

# **NF- and MF- high current circuit breakers**

**air cooled,  
to switching off load**

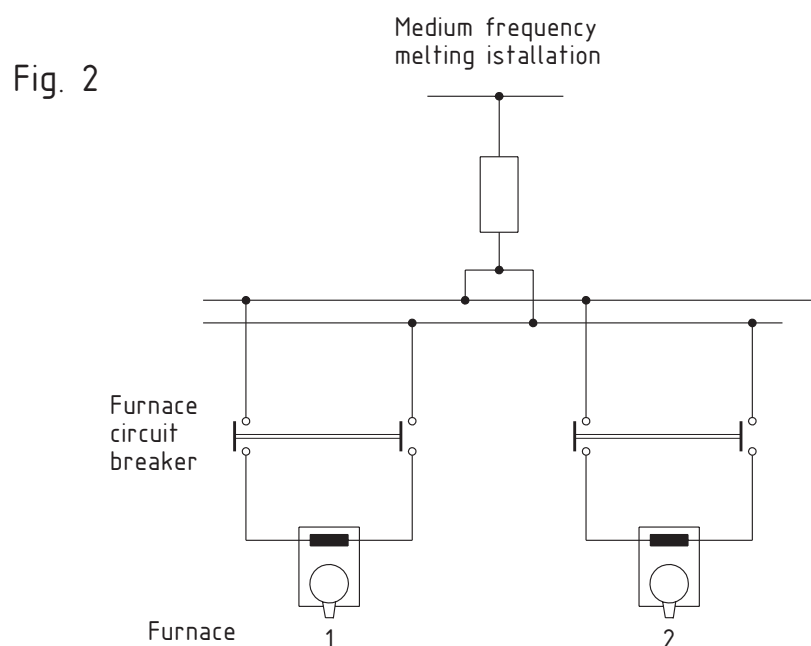
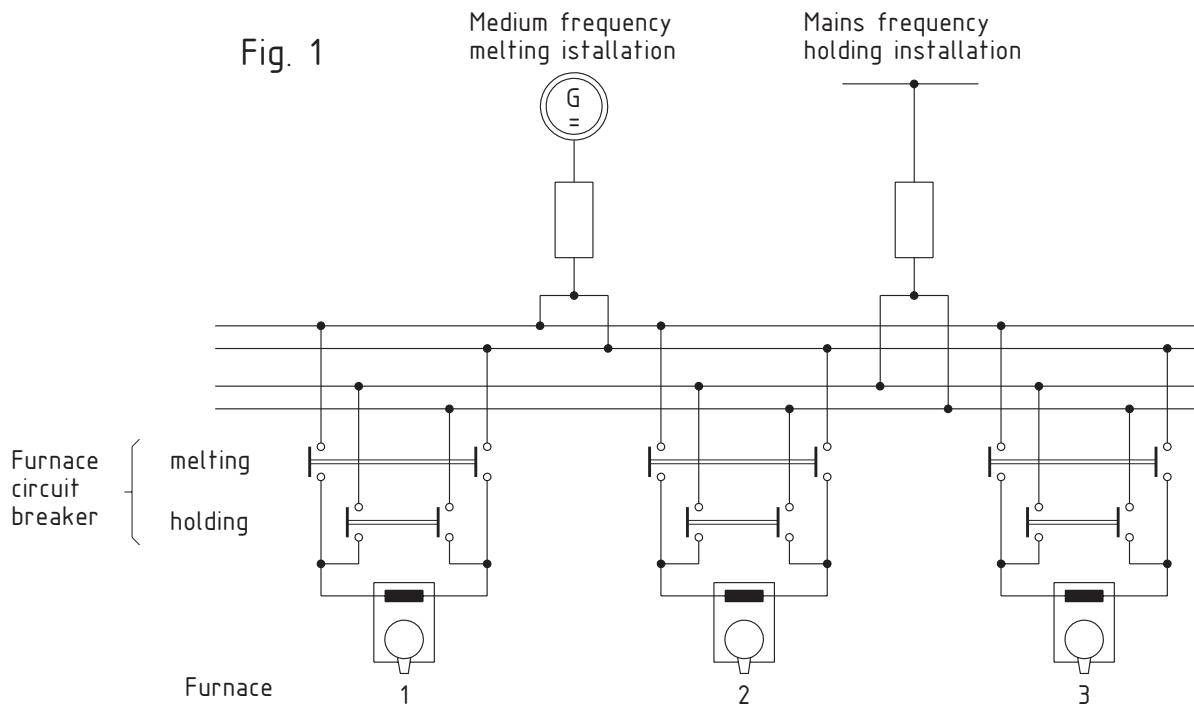
**List 145E**

