HOMA Hochstromtechnik

# NF- and MF-
# high current circuit breakers

## water cooled,

## to switching off load

# List 427E

**Edition from 01 / 2008**

**Application:**

HOMA circuit breakers type HA.... w and HAT.... are built in accordance to the regulations for switching devices VDE0660 for frequent switching ON or OFF, or for switching from one circuit to another under off-load conditions. The circuit breakers are designed to feed one furnace via various switching installations with differing voltages, frequency and power capacity as is readily shown in Fig. 1. Another possibility is the selective feeding of several furnace installations from one supply network, as shown in Fig. 2. Switches of serial HAT... serve its purpose supplementary the electrical debits according to IEC 60694 for $U_r$ = 3,6 kV (type checked by test report No. 1040.718.0.381).

Fig. 1

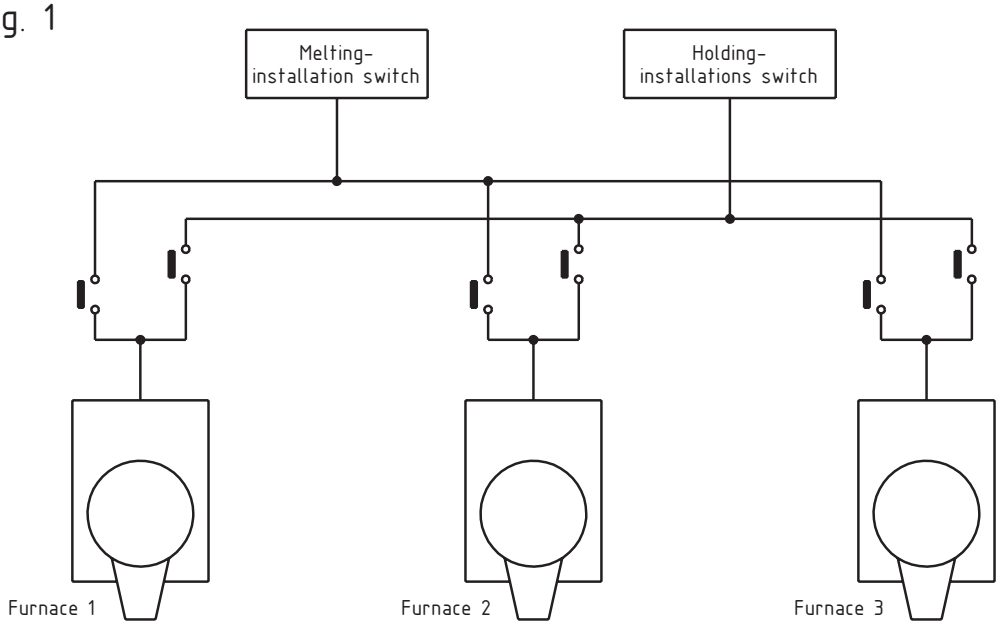
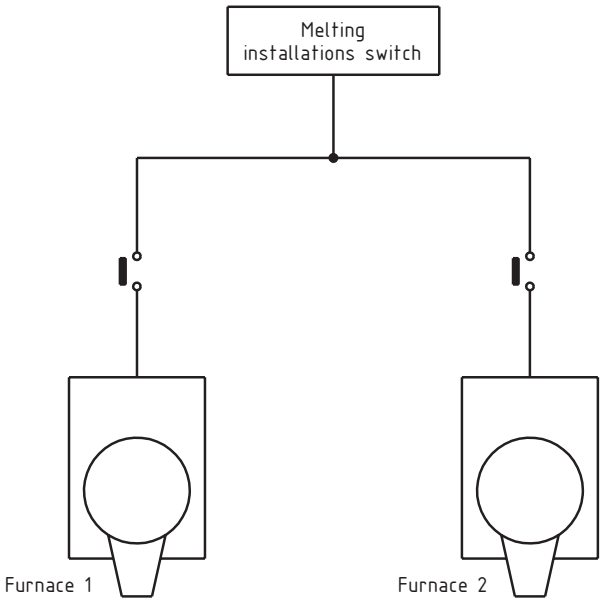



Fig. 2



**Class of protection:**
The circuit breakers are supplied in accordance with class of protection IP 00 DIN EN 50102.

**Series voltage:**
Creepage distance and clearance correspond to VDE 0110. The voltage test is carried out in accordance to VDE 0660. The rated voltage is 3000 V.

