

Negative contactors

for switching on-load

List 549E

Edition 01 / 2008

General

HOMA air-break contactors with negative main contact elements (break contacts) are used to brake and short-circuit motors, generators and choke circuits. A special application is the use as starter coupling contactor for the subsynchronous speed cascade according to the wiring diagram following page 20. On failure of the cascade for the speed control, the rotor must be reconnected with the starter within 50 ms, as otherwise the rotor voltage rise resulting from the speed drop will threaten the cascade. The closing time of HOMA negative air-break contactors is less than 50 ms.

Design

The stationary main contact elements and the magnet core with its solenoid are housed on a horizontal bar. The mobile preshaft carries the mobile main contact elements and the hinged armature. Depending on the type of contactor, 1- to 8-pin designs are available. The auxiliary switches are also arranged on the bar and preshaft. The main contact elements are of the single-break type and can be easily checked and replaced after swinging back the arc blowout chimneys. The magnetic blowout coil installed in every main contact element drives the electric arc into the arc blowout chimneys and shortens its burning period. Contactors for off-circuit disconnection e.g. as rotor short-circuit contactor and cascade coupling contactor acc. to list 280 are not equipped with blowout coils and arc blowout chimneys.

Drive

All contactors can be operated with d.c. solenoids via economy contacts and economy resistors. Built-on HOMA-Si-rectifiers allow feeding from an a.c. system (acc. to page 6 and 7, circuit 2 and 4). Contactors with a.c. solenoid acc. to circuit 1 can also be fitted with a d.c. solenoid at an extra charge.

Solenoids

According to VDE 0660, HOMA-contactors operate in the range between 0.85 and 1.1 times the nominal operating voltage. Non-standard installation conditions must be queried with us first.

Insulation

Creepage distances and air-gaps comply with VDE 0110 group C. The dielectric test is carried out according to VDE 0660 §65.

Main contacts

The contactors are equipped with contact facings consisting of a silver compound alloy, and are suitable for permanent connection and frequent switching.

Arc blowout chimneys

Depending on the operating voltage and the switching conditions, we supply contactors in the following groups:

Group	A	with fibre-reinforced concrete chimneys switching voltage 380 V nominal insulation voltage $U_i = 750V$
Group	C	with steatite chimneys and DY-blowout system switching voltage 600 V nominal insulation voltage $U_i = 1000 V, 1500 V$ or 3000 V
Group	D	with steatite chimneys and DY-blowout system (connect 2 poles in series) switching voltage 1200V nominal insulation voltage $U_i = 1500V$ or 3000V
Group	1000V	with steatite chimneys, DY-blowout system and chimney top. switching voltage 950V nominal insulation voltage $U_i = 1000V, 1500V$ or 3000V

Switching capacity

The nominal making and breaking capacity complies with the specifications for low voltage switchgear VDE 0660.

Mechanical locking device

Apart from the electrical interlock via auxiliary contacts, it is also possible to have the contactors fitted with a mechanical locking device at an extra charge. For this to be possible, they have to be arranged vertically on top of each other acc. to list 350/1, illustration 25.

Mechanical coupling

For higher operating voltages, it is necessary to connect one or three contacts per pole in series. Apart from the electrical coupling achieved by connecting the solenoids in series, mechanical coupling is carried out acc. to list 350/1, illustration 24 for the contactors' synchronous operation.

Higher operating frequencies

If HOMA-contactors are used in ripple control systems and static frequency converters, these must be equipped with wound blown cores and laminated blown sheets.

On-board operation

If they are used on board ships, the contactors are fitted with a counterweight to compensate for positions inclined by 30° from the normal installation position. Design example acc. to list 350/1, illustration 28a 28c. For on-board operation, the contactors need to be of climate-proof design.

Weatherproofing

The normal contactor design is tropic-proof for applications up to 50% relative humidity at 40°C or at 90% relative humidity at 20°C or at 5% relative humidity at 50°C.

If the place of installation is situated between latitude 15 degrees north and latitude 30 degrees south or in very humid areas up to 95% relative humidity and 45°C, the air-break contactors must be supplied in climate-proof design (DIN 50010).

Installation height

The specified permissible continuous currents $I_{1,2}$ and the specified switching capacity apply up to an installation height of 1000 m above mean sea level. These change to

91% at 2.000 m above mean sea level
87% at 3.000 m above mean sea level
and 82% at 4.000 m above mean sea level

Increased ambient temperatures

If the prevailing ambient temperature exceeds 35°C, the permissible continuous currents $I_{1,2}$ and switching capacities are reduced to

95% at 40°C
90% at 45°C
85% at 50°C
80% at 55°C

Foreign regulations

HOMA air-break contactors comply with the following regulations if the continuous currents and switching capacities are adapted accordingly:¹⁾

I.E.C. ¹⁾	-	International Electrotechnical Commission
NEMA	-	USA National Electrical Manufacturers' Association
CSA	-	Canada Canadian Standards Association
BS	-	Great Britain British Standard
UTE	-	France Union Technique de Syndicate de l'Electricité
NBN	-	Belgium Normes Belges
AEI	-	Italy Associazione Elettrotecnica Italiana
LroS ¹⁾	-	Lloyd's Register of Shipping
DNV ¹⁾	-	Det Norske Veritas, Oslo

¹⁾ Please query with us

Installation

The contactors must be screwed horizontally onto two vertical fastening irons, the free length of which should not exceed approx. 1 m. Contactors with a bar dimension A = 541 mm can be fastened on angle iron 50 x 50 x 5 mm and larger contactors on U-steel 65 or 80.

Wiring of solenoids, auxiliary contacts and control rectifiers must be carried out with flexible NYAF lines with crimping cable lugs or push-on receptacles. Main terminals can normally be connected without flexible intermediate connectors if the rails are of suitable length and somewhat elastic. Flexible connectors must be selected according to list 641.

Required ordering data

- 1) Number of pieces, type of contactor, number of poles and group
- 2) Type of switched consumers, operating current, duration of current, nominal insulation voltage, switching voltage and frequency
- 3) Switching frequency
- 4) Control voltage for the solenoids
- 5) Auxiliary contacts, number of make and break contacts
- 6) Special designs and supplementary parts
- 7) Higher nominal currents on request

We reserve the right to make changes serving the technical progress.

Auxiliary switches 2NC + 4NO

The auxiliary switches are designed as normally open contacts = 4 x NO (closed if the contactor is excited) or as normally closed contacts = 2 x NC (open if the contactor is excited). The auxiliary contacts are mounted below the magnetic system.

Mechanical service life

The mechanical service life corresponds approximately to device class D1, the service life being reciprocally proportional to the contactor size. Depending on the number of poles, contactor group and supplementary part design, the mechanical service life may deviate accordingly.

Parallel connection

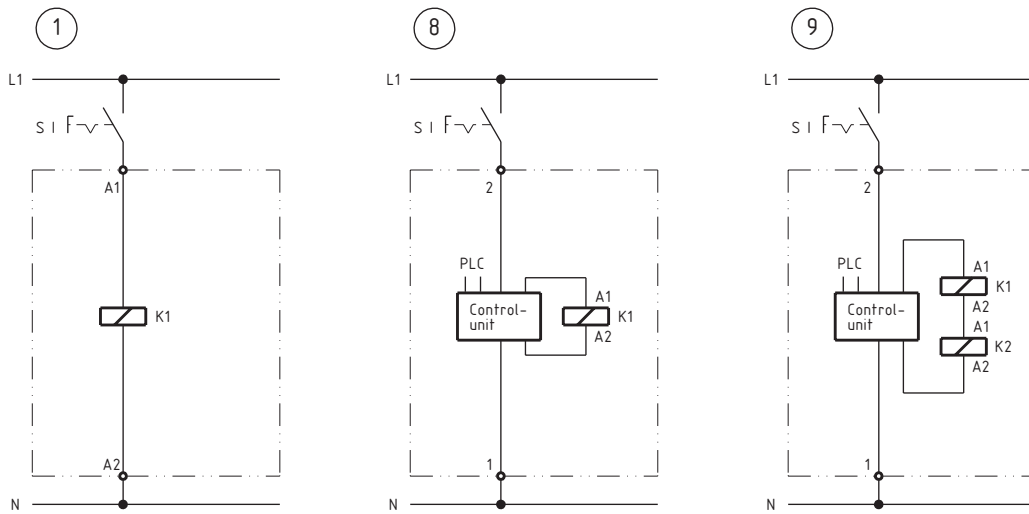
To increase the nominal current it is possible to connect 2 poles in parallel. The parallel connection should only be carried out approx. 1 metre in front and behind the contactor, so that this line length can act as stabilizing resistor. The permissible load current I_{t_2} increases 1.7 times. In case of larger currents, bar and preshaft must be non-magnetic.