**Edition 01 / 2008**

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### Application

HOMA high current cut-off switches type E... and D... are control switches for frequent switching on, cutting off, or changing over off-load conditions and accordance with the Regulations for Switchgear VDE 0660. They serve for the change over mains and medium frequency furnaces and for the latter's switching installations; they also make possible the feeding of a furnace from various switching installations of differing voltage, frequency, and output (see fig. 1), or the feeding of several furnaces from one switching installations (see fig. 2). Switches of serial type ET... and DT... serve its purpose supplementary the electrical debits according to IEC 60694 for  $U_r = 3,6 \text{ kV}$  (type checked by test report No. 1040.718.0.381).



**Class of protection:**

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

**Construction:**

Each current path has two pole halves, the ends of which are silver-plated lugs for flat-type or blade-type parallel connection. These current pole halves join together in the switch-on position of the circuit breaker by means of two movable contact pieces which lie parallel to each other (Type E...) or, one in front and the other at the back (Type D...). The movable and the fixed contact pieces with their solid silver coating are suitable for continuous switching on. The auxiliary contacts are situated actuating side under the magnet.

**Actuation:**

The actuating of the circuit breakers is effected electromagnetically. Circuit breakers type E... has one, and type D... two magnetic systems in the form of hinged armatures. The movable armatures are mounted on the rotary shaft. For switching on, the rotary shaft is turned by 15° and thereby pressed the movable contacts via insulated tappets against the fixed contact pieces of the pole halves. When the movable contact pieces touch the fixing contacts, the pressure is further increased by forced spring loading.

**Series voltage:**

Creepage distance and clearance correspond to VDE 0110 and VDE 0660 for 3000 V.

**Switching frequency:**

As a rule, the magnetic actuating is rated at 60 operations per hour; more operations per hour can be made available upon request.

**Mechanical latch-in**

A mechanical latch-in device is provided as a safety measure against accidental cut-off due to a failure of control voltage, which is released electromagnetically during the cut-off procedure by means of the release magnet.

**Control:**

Controls should be arranged as depicted on page 7 fig. 1 or 2 (depending on the type of switch). When actuating press button "I" (on), the control AC-voltage is transmitted via the two economy contacts connected in series to the Si-rectifier which feeds its outgoing DC-voltage into the magnetic coil. The armature draws and closes the main switching elements. Shortly before the final position of the armature is reached, the two economy contacts open thus switching the two parallel economy resistors into the feed-line of the rectifier. The magnetic coils is held in by means of a holding contact of the switch and by the auxiliary contact of the release coil. For switching off, press button "O" (off) must be actuated. A NO-contact of the switch energizes the release coil which released the mechanical latch-in. At the same time, the release coil opens its auxiliary NC-contact which, in turn, interrupts the holding line and switches off the magnetic coil. Due to the switching off the magnetic coil, the NO-contact in the feed line of the release coil is opened and thus deenergizes the release coil. Instead of the press buttons being fitted externally, a selector switch with fixed switching position may be supplied.

**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.

### Power consumption magnetic coil

switch type	Rated voltage 1500V				Rated voltage 3000V			
	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]
EI + DII	350	20	300	20	625	30	800	25
EII + DIV	625	30	800	40	850	40	800	40
EIII + DVI	850	55	800	50	850	55	1000	55
EIV + DIII	1200	80	1300	80	1200	80	1300	80

### Power consumption release coil

switch type	Uc 230V ...Hz		Uc 115V ...Hz	
	closing [W]	holding [W]	closing [W]	holding [W]
E...	700	95	800	100
D...	1400	190	1600	200

### Erection:

The switches must be erected in a position as drawn up on pages 7 and 8. If the switches rest on uneven surface, the frames in the area of the fixing holes must be shimed to form a level surface and make sure there will be no distortion. Change over switches can be formed by arranging two circuit breakers one above the other, or alongside each other, or one behind the other.

### Connection:

To counteract possible minor inductive voltage drops or to deal with the stray fields, the poles should be cross connected. Neither the feed line nor the downlead may form a loop within the switch. Also, a 1-pole connection is not admissible owing to the stray fields. For the switch type is E... it may, however, be chosen if the return circuit is split up and arranged at a suitable distance behind the individual poles. The connecting bus bars should be so rated as to be able to withstand a heating of up to 30°C. On page 5, various types of connecting are shown with Cu current bus bars having the quoted cross section. As a consequence of longitudinal deviations of the bus bars, due to the changing temperature, very high mechanical force arises which the connections cannot cope with. By appropriately laying to bus bars or, by inserting extensions straps in the case of long routes, the switch connections will be relieved. The best connections for the medium frequency range are non-magnetic bolts and clamping plates; with mains frequency, non-magnetic connections are only required for 4000 A per pole and above.