**Construction :**
A double pole circuit breaker is constructed of two identical single pole circuit breakers in back-to back position. In this design, both poles for the forward-and return path are arranged closely, opposite, one another in order to minimise the inductive voltage drop and stray fields. The number in the circuit breaker type indicates the number of movable double contactor units with which the upper part is in contact with the fixed lower contact unit in the closed position. The fixed contact units also serve as bus bars for electrical connections and are water cooled in the vicinity of the contacts. The circuit breakers are designed for continuous operation, and as a result the contacts feature heavy pure silver coatings.

**Drive :**
Each single pole circuit breaker incorporates its own magnetic actuator. For the reason the magnetic actuator system for a double pole circuit breaker utilises a parallel control circuit. The movable armature of the magnetic actuator is fixed to the drive shaft. When closing the circuit breaker, the actuator shaft is rotated through 15° and presses the movable double contacts, by means of insulated cams, against the fixed contact units. As soon as the movable contacts touch, the spring tension of the contactor pressure springs increases and provides the required contact pressure.

**Mechanical interlocks :**
As the circuit breakers are only designed for off-load switching, they incorporate a mechanical interlocking system for safeguard against accidental open circuiting (e.g. due to loss of control voltage). In order to open the circuit breaker under normal operation, an unblocking magnet must be energized by means of an auxiliary normal open contact. This opens a normally closed contact in the holding signal path of the main belonging to the unblocking system. The switch opens and also opens the normally open contact arranged in the unblocking solenoid circuit which de-energizes the unblocking solenoid.

**Frequency of switching operations :**
In the standard design the magnetic actuator and mechanical unblocking system is designed for 60 operations per hour.

**Auxiliary contacts**
The auxiliary contacts for the control- and latch-in condition are mounted below magnetic system. The standard design are 4NC and 4NO auxiliary contacts.

**Capacities off auxiliary contacts**

| Ue (V) | 24 | 230 |
|---|---|---|
| DC-13 (A) | 6 | 0,3 |
| AC-15 (A) | 6 | 6 |

**Control:**
The control circuits are to be connected as shown on page 6. Operating the push-button "I" (ON) applies the a.c. control voltage via two series auxiliary contacts to the Si-rectifier incorporated on the unit. The d.c. output voltage is applied to the magnetising coil which closes the armature and circuit breaker contacts. Shortlybefore the armature reaches its final position the auxiliary contacts open and connect both parallel connected power saving resistors in series with the HOMA-Si-rectifier. The holding circuit for the magnetising coil is effected via the switch

holding contact and closed contact of the unblocking magnetising coil. The circuit breaker is switched off by operating the push-button "O" (OFF). The mechanical unblocking magnetising coil is energised via a N.O. contact of the circuit breaker to lift the mechanical interlock. At the same time the auxiliary contact is opened to interrupt the holding circuit, which in turn de-energises the magnetising coil. De-energised the magnetising coil also causes the auxiliary N.O. contact in the circuit to the unblocking magnetising coil to open which in turn de-energises this coil. The push-buttons which are arranged on site may be replaced by a selector switch with definite switching positions.

**Caution:**
The circuit breaker can only be switched-off after the mains contactor has been opened and the capacitor bank of the furnaces inductor has been discharged. If necessary, a timer relay must be connected.

**Power consumption magnetic coil:**

| Switch type | I-pole | | | | II-pole | | | |
|---|---|---|---|---|---|---|---|---|
| | Uc 230V ..Hz | | Uc 115V ..Hz | | Uc 230V ..Hz | | Uc 115V ..Hz | |
| | closing [W] | holding [W] | closing [W] | holding [W] | closing [W] | holding [W] | closing [W] | holding [W] |
| HA 1w | 650 | 30 | 820 | 30 | 1300 | 60 | 1640 | 60 |
| HA 2w | 880 | 45 | 820 | 40 | 1760 | 90 | 1640 | 80 |
| HA 3w | 880 | 55 | 1060 | 50 | 1760 | 110 | 2120 | 100 |
| HA 4w | 1250 | 85 | 1360 | 80 | 2500 | 170 | 2720 | 160 |
| HA 5w | 1700 | 110 | 1670 | 115 | 3400 | 220 | 3340 | 230 |

**Power consumption release coil:**

| Switch type | Uc 230V ...Hz | | Uc 115V ...Hz | |
|---|---|---|---|---|
| | closing [W] | holding [W] | closing [W] | holding [W] |
| HA ..w I-pole | 700 | 95 | 800 | 100 |
| HA ..w II-pole | 1400 | 190 | 1600 | 200 |

**Erection:**
The circuit breakers are to be erected in accordance to the drawings on page 7 and 8. The frame must be support in the vicinity of the fixing holes if the surface is uneven, in order to prevent twisting.

