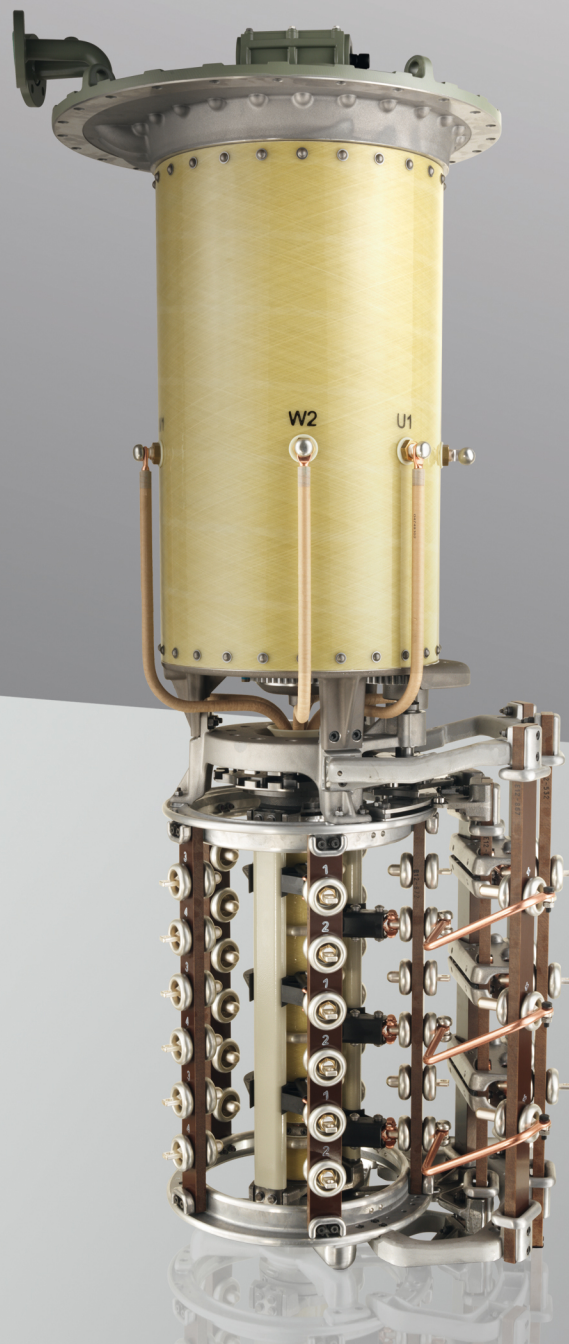




On-Load Tap-Changer VACUTAP® VM®

Technical Data

2332907/03 EN



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1 General

1.1 On-load tap-changer designations

Example: VM III 650 Y – 72.5 / C – 10 19 1W R

De-scription		Meaning	Model	Possible parameters
VM	=	Type	VACUTAP® VM®	VM
			VACUTAP® VM 300	VM 300
III	=	Number of phases	1 phase	I
			2 phases	II
			3 phases	III
650	=	I_{um} [A] = maximum rated through-current	VM I 301, VM II 302, VM III 300Y	300
			VM I 351, VM II 352, VM III 350Y	350
			VM I 501, VM II 502, VM III 500Y	500
			VM I 651, VM II 652, VM III 650Y	650
			VM I 802	800
			VM I 1002	1,000
			VM I 1203	1,200
			VM I 1503	1,500
650	=	Number of configured sectors	3 (for Y)	0
			1	1
			2	2
			3	3
Y	=	Applications	For use with neutral point only	Y
72.5	=	V_m [kV] = highest voltage for equipment	VM®	72.5
			VM®	123
			VM®	170
			VM®	245
			VM®	300
C	=	Tap selector size		B
				C
				D
			not with multiple coarse change-over selector	DE
10	=	Number of maximum operating positions without change-over selector	Pitch of tap selector:	
			10	10
			12	12
			14	14
			16	16
			18	18



De-scrip-tion		Meaning	Model	Possible parameters
			22	22
19	=	Number of maximum operating positions with change-over selector (reversing change-over selector or coarse tap connection) Note: Available for 300 amp variant with a maximum of 27 operating positions	Pitch of tap fine selector:	
			10	19
			12	23
			14	27
			16	31
			18	35
or 19	=	Number of maximum operating positions with multiple coarse change-over selector	10	59
			12	71
			14	83
			16	95
			18	107
1W	=	Mid-positions	0 mid-positions (without change-over selector)	0
			1 mid-position	1
			3 mid-positions	3
1W	=	Change-over selector	Reversing change-over selector	W
			Coarse tap connection	G
R	=	Tie-in measures	Fitted tie-in resistors	R
			Potential switches and tie-in resistors on board	S
			Potential switches with fitted tie-in resistors	P

Table 1: Explanation of type designation

1.2 Summary of the technical data

VACUTAP® VM I

On-load tap-changer	VM I 301	VM I 351	VM I 501	VM I 651	VM I 802	VM I 1002	VM I 1203	VM I 1503
Number of phases and application	1	1	1	1	1	1	1	1
Maximum rated through current $I_{um}(A)$	300	350	500	650	800	1,000	1,200	1,500
Rated short-time current (kA)	4	4.2	5	6.5	8	10	12	15
Rated duration of short-circuits (s)	3	3	3	3	3	3	3	3
Rated peak withstand current (kA)	10	10.5	12.5	16.25	20	25	30	37.5
Maximum rated step voltage V_{in} (V) ¹⁾	3,300	3,300	3,300	3,300	3,300	3,300	3,300	3,300
Step capacity P_{StN} (kVA)	990	1,155	1,625	1,625	2,600	2,600	3,500	3,500
Rated frequency (Hz)	50...60							
Operating positions	without change-over selector: maximum 18 with change-over selector: maximum 35 ²⁾ with multiple coarse change-over selector: maximum 107 ²⁾							
Oil compartment	Pressure-tight up to 0.3 bar permanent differential pressure (test pressure 0.6 bar); head and cover of the diverter switch oil compartment are vacuum sealed.							
Temperature range	The on-load tap-changer VACUTAP® VM® can be operated in the rated load range at surrounding oil temperatures of between -25 ° and +105 °C and with overload up to +115 °C in accordance with IEC 60214-1. For details of operation under arctic conditions, please refer to the General Technical Data for TD 61.							
Dimensions	Weight, displacement volume and oil content of the oil compartment are shown in the relevant dimension drawings.							

Table 2: Technical data for VACUTAP® VM I

¹⁾ The maximum rated step voltage may be exceeded by 10 % due to over-excitation of the transformer if the step capacity is limited to its rated value.

²⁾ 300 amp variants with a maximum of 27 operating positions available



Also see "Special Designs" [► 18] chapter.



VACUTAP® VM II

On-load tap-changer	VM II 302	VM II 352	VM II 502	VM II 652
Number of phases and application	2	2	2	2
Maximum rated through current I_{um} (A)	300	350	500	650
Rated short-time current (kA)	4	4.2	5	6.5
Rated duration of short-circuits (s)	3	3	3	3
Rated peak withstand current (kA)	10	10.5	12.5	16.25
Maximum rated step voltage V_{in} (V) ¹⁾	3,300	3,300	3,300	4,000
Step capacity P_{StN} (kVA)	990	1,155	1,625	1,625
Rated frequency (Hz)	50...60			
Operating positions	without change-over selector: maximum 18 with change-over selector: maximum 35 ²⁾ with multiple coarse change-over selector: maximum 107 ²⁾			
Oil compartment	Pressure-tight up to 0.3 bar permanent differential pressure (test pressure 0.6 bar); head and cover of the diverter switch oil compartment are vacuum sealed.			
Temperature range	The on-load tap-changer VACUTAP® VM® can be operated in the rated load range at surrounding oil temperatures of between -25 ° and +105 °C and with overload up to +115 °C in accordance with IEC 60214-1. For details of operation under arctic conditions, please refer to the General Technical Data for TD 61.			
Dimensions	Weight, displacement volume and oil content of the oil compartment are shown in the relevant dimension drawings.			

Table 3: Technical data for VACUTAP® VM II

¹⁾ The maximum rated step voltage may be exceeded by 10 % due to over-excitation of the transformer if the step capacity is limited to its rated value.

²⁾ 300 amp variants with a maximum of 27 operating positions available

Also see "Special Designs" [► 18] chapter.





VACUTAP® VM III

On-load tap-changer	VM III 300 Y	VM III 350 Y	VM III 500 Y	VM III 650 Y
Number of phases and application	3	3	3	3
Maximum rated through current I_{um} (A)	300	350	500	650
Rated short-time current (kA)	4	4.2	5	6.5
Rated duration of short-circuits (s)	3	3	3	3
Rated peak withstand current (kA)	10	10.5	12.5	16.25
Maximum rated step voltage V_{in} (V) ¹⁾	3,300	3,300	3,300	3,300
Step capacity (P_{StN}) (kVA)	990	1,155	1,625	1,625
Rated frequency (Hz)	50...60			
Operating positions	without change-over selector: maximum 18 with change-over selector: maximum 35 ²⁾ with multiple coarse change-over selector: maximum 107 ²⁾			
Oil compartment	Pressure-tight up to 0.3 bar permanent differential pressure (test pressure 0.6 bar); head and cover of the diverter switch oil compartment are vacuum sealed.			
Temperature range	The on-load tap-changer VACUTAP® VM® can be operated in the rated load range at surrounding oil temperatures of between -25 ° and +105 °C and with overload up to +115 °C in accordance with IEC 60214-1. For details of operation under arctic conditions, please refer to the General Technical Data for TD 61.			
Dimensions	Weight, displacement volume and oil content of the oil compartment are shown in the relevant dimension drawings.			

Table 4: Technical data for VACUTAP® VM III

¹⁾ The maximum rated step voltage may be exceeded by 10 % due to over-excitation of the transformer if the step capacity is limited to its rated value.

²⁾ 300 amp variants with a maximum of 27 operating positions available



Also see "Special Designs" [► 18] chapter.