### Parallel connection:

There should always be two poles of switch type D... parallel connected for 6000 A 50 Hz. The parallel connection should, however, be made at a distance of 1 m before or behind the switch, in order to have this length of line to serve as a stabilizing resistor for the possible differing contact resistance.

### Capacities off auxiliary contacts

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

**Current-carrying capacity:**

The maximum load current which results after taking into consideration positive tolerances, harmonics, and overvoltages should not be higher than the rated current of the circuit breakers. As is generally known, the proportion of harmonics is especially high with statically generated high frequencies. The rated current refers to an ambient temperature of 35°C, whereby a sufficient exchange of air in the switch room is assured. With higher ambient temperatures the rated current is reduced correspondingly. In the case of several parallel contacts being cross connected, an equal distribution of current must be ensured by the vectorial partitioning of active and reactive power (if this not possible, enquire the manufacturer).

**Special design:**

For higher currents two or more poles have to be operated parallel (acc. dimension drawing M 40419). Any coil voltage other than standard can be delivered at additional cost. Technical problems and prices can be clarified upon enquiry.

**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.

**Data required for orders:**

Quantity, Type of switch, Number of poles, Operating voltage and frequency, Maximum load current per pole with enforced current distribution, Control voltage and frequency, Type of terminal lugs and bottom.

**Selection-table:**

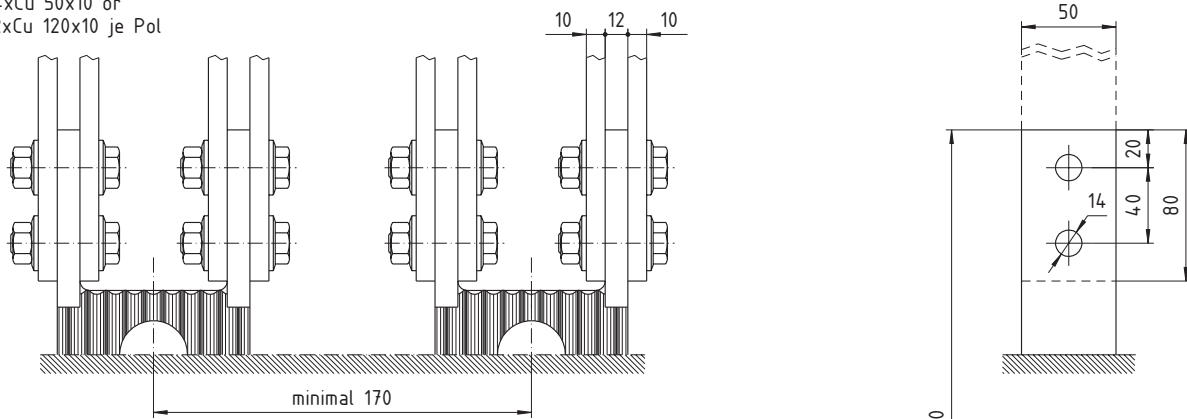
Switch type	Number of poles	Dimensions see page	Dimension A [mm]	Rated current per pole ...A at a <sup>2)</sup> frequency of ...Hz									Net weight [kg] <sup>1)</sup>
				50	150	250	500	1000	2000	4000	8000	10000	
EI	I	7	410	3300	2850	2700	2500	2250	1950	1600	1300	1250	38
EII	II		580										54
EIII	III		750										70
EIV	IV		920										85
DII	II	8	420	3500	3000	2850	2700	2350	2050	1700	1400	1300	96
DIV	IV		580										135
DVI	VI		750										172
DVIII	VIII		920										212

1) Weight of switch type E... without frame (weight frame 18 kg)