**Connection:**
In order to keep the inductive voltage drop to a minimum and to contain the magnetic stray fields, both I-pole type circuit breakers have the poles mounted as closely together as possible. For an I-pole arrangement for the furnace resonant circuit, it is essential to feed the direct return cable in a parallel manner as close as possible behind the circuit breaker pole. The connecting bus bars (water cooling design) are to be selected in accordance to the connection width of the fixed circuit breaker contactors and permissible load current. The required antimagnetic connection screws for the switch, including antimagnetic washers and spring washers are supplied. The bus bars are to be laid in such a manner in order to prevent the expanded bus bars (due to heating) from exerting mechanical stress on the circuit breakers connections.

**Current loading capacity:**
The maximum load current, dependant on positive tolerances, harmonics and possible overvoltages of the capacitors, must not be greater than the rated current of the circuit breakers.

### Switch latch device

Together with the additionally required short-circuiting devices and earth connections of the disconnected electrical installation, the switch latch device serves the purpose of protecting maintenance personnel against electric accidents. To this end, the switch latch device in the area of the magnetic system is equipped with a lever by means of which a mechanical locking device is placed between the open magnet. In the course of this, the auxiliary contacts depicted in the circuit diagram on sheet 6 are activated. These auxiliary contacts must be integrated into the installation's control circuit by the customer to prevent the control unit from being switched on. The mechanical locking device's lever is equipped with an additional facility to lock this mechanically locked position by means of three padlocks fitted by maintenance personnel. The switch latch device is not part of the normal switch design and has to be ordered additionally at an extra charge.

### Power loss:

| Switch type HA... and HAT... | Power loss [kW] | |
|---|---|---|
| | I-pole switches | II-pole switches |
| 1w | 0,9 | 1,8 |
| 2w | 1,8 | 3,6 |
| 3w | 2,7 | 5,4 |
| 4w | 3,6 | 7,2 |
| 5w | 4,5 | 9,0 |

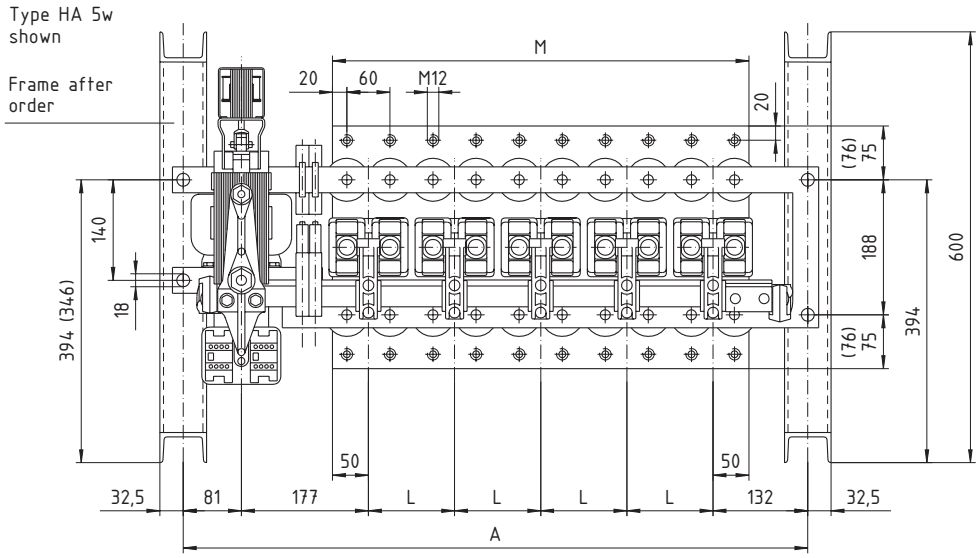
### Cooling water connections:

