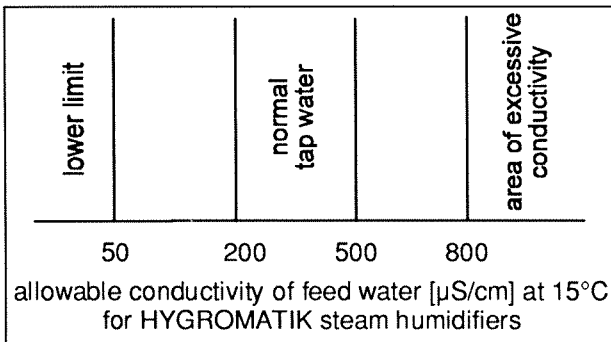
Main office, Germany (0049)	
Tel.:	(0)4193/895-0
Technical Hotline:	(0)4193/895-293
Fax.:	(0)4193/895-33

### 1.1.1 Operating Directions

The HYGROMATIK steam humidifier serves the steam production with normal tap water.

The DB-MP series of HYGROMATIK steam humidifiers includes 11 basic models with maximum generating capacities from 4 to 90 kg/h.

Be sure to use feed water with conductivity between 50 to 800  $\mu\text{S}/\text{cm}$



**Attention:** The HYGROMATIK steam humidifier produces steam at a temperature of 100°C. The steam is not to be used as a direct inhalant.

The correct use of the steam humidifier also includes adherence to our installation, dismantling, re-fitting, commissioning, operation and maintenance instruction as well as taking correct disposal steps.

Only qualified and authorised personnel may operate the unit. Persons transporting or working on the unit, must have read and understood the corresponding parts of the Operation and Maintenance Instruction and especially the chapter „Safety Notes“. Additionally, operating personnel must be informed of any possible dangers. You should place a copy of the Operation and Maintenance Instruction at the unit's operational location (or near the unit).

### 1.1.2 Typographic Distinctions

- Enumeration with preceding heading: General enumeration.
- » Enumeration with preceding double chevron: Work or maintenance steps that should or must be followed sequentially.
- Sequential step to be checked.

## 1.2 Safety Notes

### 1.2.1 General

By law we must state these safety notes. They serve to protect and prevent accidents.

#### Warning Notes and Safety Symbols

The following safety symbols shown in the text will warn about dangers and danger sources. Get familiar with these symbols.



**Attention:** Not observing this warning can lead to injury or danger to your life and/or damage to the unit.



**Attention, Voltage:** Dangerous electrical current. Not observing this warning can lead to injury or danger to your life.



**Note:** Materials/operational equipment; must be handled and/or disposed of according to the law.



**Note:** Further explanation or cross-references to other sections of the text in this Operation and Maintenance Instruction.

### 1.2.2 Operational Safety Notes

#### In General

Observe all safety and warning notices which you find about the unit.

If there should be malfunctions, shut down the unit immediately and secure against being restarted. Faults should be removed immediately. During repair work, guarantee operational safety of the unit by using qualified personnel.

Only use original HYGROMATIK spare-parts.

For the effective operation of this unit refer to any national regulations restricting or governing its use.

## Accident Prevention Regulations

Observe the accident prevention regulations:

UVV "Electrical installation and electrical equipment" (VBG 4) or equivalent national codes. In this way you can prevent injury to yourself or others.

## Operation of the Unit

Do not impair the safety of the unit.

Periodically check all protection and warning devices for proper functioning.

Safety equipment is not to be removed or put out of operation.

## Installation, Dismantling, Maintenance and Repair of the Unit.

Turn off power, when doing maintenance work or repairs to the unit.

Extensions to the unit or installation of additional equipment is only allowed after obtaining written approval from the manufacturer.



### Electrical Parts

Work on electrical parts must be carried out by qualified electricians.

Turn off the power and secure against restart when working on electrical parts.

Immediately turn the unit off when faults occur in the electrical energy supply.

Only use original type fuses of correct rating.

Check electrical equipment of the unit periodically.

Defects, like loose connections or burned cables must be removed immediately.

Test all installed protective devices after installation or repairs (e.g. grounding).

## 1.2.3 Disposal after Dismantling



**Note:** the operator is responsible for the component parts of the unit being disposed of according to the law.

## 1.3 Transport

### 1.3.1 General



**Note:** Carefully transport the steam humidifier, to prevent damage from careless loading and unloading and unnecessary force (refer to the section "Spare Parts and Storage").

### 1.3.2 Transport Size and Weight

Type	Height [cm]	Depth [cm]	Width [cm]	Weight [kg]
DB4/6/8	62	30	51	20
DB10/13/17	85	43	59	37
DB23/30	85	43	59	39
DB45	102	46	68	49
DB60	100	40	93	61
DB90	116	40	104	86



### 1.3.3 Packing

**Note:** Observe the pictograms displayed on the carton.

### 1.3.4 Interim Storage

During storage, keep the unit dry and protected from frost.

### 1.3.5 Check of Completeness and Correctness of Supply

Upon receipt of the unit, make sure that:

- type and serial number on the name plate correspond to the order and supply information,
- equipment is complete and in perfect condition.



**Note:** Immediately file a written claim with your shipping agent in case of transport damage or missing parts.

Following are typical conditions of notification to transport companies (national variations possible):

Transport Company	After Receipt of Goods
Post	24 hours at the latest
Rail	7 days at the latest
Lorry and railway companies	4 days at the latest
Parcel services	at once

## 1.4 Function and Installation

### 1.4.1 Function

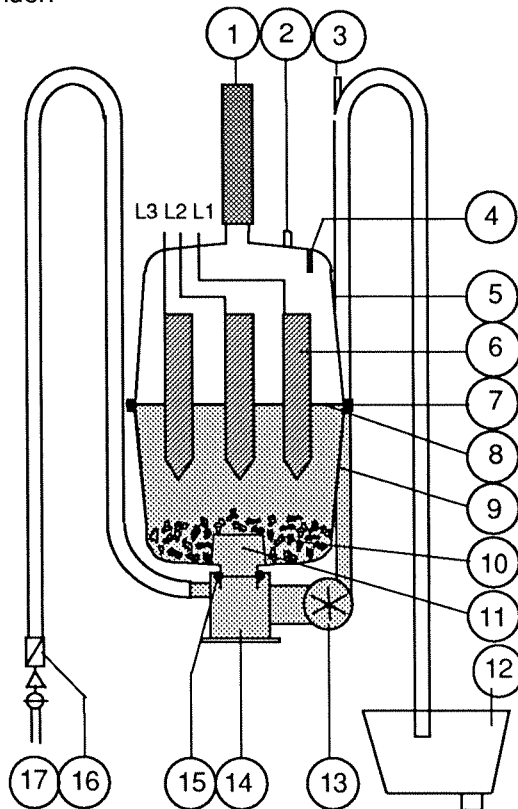
The fact that tap water normally has a certain amount of electrical conductivity is exploited to generate steam. Three or six electrodes in a closed cylinder are directly immersed in tap water and connected to an AC voltage.

As a result of the conductivity, current flows through the water between the electrodes. The electrical energy supplied to the water is converted directly into heat without loss.

The flow of current is a function of supply voltage, the immersed area of the electrodes, their spacing and the conductivity of the water. The steam output of the humidifier is a function of the power or current consumption. By changing the immersed area of the electrodes the current can be controlled.

At the same time the conductivity is held within a certain range (self-adaptive conductivity control) to achieve good continuous system controllability.

The steam generated has a temperature of about 100 °C and only a low gauge pressure ("non-pressurised steam"). It is demineralized and largely free from bacteria. The minerals remain in the cylinder.



### 1.4.2 Installation and Procedures

When the hygrostat or controller calls for humidity the main contactor is operated, the electrodes (6) are supplied with voltage. The solenoid valve (16) admits water into the steam cylinder (5+9).

The current begins to flow when the electrodes start to immerse. The control system de-energises the solenoid valve and interrupts the admission of water when the preselected amperage is reached.

After a short heating period the water between the electrodes begins to boil and steam. The steam generation lowers the water level (8) in the steam cylinder and hence the output will fall. Fresh water is therefore admitted into the steam cylinder from time to time by the inlet solenoid valve (16).

The current consumption of the humidifier is measured and monitored continuously. When starting from cold, under certain circumstances the current may rise to 128% of its rated value at maximum output as a result of the increase in conductivity of the heated water. At this point the electronic overcurrent limiting device cuts in, causing some of the water in the cylinder to be drained. This reduces the immersed area of the electrodes and hence the current consumption.

In the course of time the concentration of salts increases and leads to an increase in the electrical conductivity of the water. The service life of the electrodes is thereby drastically shortened. A reliable periodic blow-down of some of the concentrated water is therefore very important. This process is controlled to keep the conductivity of the water in the cylinder approximately constant.

Position	Description
1	Steam hose
2	Condensate return
3	Vacuum breaker
4	Sensor electrode for max. limit
5	Top part of steam cylinder
6	Electrodes
7	Cylinder flange and O-ring
8	Water level
9	Lower part of steam cylinder
10	Deposited scale
11	Strainer
12	Tundish
13	Blow-down pump
14	Cylinder base
15	O-ring
16	Water inlet solenoid valve
17	Water inlet

HYGROMATIK uses a heavy duty waste water pump (13) for blowing down. The proper function of the pump is monitored continuously during operation. The humidifier switches off in the event of a fault, as it could be damaged if the conductivity of the water were allowed to increase further.

The blow-down loss rate for water with normal quality lies between 7 and 15% of the humidification output. About 1 to 7 litres of hot water is discharged within a short time during each blow-down cycle.

Depending on the quality of the water the steam cylinder will be drained completely every 3 to 8 days.

Scale (10) collects in the space below the electrodes and is removed when the unit is maintained. Some of the smaller pieces, granular material and sludge are removed by the blow-down pump.


A sensor electrode (4) supervises the maximum level of water in the cylinder. If the cylinder is filled to the max. level electrode, filling is interrupted.

This situation may arise when the conductivity of the water is low or the electrodes are worn. However, in the former case the situation generally only lasts for a short time, as the built-in control system in conjunction with the large-area electrodes ensures that the output increases rapidly.

The steam cylinder (5+9) is provided with a flange (7) and clamps. The cylinder can therefore easily be opened in order to remove scale and sludge that have accumulated, and to replace the electrodes if necessary. The sealing between the cylinder and the cylinder base (14) as well as between the top and lower part of the cylinder is made with O-rings.

### 1.4.3 MP Controls

The MP control is equipped with an integrated PI software controller. The controller uses an active humidity sensor and it may be used for dehumidification purposes via the RO-card.

 **The function of the software controller must be activated by the factory or the authorised service personnel.**

MP Controls
1step control
Proportional control with external controller*
Proportional control with integrated controller

\* DB-MP incorporates adapters for different control signals.

Control Signals for Proportional Control	
0(2) - 10 V DC	
Single cylinder units	min. 10 mA
Double cylinder units:	min. 20 mA
0(4) - 20 V DC	
Single cylinder units:	min. 20 mA
Double cylinder units:	min. 40 mA
0(2) - 10 mA DC	
Single cylinder units	min. 10 V
Double cylinder units:	min. 20 V
0(4) - 20 mA DC	
Single cylinder units	min. 20 V
Double cylinder units:	min. 40 V
0 - 140 Ohm (min. 1 mA / 0,1 V)	
0 - 20 V DC (Phase angle control, Staefa)	

The usable signal range is set at the factory to be a minimum of 20% with 5% hysteresis for restarting, but can be altered by the factory for special control functions.

At the minimum permissible control signal the output of the humidifier is still 10% of the limited maximum capacity. The humidifier switches off if the control signal drops below this level.

When the minimum control signal plus hysteresis is reached the humidifier switches on again.

Control characteristics:

Increase in demand - immediate following of output  
Slight decrease in demand - steaming down  
Sudden drop in demand - partial drain, steaming down of remaining water.

The actual output of each cylinder may be limited to between 10 and 100% of its rated output.

For doublecylinder units the cylinders are operated in parallel.

For sequential control the cylinders can be operated separately using optional equipment.

## 1.5 Technical Data

Technical Data Steam Humidifier DB4MP - DB90MP												
Type	DB4	DB6	DB8	DB10	DB13	DB17	DB23	DB30	DB45	DB60	DB90	
Steam output [kg/h]	4	6	8	10	13	17	23	30	45	60	90	
Electr. supply	400V/3/N 50,60Hz*											
Electr. power [kW]	3	4,5	6	7,5	9,8	12,8	17,3	22,5	33,8	2x22,5	2x33,8	
Current [A]	4,4	6,5	8,7	10,8	14,1	18,4	24,9	32,5	48,8	2x32,5	2x48,8	
Fuse [A]	3x6	3x10	3x16	3x16	3x20	3x25	3x35	3x35	3x63	6x35	6x63	
Control	MP2											
Control voltage	230V											
Steam hose	1x25 mm						1x40		2x40		4x40	
Condensate hose	1x12 mm						1x12		2x12		4x12	
Empty weight [kg]	14	14	14	29	29	29	30	30	41	51	70	
Oper. weight [kg]	17	17	17	47	47	47	57	57	88	105	164	
Height [mm]	585	585	585	815	815	815	815	815	915	815	915	
Width [mm]	453	453	453	530	530	530	530	530	612	923	1087	
Depth [mm]	210	210	210	315	315	315	315	315	377	315	377	
Water supply	1 to 10 bar incl. fastener for 10 mm pipe											
Fan unit, integral	DVA 08	DVA 08	DVA 08	DVA 17	DVA 17	DVA 17	DVA 30	DVA 30	-	-	-	
Fan unit, wallmounted	DVW 08	DVW 08	DVW 08	DVW 17	DVW 17	DVW 17	DVW 30	DVW 30	2xDVW 30	2xDVW 30	3xDVW 30	
Air circulation, fan [m³/h]	160	160	160	185	185	185	350	350	350	350	350	

\* Other Voltages upon request.

## 1.6 Commissioning



**Attention:** This unit should only be serviced by qualified personnel.

### Switch Off Steam Humidifier

Before the unit is put into operation, it must be clear how it should be switched off.

- » Switch off the control switch on the unit door.
- » Close the water feed shut-off valve.

### Switch On Steam Humidifier

- » Open the water feed shut-off valve.
- » Turn on the control switch on the door.

Then the following functions are taking place :

- The LED indicating humidification lights up.
- The steam humidifier runs the pump for a few seconds. The purpose of this is to check that the system is operating properly and to replace some of the water when restarting.

- The solenoid inlet valve opens and admits water into the cylinder.
- As soon as the electrodes start to become immersed, the current begins to rise from 0 to its rating (as marked on the name plate; the steam output limit is set to 100% in the factory).
- Filling is interrupted as soon as the rated current is reached.
- The rise in temperature causes the electrical conductivity of the water to increase and the current to rise above its rated value. This may lead to the pump draining some of the water in response to the overcurrent. With water of normal conductivity steam production begins within a few minutes.

### Further Checking

Once the solenoid valve starts replenishing the water periodically the steam humidifier operates at constant rated output and the cold start sequence is complete.

- » Observe the steam humidifier and if electrode bushings are leaking after 15 to 30 minutes of operation, turn the unit off.





**Attention:** Observe safety regulations governing work carried out with live components!

» Stop the leaking by adjusting the electrode nuts.

## 1.7 Operation



**Attention:** This unit should only be serviced by qualified personnel.

Put the unit into operation doing the following:

- » Turn on water supply
- » Switch on the control switch in the door of the steam humidifier.

Now the unit proceeds as mentioned under "1.6 Commissioning".

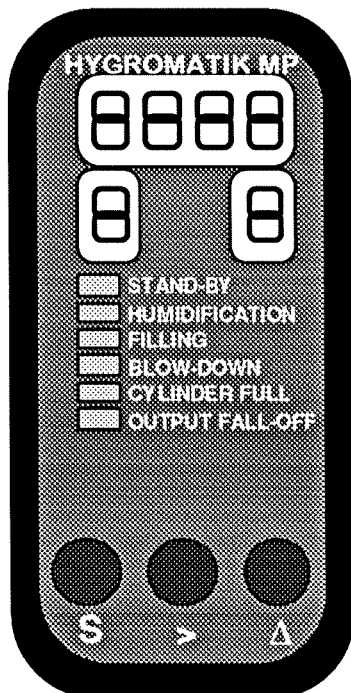
## 1.8 MP-Control

The display and control unit in the door of the electrical compartment allow local communication with the humidifier.

DB60MP and DB90MP:

Because each steam cylinder is operated by a separate control system all the controls and indicators are present in duplicated, whereby the upper display is for the right cylinder and the lower for the left.

### 1.8.1 The MP-Display



The MP-Display

The display uses modern light emitting diodes, which may be read even under adverse light conditions.

On the display and control unit several status reports are displayed by LED (see picture). Some of these reports may also be transmitted via the RO relays option or via the RS232C serial interface.

The RO card can easily be installed at a later date in the humidifier. It allows four signals relating to the state of the humidifier to be relayed via floating contacts with a load capacity of up to 250 V/5A. Relays 1 and 2 have fixed functions (R1=Stand-by, R2=Collective fault) whereas relays 3 and 4 can be assigned as required by setting parameters.

Cylinder full signals are reported in several ways. On the one hand the momentary situation is shown without delay on the display as well as in the form of a signal via the RO card. On the other hand "Cylinder full" is reported as "Output fall-off" with a delay of about 10 minutes. The purpose of this is to ignore short-term high levels and to indicate when servicing may be needed due to accumulation of scale in the cylinder or worn electrodes.

Under normal conditions the momentary steam output is displayed continuously. Other displays and functions can be called by pressing the keys "S", ">" and "Δ".