1.3 Step capacity diagram for VACUTAP® VM®

1.3.1 Step capacity diagram for network application

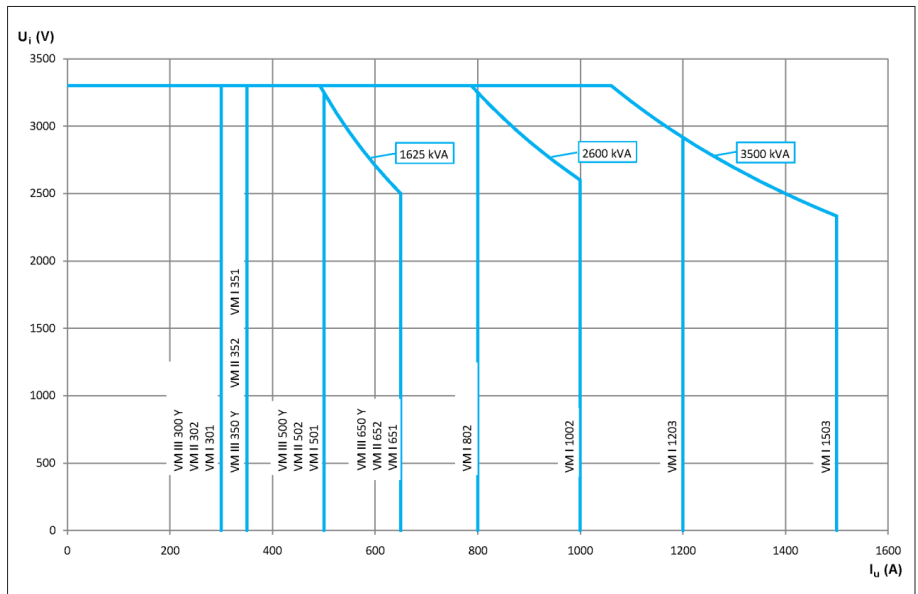


Figure 1: Step capacities (rated step voltage V_i with rated through-current I_u)

1.3.2 Step capacity diagram with electrical arc furnace operation

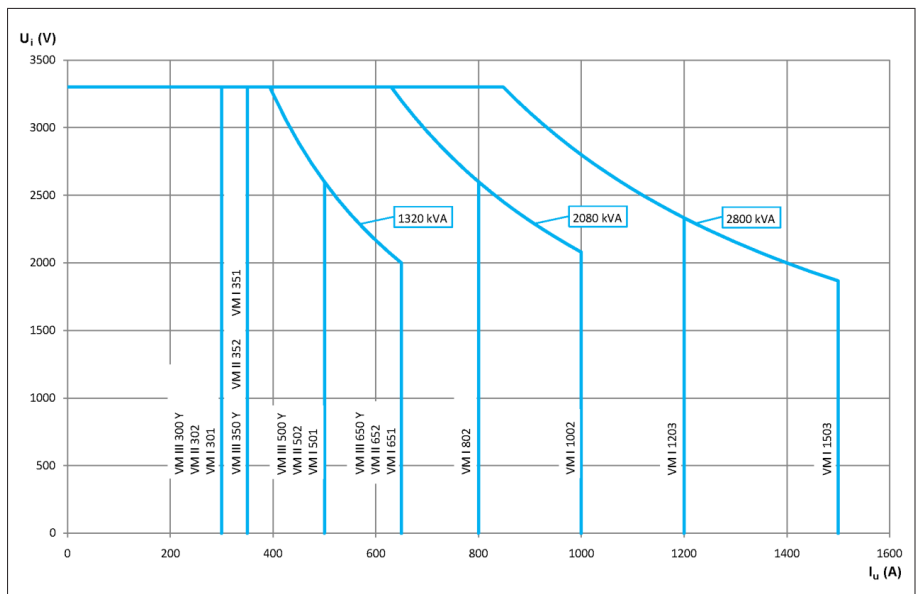


Figure 2: Step capacities (rated step voltage V_i with rated through-current I_u)



1.4 Rated insulation level

Rated insulation level	For all on-load tap-changer variants				
Highest voltage for equipment V_m (kV) ¹⁾	72.5	123	170	245	300 ²⁾
Rated lightning impulse withstand voltage (kV, 1.2/50 μ s)	350	550	750	1,050	1,050
Rated switching impulse voltage (kV)				850	850
Rated short-duration power frequency withstand voltage (kV, 50 Hz, 1 min)	140	230	325	460	460

Table 5: Rated insulation level for all on-load tap-changer variants

¹⁾ In accordance with IEC 60214-1, chapter 3.57: highest effective value for phase-to-phase voltage in a three-phase system for which an on-load tap-changer is designed with respect to its insulation.

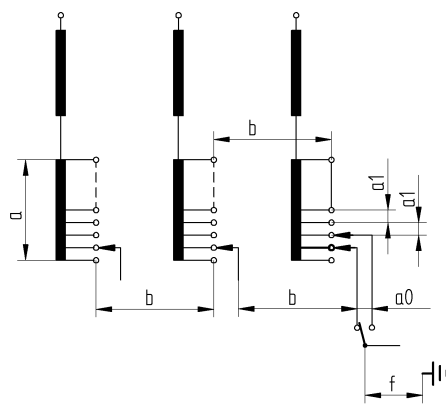
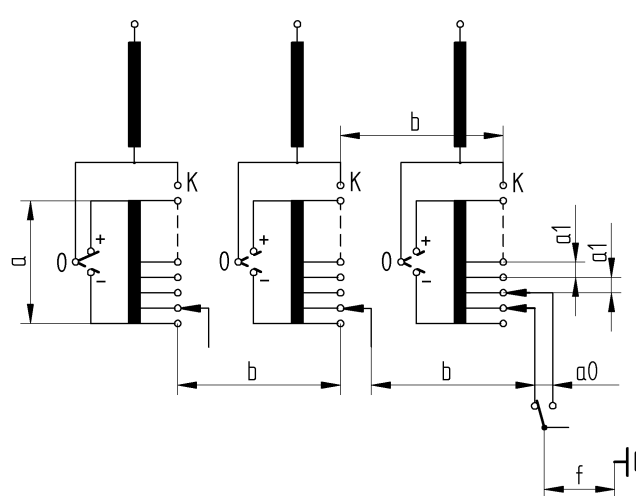
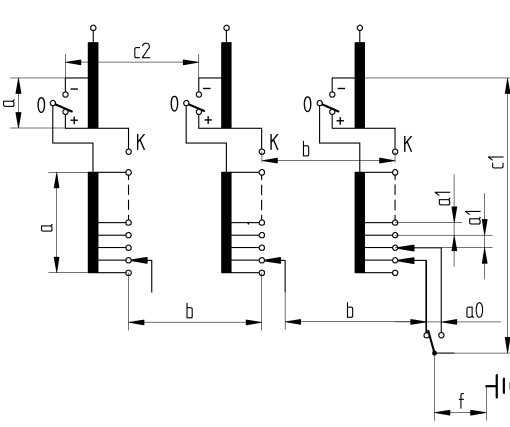
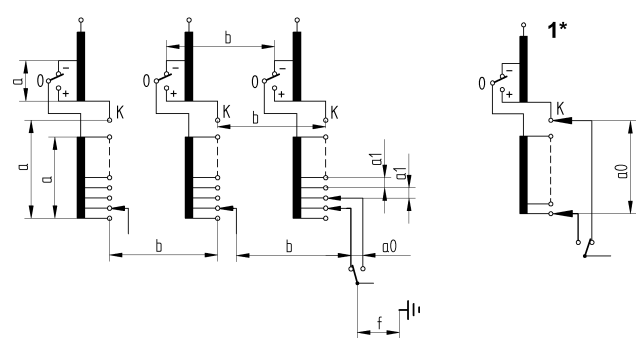
²⁾ Star-point on-load tap-changer and 300-A variants up to maximum 245 kV available.

2 Technical data

2.1 Rated withstand voltages

The following diagrams show the voltage stress present on the tap winding of the three primary basic connections of three-column on-load tap-changers and single-column on-load tap-changers.

When selecting the on-load tap-changer, you must check that the highest stress on the tap selector does not exceed the related rated withstand voltages.

	
<p>without change-over selector</p>	<p>with reversing change-over selector</p>
	
<p>with coarse change-over selector in (+) position</p>	<p>with coarse change-over selector in (-) position</p> <p><small>1* Notice: Observe maximum rated lightning impulse withstand voltage stress at a0 in mid-position!</small></p>

a0 = between selected and preselected tap on the diverter switch

a1 = between fine tap selector contacts of the winding of one tap position (connected or not connected)



a	= between start and end of a tapped winding and, in version with coarse winding, also between start and end of a coarse winding Note for coarse tap selector connection in (-) position of the change-over selector: When loading with impulse voltage, note the permissible withstand voltage "a" between the end of a coarse winding connected with the K fine tap selector contact and the fine tap selector contact at the end of the tapped winding of the same phase.
b	= between the fine tap selector contacts of different phases and between change-over selector contacts of different phases, which are connected with the beginning/end of a tapped winding or with a fine tap selector contact
f	= between diverter switch output terminal and ground
Additionally for coarse tap selector connection in (+) position of the change-over selector:	
c1	= from one (-) change-over selector contact to take-off lead of the same phase
c2	= between (-) change-over selector contacts of different phases

2.1.1 Rated withstand voltages of the internal insulation (with the exception of VACUTAP® VM 300)

The selector size (ID letters B, C, D, DE) characterizes the internal insulation of the selector, whose rated withstand voltages must be matched to the requirements of the transformer winding.