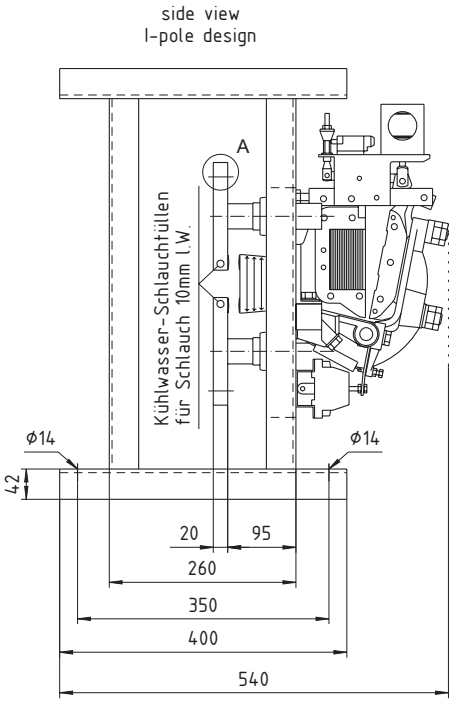
The circuit breakers can be connected with hose pipes for cooling purposes with the bus bars as shown in the drawings on page 7 and 8. The circuit breakers feature cooling water connections sleeves for the hose pipes; clips for these must be off antimagnetic material. The required cooling water quantity (ca. 1,4 l/min/kW at $\Delta$t 10° C) must be monitored by flow monitors.

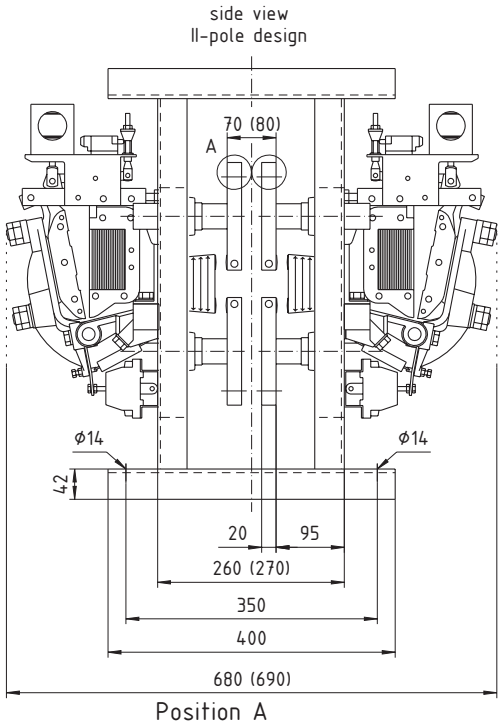
### Selection-table

| Switch type HA... and HAT... | number of poles | Rated current / Pole [kA] at a frequency ... Hz | | | | | | | | | | net-weight [kg] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 | 150 | 250 | 500 | 1000 | 2000 | 3000 | 4000 | 8000 | 10000 | |
| 1w | I | 5,25 | 4,95 | 4,7 | 4,4 | 3,95 | 3,4 | 3,1 | 2,9 | 2,3 | 2,1 | 55 |
| 2w | | 10,5 | 9,9 | 9,4 | 8,8 | 7,9 | 6,8 | 6,2 | 5,8 | 4,6 | 4,3 | 69 |
| 3w | | 16 | 15 | 14,4 | 13,4 | 12 | 10,4 | 9,4 | 8,8 | 7 | 6,5 | 83 |
| 4w | | 20 | 18,8 | 18 | 16,8 | 15 | 13 | 11,8 | 11 | 8,8 | 8,2 | 97 |
| 5w | | 25 | 23,5 | 22,5 | 21 | 18,8 | 16,2 | 14,8 | 13,8 | 11 | 10,3 | 111 |
| 1w | II | 5,25 | 4,95 | 4,7 | 4,4 | 3,95 | 3,4 | 3,1 | 2,9 | 2,3 | 2,1 | 110 |
| 2w | | 10,5 | 9,9 | 9,4 | 8,8 | 7,9 | 6,8 | 6,2 | 5,8 | 4,6 | 4,3 | 138 |
| 3w | | 16 | 15 | 14,4 | 13,4 | 12 | 10,4 | 9,4 | 8,8 | 7 | 6,5 | 166 |
| 4w | | 20 | 18,8 | 18 | 16,8 | 15 | 13 | 11,8 | 11 | 8,8 | 8,2 | 194 |
| 5w | | 25 | 23,5 | 22,5 | 21 | 18,8 | 16,2 | 14,8 | 13,8 | 11 | 10,3 | 222 |

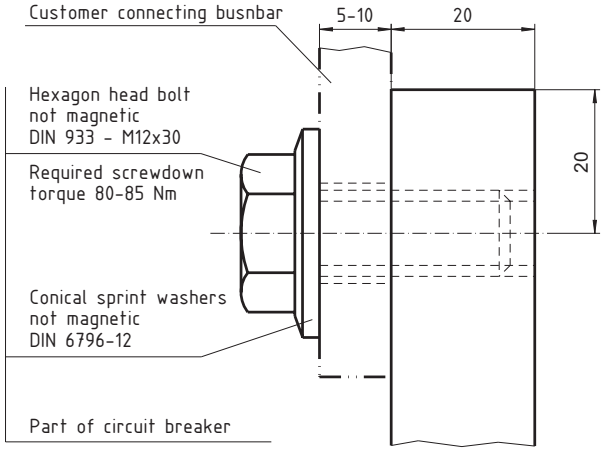
## Dimension for switch type HA... and HAT...