### 1.8.2 Service Reports

The system monitors operation of both the blow-down pump and the solenoid valve. If blow-down does not occur, or if the solenoid valve remains open continuously for longer than 30 minutes, the humidifier switches off and the fault is shown on the display.

Service Reports	
F1	Blow-down fault
F4	Solenoid valve continuously opened
F9	Internal system fault

### 1.8.3 Reading Level

By pressing the key "S" the display will progress to the next higher reading value.

The keys ">" and "Δ" are without function.

After L7, or L9 with activated software controller, L1 reappears.

Reading Level	
L1	Steam per hour [kg/h]
L2	Mom. current [A]
L3	Internal setpoint [%max. output]
L4	External control signal [%]
L5	Output limitation [%max. output]
L6	Total steam produced [t]
L7	Service interval expired [%]
L8*	Setpoint rel. humidity [%]
L9*	Actual rel. humidity [%r.H]

\* only if software controller is activated

## 1.8.4 Electronic Name Plate

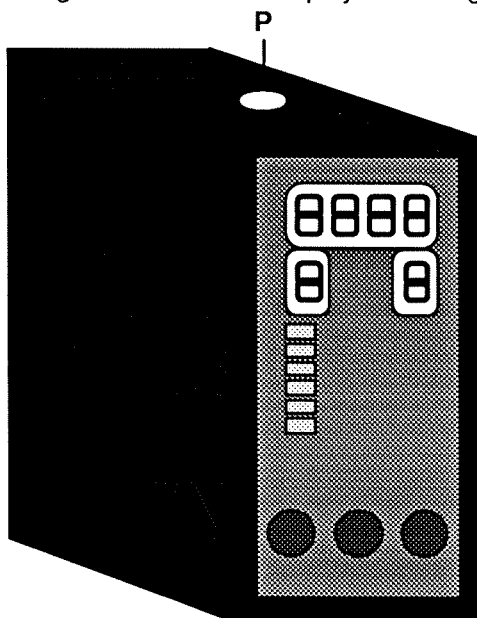
By pressing "S" and ">" simultaneously, 7 different informative statements may be displayed by the unit.

Key "S" switches to the next higher. The information level may be left by pressing both "S" and ">".

Electronic Name Plate	
I1	Number of cylinder
I2	Model
I3	Nominal voltage
I4	Number of phases
I5	Year of production
I6	Serial number
I7	Network address

## 1.8.5 Programming without Code

Upon pressing the switch "P" on the upper side of the box the electronic switches to the programming mode. The parameter "P0" is displayed and the first digit of the decimal display is blinking.



The key ">" shifts the blinking position to the right.

By repeatedly pressing "Δ" the value of this digit may be increased.

The key "S" programmes the new value and switches to the next parameter.

The next parameter level may be obtained by simultaneously pressing "S" and ">".

To leave the programming mode keys "S" and ">" are to be pressed repeatedly.

The following parameters can be changed without access code.

Parameter	Description
P0	Code input for restricted access
P1	Output limitation [%]
P8 *	Setpoint rel. humidity [%r.H]
P9 *	Setpoint rel. humidity for dehumidifier [%r.H]

\* only if software controller is activated.

**Example:** The setpoint for the relative humidity should be changed from 50% r.H. to 70 %r.H.



**Attention:** The software controller must be activated.

- » Switch on the humidifier by the control switch. (Display lights up).
  - » Press the switch "P" on the upper side of the control box. The electronic switches to the programming mode. The parameter "P0" is displayed and the first digit of the decimal display is blinking.
  - » Go to the desired parameter by pressing "S". (As the setpoint for the rel. humidity has to be changed, "P8" should appear in the display).
  - » Press the key ">" twice. The second digit to the right will now be blinking.
  - » Press the key "Δ" until "70" appears.
  - » Confirm the new programmed parameter with the key "S".
- Now the setpoint for the rel. humidity has been programmed to 70 %r.H.
- Change the value of other parameters as shown above.
- » Exit the level by pressing the keys "S" and ">" simultaneously.

## 1.8.6 Programming with Code

The MP control system is equipped with a modern microcomputer chip, whose external, programmable, non-volatile data memory basically allows operating parameters to be adapted and changed. However, in the interest of safety and depending on the requirements they can only be accessed by entering a code number into the parameter "P0".

**The code must only be used by authorised persons.**

The access to the following parameters is protected by the code P0=10.

Parameter	Designation
P2	Amount of steam service interval [t]
P3	Reset sum of steam service interval [t]
E1*	Gain PI-controller
E2*	Integration PI-controller [min]
E3	External control signal 1=0(2)-10V DC 2=0(4)-20V DC 3=0(2)-10mA DC 4=0(4)-20mA DC 5=0 - 140 Ohm 6=0-20V phase-angle (Staefa)
E4	Calibration signal input [-15 - +15%]
E5	Function 3rd relay of RO 0=Fault data transfer 1=Cylinder full 2=Output fall-off 3=Blow-down fault 4=Service interval expired 5=Solenoid valve continuously open 6=Stand-by 7=Set point exceeded* 8=(not used) 9=Internal system fault
E6	Function 4th relay of RO (as E5)
E7	Baud rate data transfer RS232C 0=9600 1=4800 2=2400 3=1200 4=600 5=300 6=150 7=75
E8*	Crossover hysteresis for dehumidifier set point [-1 - +15%]
E9*	Offset of the PI controller [10 - 100%]

\* only if software controller is activated.

**Example:** The external control signal should be changed from 0-10V to 4-20mA.



**Attention:** The example cannot be carried out if the integrated software controller is activated.

- » Switch on the humidifier by the control switch. (The display lights up).
- » Press the switch "P" on the upper side of the control box.  
The electronic switches to the programming mode. The parameter "P0" is displayed and the first digit of the decimal display is blinking.

Enter the access code.

- » Press the key ">" twice. The second digit to the right will now be blinking.
- » Press the key "Δ" until "10" (access code) appears.
- » Press the keys "S" and ">" simultaneously to get into the parameter level (E1-E9). Parameter "E1" appears.
- » Go to the desired parameter by pressing "S". (As the control signal has to be changed, "E3" should appear in the display).
- » Press the key ">" three times. The first digit to the right blinks.
- » Press the key "Δ" until "4" appears.
- » Confirm the new programmed parameter with the key "S".

Now the humidifier is programmed for an external control signal of 4-20mA.

Change the value of other parameters as shown above.

- » Exit the level by pressing the keys "S" and ">" simultaneously.

## 1.9 Data Transfer via RS232C

The MP control incorporates a standard RS232C serial interface with SubD9 socket for the transmission of all status reports and operational values.

- By this interface all parameters may be put in and modified.
- The unit may remotely be switched on and off.

Build-in socket	SubD9
Pins	2 TxD 3 RxD 5 Gnd

### 1.9.1 System Connection in Data Ring

- TxD is to be connected to the next RxD.
- The last unit in the system will again be connected to the first (the data terminal).
- Double cylinder units count as two units.
- The maximum number of addresses in the system is 10 (0-9).
- The data terminal is given address number 0.

### 1.9.2 RS232C Settings

1 Start bit, 8 Data bits, 1 Stop bit, no handshake.

The ASCII standard code (7 bit) is used.

Each telegram transmitted by the terminal is immediately transmitted on by the receiving MP. Only telegrams having the correct syntax are actually processed.

The telegram uses the following form, whereby the individual elements are joined without blanks in-between.

Parameters in commands always use two digits, parameter values 4 digits without decimal point but with leading zeroes and possibly a signum:

Address 1-digit  
ASCII 40H  
Command  
CR

### 1.9.3 Commands

ID: Identifying the MP  
Answer: MP type

RD: Reading parameter values  
Answer: Parameter and value

MO<Parameter><Value>:

Answer: Modifying a parameter value  
Parameter and value after execution

ST: Reading of active status reports  
Answer: F1 Blow-down fault  
F4 Solenoid valve cont. opened  
CF Output fall-off  
OP Humidification  
LC Local service operation  
SV Service interval exceeded  
SB Stand-by

ON: Remote switching on of MP  
Answer: ON

OF: Remote switching off of MP  
Answer: OF



**Note:**

Remote switching of the MP can only be done, when the local control switch of the unit has been engaged. A unit remotely switched off can be switched on locally for service reasons by simultaneously pressing the key "P" on the top of the box as well as the keys "S" and ">".

To return to the original state switch the local control switch off, wait for 5 seconds and switch on again.

### 1.9.4 Examples

@ = ASCII 40H

Example	Command Main computer	Answer MP
a) Identifying:	0@ID	0:MP2 Rev. 0/18
b) Read a parameter :	0@RDP1	0:P1=0100
c) Change a parameter:	0@MOP160 (wrong!)  0@MOP10060	0:0@mop16?  0:P1=0060
d) Remote switching on:	0@ON	
Answer:	0@ST	0:OP
e) Remote switching off:	0@OF	
Answer:	0@ST	0:SB

## 1.10 Faults



Immediately switch off the steam humidifier if a fault occurs. Faults are only to be remedied by qualified personnel following the proper safety instructions.

Fault	Causes	Remedies
Output fall-off, Cylinder full	<ul style="list-style-type: none"> <li>• The cylinder is filled up to the maximum water level electrode without the rated current or rated steam output being reached. This may happen when starting from cold, when restarting after a full blow-down and when the water conductivity is low or subject to considerable fluctuation.</li> <li>• The cylinder is full of scale, which limits the active immersion depth of the electrodes.</li> <li>• The electrodes are worn</li> <li>• One phase is missing (external safety fuse is defect)</li> <li>• Phase L3 has not been passed through the current transducer on the pcb</li> </ul>	<p>As a result of continuing vaporisation gradually increasing the water conductivity, the signal is cancelled after a prolonged operating period and the rated output is restored automatically.</p> <p>Clean the cylinder</p> <p>Replace the electrodes</p> <p>Replace the safety fuses</p> <p>Pass the phase L3 through the current transducer</p>
Blow-down fault (Fault F1)	<ul style="list-style-type: none"> <li>• Blow-down pump is blocked by scale preventing operation</li> <li>• Blow-down pump not receiving electrical power</li> </ul>	<p>Clean the blow-down pump</p> <p>Check cable connections. Check whether relay on the pcb operates (clicks).</p>
Solenoid valve continuously open (Fault F4)	<ul style="list-style-type: none"> <li>• The solenoid valve is blocked. (continuously open)</li> <li>• Periodically there is water being drained from the outlet (pump is not operating)</li> </ul>	<p>Clean or exchange the solenoid valve.</p> <p>There is a blockage in the steam hose. See chapter 2.6</p>
Internal system fault (Fault F9)	<ul style="list-style-type: none"> <li>• Transient voltage peaks may hinder programme execution by sensitive microcomputers or even destroy electronic components. The power supply of the main printed circuit board is therefore specially filtered, and an additional electronic "watchdog" normally ensures that the humidifier restarts automatically in the event of the programme crashing. However the watchdog itself can also be put out of action.</li> </ul>	<p>Check the wiring, particularly for the controller signal and the safety interlock system.</p> <p>Investigate external sources of interference.</p> <p>No other loads are allowed to be connected to the supply transformer for the main pcb.</p> <p>Switch the control switch off and after a short delay on again.</p> <p>Eventually change the main pcb.</p>

Fault	Causes	Remedies
No steam production (Display shows "Stand-by" but not "Humidification")	<ul style="list-style-type: none"> <li>• If the humidity exceeds the value set on the hygrostat or controller there is no demand for steam.</li> <li>• If a proportional controller is fitted the humidifier cannot start if there is a mismatch of set and actual controller signal.</li> <li>• The safety interlock system has been triggered</li> <li>• If a proportional controller is fitted, but there is no safety system, the absence of a bridge between terminals 1 and 2 prevents the humidifier starting</li> <li>• The humidifier is remotely switched off</li> </ul>	<p>Check the setting and if necessary operation of the sensor and controller.</p> <p>Check setting and Parameter "E3".</p> <p>Look for failing function and remedy</p> <p>Insert a bridge between the terminals 1 and 2 on the terminal block.</p>
Humidity level too low	<ul style="list-style-type: none"> <li>• The steam output limiting function of the unit is preventing full output being obtained.</li> <li>• Despite full output being attained the humidity cannot be achieved due to incorrect output design parameters.</li> <li>• If one phase is missing the desired output is reduced.</li> <li>• A long steam hose passing through cold and drafty rooms can lead to increased condensation levels.</li> <li>• Incorrect installation of steam distributors can lead to condensation in the air duct.</li> <li>• A control signal mismatch leads to incorrect and possibly low steam outputs</li> </ul>	<p>Check the output limitation "P1".</p> <p>Check steam output data</p> <p>Check if one phase is missing.</p> <p>Reposition humidifier, insulate hose.</p> <p>Check system layout and installation.</p> <p>Check the control signal and parameter "E3".</p>
Humidity level too high	<ul style="list-style-type: none"> <li>• Steam output limitation set too high can lead to poor control characteristics and even cause condensation in ducts.</li> <li>• Controller parameters set incorrectly can lead to poor control characteristics and even cause condensation in ducts</li> </ul>	<p>Check the output limitation</p> <p>Check the control signal and parameter "E3"</p>
The blow-down pump is operating but no water is being drained	<ul style="list-style-type: none"> <li>• The cylinder outlet is blocked</li> </ul>	<p>Clean the cylinder outlet</p>

Fault	Causes	Remedies
Water collecting on base plate of the steam humidifier	<ul style="list-style-type: none"> <li>• The cylinder was reassembled incorrectly after maintenance:               <ul style="list-style-type: none"> <li>- O-ring seal damaged or not replaced.</li> <li>- The flange itself is damaged.</li> <li>- Scale have collected in the flange.</li> <li>- The flange is clamped with insufficient or unevenly spaced clamps.</li> </ul> </li> <li>• The cylinder is incorrectly inserted into the base.</li> </ul>	<p>Look for the faults and eliminate</p> <p>Insert the cylinder correctly with a new O-ring in the cylinder base.</p>
Water leaks from the top part of the cylinder	<ul style="list-style-type: none"> <li>• The hose clamps for the steam and condensate hose are not tightened</li> <li>• The electrodes are improperly secured.</li> <li>• Main contactor doesn't operate (no "Cylinder full" signal)</li> </ul>	<p>Tighten clamps</p> <p>Tighten the hand nuts.</p> <p>Replace the main contactor</p>
Function of unit is disturbed.	<ul style="list-style-type: none"> <li>• External sources of electrical interference.</li> </ul>	<p>Turn off the control switch and after a short time turn the unit on again.</p>
Restart after a short operating period	<ul style="list-style-type: none"> <li>• Display indicates a restart, as when the humidifier is switched on, and then goes blank again, then repeats</li> </ul>	<p>The electronic watchdog tries to restart in the event of program errors. See "internal system fault, F9"</p>
No steam from steam distributor	<ul style="list-style-type: none"> <li>• Periodically there is water being drained from the outlet (pump is not operating)</li> </ul>	<p>There is a blockage in the steam hose. See chapter 2.6</p>
Water leaking from tundish	<ul style="list-style-type: none"> <li>• Tundish is improperly installed or gasket or flange is damaged.</li> </ul>	<p>Reinstall or replace making sure tundish is properly seated into rear support.</p>

## 1.11 Maintenance

The HYGROMATIK steam humidifier is to a great extent maintenance free. Nevertheless, operational faults can occur, which have to do with insufficient or improper maintenance. With proper maintenance the unit will operate longer so regular maintenance is essential.



**Attention:** Observe upon maintenance:

- Only qualified and informed personnel should work on the unit.
- Pay attention to safety regulations.
- Take unit out of operation for maintenance work and secure against restarting.
- After maintenance work the unit should be re-checked by qualified personnel for operational safety.

The operating characteristics and maintenance intervals of the steam humidifier are mainly dependent on the existing water quality (total hardness, conductivity) and the amount of steam generated since the last maintenance. Different qualities can lengthen or shorten the period. The residues found in the steam cylinder provide an indication of future maintenance intervals. The latest point in time at which a cylinder may be cleaned is:

- After a lengthy period of operation indicated by the signal "output fall-off",
- Or by the "delayed cylinder full report" on the RO, if fitted.

### 1.11.1 Maintenance Work

According to what kind of water is used the deposition and crystallisation of hardness constituents is quite individual, even if there is no difference in conductivity or hardness.

Any information concerning life time as well as cleaning and maintenance periods of the electrodes is only based on typical data found empirically.

Cycle	Maintenance Work
<b>4 weeks after commissioning</b> (with normal water quality)	Visual inspection of the electrical and mechanical components, cables, connections, etc.  Removal of scales from the cylinder, water outlet hose and drain pump  Inspection of the electrodes
<b>6 months</b> (with normal water quality),	Visual inspection of the electrical and mechanical components, cables, connections, etc.  Removal of scales from the cylinder, water outlet hose and drain pump  Inspection of the electrodes

In most cases the levels of conductivity suggested under 1.1.1 "Operation directions" can be considered as typical; although for unit control it may be necessary to adapt the parameters individually in a few cases.