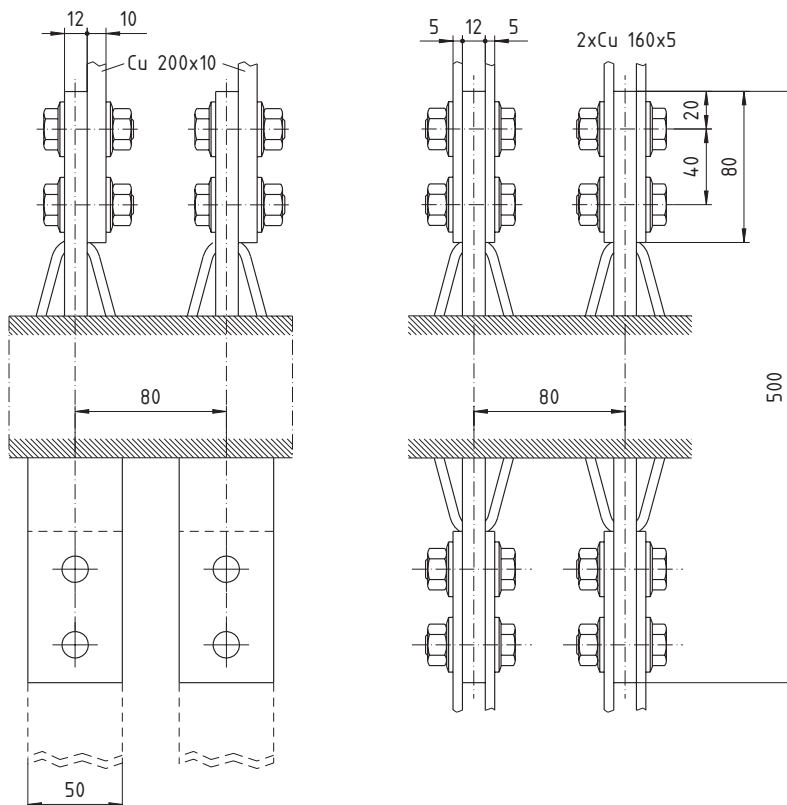
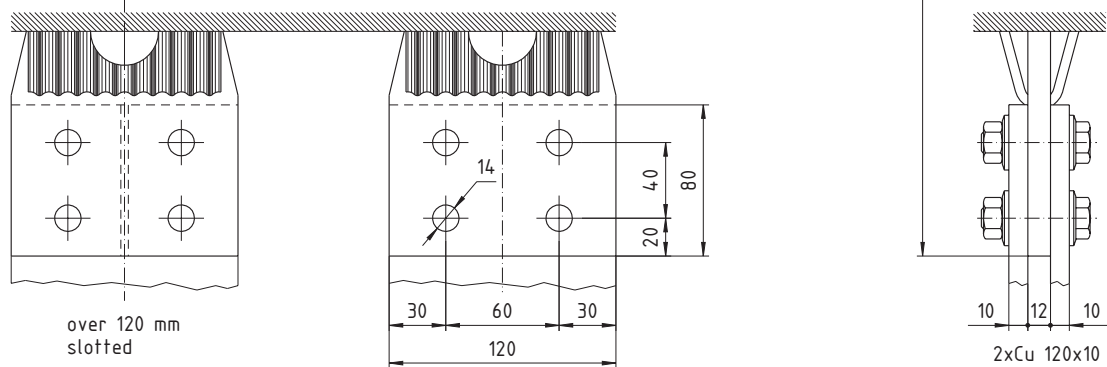
2) Non-magnetic bars and switch-bars required for 250 Hz and above.

### Examples of connections

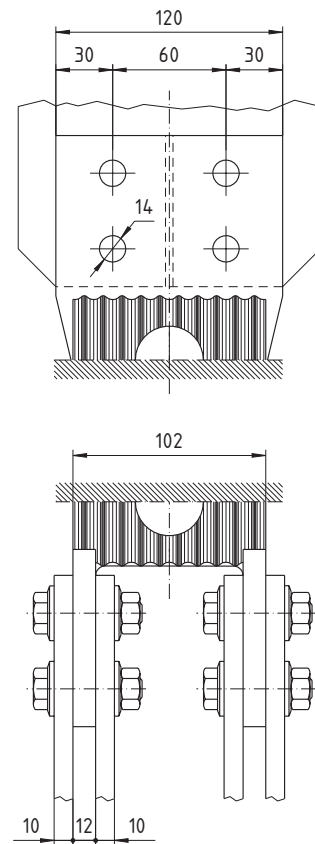
4xCu 50x10 or  
2xCu 120x10 je Pol



Blade-type parallel or flat-type connections for switch type E...