Insulation distances	Selector size B		Selector size C		Selector size D		Selector size DE	
	kV 1.2/50 µs	kV 50 Hz 1 min	kV 1.2/50 µs	kV 50 Hz 1 min	kV 1.2/50 µs	kV 50 Hz 1 min	kV 1.2/50 µs	kV 50 Hz 1 min
a0	max. 150 ²⁾	20	max. 150 ²⁾	20	max. 150 ²⁾	20	max. 150 ²⁾	20
a1	150	30	150	30	150	30	150	30
a	265	50	350	82	490	105	550	120
b ¹⁾	265	50	350	82	490	146	550	160
c1	485	143	545	178	590	208	660	230
c2 ¹⁾	495	150	550	182	590	225	660	250

Table 6: Rated withstand voltages of the internal on-load tap-changer insulation (with the exception of VACUTAP® VM 300)

¹⁾ No insulation distance with single-column on-load tap-changers

²⁾ Varistor response voltage at 1.2/50 µs lightning impulse: as of 45 kV ($U_{100\%}(t)_{\text{standardized}} \neq U_{75\%}(t)_{\text{standardized}}$) residual voltage at 3 kA peak current: 56 kV

The admissible maximum operating voltage on the individual selector distances corresponds to half the value of the above mentioned rated short-duration power frequency withstand voltages.



without change-over selector		with reversing change-over selector		with coarse change-over selector	
Tap-change operation	Selector size	Tap-change operation	Selector size	Tap-change operation	Selector size
10050	B/C/D/DE	10071W	B/C/D/DE	10071G	B/C/D/DE
10060	B/C/D/DE	10081W	B/C/D/DE	10081G	B/C/D/DE
10070	B/C/D/DE	10091W	B/C/D/DE	10091G	B/C/D/DE
10080	B/C/D/DE	12101W	B/C/D/DE	12101G	B/C/D/DE
10090	B/C/D/DE	12111W	B/C	12111G	B/C
10100	B/C/D/DE	14111W	D/DE	14111G	D/DE
12110	B/C/D/DE	14121W	B/C	14121G	B/C
12120	B/C/D/DE	14131W	B/C	14131G	B/C
14130	B/C/D/DE	16121W	D/DE	16121G	D/DE
14140	B/C/D/DE	16131W	D/DE	16131G	D/DE
16150	B/C/D/DE	16141W	B/C/D/DE	16141G	B/C/D/DE
16160	B/C/D/DE	16151W	B/C	16151G	B/C
18170	B/C/D/DE	18151W	D/DE	18151G	D/DE
18180	B/C/D/DE	18161W	B/C	18161G	B/C
22190	B/C/D/DE	18171W	B/C	18171G	B/C
22200	B/C/D/DE	10191W	B/C/D/DE	10191G	B/C/D/DE
22210	B/C	12231W	B/C/D/DE	12231G	B/C/D/DE
22220	B/C	14271W	B/C/D/DE	14271G	B/C/D/DE
		16311W	B/C/D/DE	16311G	B/C/D/DE
		18351W	B/C/D/DE	18351G	B/C/D/DE

Table 7: Available connections (also available as 3 W, 3 G)

2.1.2 Rated withstand voltages of the internal insulation for VACUTAP® VM 300

VACUTAP® VM 300 is only available in selector size B. The selector size characterizes the internal insulation of the selector, whose rated withstand voltages must be matched to the requirements of the transformer winding.

Insulation distances	VM III300 Y		VM I 301		VM II 302	
	kV 1.2/50 µs	kV 50 Hz 1 min	kV 1.2/50 µs	kV 50 Hz 1 min	kV 1.2/50 µs	kV 50 Hz 1 min
a0	max. 150 ¹⁾	20	max. 150 ¹⁾	20	max. 150 ¹⁾	20
a	300	70	300	70	300	70
b	300	70	–	–	300	70
c1	400	120	400	120	100	120
c2	400	120	–	–	400	120

Table 8: Rated withstand voltages of the internal on-load tap-changer insulation for VACUTAP® VM 300

¹⁾ Varistor response voltage at 1.2/50 μ s lightning impulse: as of 45 kV ($U_{100\%}(t)_{\text{standardized}} \neq U_{75\%}(t)_{\text{standardized}}$, residual voltage at 3 kA peak current: 56 kV

The admissible maximum operating voltage on the individual selector distances corresponds to half the value of the above mentioned rated short-duration power frequency withstand voltages.

Connection without change-over selector	Connection with reversing change-over selector	Connection with coarse change-over selector
10100	10091W	10091G
12120	12111W	12111G
14140	14131W	14131G
	10191W ¹⁾	10191G ¹⁾
	12231W ¹⁾	12231G ¹⁾
	14271W ¹⁾	14271G ¹⁾

Table 9: Available connections for VACUTAP® VM 300 (¹⁾ also available as 3 W, 3 G)

2.1.3 Rated withstand voltages for VACUTAP® VM® with multiple coarse change-over selector

Extremely fine voltage setting requires a great number of operating positions which sometimes can only be achieved with a multiple coarse tapping arrangement.

The multiple coarse change-over selector is attached to both sides of the tap selector.

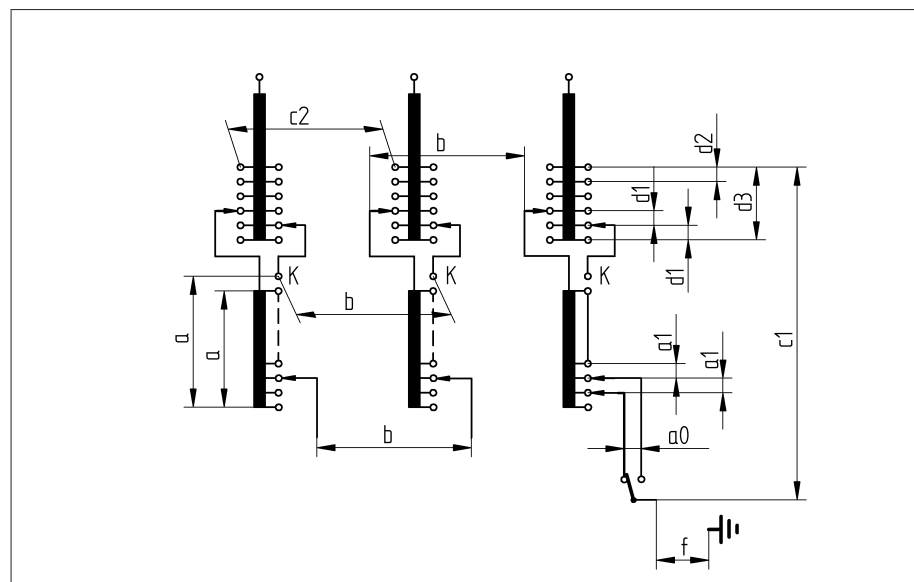


Figure 3: Designation and definition of insulation distances

a0	= between selected and preselected tap on the diverter switch
a1	= between tap selector contacts of the winding of one tap position (connected or not connected)



a	= between beginning and end of a tapped winding and between the connected K contact and any points of the tapped winding of the same phase
b	= between the tap selector contacts of different phases and between the connected K contact of one phase and any points of the tapped winding of another phase
c1	= between any coarse tapplings of one phase to the diverter switch output terminal of the same phase
c2	= between identically-named, unconnected coarse tapplings of different phases
d1	= between connected and adjacent coarse tap contacts in one phase
d2	= between unconnected, adjacent coarse tap contacts in one phase
d3	= between beginning and end of all coarse tap connections of one phase
f	= between diverter switch output terminal and ground

Insulation distances	Selector size B		Selector size C		Selector size D	
	kV 1.2/50 μ s	kV 50 Hz 1 min.	kV 1.2/50 μ s	kV 50 Hz 1 min.	kV 1.2/50 μ s	kV 50 Hz 1 min.
a0	max. 150 ²⁾	20	max. 150 ²⁾	20	max. 150 ²⁾	20
a1	150	30	150	30	150	30
a	265	50	350	82	450	105
b ¹⁾	265	50	350	82	450	146
c1	455	127	525	165	590	210
c2 ¹⁾	455	127	525	165	590	215
d1	265	50	350	82	450	105
d2	350	82	450	105	450	105
d3	350	82	450	105	490	120

Table 10: On-load tap-changer VACUTAP® VM® with multiple coarse change-over selector, rated withstand voltages of the internal on-load tap-changer insulation

¹⁾ No insulation distance with single-column on-load tap-changers

²⁾ Varistor response voltage at 1.2/50 μ s lightning impulse: as of 45 kV ($U_{100\%}(t)_{\text{standardized}} \neq U_{75\%}(t)_{\text{standardized}}$, residual voltage at 3 kA peak current: 56 kV

The admissible maximum operating voltage on the individual selector distances corresponds to half the value of the above mentioned rated short-duration power frequency withstand voltages.

3 Special designs

3.1 Parallel bridges for parallel connections

For current division on the connection contacts of 2 tap selector planes only for on-load tap-changers VACUTAP® VM I 802/1002 and of 3 tap selector planes only for on-load tap-changers VACUTAP® VM I 1203/1503 see [► 57].

Parallel bridges on the tap selector connection contacts are then mandatory if the tap winding has been wound in two or more branches and each of these branch taps is connected to the contacts of the tap selector.

This measure reliably prevents the following:

- Introduction of circulating currents into the current paths of tap selector and diverter switch
- Commutating arc on movable tap selector contact bridges
- Overvoltage between adjacent tap selector connection contacts connected in parallel

3.2 On-load tap-changer combination for delta connection

The on-load tap-changers can also be used with the single-column on-load tap-changer VM I 351 as a two-column on-load tap-changer combination VM I 351/VM II 352 for adjusting the voltage of transformer windings in a delta connection (analogous to VM I 301/VM II 302 and VM I 651/VM II 652). This combination is known as VM III K ("K" for the German for combination).

The tap windings for this should be provided as shown below:

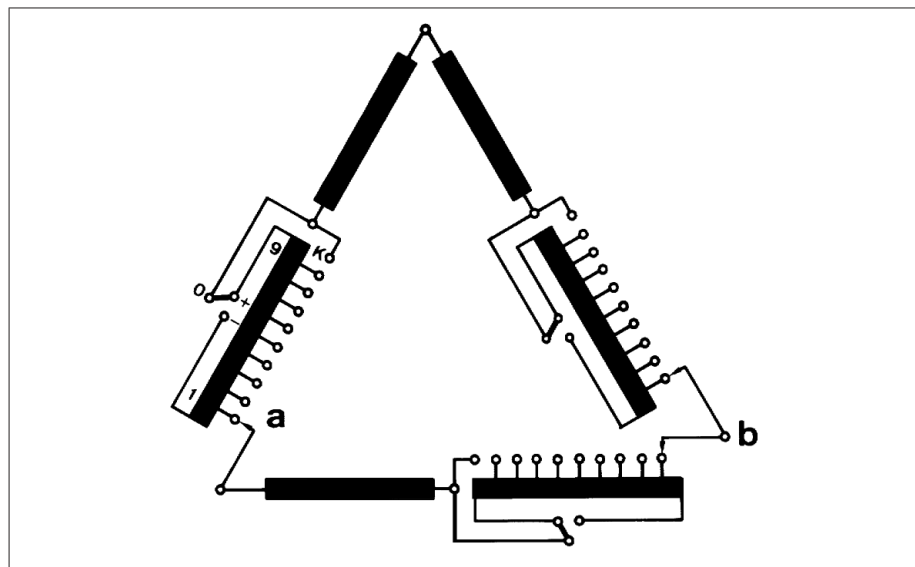


Figure 4: On-load tap-changer combination VM III K for delta connection VM I 351/VM II 352 (a = VM I 351, b = VM II 352)



3.3 On-load tap-changer VACUTAP® VM III 650 Y ... VM I 1503 with multiple coarse change-over selector (up to maximum 5 coarse tap connections)

Extremely fine voltage setting requires a great number of operating positions which sometimes can only be achieved with a multiple coarse tapping arrangement.