Air-break contactors as negative contactors for direct, alternating and rotary current - parameters

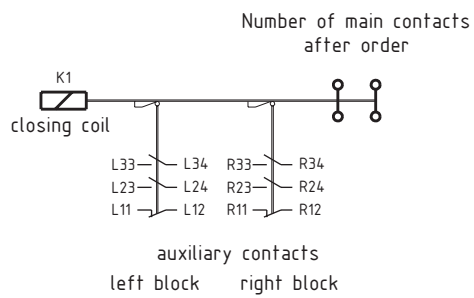
Type of contactor ⁵⁾	Continuous current I _{th2} [A]	Thermal current limit ¹⁾ 1s-current [kA]	Nominal impulse current ¹⁾ 50ms [kA]	Three-phase current				Direct current			
				Nominal making capacity ¹⁾ at 500V [kA]	Limit breaking capacity ³⁾ cos.φ = 0,4 [kA]			Nominal making capacity ¹⁾ at 500V [kA]	Limit breaking capacity ³⁾ for III-pole circuit T = L/R = 30ms		
					220V ⁴⁾	380V ⁴⁾	500V ⁴⁾		220V ²⁾⁴⁾	440V ⁴⁾	660V
G 320	320	3	3,5	3	4	3,5	3	3	3,5	3,5	2,5
G 320v	400	3	3,5	3	4	3,5	3	3	3,5	3,5	2,5
G 500	500	5	6	5	6	5,5	5	5	5	5	3,5
G 500v	700	5	6	5	6	5,5	5	5	5	5	3,5
G 800	800	6	7	6	8	7,5	7	6	6	6	4
G 5002b	1000	9	10	9	10	9	8	9	7	7	4,5
G 55002v	1250	9	10	9	10	9	8	9	7	7	4,5
G 1400	1400	9	10	9	10	9	8	9	7	7	4,5
G 5003v	1600	12	14	12	14	12,5	11	12	7,5	7,5	5
G 2000	2000	12	14	12	14	12,5	11	12	7,5	7,5	5

- 1) without contact welding, higher values on request
- 2) for I-pole circuit
- 3) Switching voltage per pole group A = 220V, group C = 330V, group D = 660V
- 4) Values in group C, in group A approx. 35% lower
- 5) Higher nominal currents on request

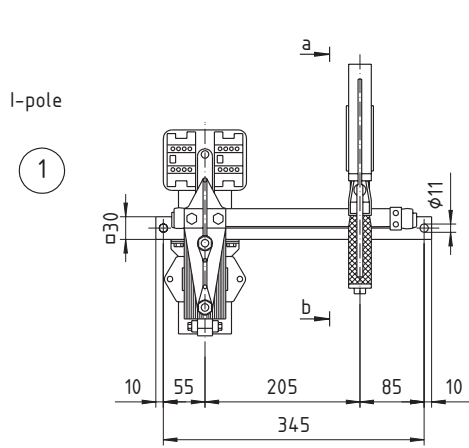
Circuit diagrams



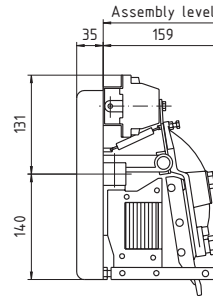
Arrangement for auxiliary contacts



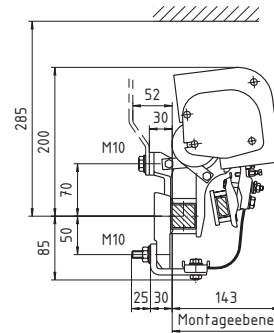
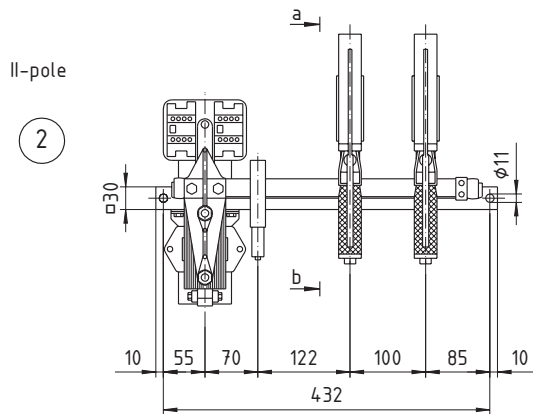
Dimension diagram for G 320 and G 320v group A and C, $U_i = 1500V$



Side view
(Shown without switching pole)

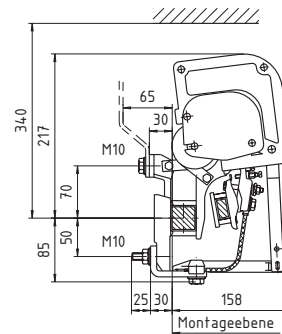
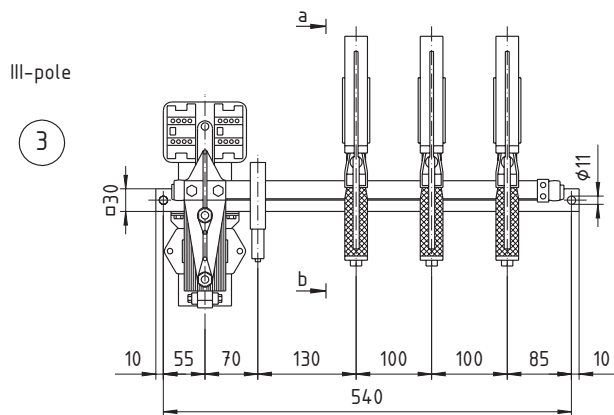


Section a-b
group A



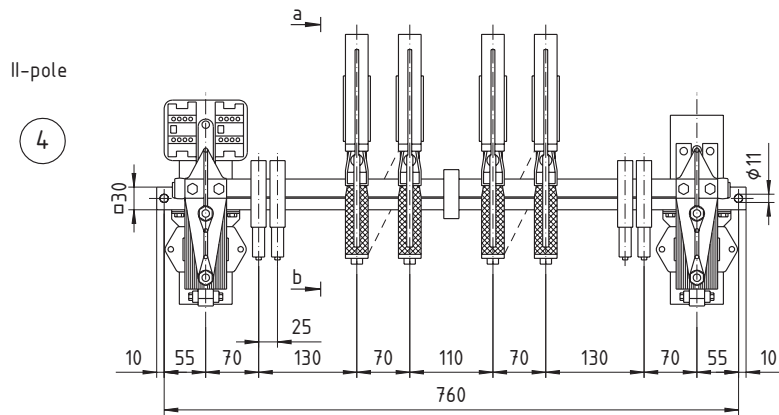
Area of connection 30x30
with thread M10

Section a-b
group C

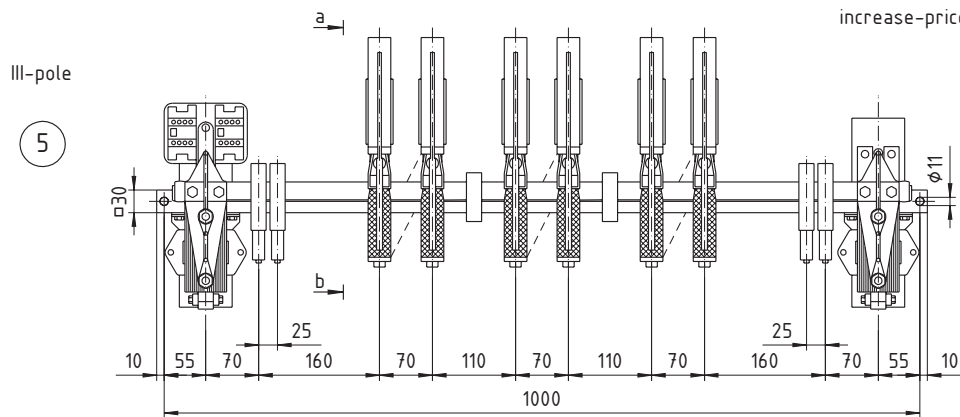


Area of connection 30x30
with thread M10

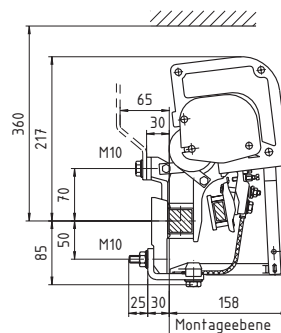
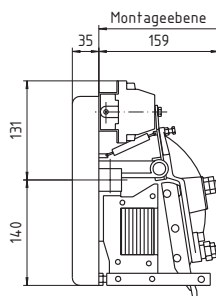
Dimension diagram for G 320 and G 320v group D, $U_i = 3000V$



For group D, 2 poles of group C must be switched in serial in each case.
The series-switch-connections are available on wish against increase-price.