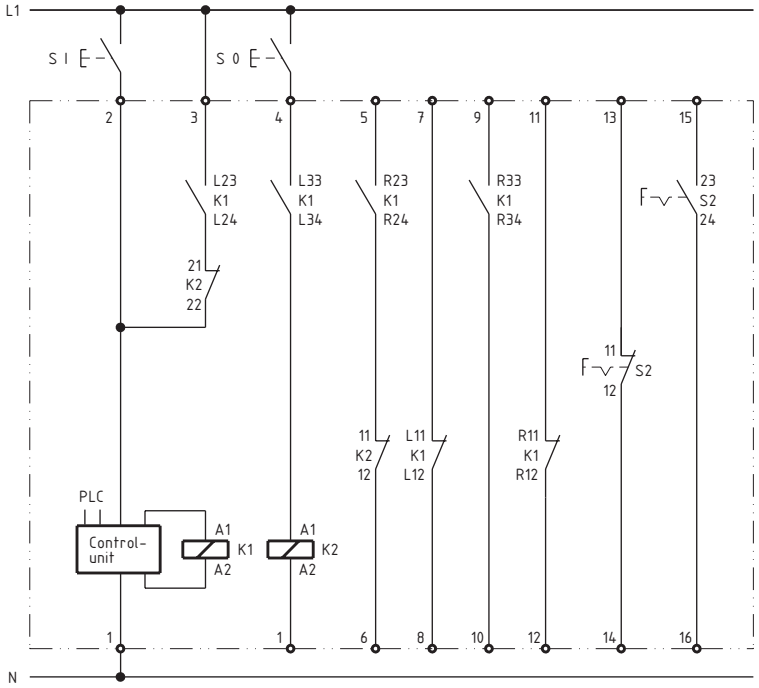

Position A
(scale 1:1)



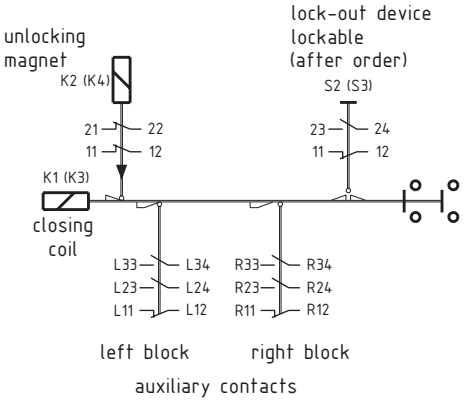

| Type HA... and HAT... | Table of dimensions [mm] | | |
|---|---|---|---|
| | A | L | M |
| 1w | 390 | - | 100 |
| 2w | 510 | 120 | 220 |
| 3w | 630 | | 340 |
| 4w | 750 | | 460 |
| 5w | 870 | | 580 |