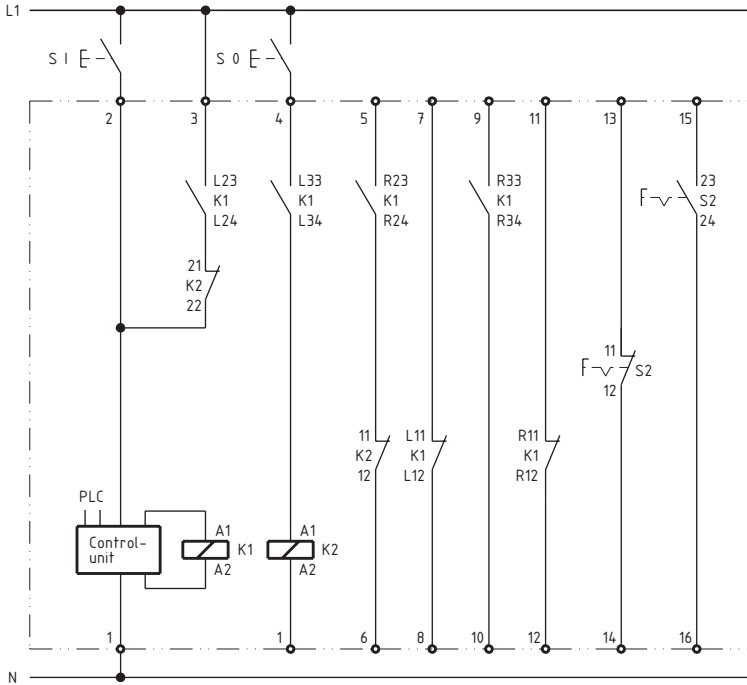


Blade-type parallel or flat-type connections for switch type D...

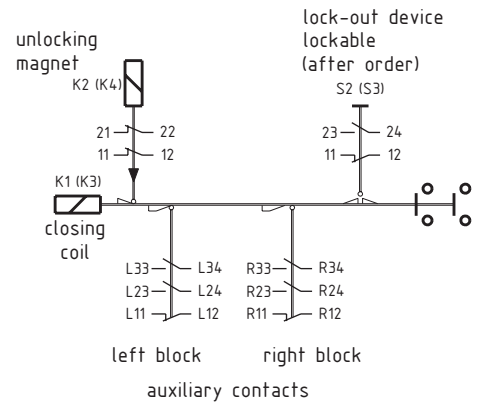


### Circuit diagrams

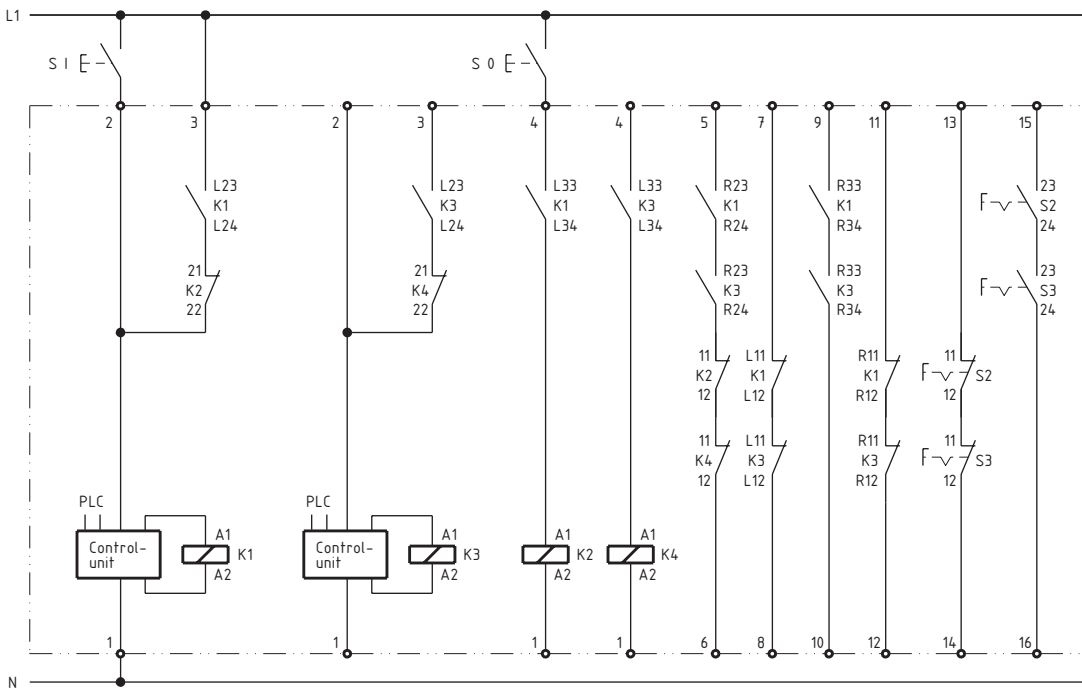
switching diagram for Typ E and ET complete wired  
 unwired terminals 1 - 4 only  
 terminals 13 - 16 by lock-out device only