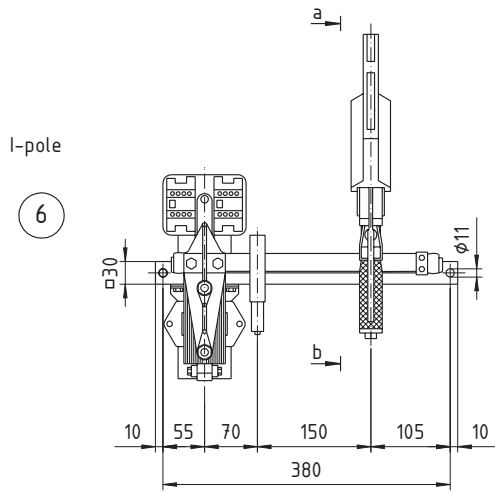
Side view
(Shown without switching pole)



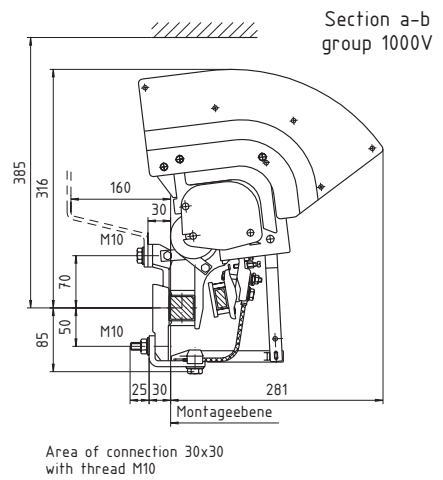
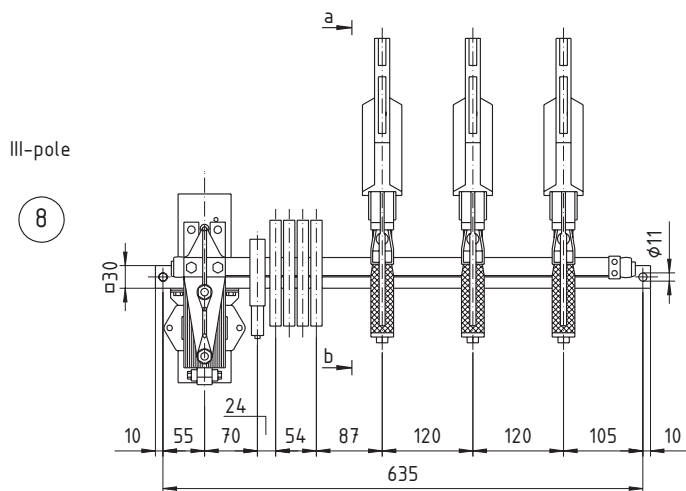
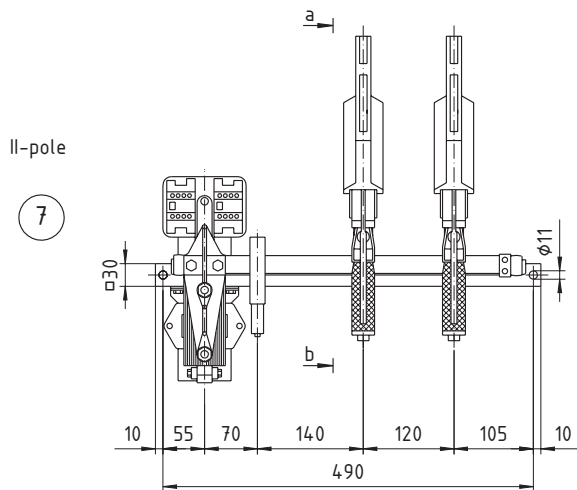
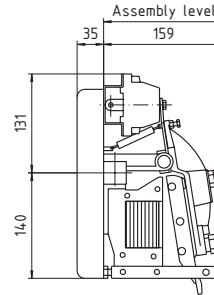
Section a-b
group C

Area of connection 30x30
with thread M10

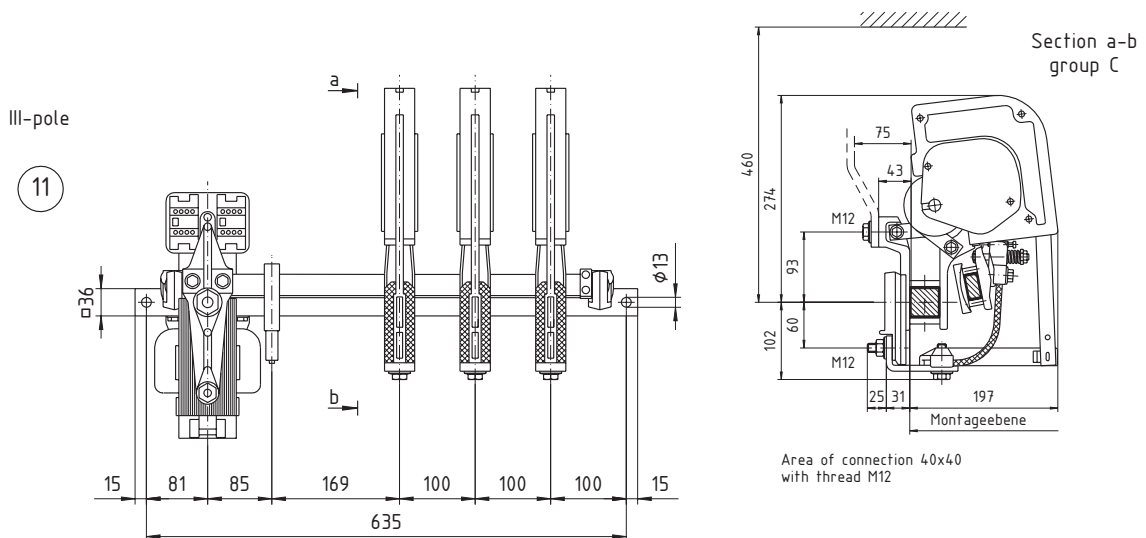
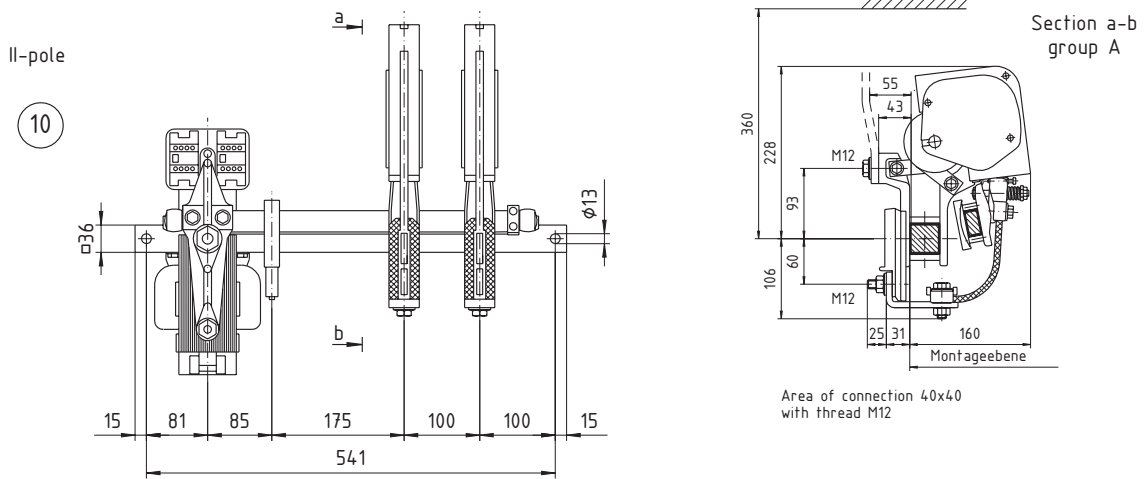
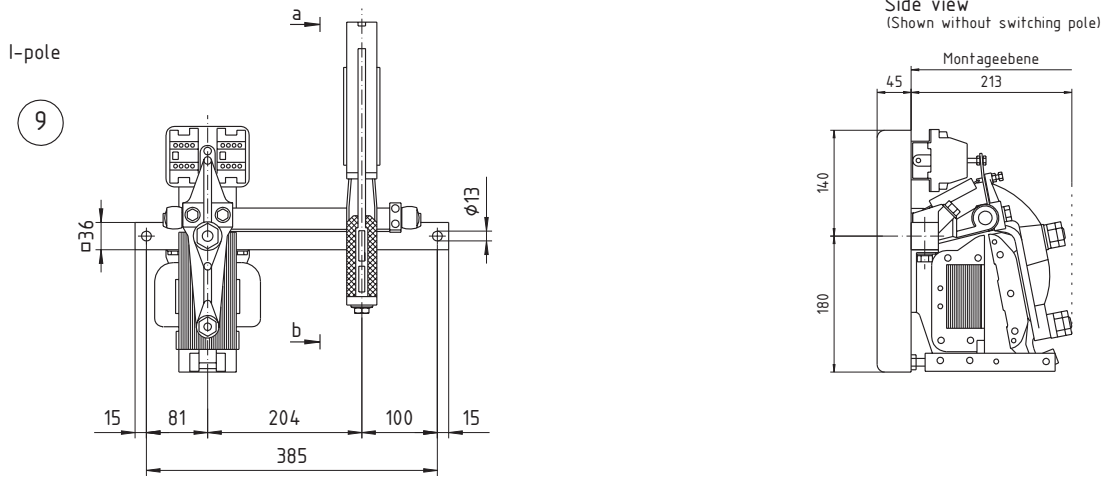
Dimension diagram for G 320 and G 320v group 1000V, $U_i = 3000V$