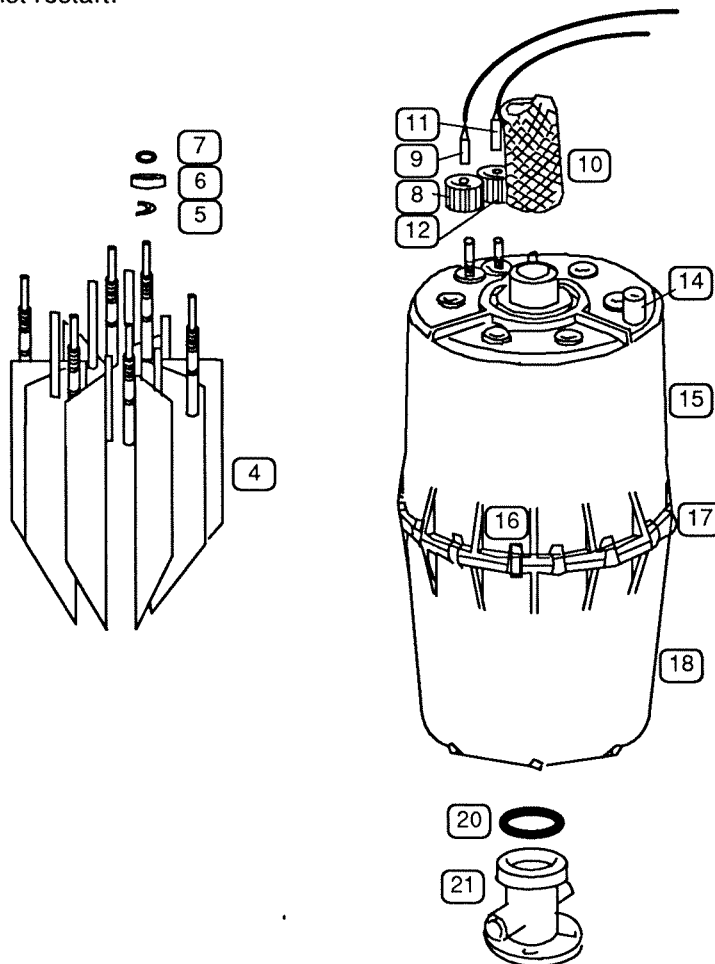
Only in rare cases does water need pre-treatment (softening followed by blending to approx. 4 - 8 °dH, partial demineralisation to avoid unsuitable hardness). If asked for, HYGROMATIK will provide the address of companies specialised on water treatment.



## 1.11.2 Cleaning the Steam Cylinder

### Disassembly

- » Switch on the unit by the control switch.
- » Press the keys "S", ">" and "Δ" simultaneously on the display. The cylinder is being drained by the blow-down pump.
- » Disconnect the steam humidifier from the power supply. Control switch OFF and remove safety fuse F1. Secure against restart.




- » Unplug the electrodes (9).
- » Unplug the sensor electrode (11).
- » Disconnect steam (10) and condensate (14) hoses.
- » Lift steam cylinder (15+18) out of the base (21) and the side supports and remove from humidifier.
- » Release its flange clamps (16) and open the cylinder.

### Cleaning



**Note:** When cleaning do not use acids or other chemicals!


- » Remove all scale and sludge from cylinder.
- » Mechanically remove the deposit from the heating electrodes (4) by knocking them (small amounts that remain are acceptable).
- » Inspect the inside of the top part of the cylinder for furring and any electrical bridging (black grooves) between the electrodes and their busings and remove completely by washing.

 **Note:** The top part must be replaced if electrical bridges have penetrated deeply into the material.

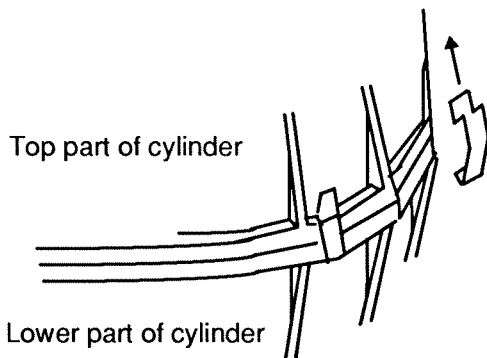
- » Clean cylinder strainer.
- » Restore the surface of the level electrode in the top part of the cylinder to bright metal condition.

## Reassembly


- » Replace the flange O-ring (16) with original HYGROMATIK solvent-free O-ring.

 **Note:** When joining the cylinder the upper and lower parts must fit firmly on top of one another.

- » Connect upper and lower parts with clamps.



- » Remove the O-ring (20) from the cylinder.
- » Insert a new solvent-free HYGROMATIK O-ring (20) into the cylinder base.
- » Refit the cylinder into the steam humidifier (the condensate connection must be in front, and slightly to the left).
- » Connect the plug (11) to the sensor electrode.
- » Connect the plugs (9) to the electrodes.

 **Note:** Connect the electrode plugs with the matching electrodes. Pay attention to the coloured hand nuts!

- » Push in the safety fuse F1.

Switch on the unit and operate for 15 to 30 minutes. Check for any leaks.

### 1.11.3 Uneven Electrode Wear

Replace badly worn electrodes completely. Check main fuses! If a main fuse has blown the corresponding electrode will not be supplied with power and hence will not wear.

The wear of the electrodes is dependent on:


- The feed water quality and
- the generated amount of steam.

The latest point in time at which the electrodes must be changed is indicated by the LED "output fall-off" coming on and the rated current not being reached even after cleaning and a prolonged period of operation. As a guide they must still be a third to one half their original length.

The original length of HYGROMATIK stainless steel large-area electrodes is as follows:

Type	DB4-8	DB10-30, 60	DB45, 90
Length [mm]	155	235	300


### 1.11.4 Replacing Electrodes

 **Note:**

- if the electrodes must frequently be exchanged or
- black sludge collects in the cylinder or
- there is arcing in the cylinder

this indicates, that the conductivity of the water is too high, or the cylinder is not being drained frequently enough. In this case please turn to HYGROMATIK for advice.

- » Disassemble the cylinder and open, as written in chapter "Maintenance, Cleaning the Steam Cylinder".
- » Loosen the hand nuts (8) and take out the old electrodes (4).
- » Insert the new electrodes and fasten the hand nuts (**by hand only**).
- » Replace flange O-ring (16) and
- » Base O-ring (20) with solvent-free HYGROMATIK parts.
- » Reassemble the steam cylinder and fit in the steam humidifier as described in chapter, "Maintenance, Cleaning the Steam Cylinder".
- » Connect the plugs (9) to the electrodes.

 **Note:** Connect the electrode plugs with the matching electrodes. Pay attention to the coloured hand nuts!

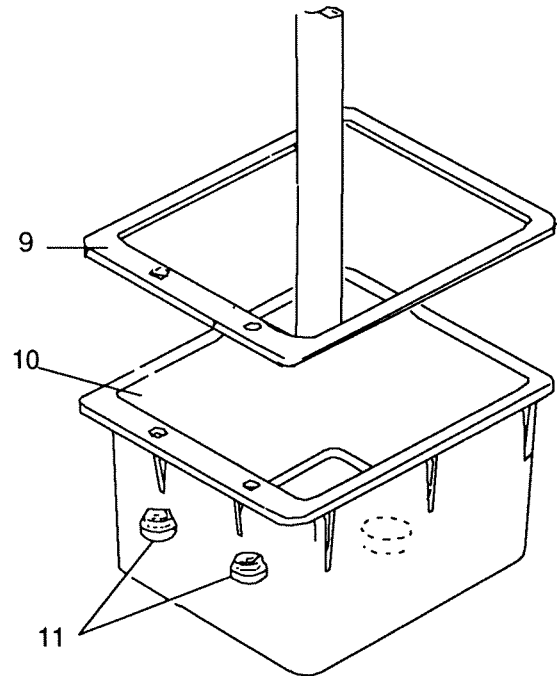
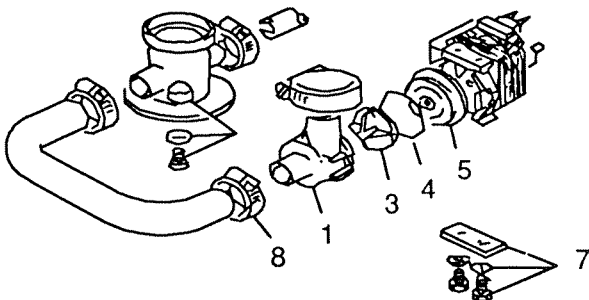
- » Connect the sensor electrode plug (11) to the sensor electrode. (Hand nut - grey)

- » Push in the safety fuse F1.
- » Switch on the unit and after 15-30 minutes of operation check for leaks.

If there is a leakage, switch off the power and observe safety regulations governing work carried out with live components.

## 1.11.5 Cleaning the Draining System and the Pump

- » Disassemble the cylinder, as described in chapter "Maintenance, Cleaning the Steam Cylinder".
- » Remove the electric cable from the pump.
- » Remove the screws (11). Disconnect tundish (10) and clean.
- » Disconnect the hoses from the pump.
- » Remove the screws (7) and the pump from the cylinder base.
- » Open the pump (bayonet joint).
- » Remove residues from discharge hoses and pump. Replace pump impeller (3), O-ring (4), shaft seal (5) or body (1) as necessary if any of these parts are no longer in perfect condition.
- » Reassemble the pump.
- » Insert the pump into the cylinder base and tighten with screws (7).
- » Connect the hoses to the pump.
- » Connect the electric cable to the pump.
- » Assemble the cylinder, as described in chapter "Maintenance, Cleaning the Steam Cylinder".
- » Insert the tundish (10), checking that the seal (9) is seated properly and replace if necessary.
- » Check for any leaks.



## 1.11.6 Cleaning the Solenoid Inlet Valve and Strainer

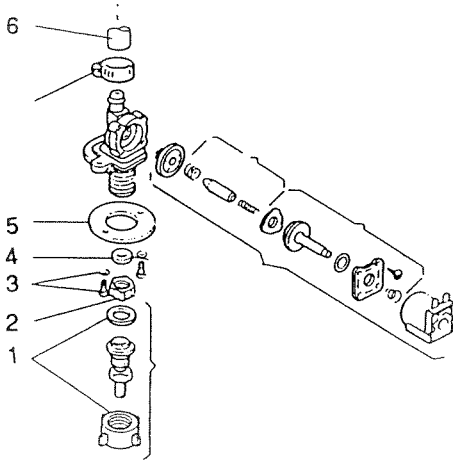
### Disassembly

- » Switch off the unit and pull out the safety fuse F1. Secure against restarting.
- » Turn off the water supply and turn loose the nut to the fresh water connection (1).
- » Disassemble the cylinder, as described in chapter "Service, Cleaning the Steam Cylinder".
- » Release the connecting hose (6) to the cylinder base.
- » Pull out the cable plugs.
- » Remove the fitting screws from the solenoid valve.
- » Remove the solenoid valve.
- » Remove strainer (2) in the supply and clean.
- » Take out the inlet limiter (4) with a pair of small pliers and clean.

### Assembly

- » Insert the inlet limiter (4) and strainer (2).
- » Connect the E-cable to the solenoid valve.
- » Insert the solenoid valve and seal into the unit.
- » Connect the connection hose (6) to the cylinder.
- » Firmly tighten the solenoid valve with the screws (3).

- » Connect the water supply (1).
- » Assemble the cylinder as described in chapter "Maintenance, Cleaning the Steam Cylinder".
- » Open the water supply.
- » Push in the safety fuse F1.
- » Check the water supply hose for leaks.
- » The unit can now be taken into operation again.



## 1.11.7 Cable Fitting, Electrode Cables

- » Check all fittings to be firmly seated.

Loose cable connections lead to excessive contact resistance and overheating of the contact surface.

## 1.11.8 Checking Operation

Start the steam humidifier and operate for a few minutes at maximum output if possible.

- » Check safety devices.
- » Check hose connections for any leaks.

## 1.12 Dismantling

Removing the steam humidifier follows the same sequence as installing, only in reverse order



**Attention:** The dismantling of the unit should only be carried out by qualified personnel. The electrical supply should only be disconnected by a qualified electrician.

Pay attention to the "Safety Notes" chapter 1.2, particularly to those referring to disposal regulations.

## HYGROMATIK Electrode Steam Humidifier for use with tap water

Type DB4MP - DB90MP

### Operation and Maintenance Instruction

#### Part 2: For the Installer

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2.1.2	Equipment Dimensions DB45MP .....	4
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## 2. Installation



**Attention:** Installing this unit should only be carried out by qualified personnel. We accept no liability for damages caused by faulty installation.

Observe all safety and warning notices you find on the unit.

Do not connect the unit to electrical power before final installation.

Additional equipment may not be installed inside the unit without prior written consent by HYGROMATIK.

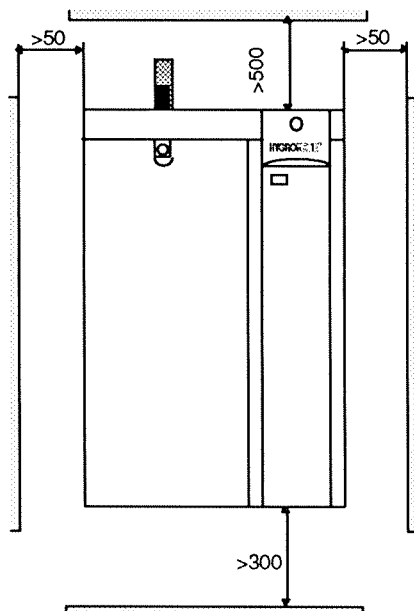
### 2.1 Steam Humidifier



**Note:** Be aware of the following when selecting the installation location of the steam humidifier:

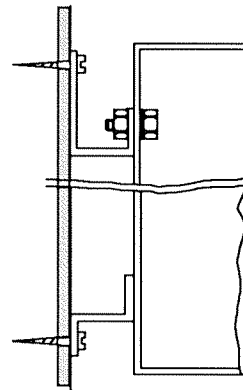
- Ambient temperature 5 to 40 °C.
- Relative humidity below 80 %r.H.
- Distances to the walls in compliance with those quoted in the diagrams.
- The steam manifold should be joined to the steam humidifier using the shortest possible lengths of steam and condensate hoses. Only then can the optimum efficiency be achieved.
- The hoses must be without sags and kinks and be laid with a continuous slope of 5-10% (otherwise sags will be formed).

#### Wall Distances



**Note:** It is often advantageous to take into account existing water connections (feed and drain) when selecting the location of the steam humidifier.

#### Wall Mounting



**Note:** To function properly the steam humidifier must be vertically installed.

- » Position the mounting bracket of the humidifier in the planned location, adjust with spirit level and fasten.
- » Hang the unit onto the bolts of the mounting bracket, tighten bolts and fix the lower mounting bracket to the wall.
- » After finishing the mounting remove all transport safety packaging.

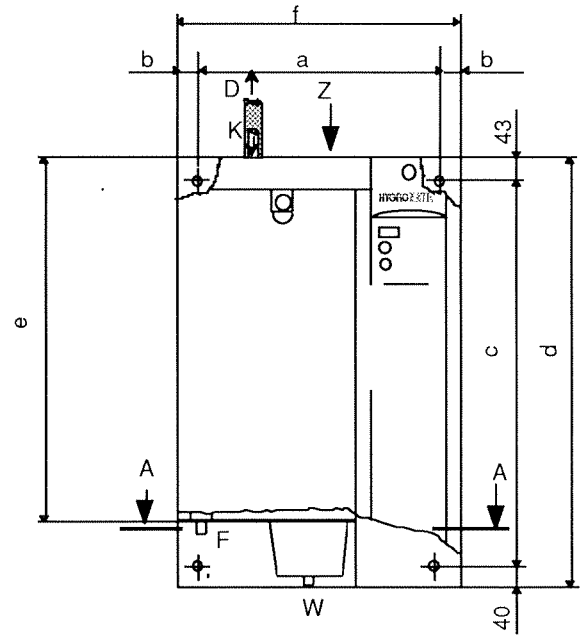
If there is no suitable wall, it is recommended that the equipment is installed on brackets which can be embedded in the floor.