For instance, 107 operating positions can be obtained by using a coarse 5-tap winding and a tapped winding with 18 taps.

The multiple coarse change-over selector is attached to both sides of the tap selector.

The on-load tap-changers are available for $U_m = 72.5$ up to max. 300 kV and for 2...5 coarse tap connections (selector sizes B, C and D).

3.4 Two-column on-load tap-changer VACUTAP® VM II 302/352/502/652

On-load tap-changer VM II 302/352/502/652 [► 24] can be supplied as a two-column on-load tap-changer for single-phase center point tap-change operations with the same technical data as on-load tap-changers VM III 350 Y, VM III 500 Y or VM III 650 Y [► 23].

3.5 On-load tap-changer VACUTAP® VM III 300/350/500/650 Y for Y connection with open neutral point

If on-load tap-changers have an open neutral point, **only current transformers** may be connected to the open neutral point. Otherwise impermissible overvoltages arise at the neutral point.



Reactors must not be connected.

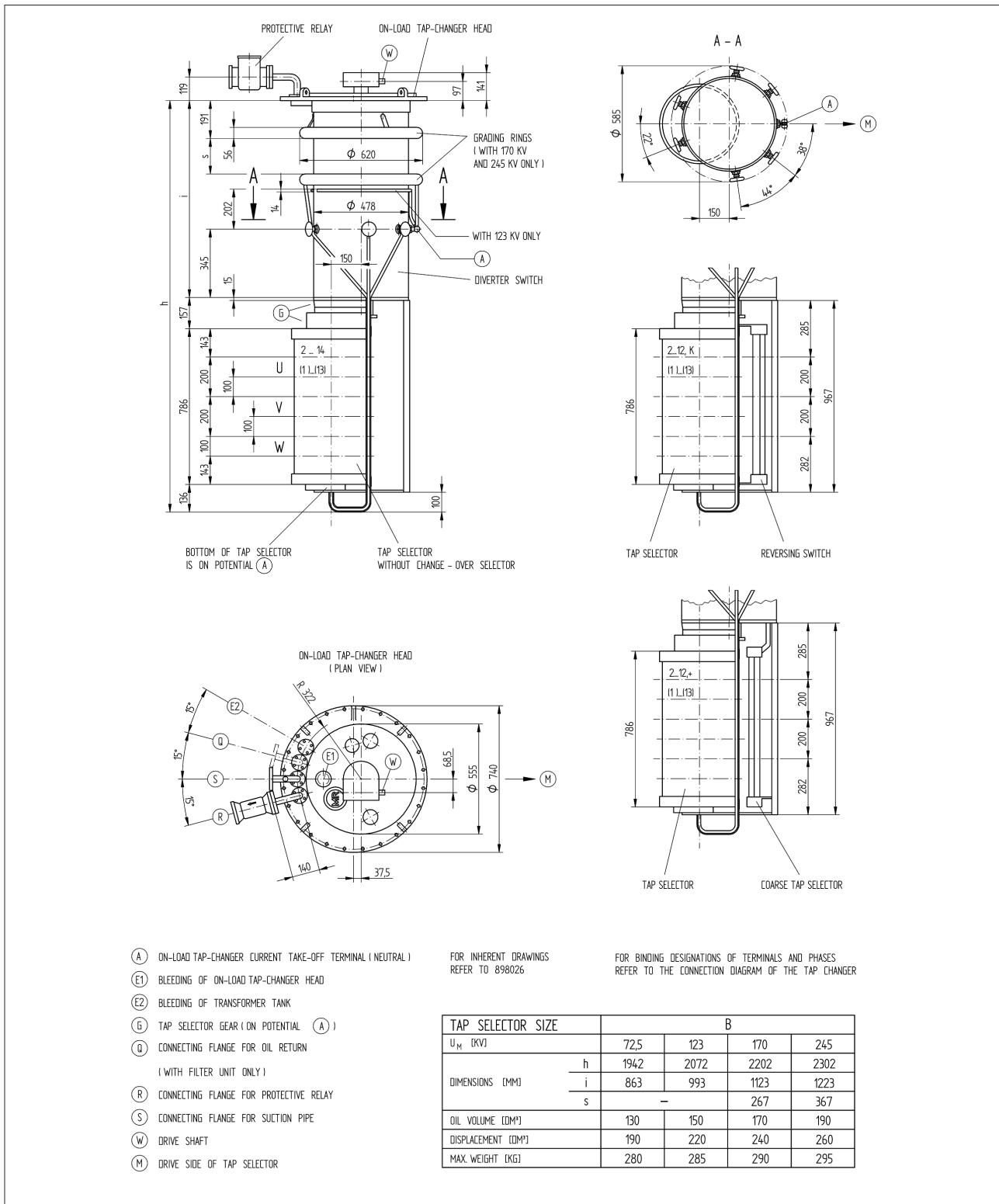
Connection of three oil vessel outputs (= open neutral point)	VACUTAP VM III 300/350/500/650 Y	
Current transformer connection and neutral point formation outside on-load tap-changer	A) Test voltages permitted between the oil vessel output contacts	
	Rated lightning impulse withstand voltage	4 kV (1.2/50 μS)
	Rated short-duration power frequency withstand voltage	2.5 kV (50 Hz, 1 min.)
	B) Permissible maximum operating voltage between oil vessel output contacts	1 kV (50...60 Hz)

Table 11: Permissible test voltages and operating voltages for VACUTAP® VM III 300/350/500/650 Y

4 Appendix

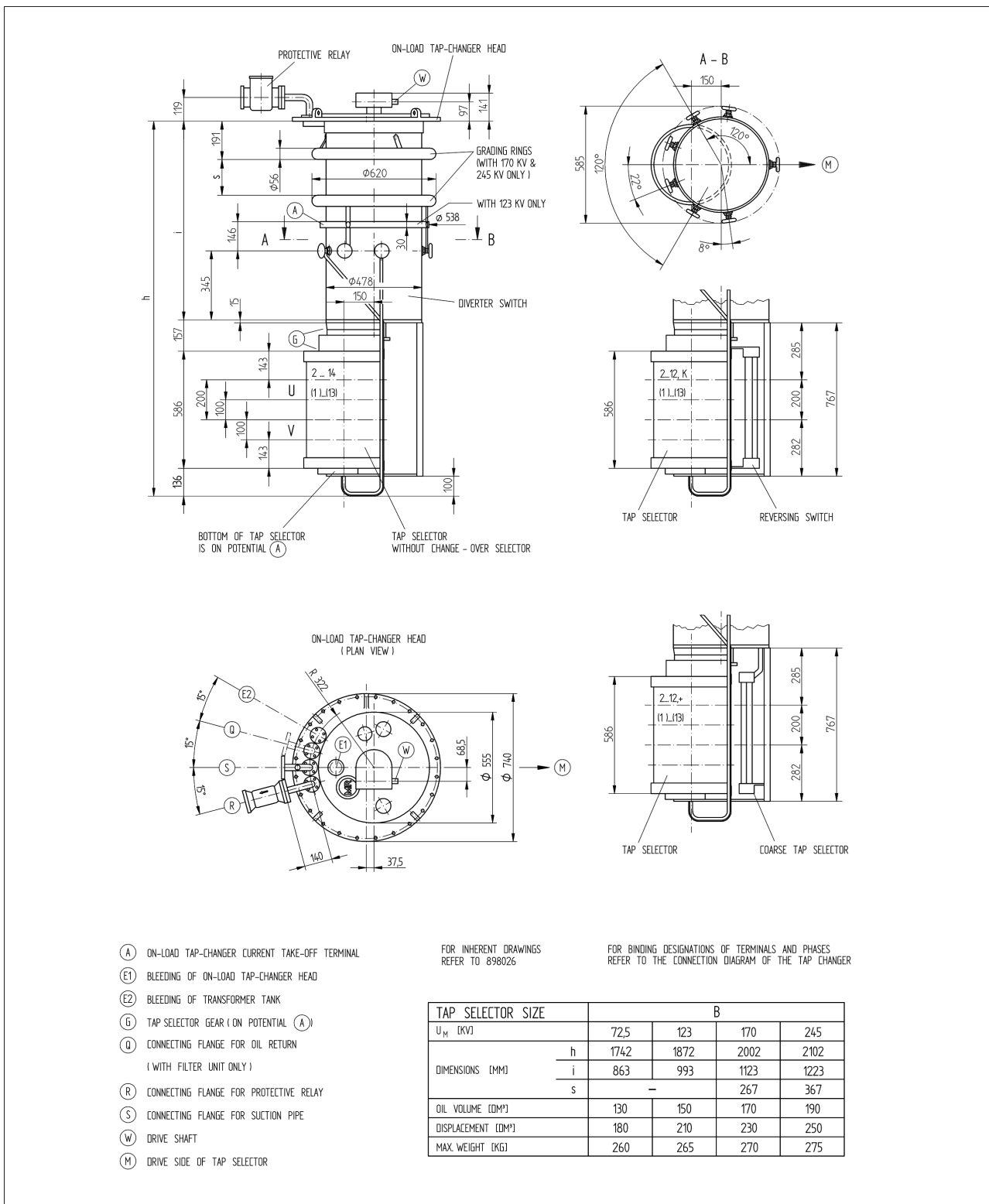
4.1 Dimensional drawings/connection diagrams