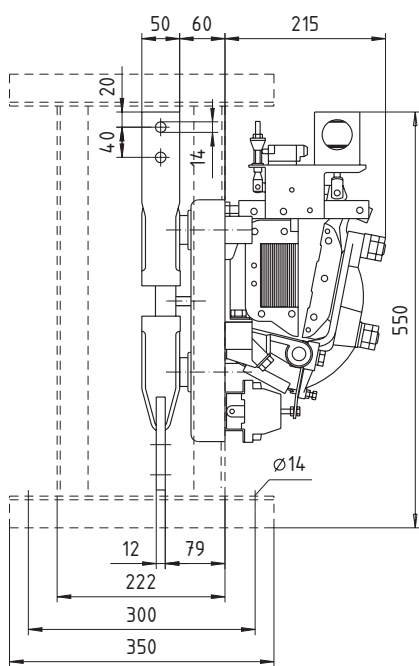
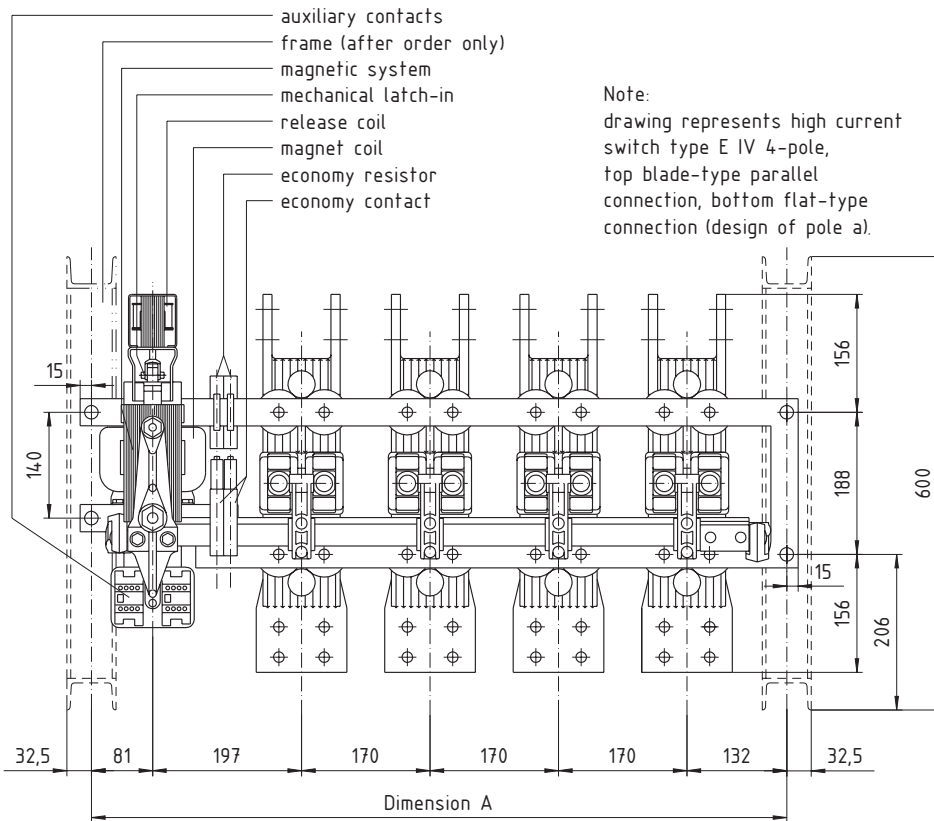
schematic diagram  
 1- or 2-pole  
 after order



switching diagram for Typ D and DT complete wired  
 unwired terminals 1 - 4 only  
 terminals 13 - 16 by lock-out device only



### Dimension for switch type E...



possible alternatives  
 for pole design

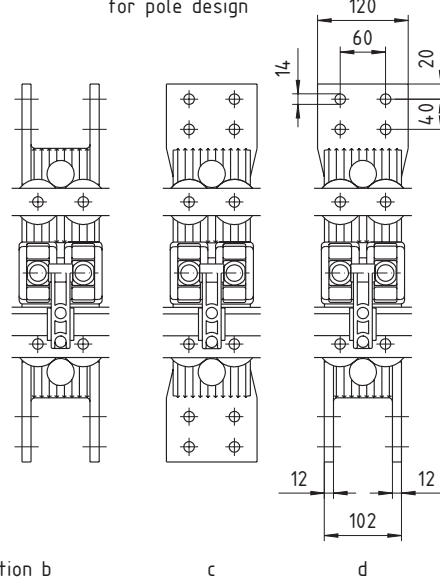


Table of dimension		
type	number of pole	dimension A [mm]
E I	I	410
E II	II	580
E III	III	750
E IV	IV	920