## 2.1.1 Equipment Dimensions DB4MP- DB30MP

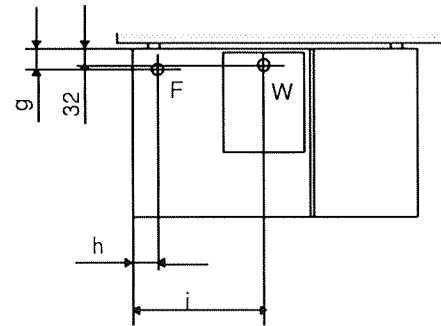
	DB4-8MP	DB10-30MP
a	373	450
b	40	40
c	502	732
d	585	815
e	450	690
f	453	530
g	40	41
h	45	48
i	180	244
m	108,5	155
n	210	315
o	106	159,5
t	158	250,5
Dimensions in mm		

- D = Steam output
- K = Condensate inlet
- W = Water drain
- F = Water feed
- E1 = Cable entry PG 29
- E2 = Cable entry PG 21
- E3 = Cable entry PG 16
- E4 = Cable entry PG 13
- E5 = Cable entry PG 9

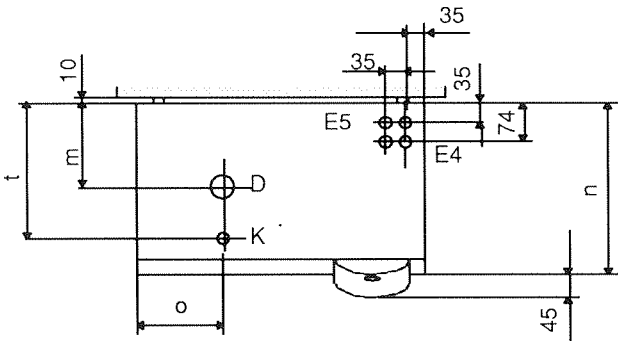
Front view



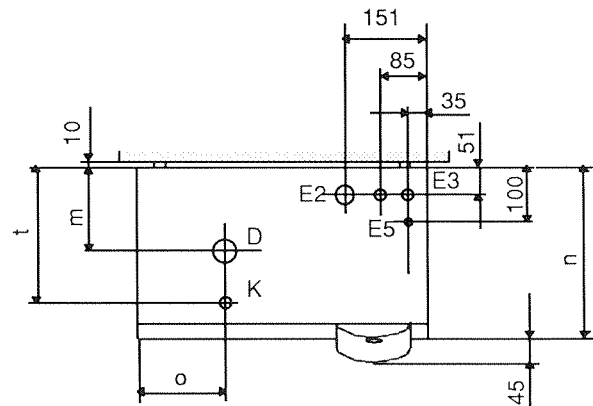
Sections A-A



Plan views DB4 - DB8MP



DB10 - 30MP

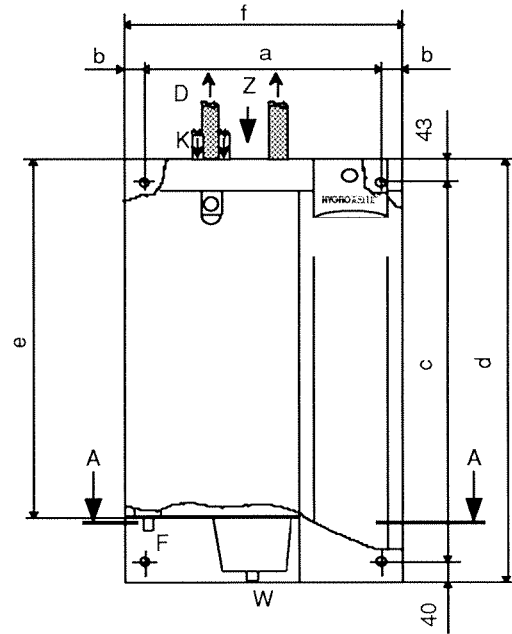


## 2.1.2 Equipment Dimensions DB45MP

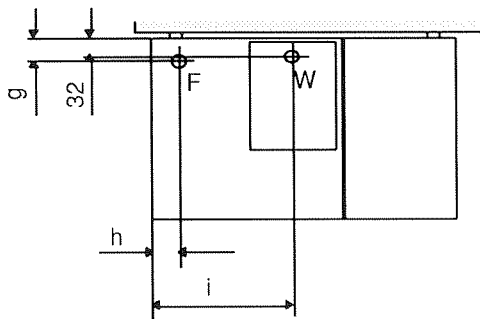
	DB45MP
a	532
b	40
c	832
d	915
e	790
f	612
g	41
h	48
i	325
m	186
n	377
o	204
r	17
s	130
t	316
Dimensions in mm	

- D = Steam output
- K = Condensate inlet
- W = Water drain
- F = Water feed
- E1 = Cable entry PG 29
- E2 = Cable entry PG 21
- E3 = Cable entry PG 16
- E4 = Cable entry PG 13
- E5 = Cable entry PG 9

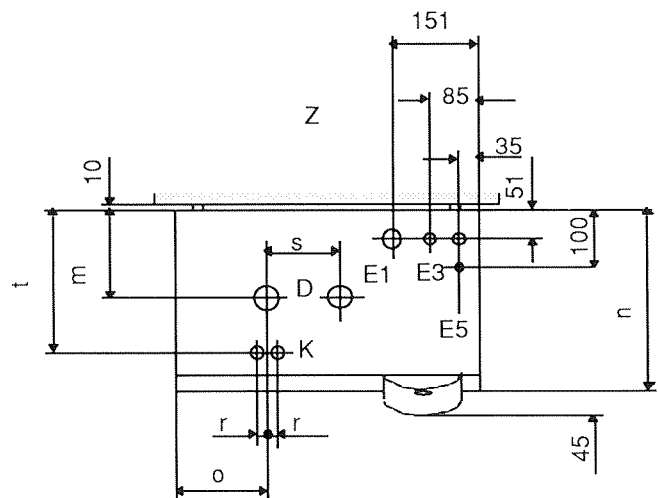
Front view



Sections A-A



Plan views DB45MP



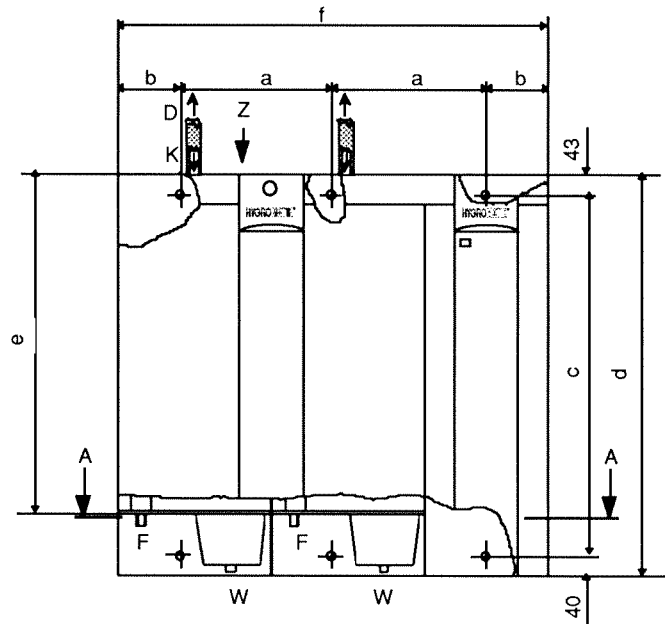


## 2.1.3 Equipment Dimensions DB60MP

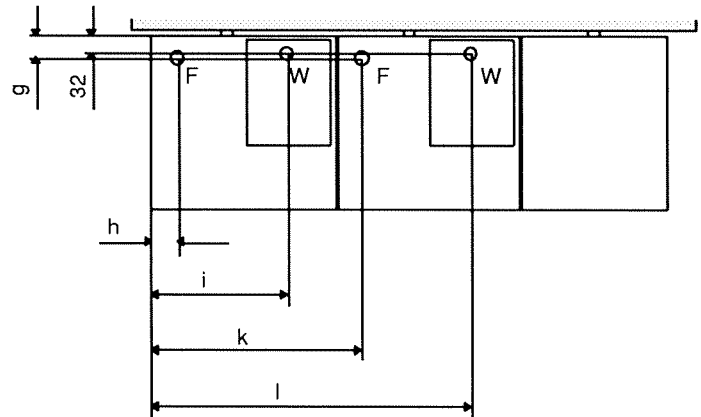
	DB60MP
a	329
b	132,5
c	732
d	815
e	690
f	923
g	41
h	48
i	244
k	378
l	573
m	155
n	315
o	159,5
p	488,5
t	250,5
Dimensions in mm	

- D = Steam output
- K = Condensate inlet
- W = Water drain
- F = Water feed
- E1 = Cable entry PG 29
- E2 = Cable entry PG 21
- E3 = Cable entry PG 16
- E4 = Cable entry PG 13
- E5 = Cable entry PG 9

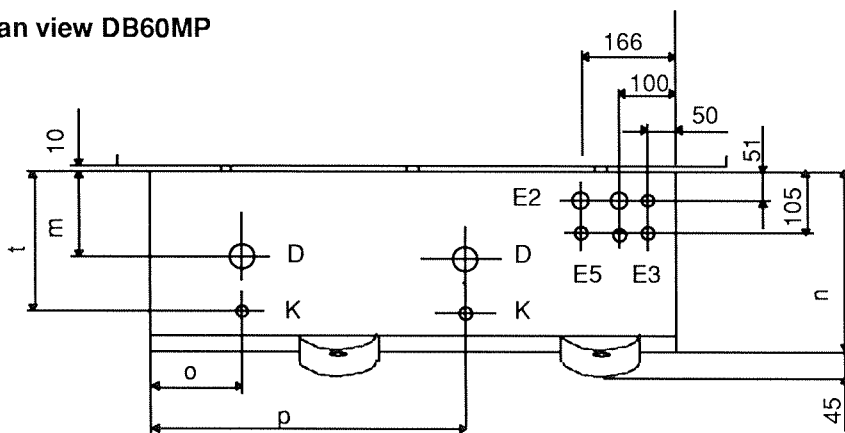
Front view



Sections A-A



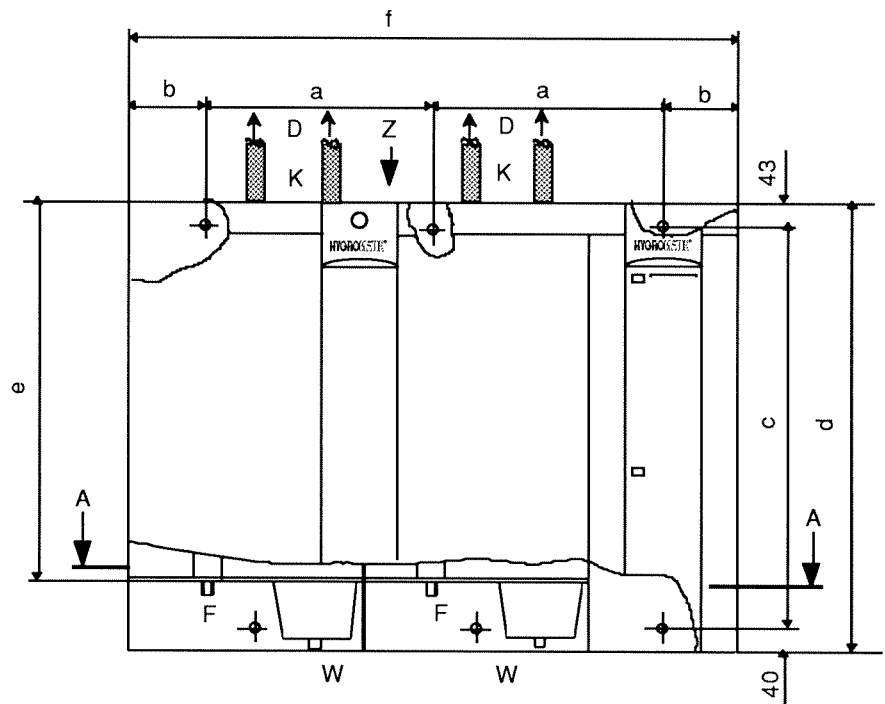
Plan view DB60MP



## 2.1.4 Equipment Dimensions DB90MP

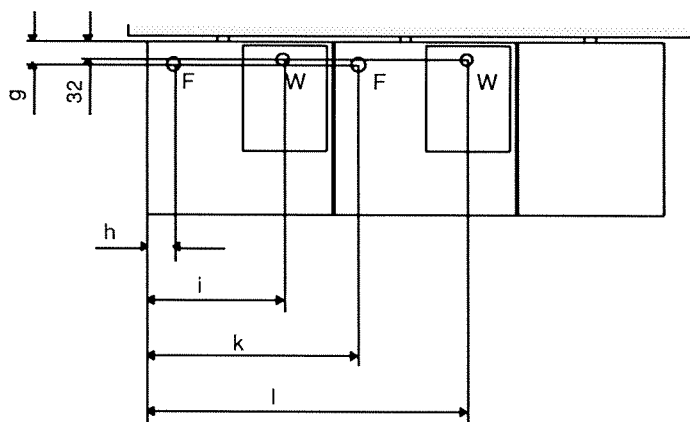
DB90MP	
a	411
b	132,5
c	832
d	915
e	790
f	1087
g	41
h	48
i	325
k	460
l	737
m	186
n	377
o	204
p	615
r	17
s	130
t	316
Dimensions in mm	

Front view

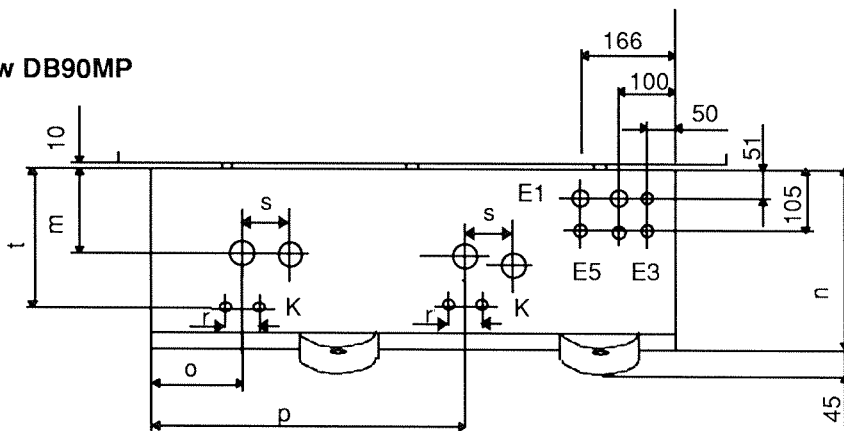


- D = Steam output
- K = Condensate inlet
- W = Water drain
- F = Water feed
- E1 = Cable entry PG 29
- E2 = Cable entry PG 21
- E3 = Cable entry PG 16
- E4 = Cable entry PG 13
- E5 = Cable entry PG 9

Sections A-A



Plan view DB90MP



## 2.2 Fan Unit (option)



**Note:** The fan unit should be positioned such that draught effects are avoided. A minimum height of 2 m is generally sufficient.

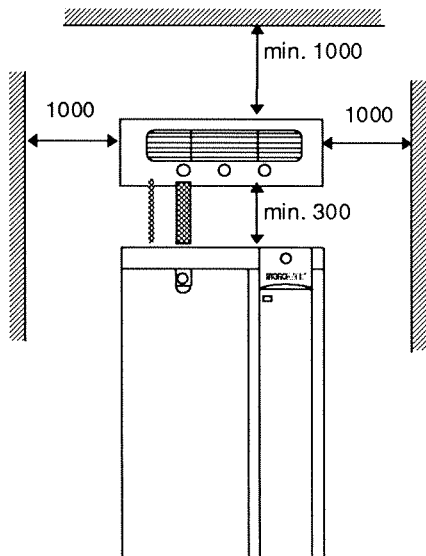
- The fan unit can either be used for integral mounting or for separate wall mounting.

Fan Unit*	Type
Integral mounting	DVA 08, 17, 30
Wall mounting	DVW 08, 17, 30

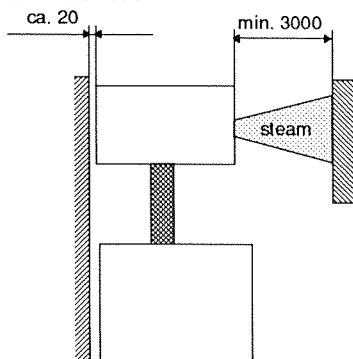
\* See also chapter 1.5 "Technical Data".

### 2.2.1 Fan Unit Type DVW

- The fan unit is mounted above the steam humidifier.
- When using a number of fan units simultaneously a maximum distance of 5 m from the steam humidifier should not be exceeded.
- The distances to the walls have to comply with the figures quoted in the diagrams.



Fan unit, wall mounted



Side view, wall mounted fan unit

### 2.2.2 Fan Unit Type DVA

The fan units DVA 17 and 30 are delivered separately with the steam humidifier.

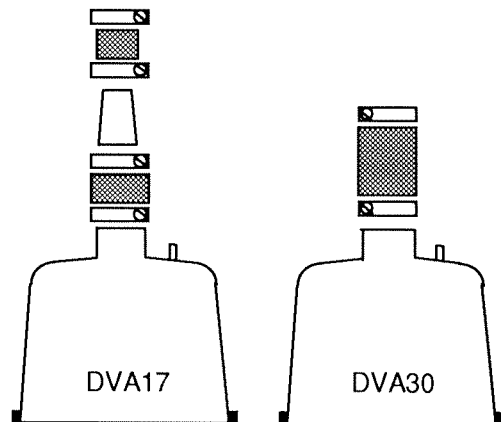
For the installation of the fan units the necessary installation material is enclosed:

- 1 Cable entry fitting
- 2 Blind plugs
- 1 Hose clamp for condensate hose
- 2 Hose clamps DN 40
- 2 Hose clamps DN 25 (DVA17)
- 1 Reducing piece (DVA17)
- 1 Piece of steam hose DN 25 (DVA17)
- 1 Piece of steam hose DN 40
- 7 Connecting crews compl.

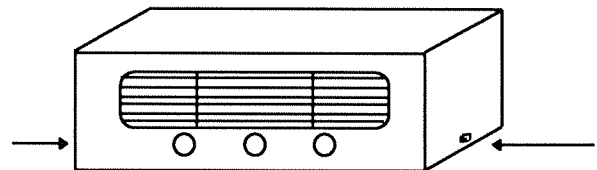
Please pay attention to the wall distances in chapter 2.2.1.

#### How to Install the Fan Units DVA

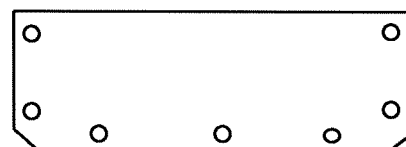
- » Connect the steam hose with the clamps.

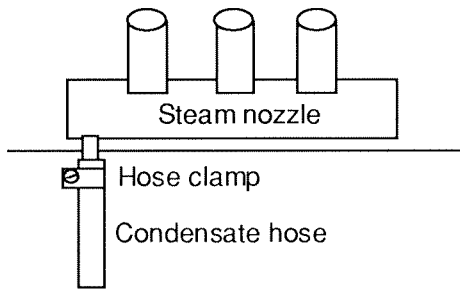


- » Remove the cover of the fan unit by loosening the two connecting screws.

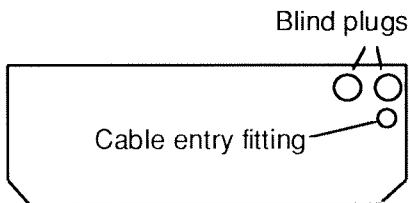


- » Install the fan unit on top of the steam humidifier with the 7 connecting screws enclosed.