4.1.1 VACUTAP® VM III 300 Y-0/W/G (768698)

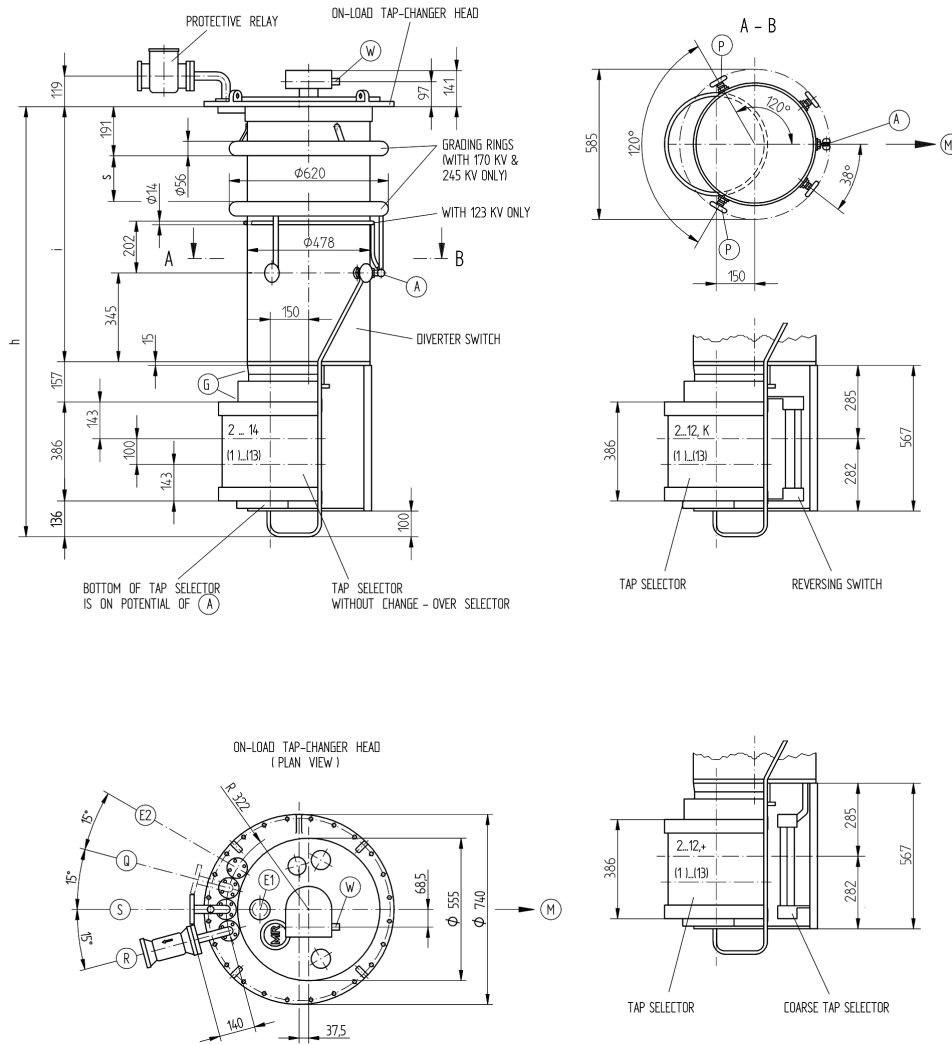




4.1.2 VACUTAP® VM II 302-0/W/G (769225)



4.1.3 VACUTAP® VM I 301-0/W/G (769226)



- (A) ON-LOAD TAP-CHANGER CURRENT TAKE - OFF TERMINAL
- (E1) BLEEDING OF ON-LOAD TAP-CHANGER HEAD
- (E2) BLEEDING OF TRANSFORMER TANK
- (G) TAP SELECTOR GEAR (ON POTENTIAL (A))
- (D) CONNECTING FLANGE FOR OIL RETURN
(WITH FILTER UNIT ONLY)
- (R) CONNECTING FLANGE FOR PROTECTIVE RELAY
- (S) CONNECTING FLANGE FOR SUCTION PIPE
- (W) DRIVE SHAFT
- (M) DRIVE SIDE OF TAP SELECTOR
- (P) IS ON POTENTIAL OF (A)

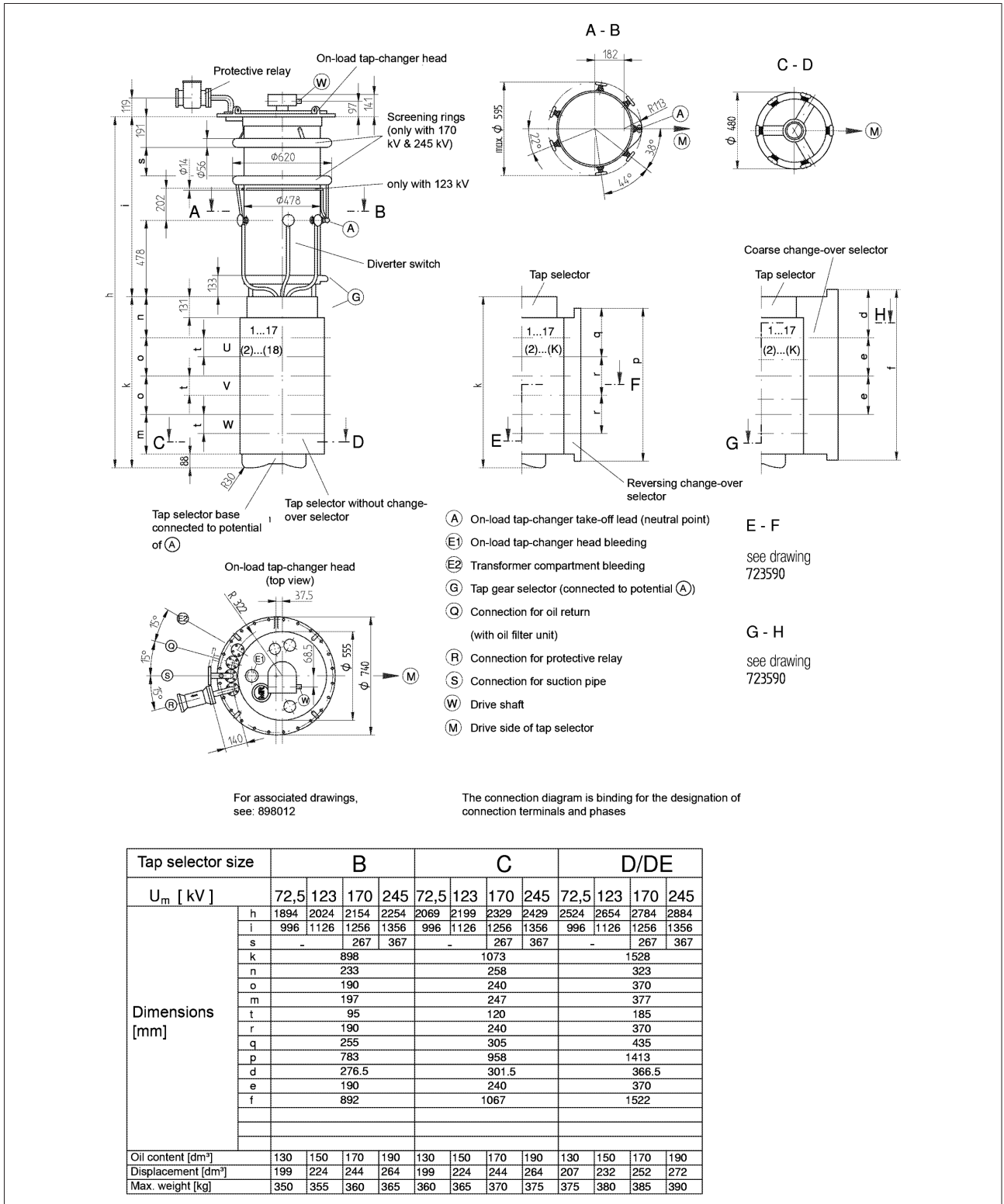
FOR INHERENT DRAWINGS
REFER TO 898026

FOR BINDING DESIGNATIONS OF TERMINALS AND PHASES
REFER TO THE CONNECTION DIAGRAM OF THE TAP-CHANGER

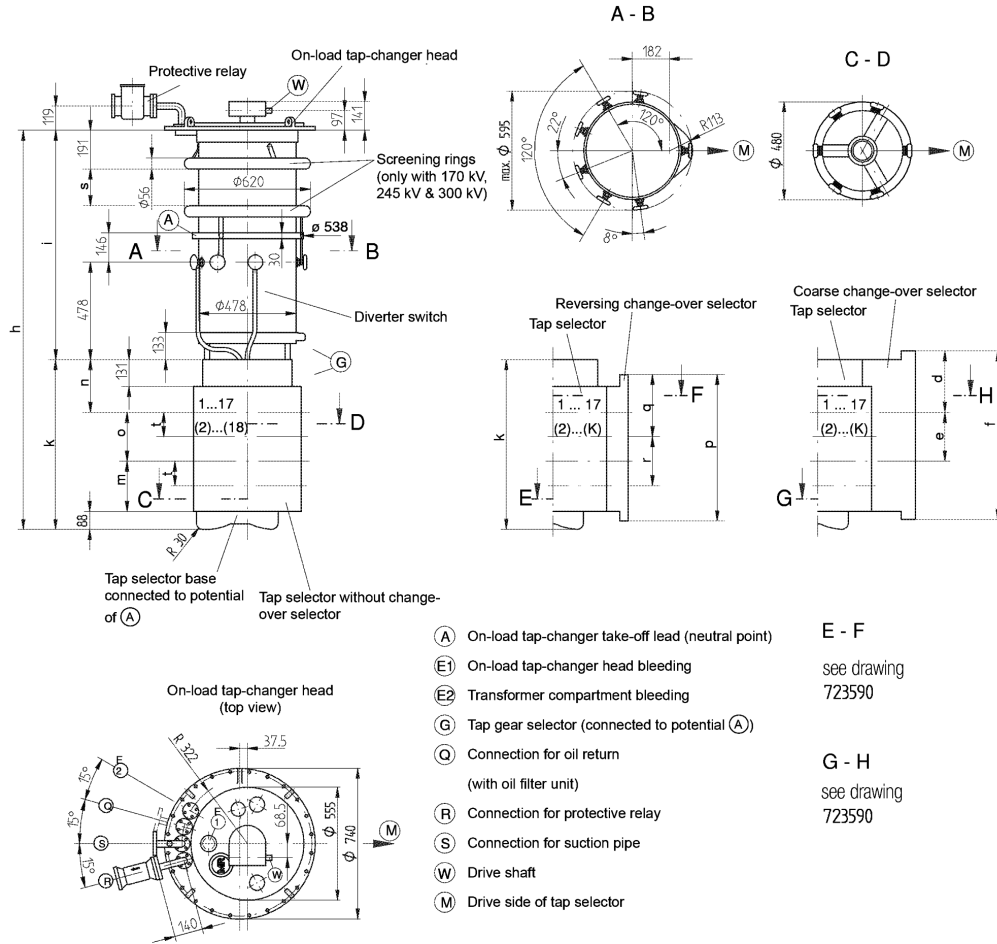
TAP SELECTOR SIZE	B				
	725	123	170	245	
U _M (KV)					
DIMENSIONS (MM)	h	1542	1672	1802	1902
	i	863	993	1123	1223
	s			267	367
OIL VOLUME (DM ³)	130	150	170	190	
DISPLACEMENT (DM ³)	160	190	210	230	
MAX. WEIGHT (KG)	240	245	250	255	