## Circuit diagrams

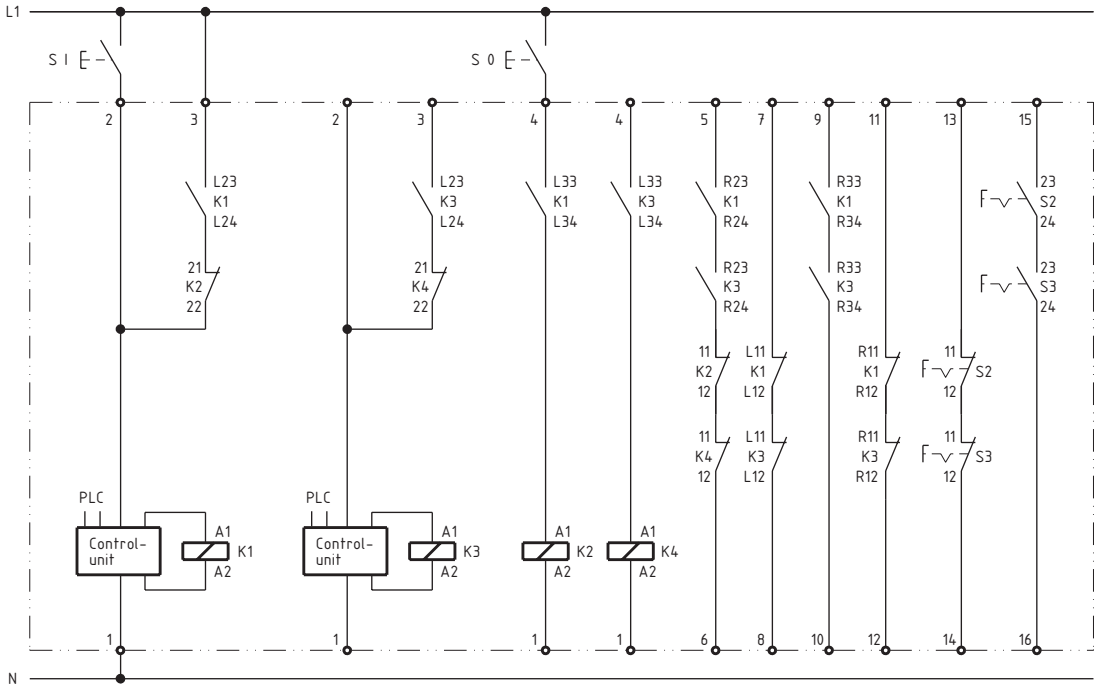
switching diagram for Typ HA... and HAT... 1-pole complete wired
unwired terminals 1 - 4 only
terminals 13 - 16 by lock-out device only