» Lead the condensate hose with a slope to the tundish. Do not connect the condensate hose to the cylinder as this could cause spitting from the steam nozzle!



- » Install the cable entry fitting and blind plugs and put the connecting cable through the cable entry fitting.
- » Connect the fan unit according to the wiring diagram chapter 4.2 "Fan Unit".
- » Connect the cover to the fan unit.

## 2.3 Steam Manifolds

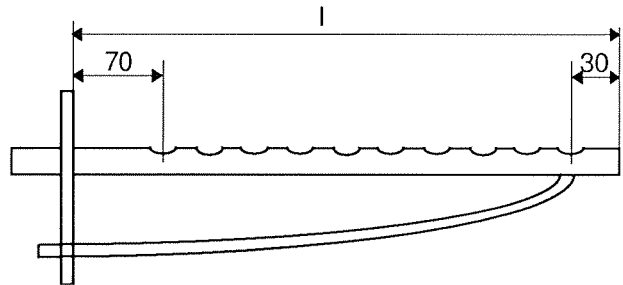
- Install steam manifolds close to the steam humidifier.
- Position control sensors and limiting devices appropriately away from the last manifold, taking into account the complete steam diffusion section.

The quantity and size of available steam manifolds and the nominal diameter of the relevant steam and condensate hoses, together with the recommended duct widths can be taken from the table.

DB	4-17	23-30	45-60	90
Steam manifold	1x25	1x40	2x40	4x40
Steam hose	DN25	DN40	2xDN40	4xDN40
Condensate hose	DN12	DN12	2xDN12	4xDN12

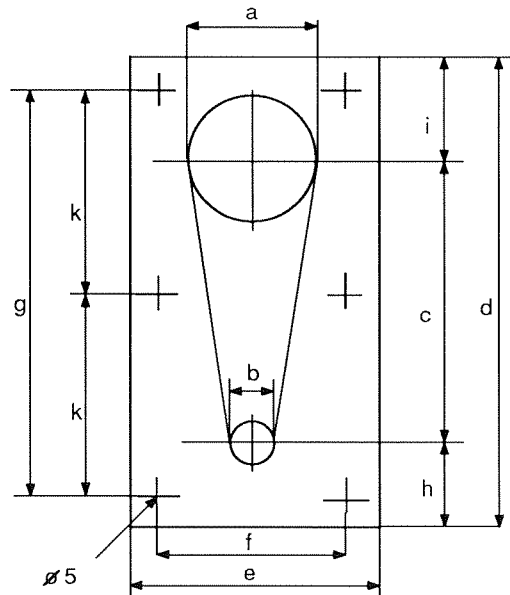
Steam Manifold Lengths [mm]

l	240	300	400	500	700	900	1000	1300
DN25	x		x		x		x	x
DN40		x		x	x	x		x



Dimensions of Boreholes and Flange [mm]

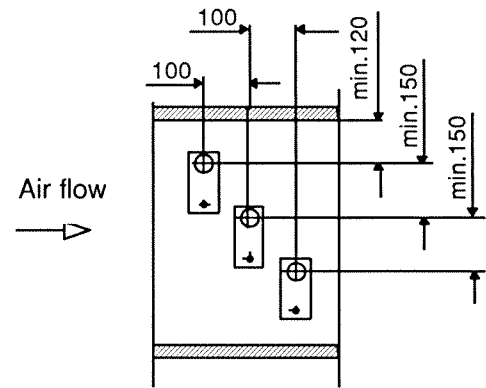
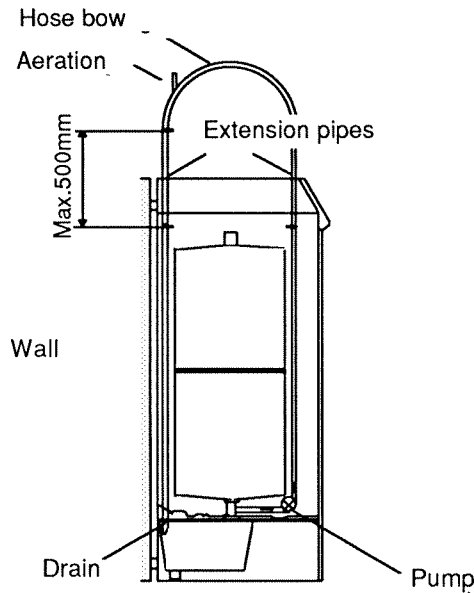
	a	b	c	d	e	f	g	h	i	k
DN25	25	12	90	130	60	42	114	15	25	-
DN40	40	12	90	150	80	60	131	20	40	65,5



### 2.3.1 Installation

- Steam manifolds should preferably be fitted on the fan discharge side in an air duct with pressure up to 1200 Pa max.
- If fitted on the fan suction side a maximum pressure of -500 Pa is permitted.

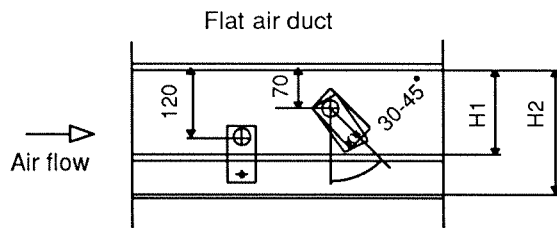
In case of high pressure systems extensions should be made to the feed and drain hoses depending on the actual total pressure. Detailed information is available on request.



If the installation situation is unfavourable always carefully check the conditions of air flow, in particular for possible risks of condensation in the air duct.

By installing the steam manifolds, please pay attention to the following:

- Steam manifolds are always installed horizontally in the side wall of the duct.
- The direction of air flow may be from all directions.
- A minimum distance of 120 mm to the top of the air duct should be observed.
- The minimum distance may be reduced to 70 mm if the steam manifold is turned to an angle of 30 - 45° to the direction of the air flow.



	H1 [mm]		H2 [mm]
	30°	45°	
DN25	182	168	225
DN40	193	179	230

- Ensure uniform steam distribution in the air duct.

Air Duct	Installation Point
Flat	Different lengths, next to one another
Narrow, high	Equal lengths, above one another. Displaced sideways if possible
Square-shaped	Equal lengths, displaced in height and sideways
Flat, very wide	Opposite one another

## 2.4 Steam Hose



**Note:** By installing the steam hose, please pay attention to the following:

- The diameter of the steam hose must not be smaller than the steam outlet of the HYGROMATIK steam humidifier (do not restrict the cross-section otherwise the back pressure will increase unnecessary).
- The steam hose must be without sags and kinks and be laid with a continuous slope of 5-10% (otherwise sags will be formed).
- The steam hose should be as short as possible. In case of lengths of over 5 m the hose should be insulated to avoid excess condensation.
- Depending on how the hose is laid, hose clips should be set at intervals of approx. 500 mm.
- Allow access to the steam hose, so that it can be inspected later.
- In case of straight lengths of several meters, it is recommended to place the steam hose in temperature resistant plastic pipe (40 mm dia for hose DN25; 60 mm dia for hose DN40) or to use copper pipe.
- Only genuine quality HYGROMATIK hoses are capable of withstanding the operating conditions.
- Allow for minimum bending radii:
  - Steam hose DN 25:  $R_{min} = 200 \text{ mm}$
  - Steam hose DN 40:  $R_{min} = 400 \text{ mm}$

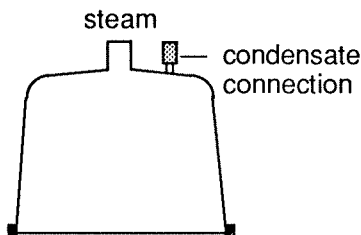
## 2.5 Condensate Hose



**Note:** By installing the condensate hose, please pay attention to the following:

**The steam manifold is positioned higher than 200 mm above the steam humidifier.**

- » Remove the condensate plug from the connection on the cylinder.



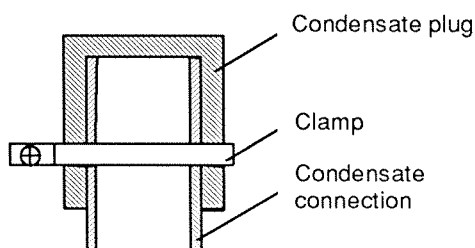
- » Lay the condensate hose with a slope of 5-10% to the steam cylinder so that condensate can flow back unrestricted.



**Note:** It is recommended to form a loop of 200 mm diameter as a vapour trap provided there is enough space. Possible operating noises coming from the steam humidifier can be reduced in this manner.

**Steam manifold is positioned lower than 200 mm above the steam humidifier.**

- » In order to avoid steam losses, a loop of at least 200 mm diameter should be formed.
- » The loop in the condensate hose should not be located too close to the steam manifold connection.
- » Let the condensate flow into the drain.
- » Ensure that the condensate connection on the steam cylinder is closed with a plug.

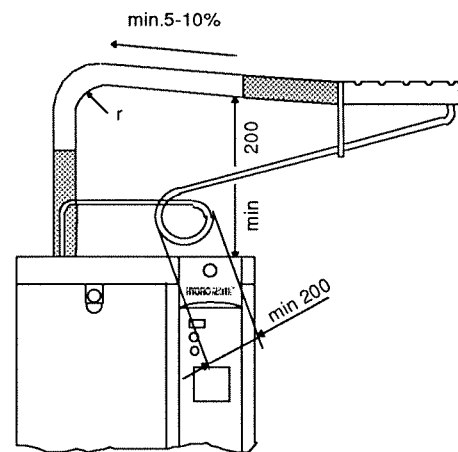


- » Use hose clips at intervals of approx. 500 mm depending on the type of hose.

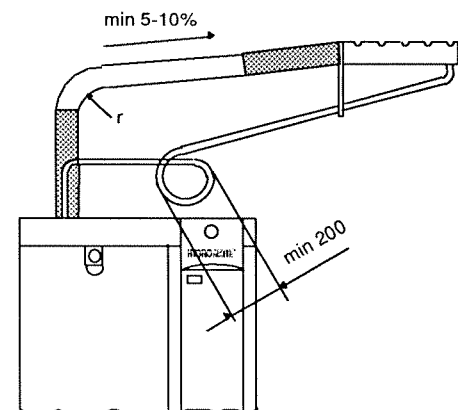
## 2.6 Installation Examples

**Steam manifold is positioned more than 200 mm above the steam humidifier.**

- » Lay the steam hose at a height of at least 400 mm and then connect to the steam manifold with a constant rise of fall.
- » Lay the condensate hose with a slope to the steam cylinder.



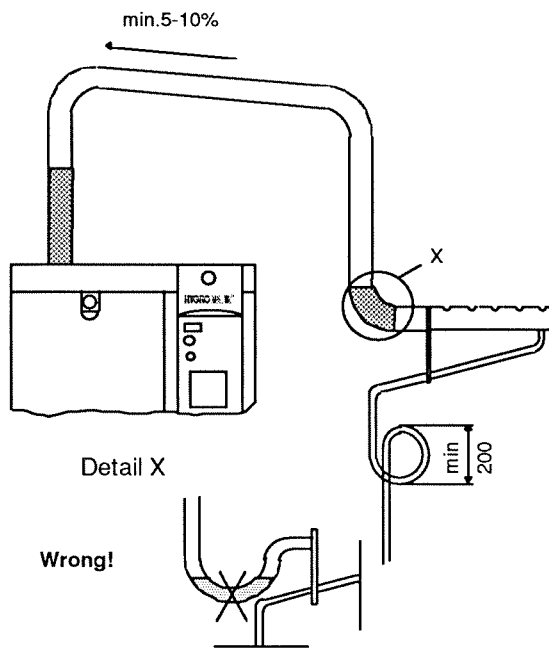
*Steam hose with falling slope*



*Steam hose with rising slope*

**Steam manifold is positioned below the steam humidifier.**

- » Lay the steam hose at a height of at least 600 mm and then connect to the steam manifold with a constant fall.



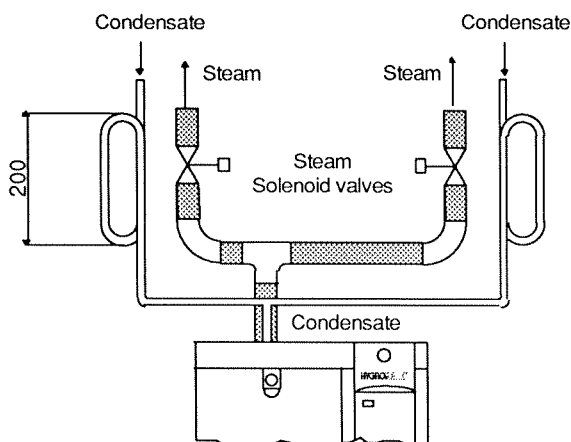
» Lay the condensate hose with a loop of 200 mm diameter to the drain.

## 2.7 Steam Solenoid Valves

When humidifying a number of loads, which are to be controlled separately, using a single steam humidifier, steam solenoid valves must be included in the steam hoses.

- Install in the vertical risers with the flow from the bottom to the top.
- The best position is just above the steam humidifier.

Hose nozzles are included with the steam solenoid valves for easing installation in the steam hose. The condensate hose must normally be laid with a loop (at least 200 mm) to the steam humidifier or drain.



## 2.8 Checking



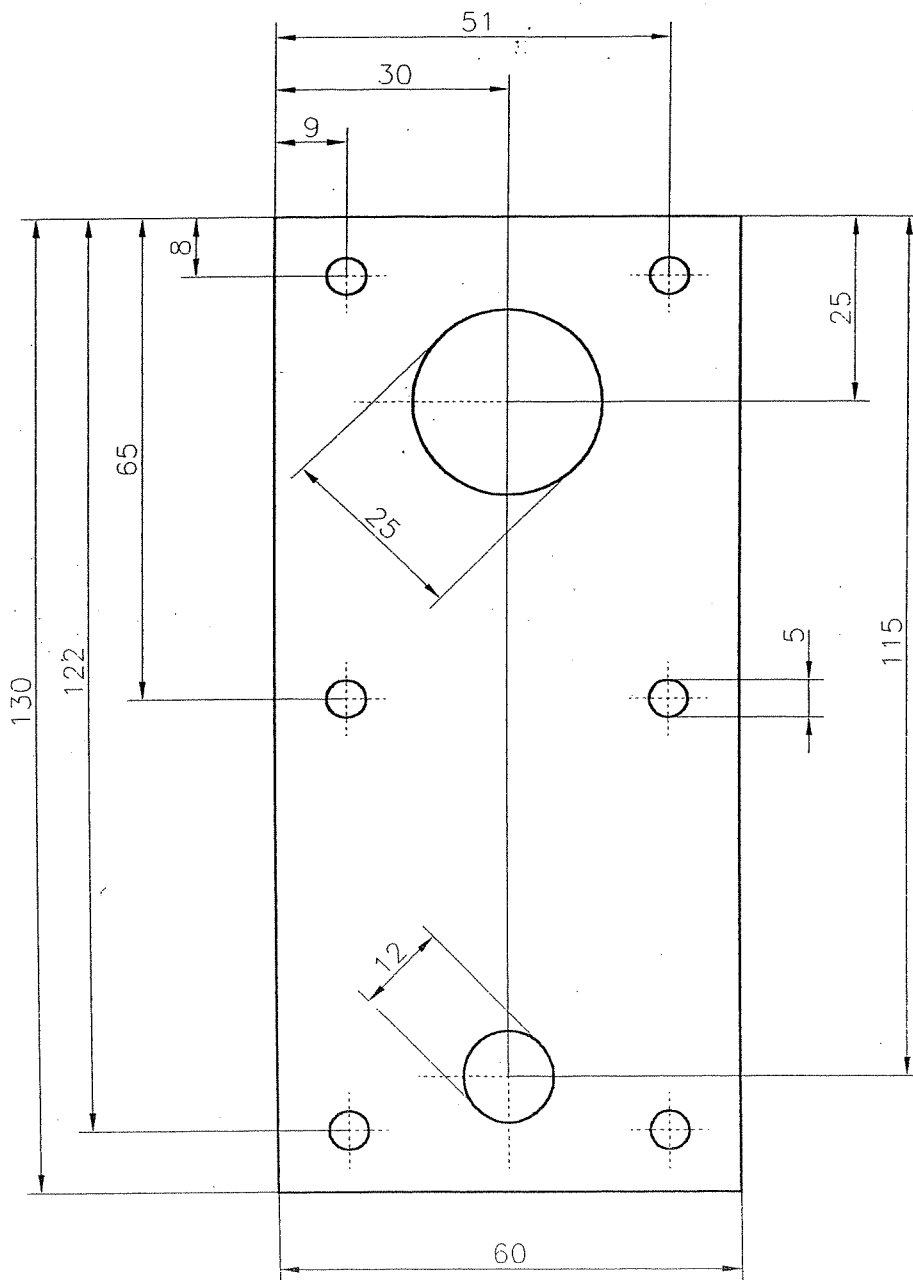
**Attention:** This unit may only be operated by qualified and properly instructed personnel.

Please check the installation using the following list:

- Does the unit hang vertically?
- Are the distances to the unit within the range?
- Does the steam hose have a slope of 5-10%?
- Is the condensate hose installed with a slope of min. 200 mm?
- Is the steam manifold positioned correctly?
- Are all bolts and clamps tightened?