4.1.4 VACUTAP® VM III 350/500/650 Y-0/W/G (746219)



4.1.5 VACUTAP® VM II 352/502/652-0/W/G (746220)

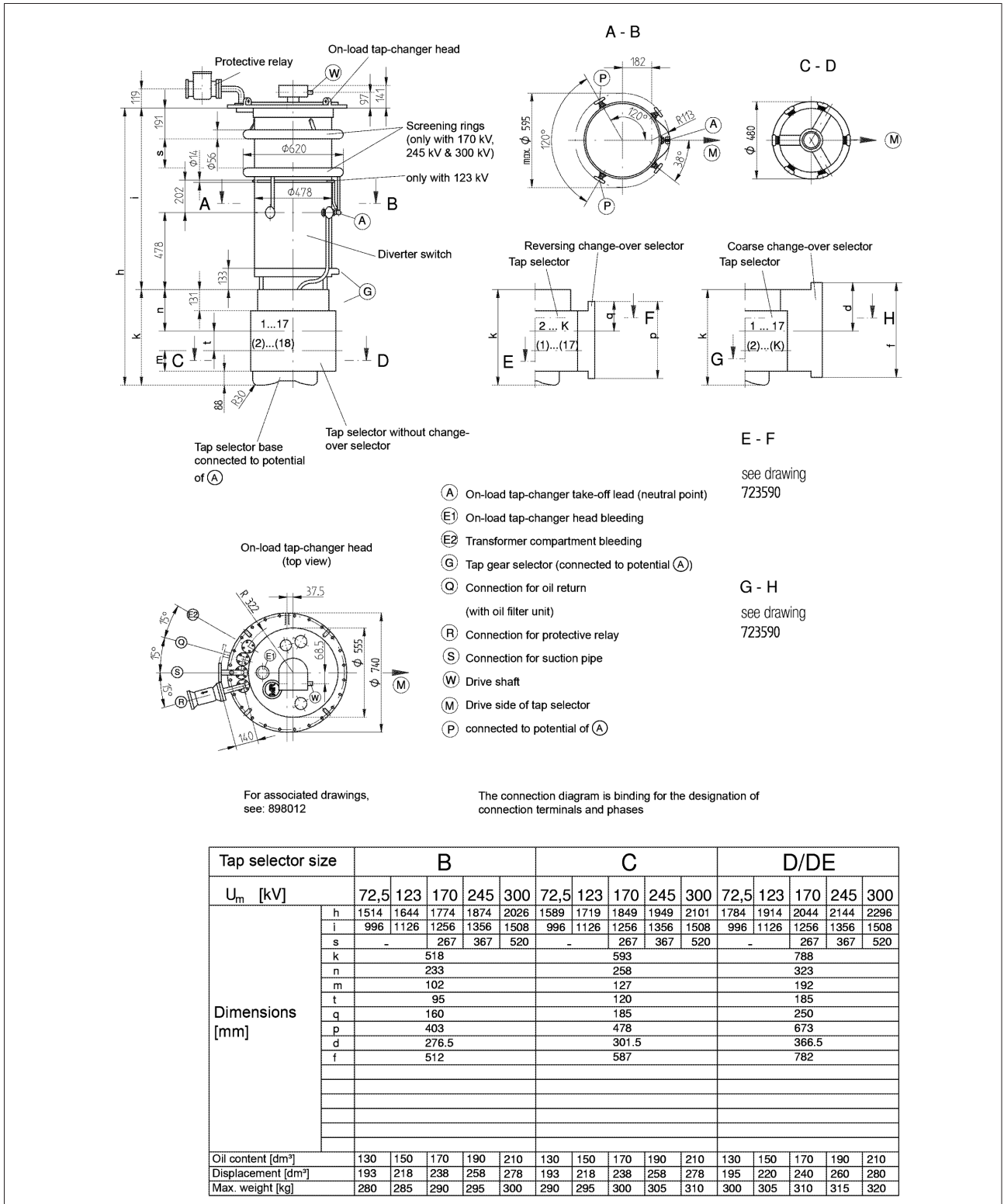


For associated drawings, see: 898012

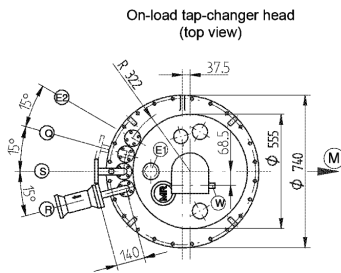
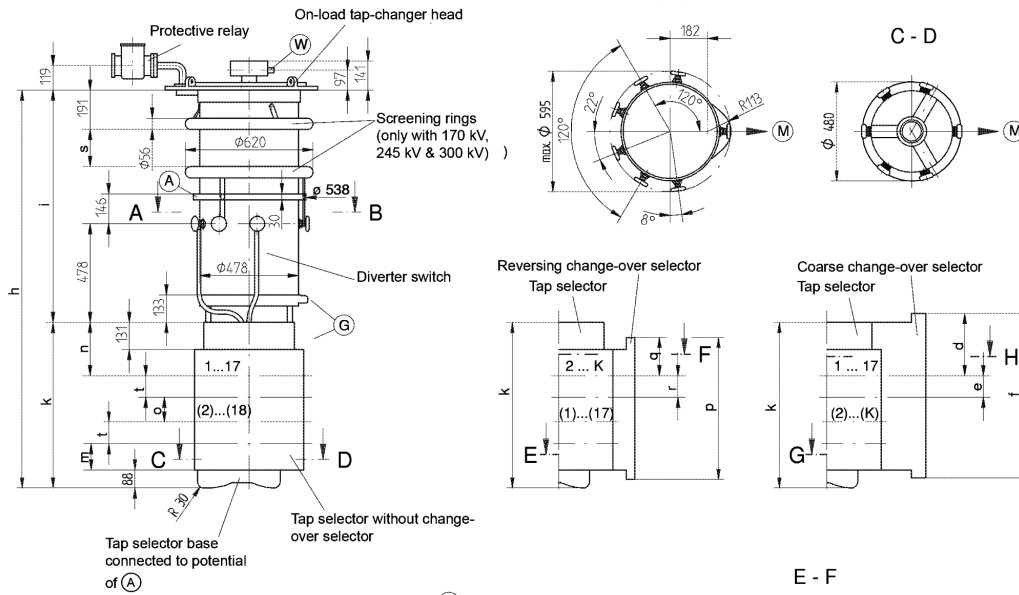
The connection diagram is binding for the designation of connection terminals and phases

Tap selector size	B					C					D/DE				
U _m [kV]	72,5	123	170	245	300	72,5	123	170	245	300	72,5	123	170	245	300
h	1704	1834	1964	2064	2216	1829	1959	2089	2189	2341	2154	2284	2414	2514	2666
i	996	1126	1256	1356	1508	996	1126	1256	1356	1508	996	1126	1256	1356	1508
s	-	-	267	367	520	-	-	267	367	520	-	-	267	367	520
k	708					833					1158				
n	233					258					323				
o	190					240					370				
m	197					247					377				
t	95					120					185				
r	190					240					370				
q	255					305					435				
p	593					718					1043				
e	190					240					370				
d	276.5					301.5					366.5				
f	702					827					1152				
Oil content [dm ³]	130	150	170	190	210	130	150	170	190	210	130	150	170	190	210
Displacement [dm ³]	196	221	241	261	281	196	221	241	261	281	199	224	244	264	284
Max. weight [kg]	310	315	320	325	330	320	325	330	335	340	330	335	340	345	350

4.1.6 VACUTAP® VM I 351/501/651-0/W/G (746221)



4.1.7 VACUTAP® VM I 802/1002-0/W/G (746222)



- (A) On-load tap-changer take-off lead (neutral point) see drawing 723590
- (E1) On-load tap-changer head bleeding see drawing 723590
- (E2) Transformer compartment bleeding see drawing 723590
- (G) Tap gear selector (connected to potential (A)) see drawing 723590
- (Q) Connection for oil return (with oil filter unit)
- (R) Connection for protective relay
- (S) Connection for suction pipe
- (W) Drive shaft
- (M) Drive side of tap selector