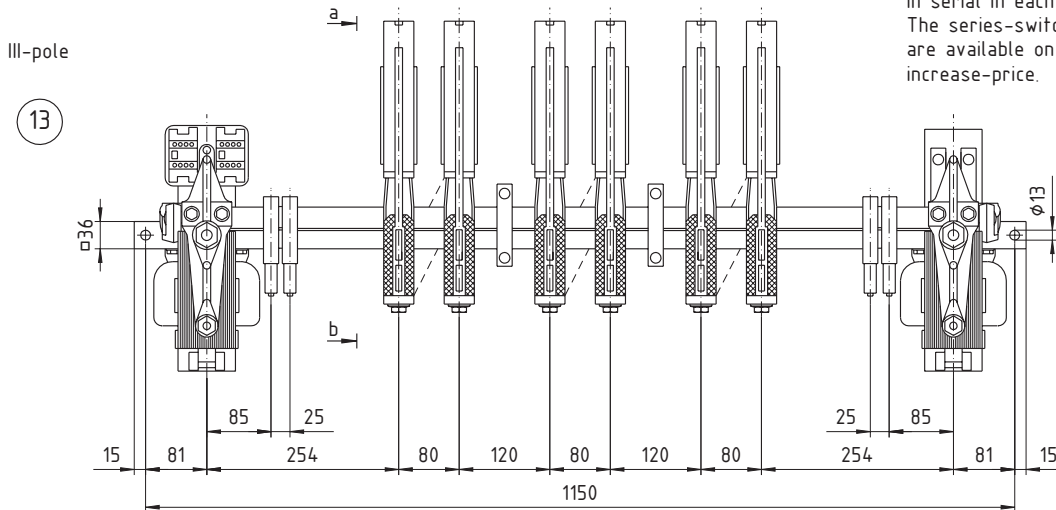
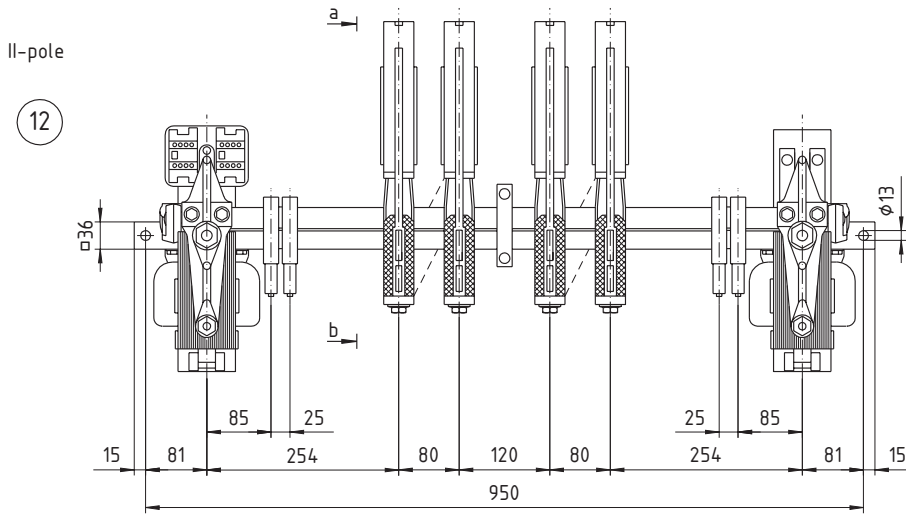
Side view
(Shown without switching pole)



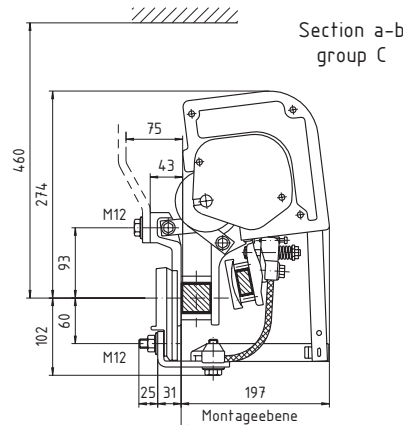
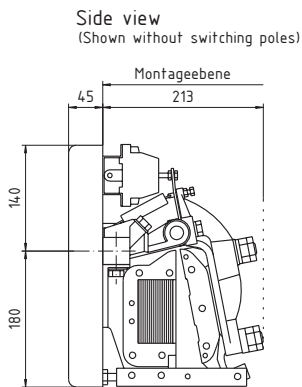
Dimension diagram for G 500, G 500v and G 800 group A and C, $U_i = 1500V$



Dimension diagram for G 500, G 500v and G 800 group D, $U_i = 3000V$

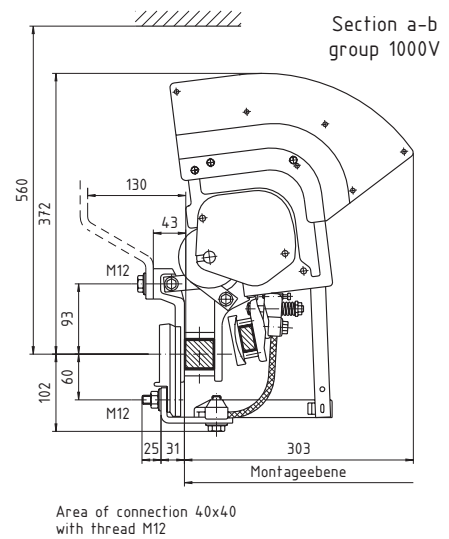
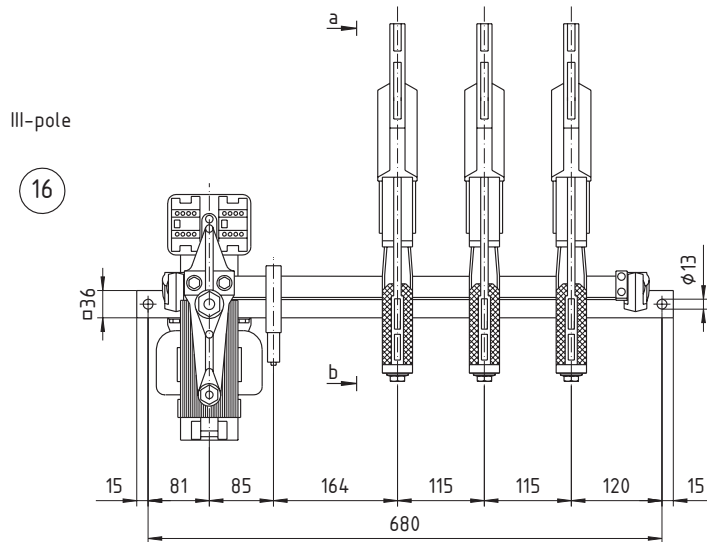
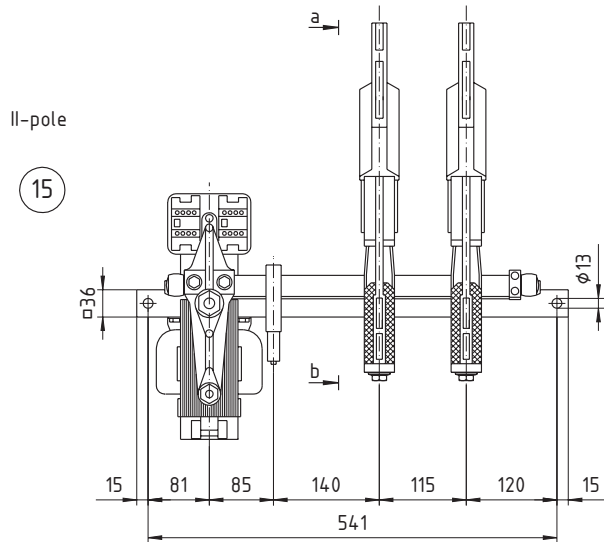
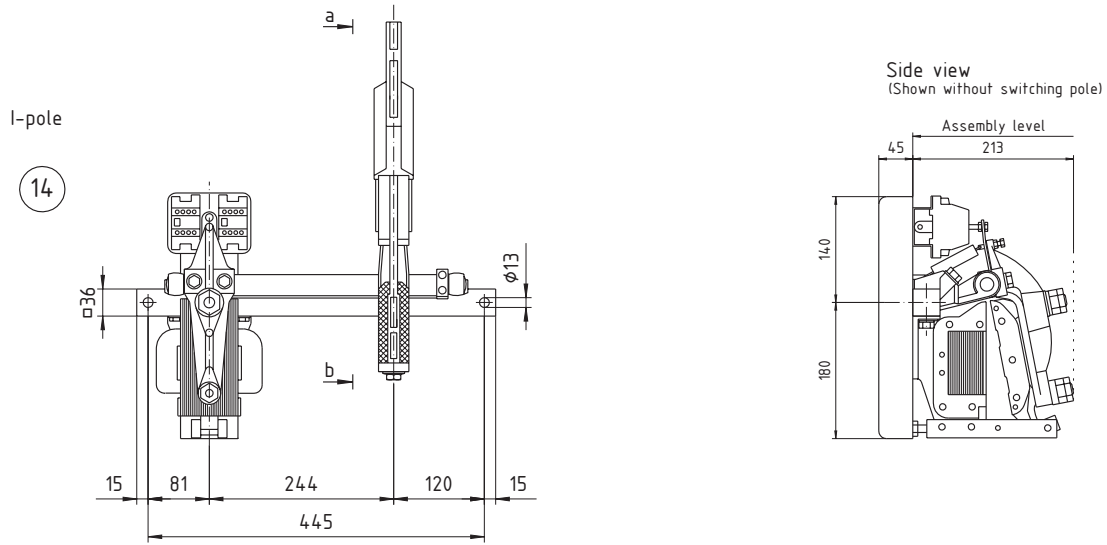