### Dimension for switches type D...

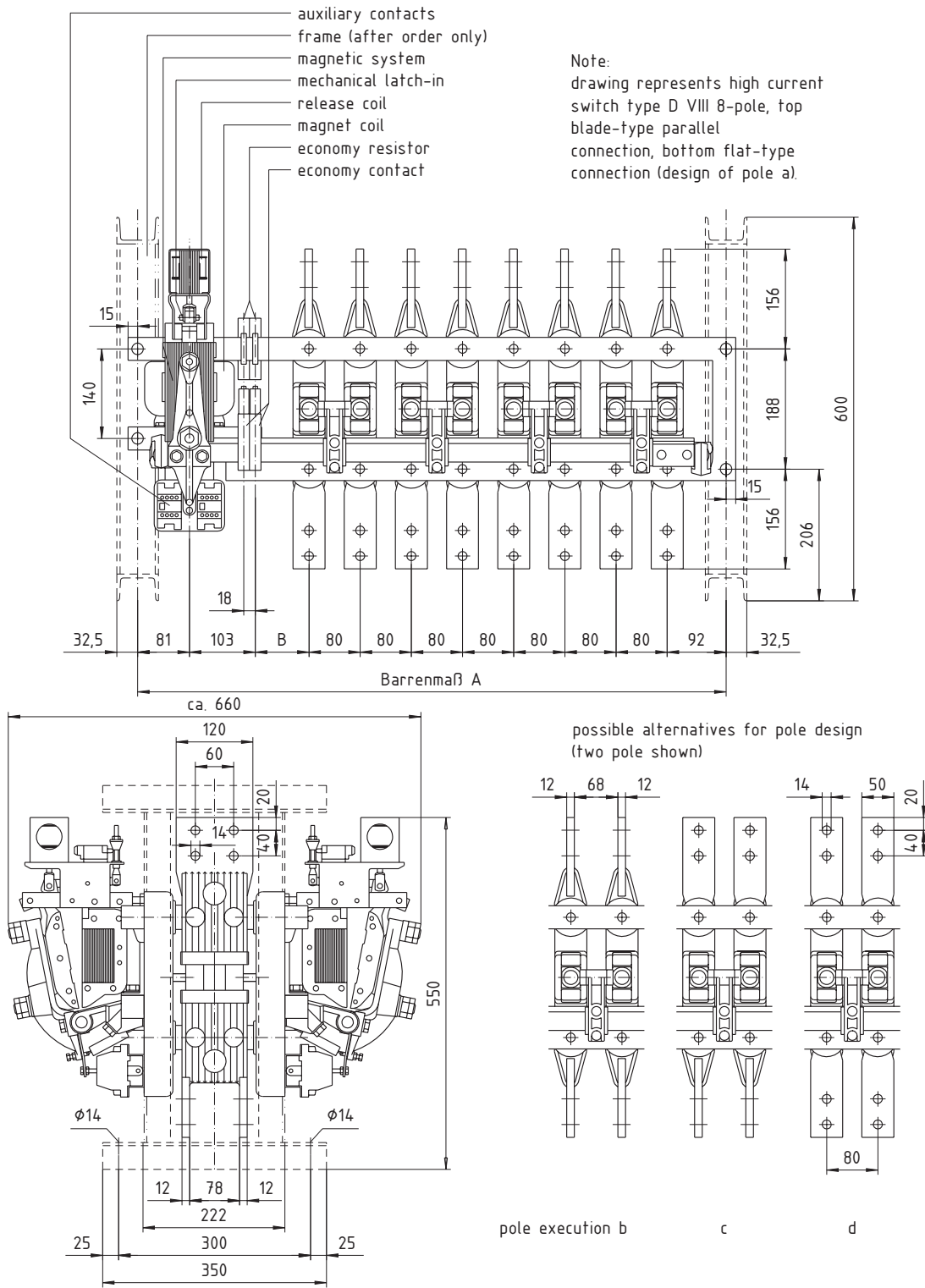
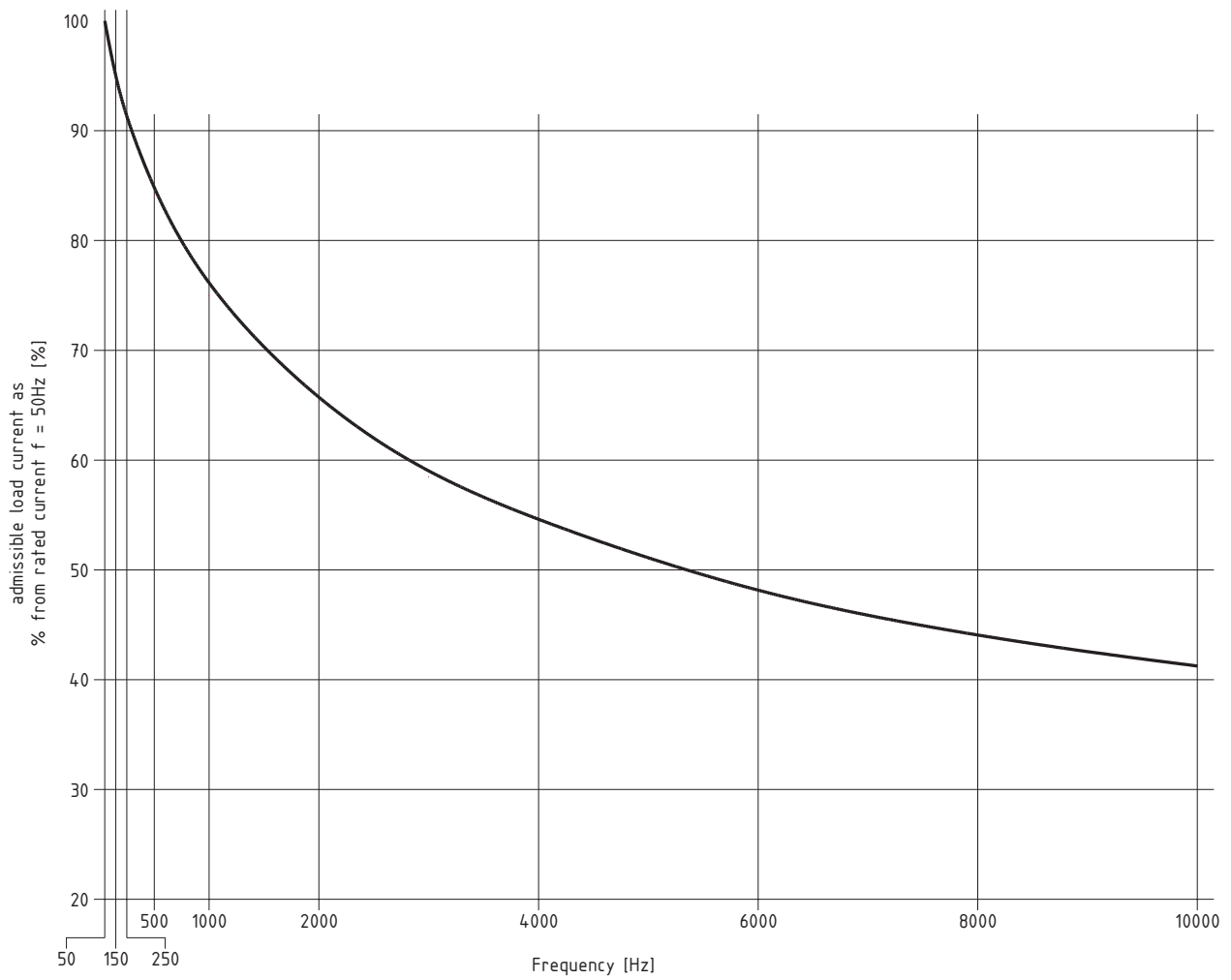