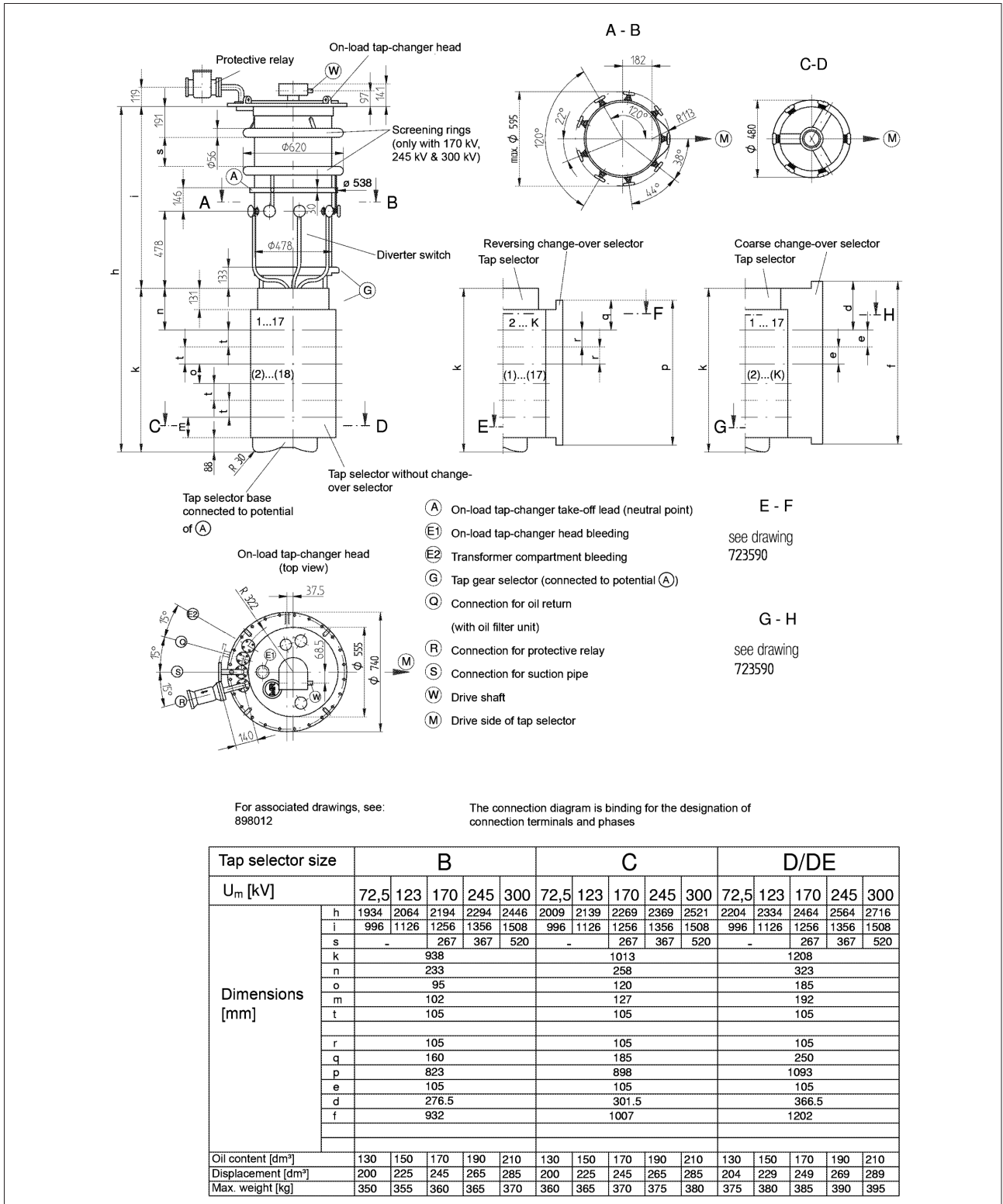
For associated drawings, see: 898012

The connection diagram is binding for the designation of connection terminals and phases

Tap selector size	B					C					D/DE					
	72,5	123	170	245	300	72,5	123	170	245	300	72,5	123	170	245	300	
U_m [kV]																
Dimensions [mm]	h	1724	1854	1984	2084	2236	1799	1929	2059	2159	2311	1994	2124	2254	2354	2506
	i	996	1126	1256	1356	1508	996	1126	1256	1356	1508	996	1126	1256	1356	1508
	s	-	-	267	367	520	-	-	267	367	520	-	-	267	367	520
	k	-	-	728	-	-	-	-	803	-	-	-	-	998	-	-
	n	-	-	233	-	-	-	-	258	-	-	-	-	323	-	-
	o	-	-	95	-	-	-	-	120	-	-	-	-	185	-	-
	m	-	-	102	-	-	-	-	127	-	-	-	-	192	-	-
	t	-	-	105	-	-	-	-	105	-	-	-	-	105	-	-
	r	-	-	105	-	-	-	-	105	-	-	-	-	105	-	-
	q	-	-	160	-	-	-	-	185	-	-	-	-	250	-	-
	p	-	-	613	-	-	-	-	688	-	-	-	-	883	-	-
	e	-	-	105	-	-	-	-	105	-	-	-	-	105	-	-
	d	-	-	276.5	-	-	-	-	301.5	-	-	-	-	366.5	-	-
	f	-	-	722	-	-	-	-	797	-	-	-	-	992	-	-
	Oil content [dm³]	130	150	170	190	210	130	150	170	190	210	130	150	170	190	210
	Displacement [dm³]	196	221	241	261	281	196	221	241	261	281	199	224	244	264	284
	Max. weight [kg]	310	315	320	325	330	320	325	330	335	340	330	335	340	345	350



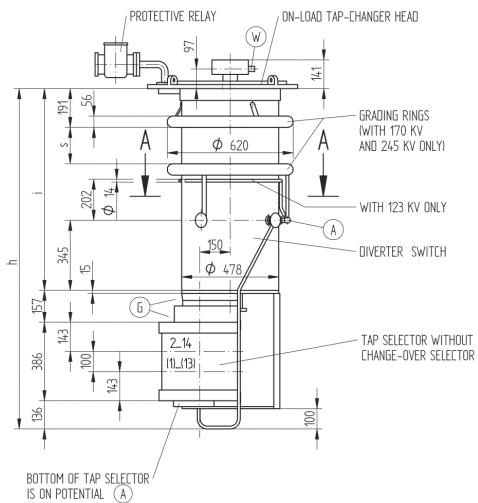
4.1.8 VACUTAP® VM I 1203/1503-0/W/G (746223)



4.1.9 VACUTAP® VM III 300 K-0/W/G (768851)

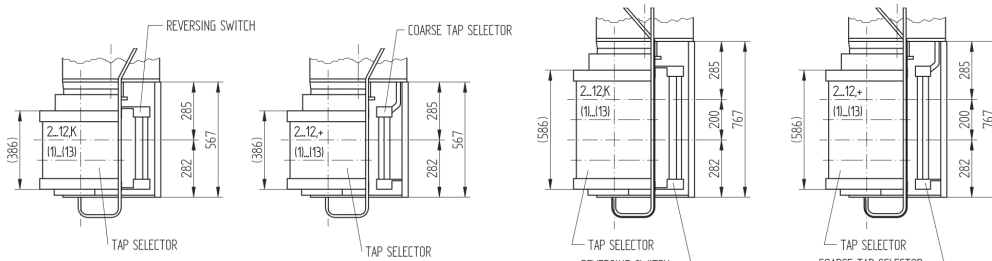
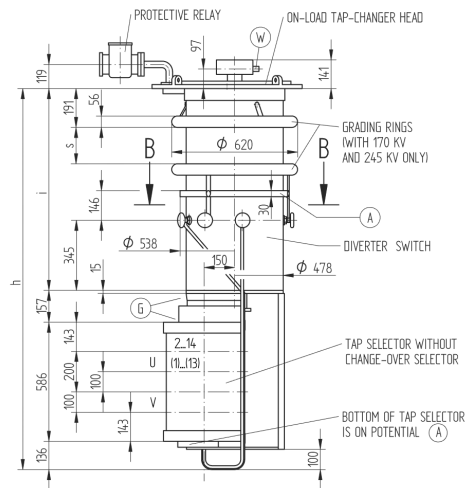
VM I 301 - 0 / W / G

TAP SELECTOR SIDE		B			
Um (kV)		725	123	170	245
DIMENSIONS [MM]	h	1542	1672	1802	1902
	i	863	993	1123	1223
	s	-	-	267	367
OIL VOLUME [DM ³]		130	150	170	190
DISPLACEMENT [DM ³]		160	190	210	230
MAX. WEIGHT [KG]		240	245	250	255

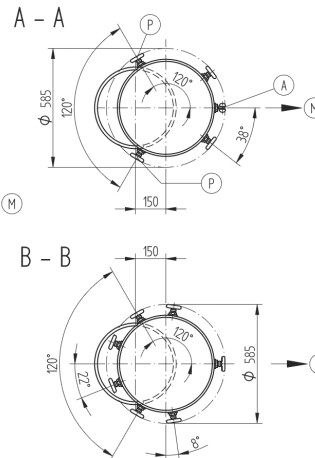
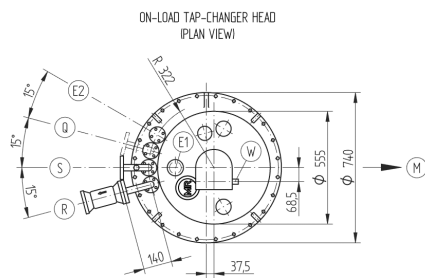


VM II 302 - 0 / W / G

TAP SELECTOR SIDE		B			
Um (kV)		725	123	170	245
DIMENSIONS [MM]	h	1742	1872	2002	2102
	i	863	993	1123	1223
	s	-	-	267	367
OIL VOLUME [DM ³]		130	150	170	190
DISPLACEMENT [DM ³]		180	210	230	250
MAX. WEIGHT [KG]		260	265	270	275



- (A) ON-LOAD TAP-CHANGER CURRENT TAKE-OFF TERMINAL
- (E1) BLEEDING OF ON-LOAD TAP-CHANGER HEAD
- (E2) BLEEDING OF TRANSFORMER TANK
- (G) TAP SELECTOR GEAR (ON POTENTIAL (A))
- (M) DRIVE SIDE OF TAP SELECTOR
- (P) IS ON POTENTIAL (A)
- (D) CONNECTING FLANGE FOR OIL RETURN (WITH FILTER UNIT ONLY)
- (R) CONNECTING FLANGE FOR PROTECTIVE RELAY
- (S) CONNECTING FOR SUCTION PIPE
- (W) DRIVE SHAFT



FOR INHERENT DRAWINGS REFER TO 898026

FOR BINDING DESIGNATIONS OF TERMINALS AND PHASES REFER TO THE CONNECTION DIAGRAM OF THE ON-LOAD TAP-CHANGER

4.1.10 VACUTAP® VM III K-0/W/G (746224)

VM I 351 / 501 / 651 - 0 / W / G

Um IN KV	725	123	170	245	300	725	123	170	245	300	725	123	170	245	300	
h	1514	1844	1774	1874	2026	1589	1719	1849	1949	2101	1784	1914	2044	2144	2296	
i	996	1126	1256	1356	1508	996	1126	1256	1356	1508	996	1126	1256	1356	1508	
s	-	267	367	520	-	267	367	520	-	267	367	520	-	267	367	520
k	-	518	-	-	-	593	-	-	-	788	-	-	-	-	-	-
n	-	233	-	-	-	258	-	-	-	323	-	-	-	-	-	-
m	-	102	-	-	-	127	-	-	-	192	-	-	-	-	-	-
t	-	95	-	-	-	120	-	-	-	185	-	-	-	-	-	-
q	-	160	-	-	-	185	-	-	-	250	-	-	-	-	-	-
p	-	403	-	-	-	478	-	-	-	673	-	-	-	-	-	-
d	-	276.5	-	-	-	301.5	-	-	-	366.5	-	-	-	-	-	-
f	-	512	-	-	-	587	-	-	-	782	-	-	-	-	-	-
OIL VOLUME DM³	130	150	170	190	210	130	150	170	190	210	130	150	170	190	210	
DISPLACEMENT DM³	193	218	238	258	278	193	218	238	258	278	193	218	238	258	278	
WEIGHT KG	280	285	290	295	300	290	295	300	305	310	300	305	310	315	320	