For group D, 2 poles of group C must be switched in serial in each case. The series-switch-connections are available on wish against increase-price.

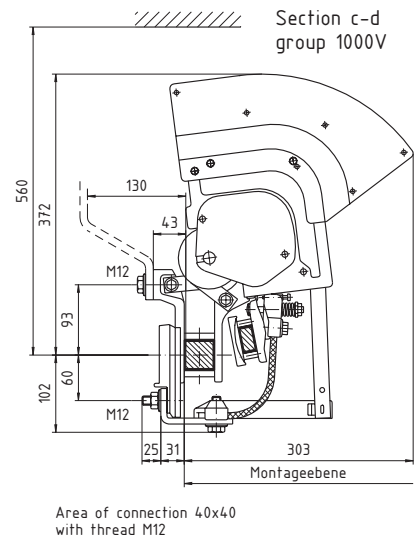
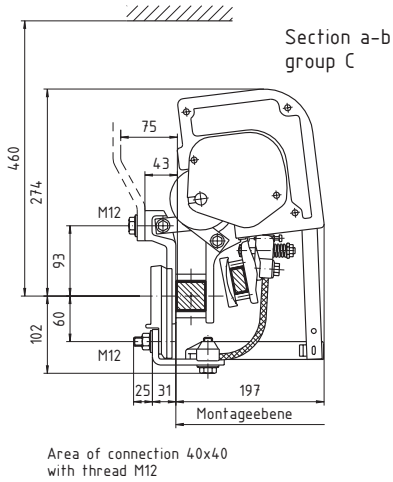
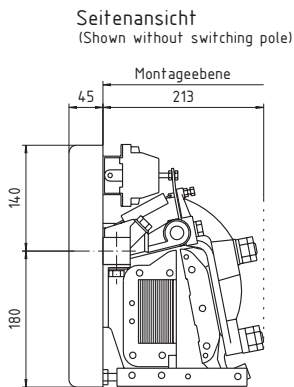
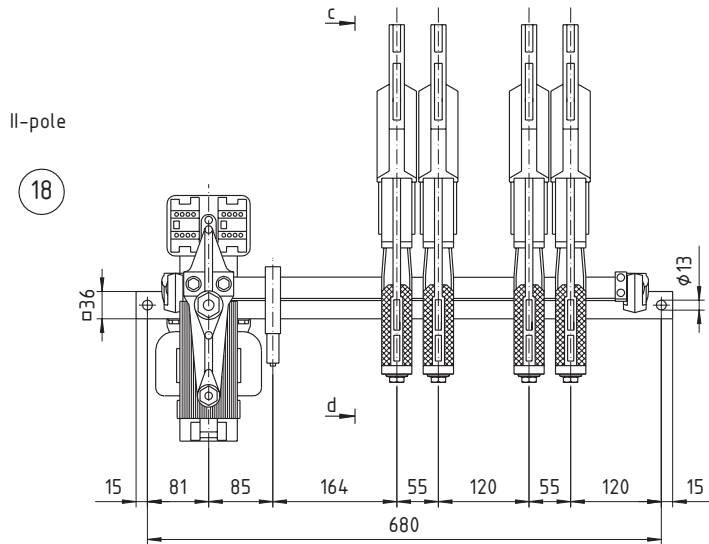
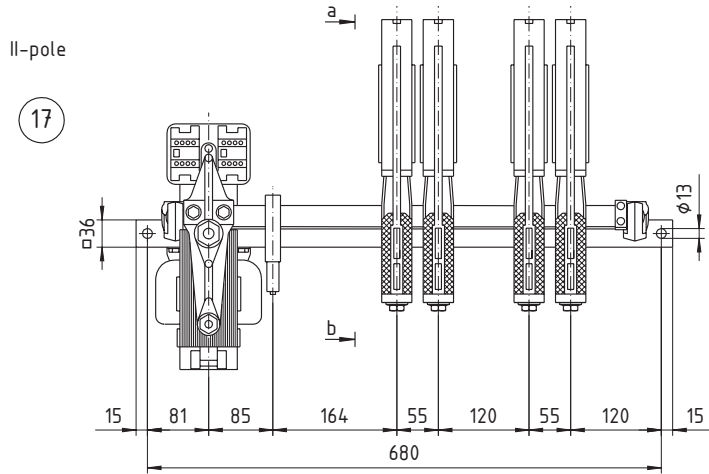