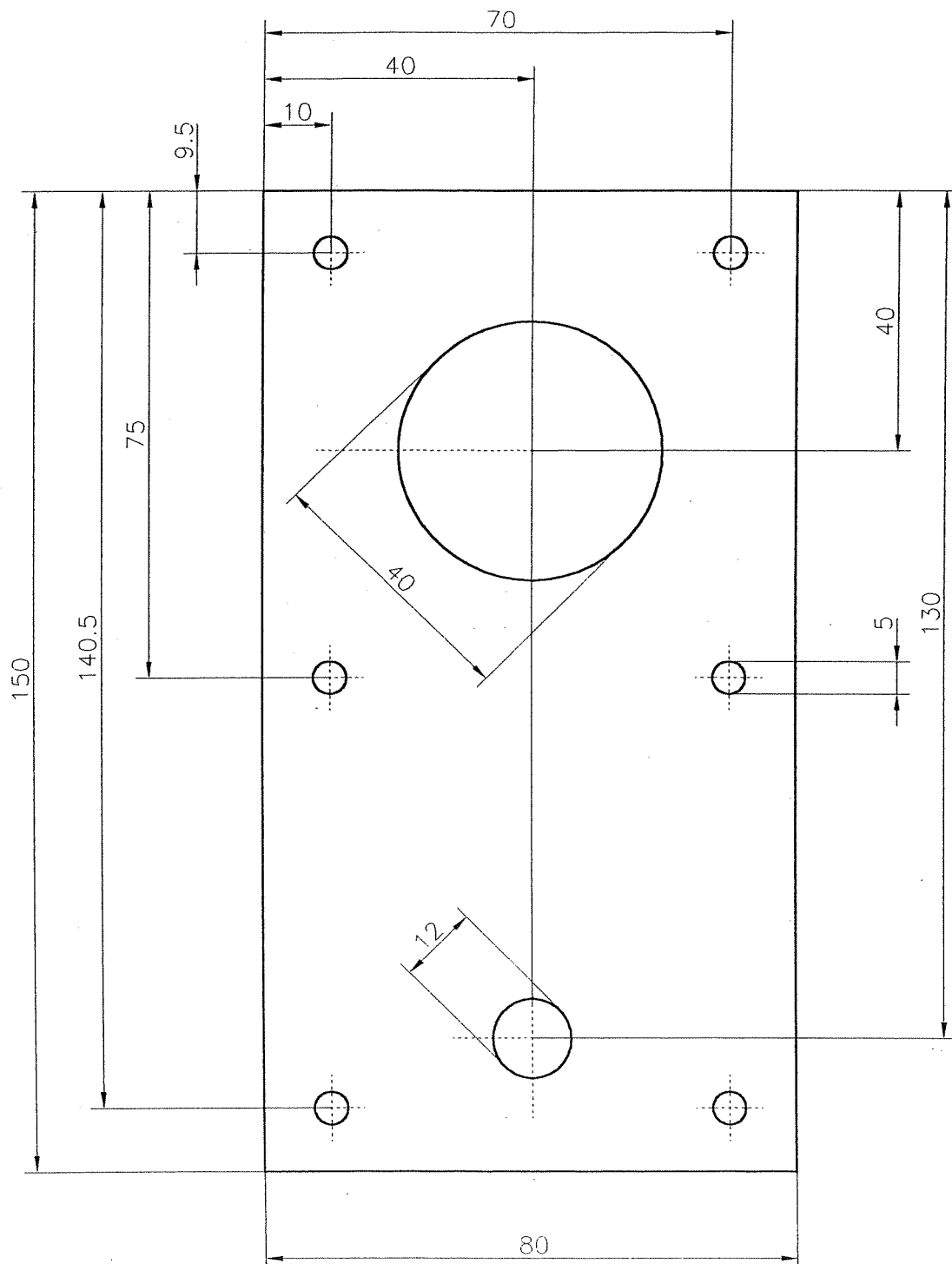
## 2.9 Drill Pattern

DN 25





DN 40



## HYGROMATIK Electrode Steam Humidifier for use with tap water

Type DB4MP - DB90MP

### Operation and Maintenance Instruction

#### Part 3: For the Plumber

3.	Water Installation .....	2
3.1	Operation with Softened Water .....	2
3.2	Water Supply .....	2
3.3	Water Discharge .....	3
3.4	Checking .....	3

## 3. Water Installation



**Attention:** During installation please observe:

- All work must be carried out by qualified personnel.
- Switch off the unit beforehand.
- Observe local regulations of water works or municipalities.
- Do not connect softened water or water with additives and only use water with a conductivity between 50 and 800  $\mu\text{S}/\text{cm}$ .
- The inlet water temperature may be up to 40 °C.
- Water inlet pressure: 1-10 bar
- The discharge shall flow freely into the drain.

### 3.1 Operation with Softened Water



**Note:** When the HYGROMATIK steam humidifier is fed with softened water, please get in touch with HYGROMATIK.



**Note:** In case a water softening system has been installed it is advised to use a mixture of softened water and normal tap water so that the water hardness will be 4 to 8 °dH. (see Chapter 1.11.1 "Maintenance work").



**Attention:** Operation with softened water is generally not advisable, because one of the following problems could occur:

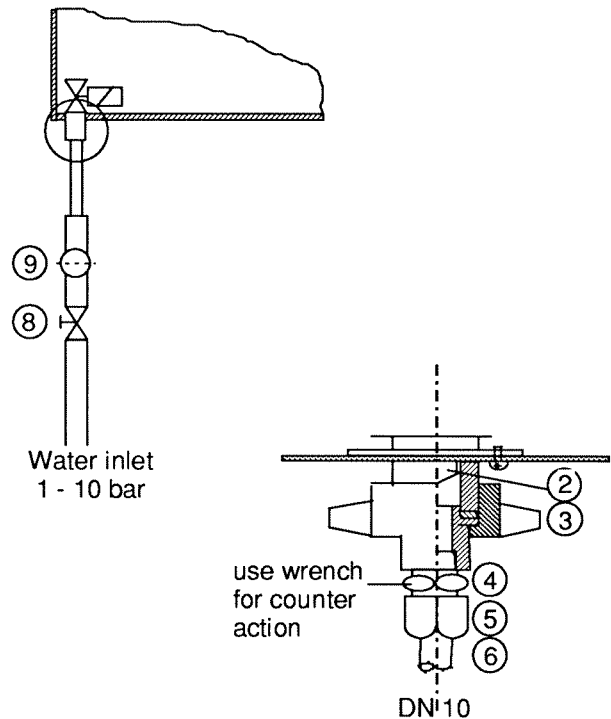
- Inadmissible high conductivity
- Salt bridge formation between the electrodes and their bushings on the inside of the top part of the cylinder
- Foaming in the steam cylinder.

Salt bridges create electrical arcing, indicated by black grooves. The top part of the cylinder must then be replaced, otherwise the material will be further damaged and short circuits occur, leading to the main fuses blowing.

The foam touches the level electrodes and triggers a signal indicating that the cylinder is full when it is not and the rated current has not yet been reached.

## 3.2 Water Supply

- » Install a shut-off valve (8) in the supply hose
- » Install a water filter (9) if the water quality requires it.



The inlet connection of the water solenoid valve extends through the bottom tray.

- » Screw on fitting using plastic nut (3). Tighten by hand.

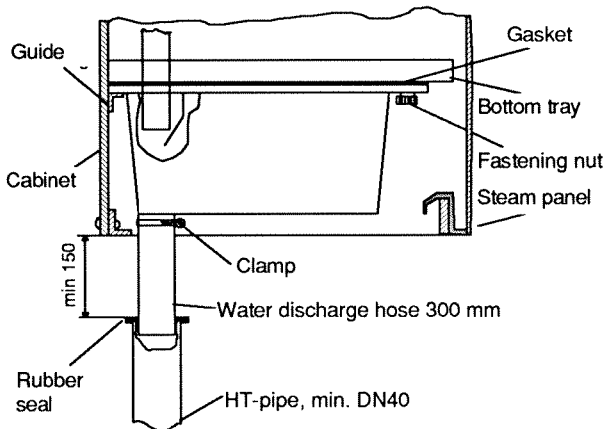


**Note:** Tightening too much will destroy the fitting. The strainer must be in the solenoid valve.

- » Insert pipe (6) of 10 mm outside diameter into fitting (5) until stop and tighten brass-nut (5) by hand.

- » Tighten the brass-nut (5) by 17 mm wrench  $\frac{1}{2}$  to max.  $1\frac{1}{4}$  turns and use a second 14 mm wrench for counter action (4).

## 3.3 Water Discharge



**Attention:** Discharged water must flow freely!

For the water drain, we recommend to use a discharge hose.



**Attention:**

- Do not bend, shorten or lengthen the discharge hose.
- The water drain shall withstand temperatures up to 95°C.

Install the water drain system as follows

- Discharge hose DN 1" extending appr. 300 mm from the outlet of the housing, so that the discharge can flow freely into a pipe having a minimum inside diameter of 40 mm. Place a rubber seal between pipe and hose.
- Connect the discharge hose to the outlet of the tundish using the supplied clamps.

## 3.4 Checking

Please check the installation according to the following:

- Are the screws and clamps tightened?
- Is the water supply connection correctly installed and the water discharge can flow freely?
- Are the water supply and discharge hoses free from any leakage?

## HYGROMATIK Electrode Steam Humidifier for use with tap water

Type DB4MP - DB90MP

### Operation and Maintenance Instruction

#### Part 4: For the Electrician

4.	Electrical Installation .....	2
4.1	Installation .....	2
4.2	Fan Unit .....	2
4.3	Safety Interlock .....	2
4.4	Control.....	2
4.4.1	1step Control .....	3
4.4.2	Proportional Control with External Controller.....	3
4.4.3	Proportional Control with Integral Controller.....	4
4.5	Floating Signal Outputs .....	4
4.5.1	Relay-Option.....	4
4.6	Checking .....	5
4.7	Illustrations MP2.....	5
4.8	MP-Electronic.....	5
4.9	Wiring Diagrams .....	6



**ATTENTION:** All work must be executed by qualified personnel.  
All electrical installations and work on electrical components of this unit must be carried out by a qualified electrician.  
Switch power off beforehand!

## 4. Electrical Installation



**Attention:** Upon installation, please pay attention to the following:

- All electrical installation and work on electrical components of this unit must be carried out by qualified electricians.
- Observe local regulations governing the installation of electrical appliances or equipment.
- Switch power off beforehand and secure against restart.
- Check that the unit is dead.
- The electrical connections must be made professionally.
- The electrical connections shall correspond to the wiring diagrams.
- The internal power supply transformer may not be used for other purposes (controller).
- If rated capacities are above e.g. 3.3 kW only permanent connections at fixed installations are allowed.

### 4.1 Installation

- » The safety fuses require a contact aperture of min. 3 mm. per pole.
- » Each steam cylinder requires its own main power connection including fuses, main breaker, etc.
- » The potential equalisation is to be connected to the threaded bolt M6 outside the cabinet.
- » Main power supply as follows:  
DB4-45MP: 1 x 400V/3Phases/N  
DB60-90MP: 2 x 400V/3Phases/N

Other voltages are available upon request.

Select fuses with quick or medium blow characteristics (applicable only for the above voltage).

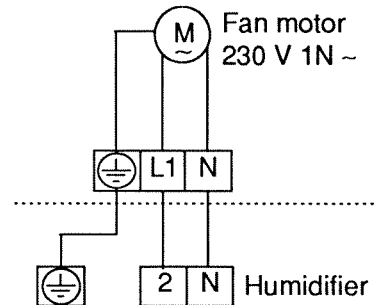
Fuse protection:

Type	Nominal Current [A]	Fuses [A]
DB 4MP	4,4	3x6
DB 6MP	6,5	3x10
DB 8MP	8,7	3x16
DB 10MP	10,8	3x20
DB 13MP	14,1	3x25
DB 17MP	18,4	3x25
DB 23MP	24,9	3x35
DB 30MP	32,5	3x35
DB 45MP	48,8	3x63
DB 60MP	2x32,5	6x35
DB 90MP	2x48,8	6x63

4.2

### 4.2 Fan Unit

» Connect the fan unit according to the wiring diagram.



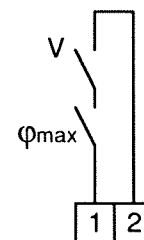
The operation of the fan unit is parallel to humidification demand. The power supply on/off is controlled by the safety interlock system.

### 4.3 Safety Interlock

Floating interlock contacts of a safety chain, such as maximum hygrostat, flow control switch, pressure switch etc. are to be installed in series between terminals 1 and 2.



**Attention:** The terminals 1 and 2 require potentialfree contacts. No power is to be supplied to 1+2.



### 4.4 Control



**Attention:** The unit shall be controlled such that it will not operate the breaker more than 4 times per minute (this will otherwise lead to destruction of the breaker).

The steam humidifier DB-MP can be programmed for the following controls.

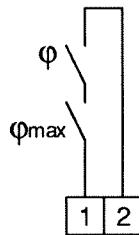
MP Controls
1step Control
Proportional Control with External Controller
Proportional Control with Integral Controller



**Note:** Please turn to HYGROMATIK for reprogramming.

## 4.4.1 1step Control

The hygrostat should be installed in series with the terminals of the safety chain between 1 and 2.



## 4.4.2 Proportional Control with External Controller



**Attention!** The internal power supply transformer may not be used for other purposes (controller).



**Note:** If the control signal wires pick up stray induction signals from surrounding power cables the humidifier might operate erratically. It is therefore recommended to use shielded control wiring with the shielding earthed at the controller.

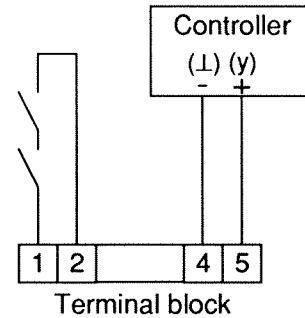
The parameter E3 has to be set according to chapter 1.8.6 "Programming with Code" to match the humidifier to the control signal.

E3	External Control Signals
1	0(2) - 10 V DC Single cylinder units: min. 10 mA Double cylinder units: min. 20 mA
2	0(4) - 20 V DC Single cylinder units: min. 20 mA Double cylinder units: min. 40 mA
3	0(2) - 10 mA DC Single cylinder units: min. 10 V Double cylinder units: min. 20 V
4	0(4) - 20 mA DC Single cylinder units: min. 20 V Double cylinder units: min. 40 V
5	0 - 140 Ohm (min. 1 mA / 0,1 V)
6	0 - 20 V DC (Phase angle control, Staefa)

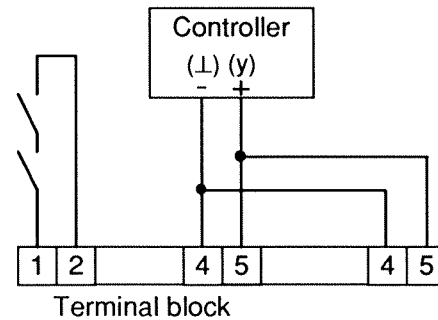
The standard setting is 0(2)..10 VDC.

The humidifier switches off at 2 V and on at 2,5 V.

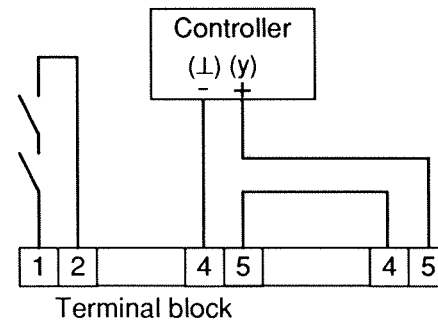
Connect to the terminal block according to the diagram:



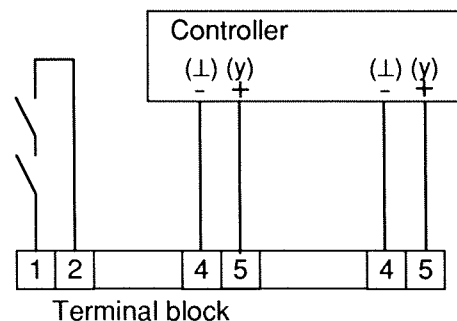
External control signal, single cylinder units



External control signal, double cylinder units - voltage output



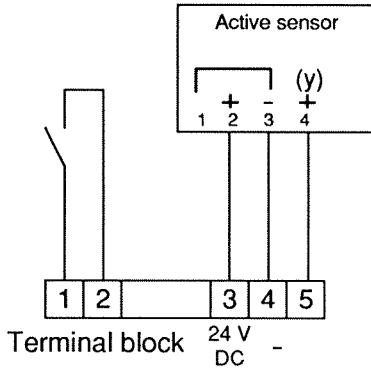
External control signal, double cylinder units - amperage output



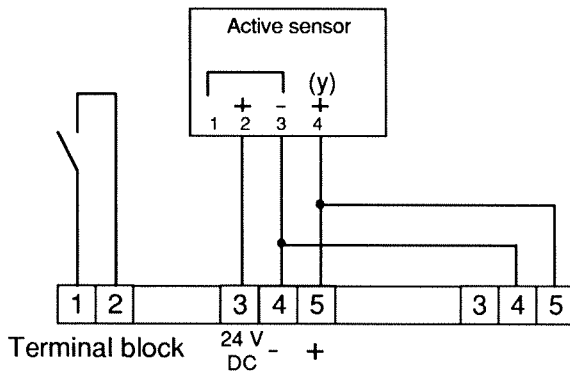
External control signal, double cylinder units - resistance output

## 4.4.3 Proportional Control with Integral Controller


The sensor supplied upon request to operate the internal software PI controller has an output signal of 0 - 10 V. A signal of 0 V demands 100 % output from the humidifier.