Table of dimension			
Type	Number of poles	Dimension A [mm]	Dimension B [mm]
DII	II	420	64
DIV	IV	580	64
DVI	VI	750	74
DVIII	VIII	920	84

### Pernissible load current against frequency



## Manufacturing-program

026/1	pole-changing switches, change over switches, circuit breakers
<b>145</b>	<b><i>NF and MF high-current switches (air-cooled)</i></b>
280	NF and MF contactors for off-load switching
282	Damping resistors
350/1	DC- and NF-contactors for on-load switching
421	Prism-contacts (air- and water-cooled)
427	NF and MF high-current switches (watercooled)
460	insulator-supports and bus-bar-supports
467	MF-contactors for on-load switching
475/1	Prism-contacts (air-cooled)
502	cable (air- and water-cooled)
506	discharge- and dropping-resistors
507	capacitor-contactor for on-load switching
549	contactors with NC-contacts for on-load switching
559	Prism-contacts for the electrode-position
560	spare parts
600	pole-changing switches, with motor-drive (water-cooled)
615	NF and MF high-current circuit breaker for off-load switching (water-cooled)
617	NF and MF high-current circuit breaker for off-load switching (air-cooled)
624	contactors with NC-contacts off-load switching
625	DC-contactors with brake-contacts
641	Air-cooled-current-carrying leads