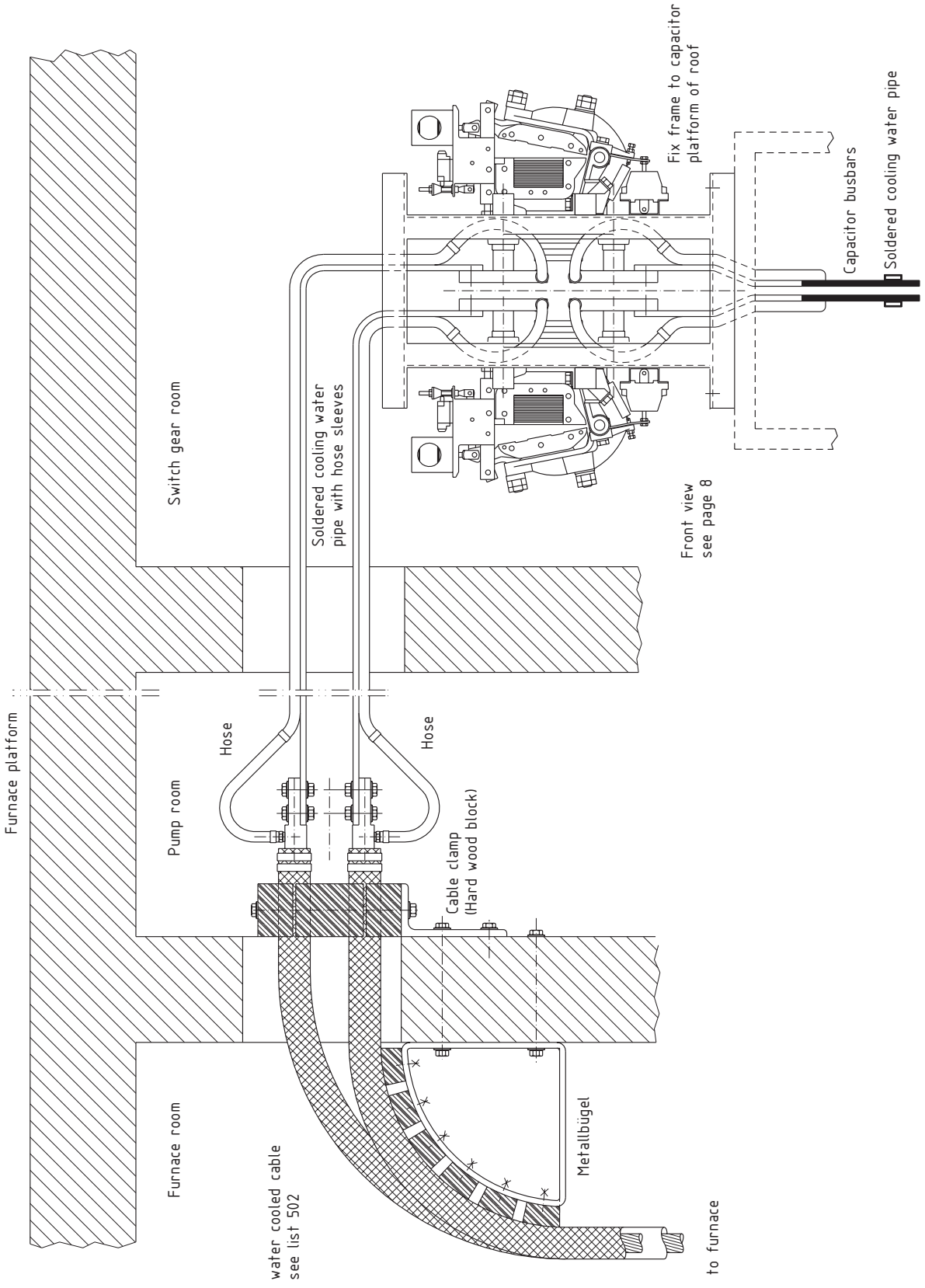

schematic diagram
1- or 2-pole
after order




switching diagram for type HA... and HAT... 2-pole complete wired
unwired terminals 1 - 4 only
terminals 13 - 16 by lock-out device only