Active sensor, single cylinder units - voltage output



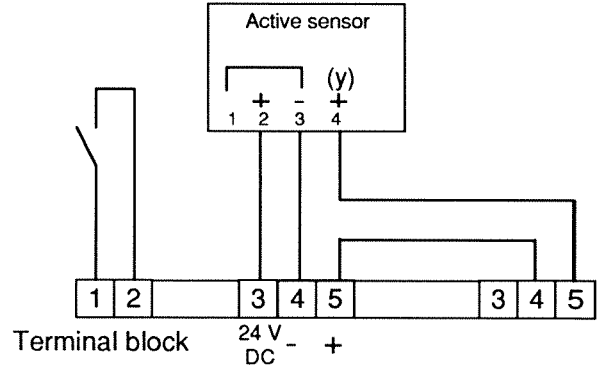
Active sensor, double cylinder units - voltage output

 **Note:** Up to four one-cylinder units can be controlled with one single HYGROMATIK-active sensor.

If other sensors are used it is necessary to adjust parameter E3 accordingly.

E3	Control Signals for Active Sensor
1	0(2) - 10 V DC
2	0(4) - 20 V DC
3	0(2) - 10 mA DC
4	0(4) - 20 mA DC
5	0-140 ohm
6	0 - 20 V DC (Phase angle control, Staefa)

Consult the following diagram for amperage output.



Active sensor, double cylinder units - amperage output

In case of resistance output and double cylinder units two sensors are required.

## 4.5 Floating Signal Outputs

The maximum contact load is 250V/5A.

### 4.5.1 Relay-Option

The RO is to be installed in the unit on the rails and is connected to the main pcb via multi-wire cable. There are four relays, two of which have fixed outputs and two have outputs as programmed by the user.

Below are the RO relays and their outputs:

Relay	Terminals	Description
1	25,26,27	Humidification
2	28,29,30	Collective fault: - Cylinder full, delayed - Blow-down fault - Solenoid valve cont. open - internal system fault
3	34,35,36	Free programmable Parameter E5
4	37,38,39	Free programmable Parameter E6

For programming see instruction manual chapter 1.8.6 "Programming with Code".



## 4.6 Checking

All work - especially electrical - must be carried out by properly qualified personnel in accordance with the safety regulations.

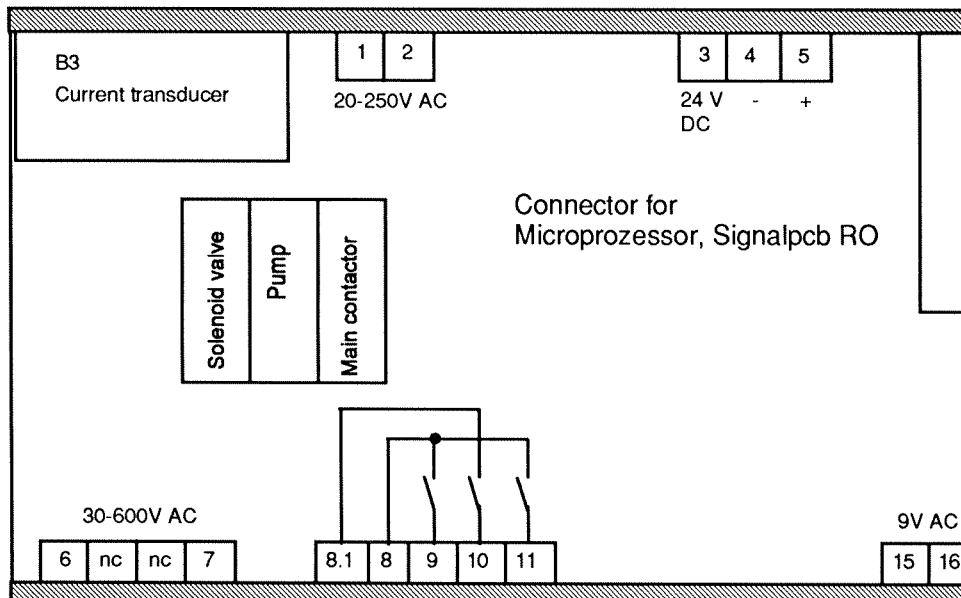
- The supply voltage must correspond to the specified voltage on the name plate.
- All electrical connections must correspond to the wiring diagrams.
- Cable connections as well as plugs and their connections must be tightened.
- The unit must be connected to ground.

You can now switch on the steam humidifier.

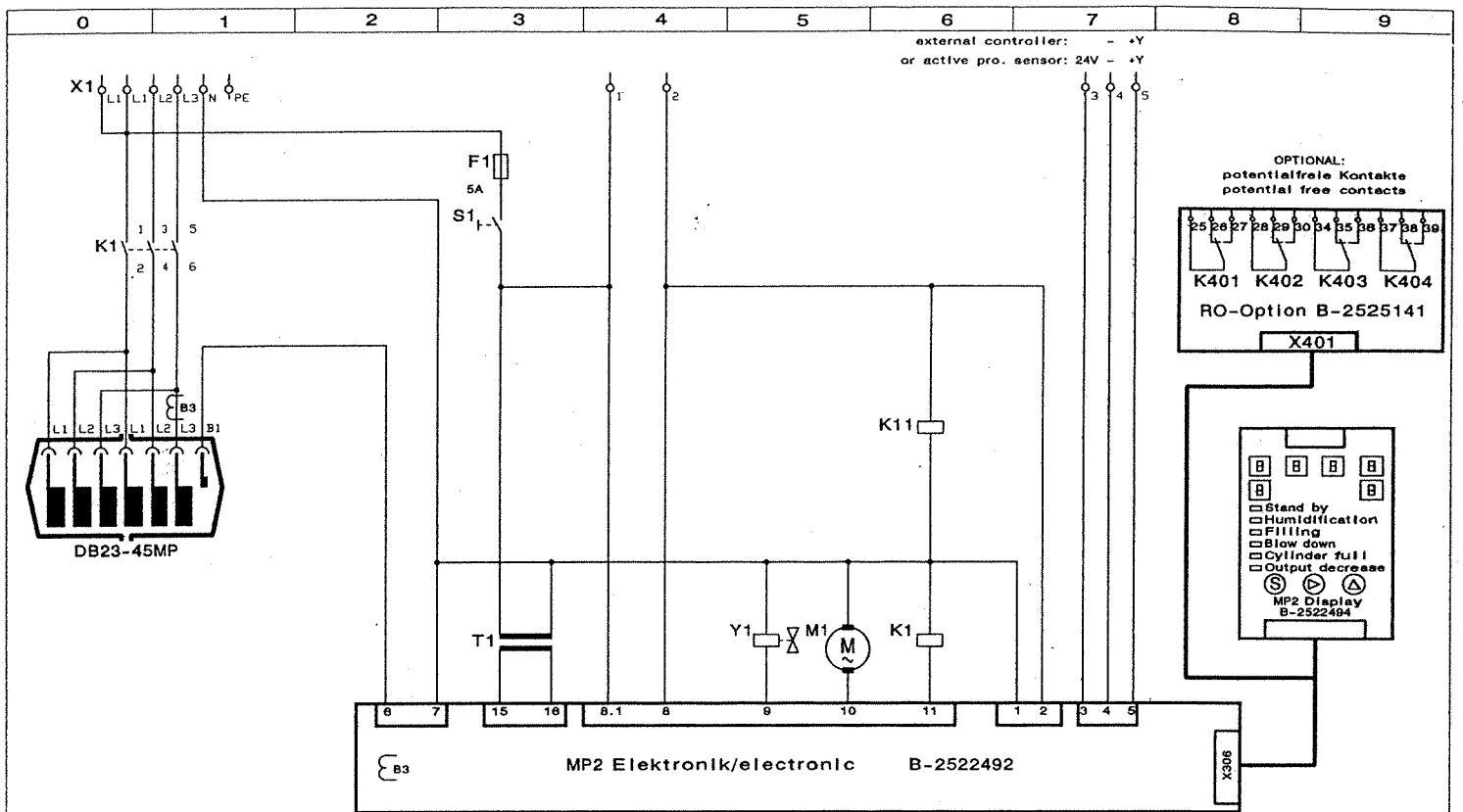
## 4.7 Illustrations MP2

B1	Sensor electrode
B3	Current transducer
F1	Control fuse 5 A
K1	Main contactor
L1-L3	Main terminals
M1	Drain pump
S1	Control switch on/off
T1	Transformer
Y1	Solenoid valve
X1	Terminal block
1-2	Terminals for system interlock
3-5	Terminals for proportional control
6-7	Input sensor electrode
8.1	Permanent supply pump relay
8	Supply solenoid valve and main contactor
9	Output solenoid valve
10	Output blow-down pump
11	Output main contactor
15-16	Power supply 9 V AC
25-27	Humidification
28-30	Collective fault
34-36	Free programmable
37-39	Free programmable

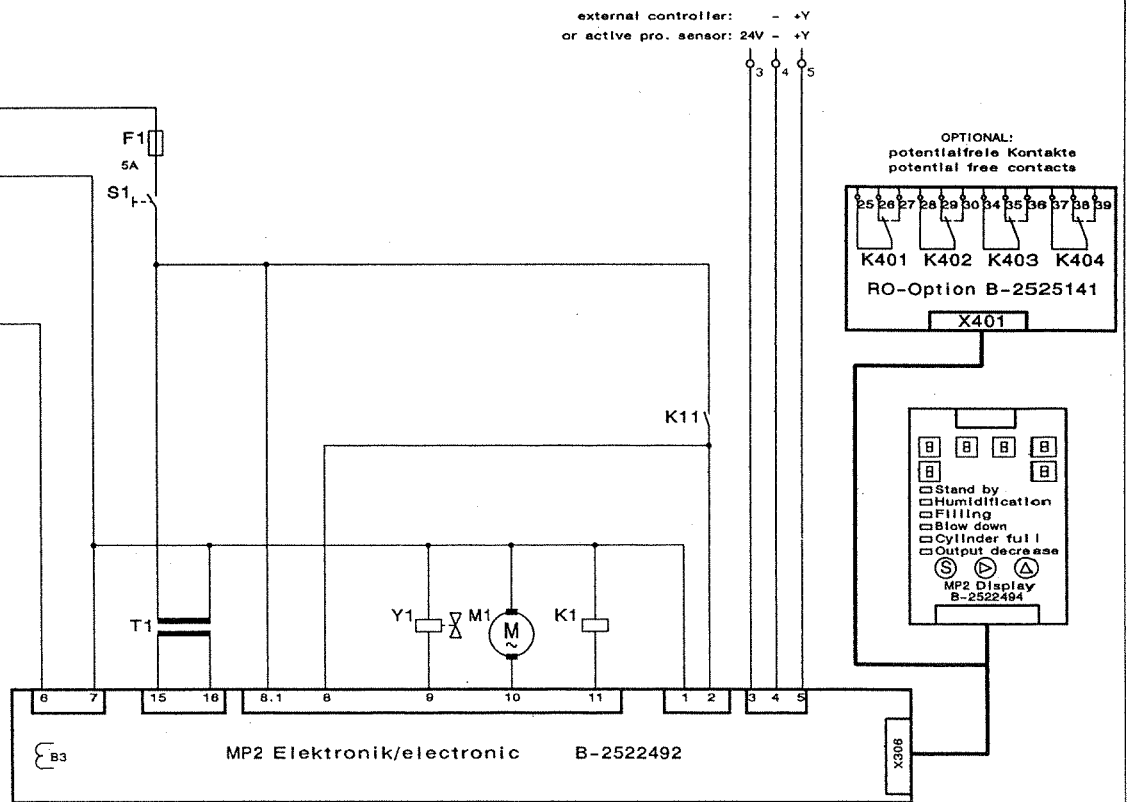
## 4.8 MP-Electronic







Zylinder/cylinder 1



Zylinder/cylinder 2

a	Freigabe	08.03.95	Kral	Datum	08.03.95	(Benennung/designation)	DB60-90MP/400/3	(Zeichnung Nr.)	S-950302	HYGROMATIK Oststraße 55 D-22844 Norderstedt Tel. 040-526833-0 Fax. 040-526833-33	(Artikel Nr./part no.)			
b	B3:DB23-45	21.06.95	Kral	Bearb.	Kral									
c	Fehler:B3	19.09.95	Kral	Gepr.	Kral									
Zust.	Änderung	Datum	Name	Norm		Urspr.	S-950303	Ers.f	S-950303	Ers.d		(Datei/file)	S950302C.001	Blatt 1 von 1 Bl.



# **HYGROMATIK Electrode Steam Humidifier**

for use with tap water

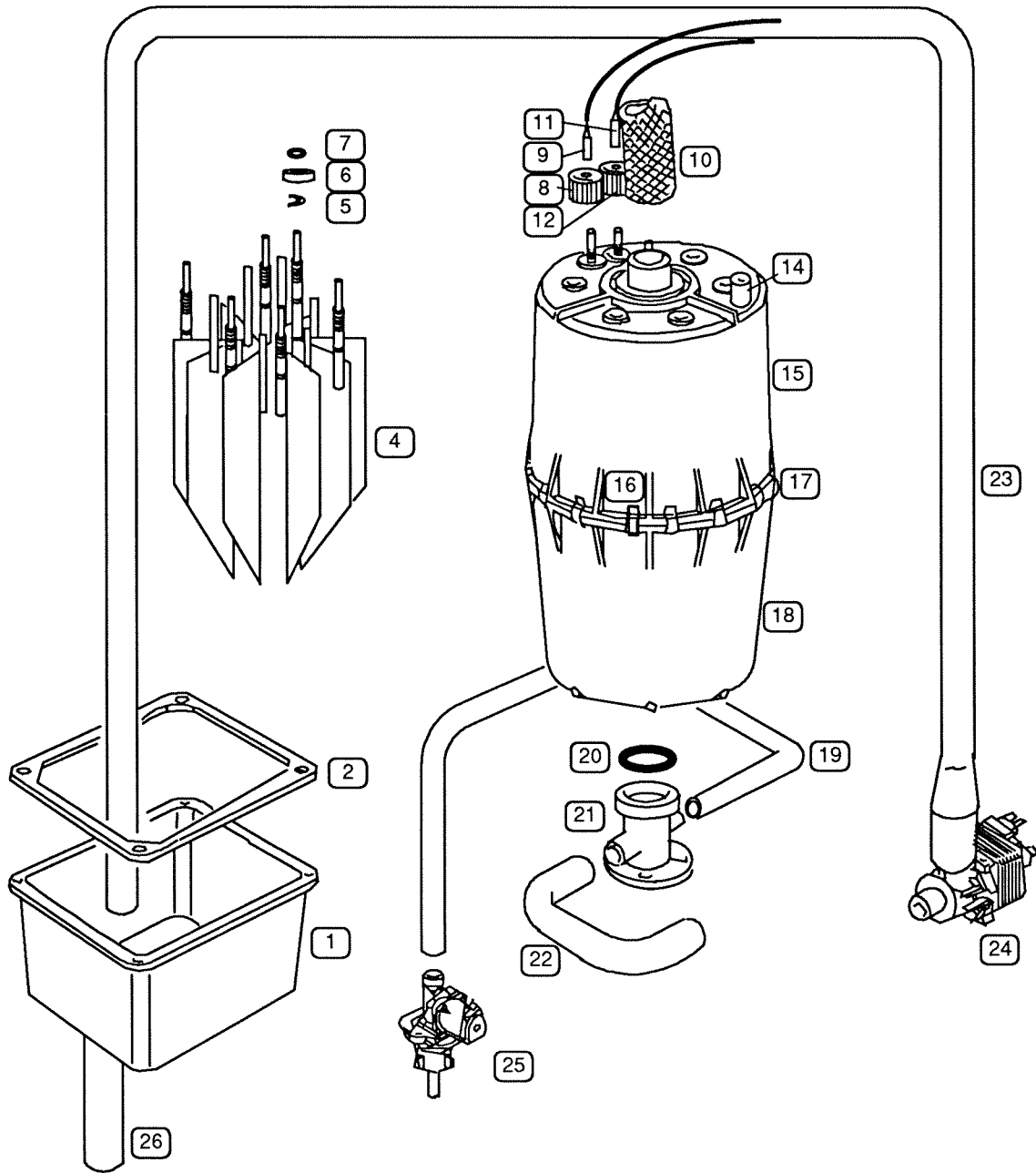
Type DB4MP - DB90MP

## **Operation and Maintenance Instruction**

### **Part 5: Spare Parts**

5.1	DB-MP.....	2
5.2	Spare Parts List .....	3

## 5.1 DB-MP



*	DB						Art. Nr.	Description
	4-8	10-17	23-30	45	60	90		
							<b>Cabinet</b>	
	1		1				B-3120403 Cabinet, excl. electric blind, beige, green, empty	
		1	1				B-2120503 Cabinet, excl. electric blind, beige, green, empty	
				1			B-2121002 Cabinet, excl. electric blind, beige, green, empty	
					1		B-2120802 Cabinet, excl. electric blind, beige, green, empty	
						1	B-2121102 Cabinet, excl. electric blind, beige, green, empty	
	1						E-3120419 Front panel for steam section	
		1	1				E-2120519 Front panel for steam section	
				1			E-2121019 Front panel for steam section	
					1		E-2120819 Front panel for steam section	
						1	E-2121119 Front panel for steam section	
	1						E-3120420 Front panel for electric section, excl. electric blind	
		1	1				E-2120520 Front panel for electric section, excl. electric blind	
				1			E-2121020 Front panel for electric section, excl. electric blind	
					1		E-2120820 Front panel for electric section, excl. electric blind	
						1	E-2121120 Front panel for electric section, excl. electric blind	
	1	1	1	1	2	2	E-2124014 Safety lock for electric panel DB4-90 and steam panel DB60,90	
	1	1	1	1			E-2124016 Safety lock for steam panel DB4-45	
	2	2	2	2	2	2	E-2124015 Key for safety lock (per set = 2 pc.)	
	1	1	1	1	2	2	E-2120102 Grip for electric panel DB4-90 / steam panel DB60,90, green, without lock	
	1	1	1	1			E-2120101 Grip for steam panel DB4-45, green, without lock	
	1						B-3126010 Complete set of cable entry fittings for connecting cable	
		1	1				B-2125016 Complete set of cable entry fittings for connecting cable	
				1			B-2127014 Complete set of cable entry fittings for connecting cable	
					1		B-2123017 Complete set of cable entry fittings for connecting cable	
						1	B-2127024 Complete set of cable entry fittings for connecting cable	
	1						E-3120406 Blind electric panel, L-electronic	
		1	1				E-2120506 Blind electric panel, L-electronic	
				1			E-2121006 Blind electric panel, L-electronic	
	1						E-3120404 Blind electric panel, EM-electronic	
		1	1				E-2120504 Blind electric panel, EM-electronic	
				1			E-2121004 Blind electric panel, EM-electronic	
					1		E-2120804 Blind electric panel, EM-electronic	
						1	E-2121104 Blind electric panel, EM-electronic	
	1						E-3120405 Blind electric panel, MP-electronic	
		1	1				E-2120505 Blind electric panel, MP-electronic	
				1			E-2121005 Blind electric panel, MP-electronic	
					1		E-2120805 Blind electric panel, MP-electronic	
						1	E-2121105 Blind electric panel, MP-electronic	
					1		E-2120810 Blind steam panel	
						1	E-2121110 Blind steam panel	
	3	3	3	3	6	6	E-2120001 Screw M4 for mounting grip E-2120102	
	5	5	5	5	10	10	E-2505123 Plastic cap nut M3 for mounting electric and steam blind	
	1	1	1	2	1	2	E-2120002 Blind plug for hole in the steam part bottom	
							<b>Steam Generation</b>	
	1						B-3204031 Steam cylinder CY 8 transp. compl. with electrodes, ready for installation	
		1					B-2204101 Steam cylinder CY17 transp. compl. with electrodes, ready for installation	
			1		2		B-2204105 Steam cylinder CY30 transp. compl. with electrodes, ready for installation	
				1		2	B-2204109 Steam cylinder CY45 transp. compl. with electrodes, ready for installation	
15	1						E-3226005 Top part of steam cylinder, DN 25/12, empty	
15		1					E-2206068 Top part of steam cylinder, DN 25/12, empty	
15			1			2	E-2206069 Top part of steam cylinder, DN 40/12, empty	