Area of connection 40x40 with thread M12

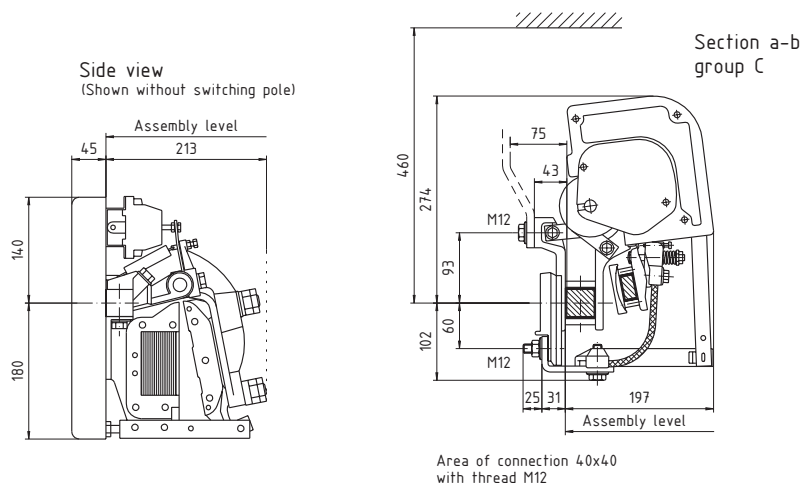
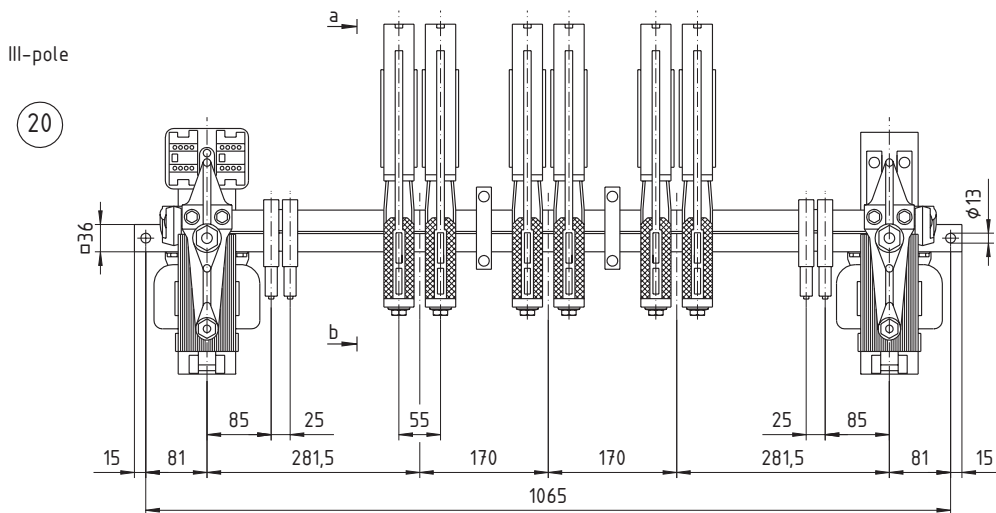
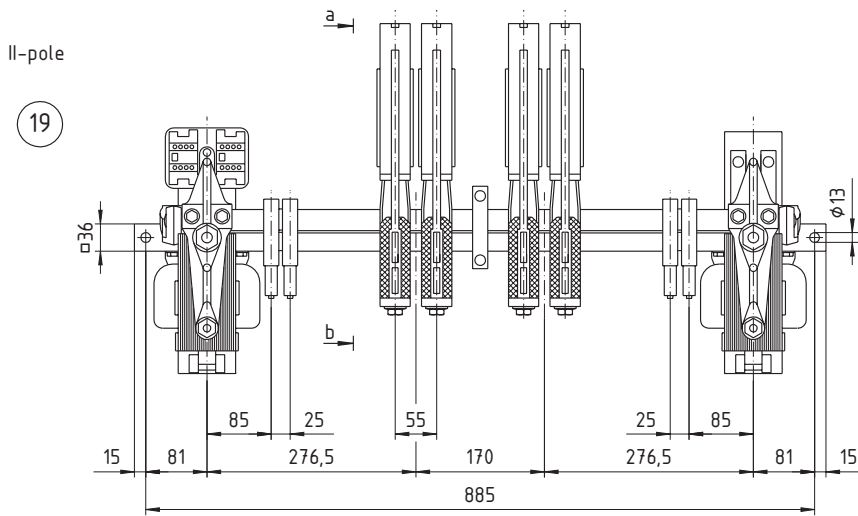
Dimension diagram for G 500, G 500v and G 800 group 1000V, $U_i = 3000V$



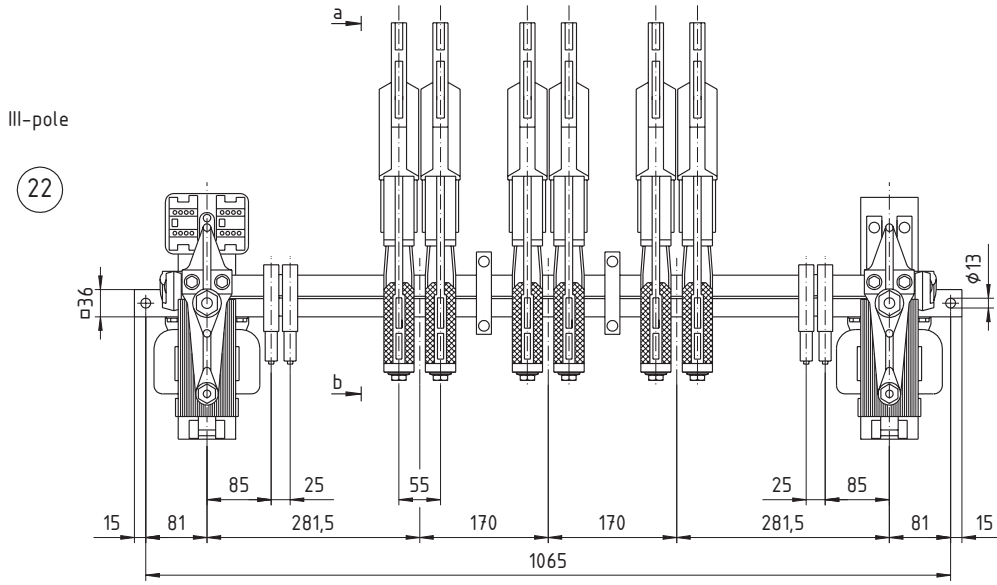
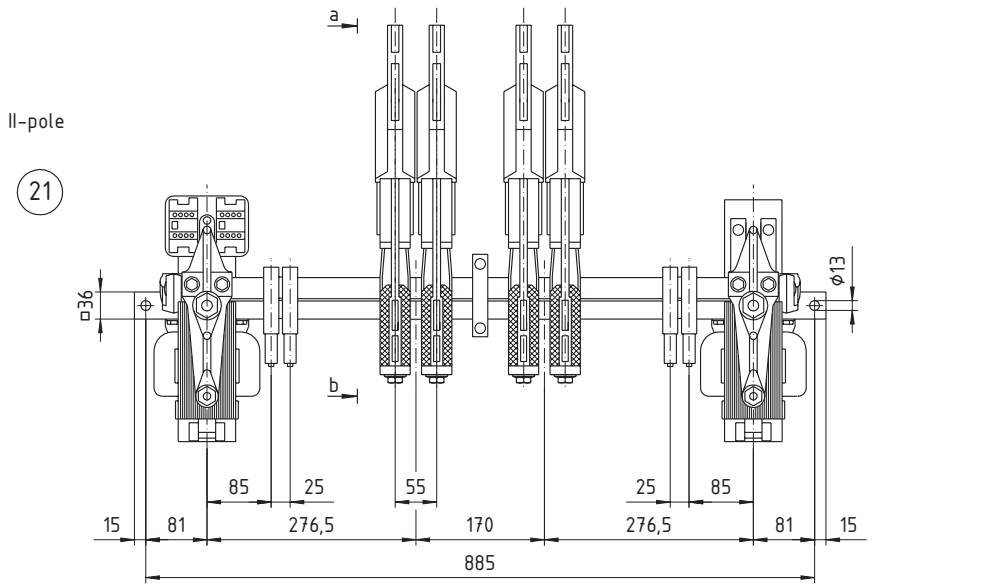
Dimension diagram for G 5002b, G 5002v and G 1400 group C and 1000V, $U_i = 3000V$



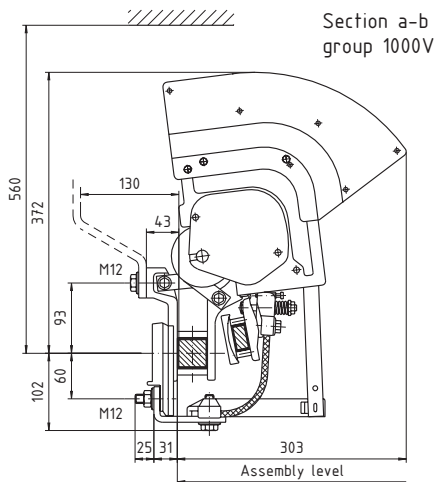
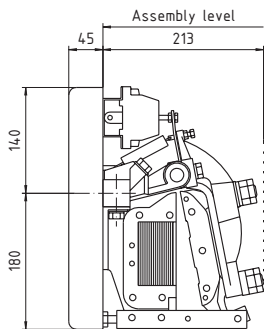
Dimension diagram for G 5002b, G 5002v and G 1400 group C, $U_i = 1500V$