**Connection and installation from high current circuit breakers into bus bars arrangement**



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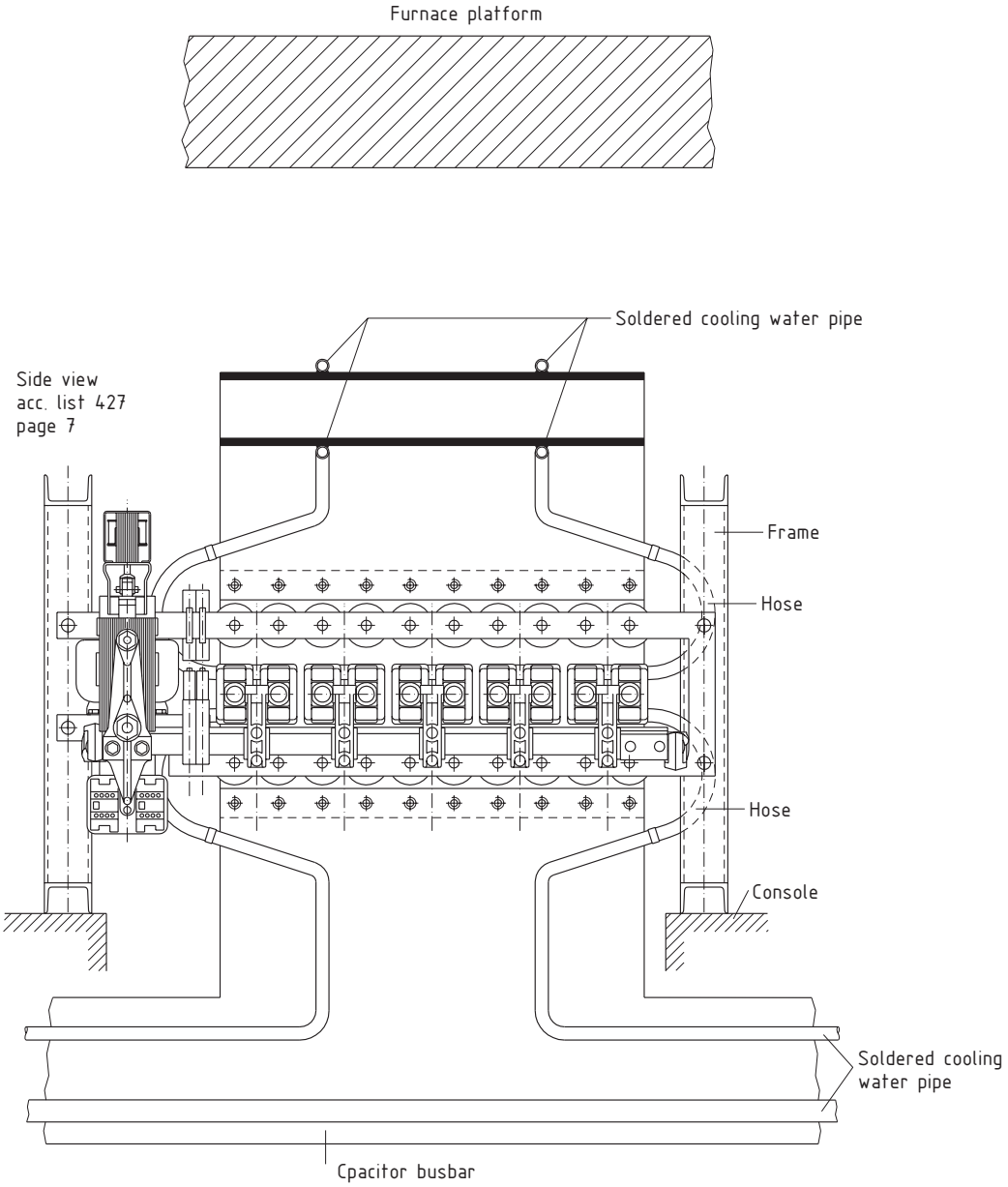
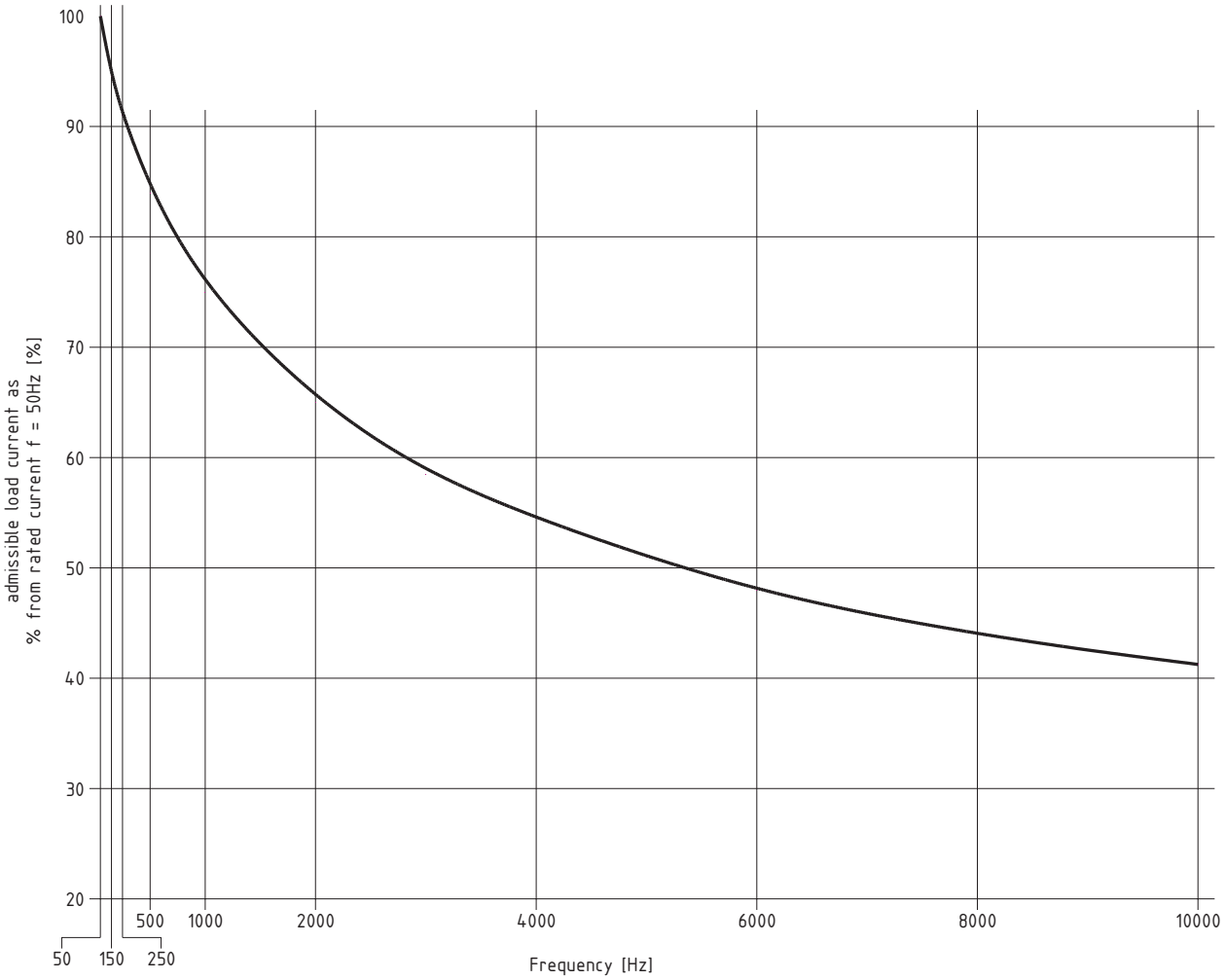


## Pernissible load current against frequency



**Manufacturing-program**