*	DB						Art. Nr.	Description
	4-8	10-17	23-30	45	60	90		
15				1		2	E-2207001	Top part of steam cylinder 2xDN 40/12, empty
18	1						B-3216007	Lower part of steam cylinder, compl. with strainer
18		1					B-2206046	Lower part of steam cylinder, compl. with strainer
18			1		2		B-2206071	Lower part of steam cylinder, compl. with strainer
18				1		2	B-2207002	Lower part of steam cylinder, compl. with strainer
	1						B-3204025	Top part of steam cylinder, compl. with electrodes for CY8
		1					B-2204095	Top part of steam cylinder, compl. with electrodes for CY17
			1		2		B-2204099	Top part of steam cylinder, compl. with electrodes for CY30
				1		2	B-2204079	Top part of steam cylinder, compl. with electrodes for CY45
17	1						E-3216010	O-ring seal for cylinder flange, transparent cylinder
17		1					E-2206050	O-ring seal for cylinder flange, transparent cylinder
17			1		2		E-2206051	O-ring seal for cylinder flange, transparent cylinder
17				1		2	E-2207011	O-ring seal for cylinder flange, transparent cylinder
20	1						E-3216011	O-ring seal for cylinder base
20		1	1	1	2	2	E-2204022	O-ring seal for cylinder base
4	1						B-3204021	Electrodes, compl. without Hand nuts for CY8, Set=3pc.
4		1					B-2204087	Electrodes, compl. without Hand nuts for CY17, Set=3pc.
4			1		2		B-2204089	Electrodes, compl. without Hand nuts for CY30, Set=6pc.
4				1		2	B-2204091	Electrodes, compl. without Hand nuts for CY45, Set=6pc.
	1						B-3204029	Sensor electrode, compl. without Hand nut, max. limitation
		1	1	1	2	2	B-2204073	Sensor electrode, compl. without Hand nut, max. limitation
6	3						E-3204010	Retainer for O-ring, electrode
6		3	6		12		E-2204062	Retainer for O-ring, electrode
6				6		12	E-2204064	Retainer for O-ring, electrode
5	3						E-3204022	Safety washer RA5.0 for electrode
5		3	6		12		E-2204086	Safety washer RA6.0 for electrode
5				6		12	E-2204088	Safety washer RA8.0 for electrode
7	3						E-3216018	O-ring electrode, 5mm
7		3	6		12		E-2204020	O-ring electrode, 8mm
7				6		12	E-2207012	O-ring electrode, 10mm
	1	1	1	1	2	2	E-3204010	Retainer for O-ring, sensor electrode
	1	1	1	1	2	2	E-3204022	Safety washer RA5.0 for sensor electrode
	1	1	1	1	2	2	E-3216018	O-ring sensor electrode 5mm
8	1						E-3204014	Hand nut for electrode fastening, M6, colour: red
8	1						E-3204016	Hand nut for electrode fastening, M6, colour: black
8	1						E-3204018	Hand nut for electrode fastening, M6, colour: grey
8		1	2		4		E-2204068	Hand nut for electrode fastening, M8, colour: red
8		1	2		4		E-2204070	Hand nut for electrode fastening, M8, colour: black
8		1	2		4		E-2204072	Hand nut for electrode fastening, M8, colour: grey
8				2		4	E-2204074	Hand nut for electrode fastening, M10, colour: red
8				2		4	E-2204076	Hand nut for electrode fastening, M10, colour: black
8				2		4	E-2204078	Hand nut for electrode fastening, M10, colour: grey
12	1	1	1	1	2	2	E-3204018	Hand nut for sensor electrode fastening, M6, colour: grey
11	1	1	1	1	2	2	E-3216025	Plug-in contact with insulating hose for sensor electrode
9	3						E-3216024	Plug-in contact with insulating hose for electrode
9		3	6		12		E-2206059	Plug-in contact with insulating hose for electrode
9				6		12	E-2207016	Plug-in contact with insulating hose for electrode
16	12	18	24	24	48	48	E-3216022	Clamp for flange of transparent cylinder
	1	1	1	1	2	2	E-2204023	Drain filter
21	1						E-3216050	Base for steam cylinder
21		1	1	1	2	2	E-2206052	Base for steam cylinder
	2	2	2	2	4	4	E-2204034	Plastic cap-nut M5 for mounting cylinder base
14	1	1	1	1	2	2	E-2204035	Condensate plug

\* Pos.-Nr. diagram 5.1

*	DB						Art. Nr.	Description
	4-8	10-17	23-30	45	60	90		
<b>Water feed</b>								
19	2	2	2	2	4	4	E-2304015	Clamp for connecting hose solenoid valve - cylinder base, d= 12mm
19	1						B-3326002	Connecting hose, solenoid valve - cylinder base, l=1000mm
19		1	1		2		B-2325013	Connecting hose, solenoid valve - cylinder base, l=1500mm
19				1		2	B-2327000	Connecting hose, solenoid valve - cylinder base, l=1950mm
25	1						B-2304017	Solenoid valve, servo controlled, straight type, 0,2-10bar, 2,5l/min.
25		1	1	1	2	2	B-2307001	Solenoid valve, servo controlled, straight type, 0,2-10bar, 3,5l/min.
	1	1	1	1	2	2	E-2304029	Fine filter in the inlet fitting of solenoid valve
	1						E-3320400	Flow rate controller 2.5l/min.
		1	1	1	2	2	E-2321100	Flow rate controller 3.5l/min.
	1	1	1	1	2	2	E-2304036	Rubber seal solenoid valve - cabinet
	1	1	1	1	2	2	E-2304031	Servo controlled membrane for solenoid valve
	1	1	1	1	2	2	B-2304038	Valve piston with springs
	1	1	1	1	2	2	B-2304039	Piston coating, valve cover, coil-spring
	1	1	1	1	2	2	E-2304034	Solenoid valve coil with bayonet fitting, 230V/50-60Hz
	1	1	1	1	2	2	B-2304024	Threaded inlet fitting for solenoid valve, pipe d=10mm,
	1	1	1	1	2	2	B-2304030	Plastic union nut compl with sealing for solenoid valve
<b>Water Drain</b>								
	1						E-3616006	Clamp for drain hose, from cylinder base to drain pump
22	2	3	3	3	6	6	E-2404004	Clamp f. drain hose, from cyl. base to drain pump DB10-90/pump DB4-90
22	1						E-2403995	Drain hose from base to drain pump
22		1	1		2		E-2404002	Drain hose from base to drain pump
22				1		2	E-2407001	Drain hose from base to drain pump
24	1	1	1	1	2	2	B-2404005	Drain pump without mounting set
	1	1	1	1	2	2	E-2404008	Cover for drain pump
	1	1	1	1	2	2	E-2404009	Impeller for drain pump
	1	1	1	1	2	2	E-2404006	O-Ring seal for drain pump
	1	1	1	1	2	2	E-2404007	Shaft seal for drain pump
	1	1	1	1	2	2	B-2424014	Mounting set for drain pump
	1	1	1	1	2	2	E-3416003	Fastening clamp for drain hose
	1	1	1	1			E-3416005	Fastening clamp for drain hose, for split models
23	1						E-3426009	Pump drain hose DN15, L=900mm
23		1	1		2		E-2424003	Pump drain hose DN15, L=1445mm
23				1		2	E-2427000	Pump drain hose DN15, L=1670mm
	2	2	2	2	4	4	E-2420427	Nut for mounting tundish
	1	1	1	1	2	2	E-2404004	Clamp for tundish hose
	1	1	1	1	2	2	E-2420425	Drain hose for tundish, DN1 inch, per m
1+2	1	1	1	1	2	2	B-2420421	Tundish for drain water incl. sealing
2	1	1	1	1	2	2	E-2420426	Sealing for tundish
<b>Electronic</b>								
	1	1	1	1	2	2	B-2502400	Control switch, single pole, incl. protecting cap
	1						E-2501005	Main contactor 16A, 230V
		1					E-2501006	Main contactor 24A, 230V
			1		2		E-2505007	Main contactor 40A, 230V
				1	2		E-0505009	Main contactor 63A. 230V
	1	1	1	1	2	2	E-2525151	Transformer 230V/9V, 15VA
	1	1	1	1	2	2	E-2504039	Control fuse 5A, 5x20 mm
	1						B-3520001	Connecting cable terminal block - main contactor, set=3pc
		1					B-2524044	Connecting cable terminal block - main contactor, set=3pc
			1		2		B-2524045	Connecting cable terminal block - main contactor, set=3pc
				1		2	B-2527011	Connecting cable terminal block - main contactor, set=3pc



*	DB						Art. Nr.	Description
	4-8	10-17	23-30	45	60	90		
1		1					B-3526013 Connecting cables for electrodes with plug-in contact, set=3pc	
			1				B-2524035 Connecting cables for electrodes with plug-in contact, set=3pc	
				1			B-2524036 Connecting cables for electrodes with plug-in contact, cylinder1, set=6pc	
					1		B-2524037 Connecting cables for electrodes with plug-in contact, cylinder2, set=6pc	
				1		1	B-2527009 Connecting cables for electrodes with plug-in contact, cylinder1, set=6pc	
						1	B-2527010 Connecting cables for electrodes with plug-in contact, cylinder2, set=6pc	
1							B-3520401 Main wire loom	
	1	1					B-2520501 Main wire loom	
				1			B-2521001 Main wire loom	
					1		B-2520801 Main wire loom	
						1	B-2521101 Main wire loom	
1	1	1	1	1	2	2	E-2525121 Cover for electronic pcb	
1	1	1	1	1	2	2	B-2525122 Mounting set for cover	
					1	1	E-2504008 Auxiliary relay 230V - 3-pole, plug-in type	
					1	1	E-2504023 Socket for auxiliary relay	
<b>L-Electronic</b>								
1	1	1	1				B-3524062 L-electronic pcb compl. with module holder	
1	1	1	1				E-3516010 Operation control lamp, "green", 230V	
1	1	1	1				E-3516011 LED "red" for cylinder max. level	
1							B-3524080 Terminal block complete for L-electronic	
	1						B-2524081 Terminal block complete for L-electronic	
		1					B-2524082 Terminal block complete for L-electronic	
			1				B-2524083 Terminal block complete for L-electronic	
1							B-3524001 Wire loom signal lamp control	
	1	1					B-2524002 Wire loom signal lamp control	
				1			B-2524003 Wire loom signal lamp control	
1	1	1	1				E-3524070 Signal output pcb for collective fault	
<b>EM - electronic</b>								
1	1	1	1	2	2		B-2525160 EM-electronic pcb compl. with module holder	
1	1	1	1	2	2		E-2525131 Display for EM-electronic	
1							B-3525080 Terminal block complete for EM-electronic	
	1						B-2525081 Terminal block complete for EM-electronic	
		1					B-2525082 Terminal block complete for EM-electronic	
			1				B-2525083 Terminal block complete for EM-electronic	
				1			B-2525084 Terminal block complete for EM-electronic	
					1		B-2525085 Terminal block complete for EM-electronic	
1	1	1		1			B-2525002 Wire loom prop. control for EM-electronic	
			1	1	2		B-2525003 Wire loom prop. control for EM-electronic	
	1	1	1				B-2525135 Bus cable EM - RO 0,3m	
1					2		B-2525136 Bus cable EM - RO 0,5m	
					2		B-2525137 Bus cable EM - RO 0,7m	
1	1	1	1	2	2		B-2525141 Ro signal output pcb complete with module holder	
1	1	1	1				B-0623023 Signal outputs "Operation" and "Collective fault"	
				1	1		B-0623037 Signal outputs "Operation" and "Collective fault"	
<b>MP-electronic</b>								
1	1	1	1	2	2		B-2522492 MT - pcb compl. with module holder	
1	1	1	1	2	2		E-2522494 MP-electronic/Display for MP-electronic	
1	1	1			2		B-3522451 Bus cable MP - MT 1,05m	
			1		2		B-2522453 Bus cable MP - MT 1,35m	
1							B-3522480 Terminal block complete for MP-electronic	
	1						B-2522481 Terminal block complete for MP-electronic	

*	DB						Art. Nr.	Description
	4-8	10-17	23-30	45	60	90		
			1				B-2522482	Terminal block complete for MP-electronic
				1			B-2522483	Terminal block complete for MP-electronic
					1		B-2522484	Terminal block complete for MP-electronic
						1	B-2522485	Terminal block complete for MP-electronic
	1	1	1		1		B-2522402	Wire loom prop. control for MP-electronic
				1	1	2	B-2522403	Wire loom prop. control for MP-electronic
	1	1	1		1		B-3522452	Bus cable MP - MT - RO 1,43m
				1	1	2	B-2522454	Bus cable MP - MT - RO 1,94m
	1	1	1	1	2	2	B-2525141	RO signal output pcb complete with module holder
<b>Accessories</b>								
	x	x					E-2604249	Steam distributor, DN 25, 240mm, holes evenly spaced
	x	x					E-2604251	Steam distributor, DN 25, 400mm, holes evenly spaced
	x	x					E-2404253	Steam distributor, DN 25, 700mm, holes evenly spaced
	x	x					E-2604255	Steam distributor, DN 25, 1000mm, holes evenly spaced
	x	x					E-2304256	Steam distributor, DN 25, 1300mm, holes evenly spaced
			x	x	x	x	E-2604400	Steam distributor, DN 40, 300mm, holes evenly spaced
			x	x	x	x	E-2604402	Steam distributor, DN 40, 500mm, holes evenly spaced
			x	x	x	x	B-3626403	Steam distributor, DN 40, 700mm, holes evenly spaced
			x	x	x	x	B-2624404	Steam distributor, DN 40, 900mm, holes evenly spaced
			x	x	x	x	B-2604406	Steam distributor, DN 40, 1300mm, holes evenly spaced
	x	x					E-2604012	Steam hose DN25, per m
			x	x	x	x	E-2604013	Steam hose DN 40, per m
	x	x	x	x	x	x	E-2604014	Condensate hose DN 12, per m
	x	x					E-2404004	Steam hose clamp DN 25
			x	x	x	x	E-2604016	Steam hose clamp DN 40
	x	x	x	x	x	x	E-2304015	Condensate hose clamp DN 12
	x	x					E-2604019	Connectors for steam distribution T-piece DN 25
			x	x	x	x	E-2604020	Connectors for steam distribution T-piece DN 40
	x	x	x	x	x	x	E-2604021	Connectors for condensate T-piece DN 12
	1						B-3626010	Mounting kit
		1	1				B-2624022	Mounting kit
				1			B-2624023	Mounting kit
					1		B-2624024	Mounting kit
	x	x					B-2604026	Steam solenoid valve 0-0,4 bar, compl. for steam hose DN 25
			x	x	x	x	B-2604040	Steam solenoid valve 0-0.4 bar, compl. for steam hose DN 40
							E-2604029	Hose adapter DN 25
	x	x					E-2604030	Elbows 90° DN 25, stainless steel
			x	x	x	x	E-2604034	Elbows 90° DN 40, plastic
			x	x	x	x	E-2604036	Elbows 90° DN 40, stainless steel
							E-2604031	Connector DN 40/25
	1						B-2208005	Cylinder star
		1					B-2208007	Cylinder star
			1		2		B-2208009	Cylinder star
				1	2		B-2208011	Cylinder star
	1						B-2304063	Super flush complete
		1	1	1	2	2	B-2304065	Super flush complete

\* Pos.-Nr. diagram 5.1