Dimension diagram for G 5002b, G 5002v and G 1400 group 1000V, $U_i = 3000V$

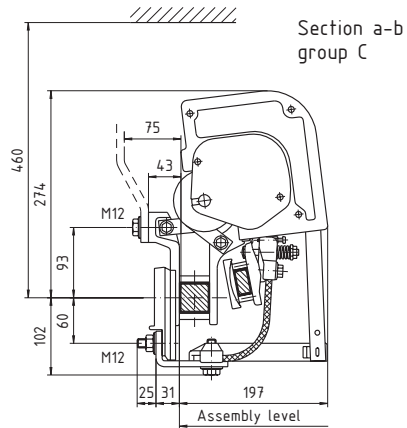
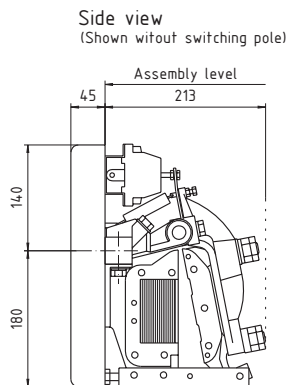
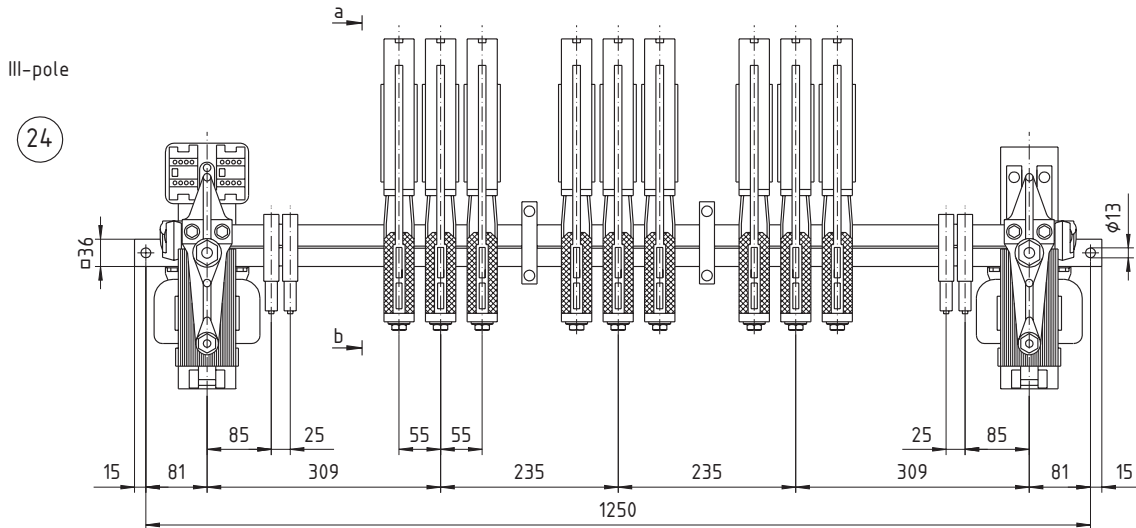
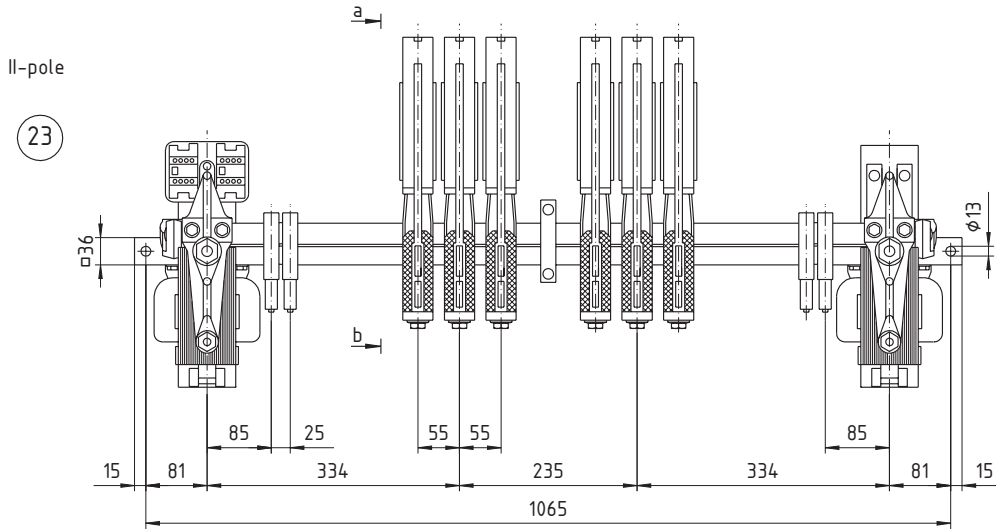


Side view
(Shown without switching pole)



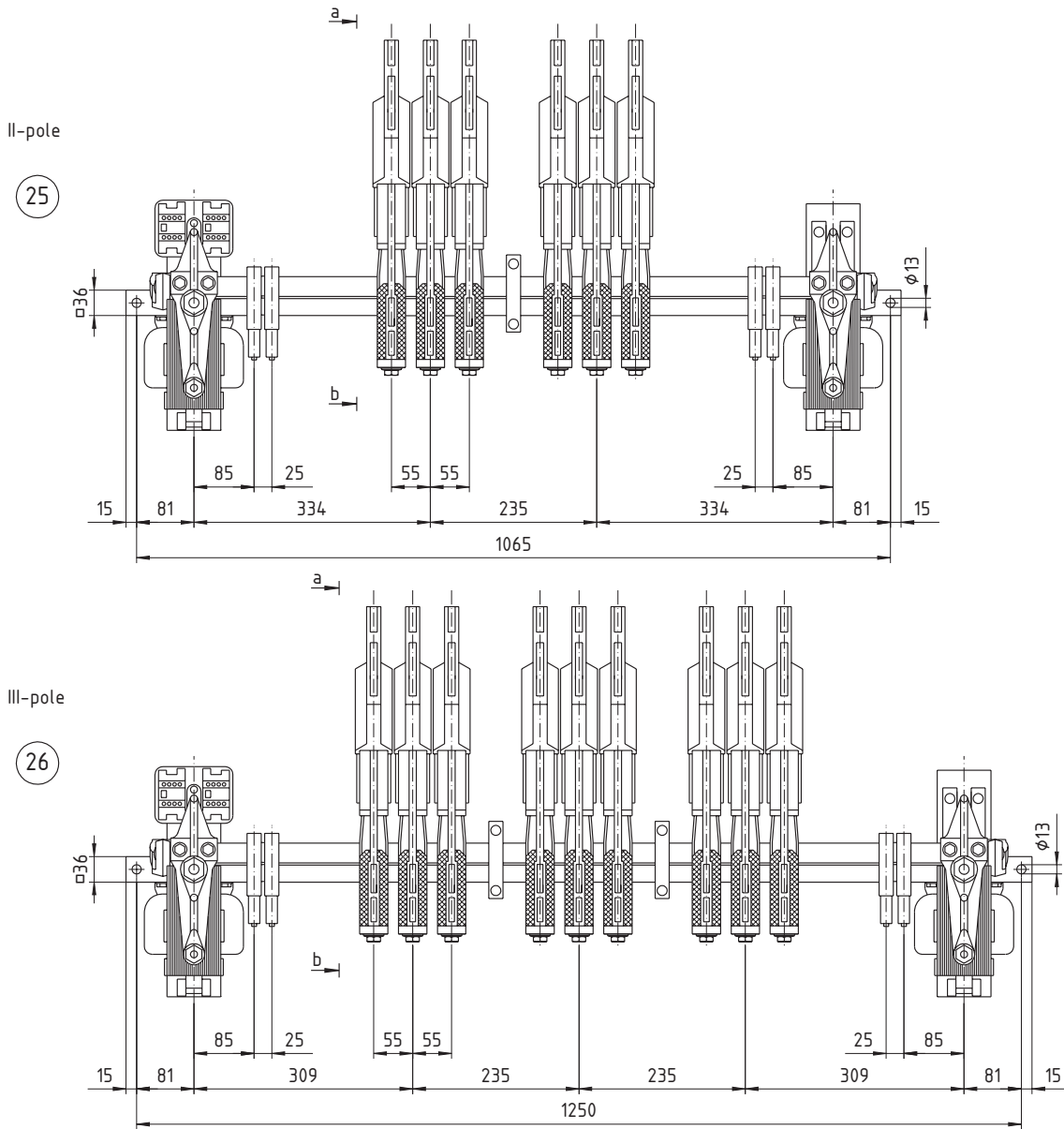
Area of connection 40x40
with thread M12

Dimension diagram for G 5003v and G 2000 group C, $U_i = 3000V$

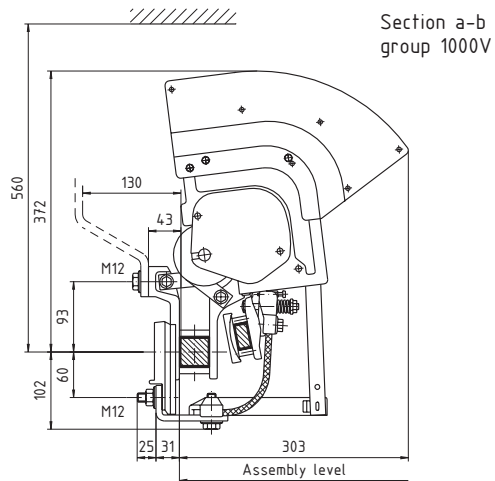
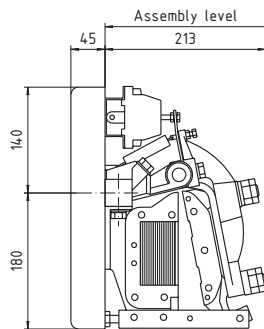


Area of connection 40x40
with thread M12

Dimension diagram for G 5003v and G 2000 group 1000V, $U_i = 3000V$



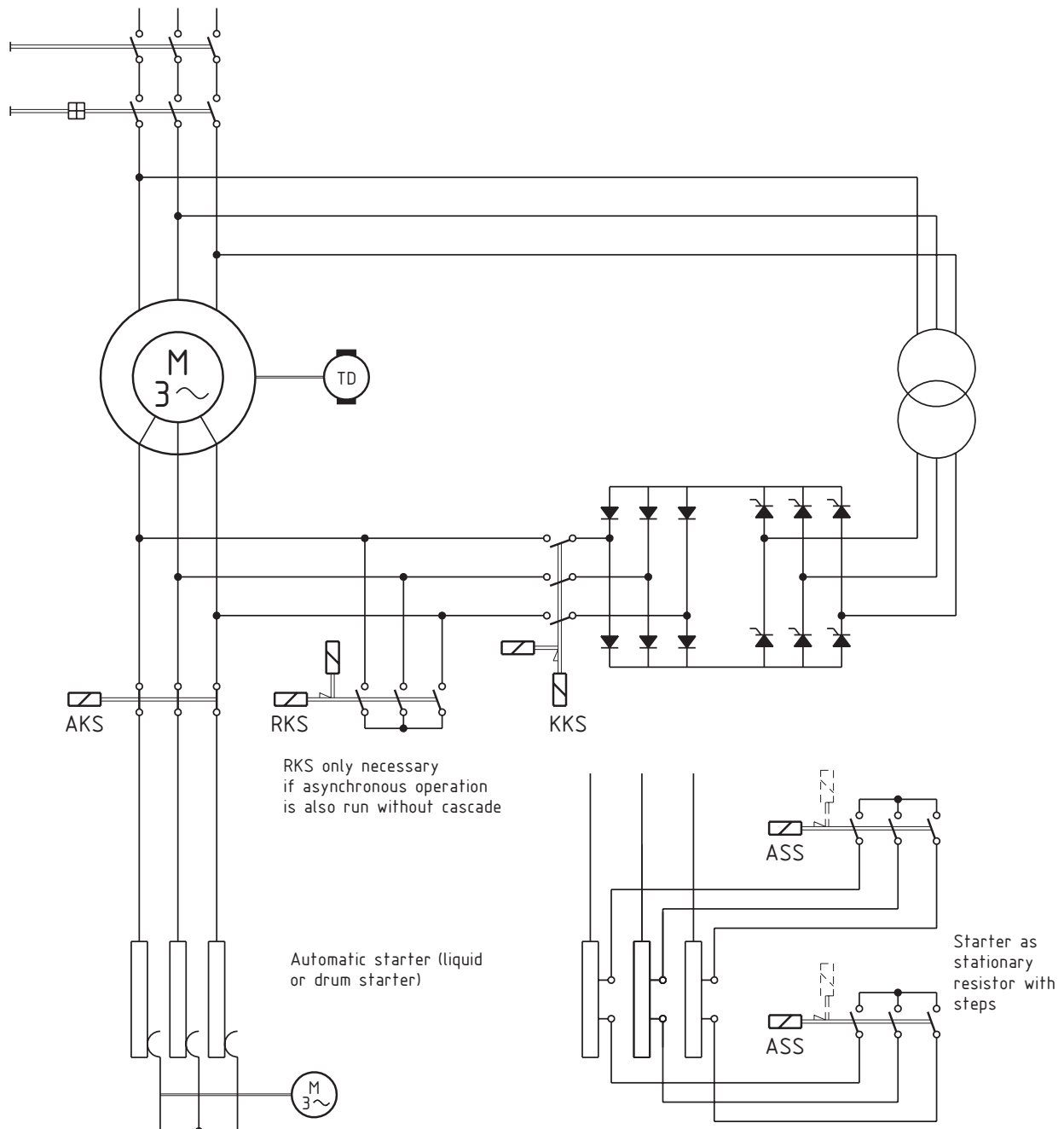
Side view
(Shown without switching pole)



Area of connection 40x40
with thread M12

Wiring diagram for subsynchronous speed cascade

- ASS = starter step contactor acc. to list 280 and 350/1
 AKS = starter coupling contactor acc. to list 549
 KKS = cascade coupling contactor acc. to list 280
 RKS = rotor short-circuit contactor acc. to list 280



Required ordering data:

Rotor open-circuit voltage U_{20} V

Rotor current A

Speed control range from ...% to 100%

Starting time s

Starting frequency and cycle duration

Auswahltablelle Negativ-Luftschütze Gruppe A und C

Contactor type	Number of poles	Group	Rated insulation voltage [kV]	Figure	Dimension A [mm]	Control wiring diagram	Net weight [kg]
G 320	I	A	1,5	1	344	1	11,0
	II			2	432	2	14,5
	III			3	540	2	18,0
G 320v	I	A	1,5	1	344	1	11,0
	II			2	432	2	14,5
	III			3	540	2	18,0
G 500	I	A	1,5	9	385	1	23,0
	II			10	541	2	30,0
	III			11	635	2	36,0
G 500v	I	A	1,5	9	385	1	23,0
	II			10	541	2	30,0
	III			11	635	2	36,0
G 800	I	A	1,5	9	385	1	23,5
	II			10	541	2	31,0
	III			11	635	2	37,0
G 320	I	C	1,5	1	344	1	12,0
	II			2	432	2	16,0
	III			3	540	2	20,0
G 320v	I	C	1,5	1	344	1	12,0
	II			2	432	2	16,0
	III			3	540	2	20,0
G 500	I	C	1,5	9	385	1	24,0
	II			10	541	2	32,0
	III			11	635	2	40,0
G 500v	I	C	1,5	9	385	1	24,0
	II			10	541	2	32,0
	III			11	635	2	40,0
G 800	I	C	1,5	9	385	1	24,5
	II			10	541	2	32,5
	III			11	635	2	41,0
G 5002b	II	C	3	17	680	2	52,0
G 5002v	II			17	680	2	52,0
G 1400	II			17	680	2	53,0
G 5002b	II	C	3	19	885	4	60,0
	III			20	1065	4	75,0
G 5002v	II	C	3	19	885	4	60,0
	III			20	1065	4	75,0
G 1400	II	C	3	19	885	4	60,0
	III			20	1065	4	75,0
G 5003v	II	C	3	23	1065	4	75,0
	III			24	1250	4	105,0

Selection table for negative air-contactors group 1000V and group D

Contactor type	Number of poles	Group	Rated insulation voltage [kV]	Figure	Dimension A [mm]	Control wiring diagram	Net weight [kg]
G 320	I	1000V	3	6	380	1	13
	II			7	490	2	18
	III			8	635	2	27
G 320v	I	1000V	3	6	380	1	13
	II			7	490	2	18
	III			8	635	2	27
G 500	I	1000V	3	14	445	1	25
	II			15	541	2	34
	III			16	680	2	48
G 500v	I	1000V	3	14	445	1	25
	II			15	541	2	34
	III			16	680	2	48
G 800	I	1000V	3	14	445	1	25
	II			15	541	2	34
	III			16	680	2	48
G 5002b	II	1000V	3	18	680	2	55
G 5002v	II						55
G 1400	II						56
G 5002b	II	1000V	3	21	885	4	64
	III			22	1065	4	86
G 5002v	II	1000V	3	21	885	4	64
	III			22	1065	4	86
G 1400	II	1000V	3	21	885	4	65
	III			22	1065	4	88
G 5003v	II	1000V	3	25	1065	4	88
	III			26	1250	4	110
G 2000	II	1000V	3	25	1065	4	88
	III			26	1250	4	110
G 320	II	D	3	4	760	4	32
	III			5	1000	4	40
G 320v	II	D	3	4	760	4	32
	III			5	1000	4	40
G 500	II	D	3	12	950	4	62
	III			13	1150	4	83
G 500v	II	D	3	12	950	4	62
	III			13	1150	4	83
G 800	II	D	3	12	950	4	63
	III			13	1150	4	85

Manufacturing-program

026/1	pole-changing switches, change over switches, circuit breakers
145	NF and MF high-current switches (air-cooled)
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	<i>contactors with NC-contacts for on-load switching</i>
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