VM II 352 / 502 / 652 - 0 / W / G

Um IN KV	725	123	170	245	300	725	123	170	245	300	725	123	170	245	300	
h	1704	1834	1964	2064	2216	1829	1959	2089	2189	2341	2154	2284	2414	2514	2666	
i	996	1126	1256	1356	1508	996	1126	1256	1356	1508	996	1126	1256	1356	1508	
s	-	267	367	520	-	-	267	367	520	-	-	267	367	520	-	
k	-	708	-	-	-	708	-	-	-	833	-	-	-	-	-	-
n	-	233	-	-	-	258	-	-	-	323	-	-	-	-	-	-
m	-	190	-	-	-	240	-	-	-	370	-	-	-	-	-	-
t	-	197	-	-	-	247	-	-	-	377	-	-	-	-	-	-
q	-	95	-	-	-	120	-	-	-	185	-	-	-	-	-	-
p	-	190	-	-	-	240	-	-	-	370	-	-	-	-	-	-
d	-	255	-	-	-	305	-	-	-	435	-	-	-	-	-	-
f	-	593	-	-	-	718	-	-	-	1043	-	-	-	-	-	-
e	-	190	-	-	-	240	-	-	-	370	-	-	-	-	-	-
d	-	276.5	-	-	-	301.5	-	-	-	366.5	-	-	-	-	-	-
f	-	702	-	-	-	827	-	-	-	1152	-	-	-	-	-	-
OIL VOLUME DM³	130	150	170	190	210	130	150	170	190	210	130	150	170	190	210	
DISPLACEMENT DM³	196	221	241	261	281	196	221	241	261	281	199	224	244	264	284	
WEIGHT KG	310	315	320	325	330	320	325	330	335	340	330	335	340	345	350	

A - A **B - B**

C - C

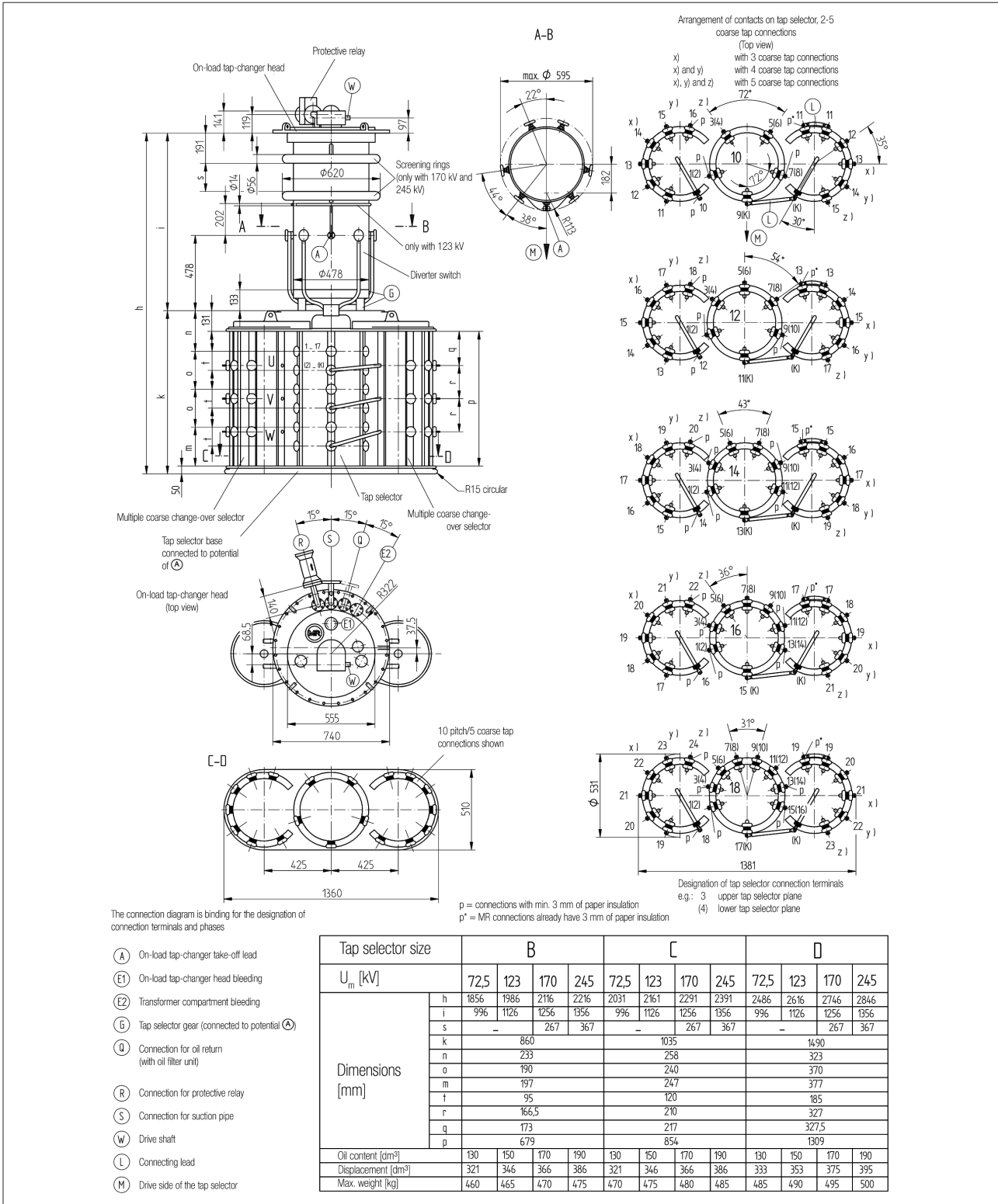
E - F / G - H

- (A) ON-LOAD TAP-CHANGER CURRENT TAKE-OFF TERMINAL
- (E1) BLEEDING OF ON-LOAD TAP-CHANGER HEAD
- (E2) BLEEDING OF TRANSFORMER TANK
- (G) TAP SELECTOR GEAR (ON POTENTIAL (A))
- (L) LEAD (WITH CONNECTING DIAGRAM 10 19 3W _ 18 35 3W ONLY)
- (M) DRIVE SIDE OF TAP SELECTOR
- (B) CONNECTING FLANGE FOR OIL RETURN (WITH FILTER UNIT ONLY)
- (R) CONNECTING FLANGE FOR PROTECTIVE RELAY
- (S) CONNECTING FOR SUCTION PIPE
- (W) DRIVE SHAFT
- (P) IS ON POTENTIAL OF (A)

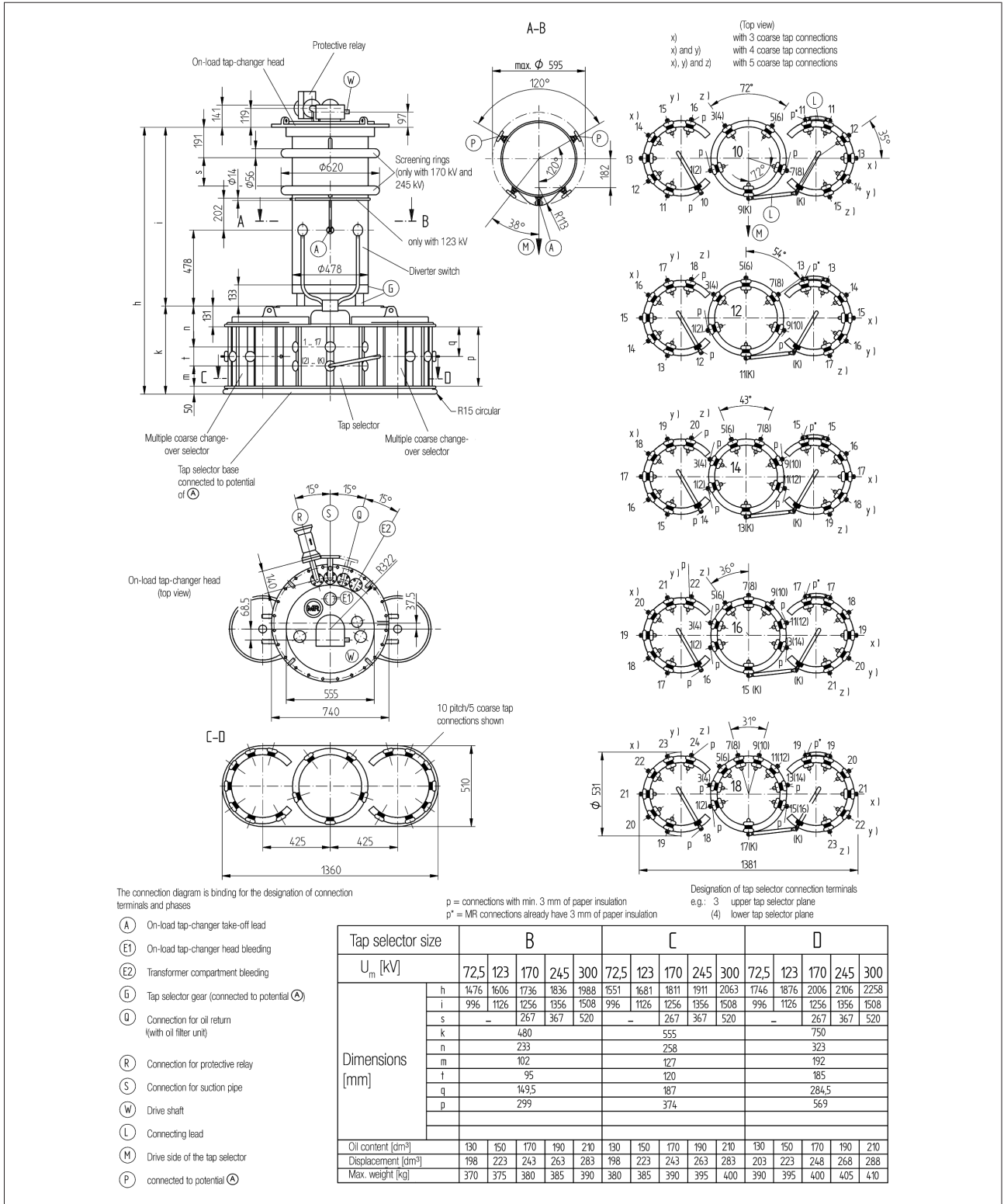
FOR INHERENT DRAWINGS REFER TO 898012

FOR BINDING DESIGNATIONS OF TERMINALS AND PHASES REFER TO THE CONNECTION DIAGRAM OF THE ON-LOAD TAP-CHANGER

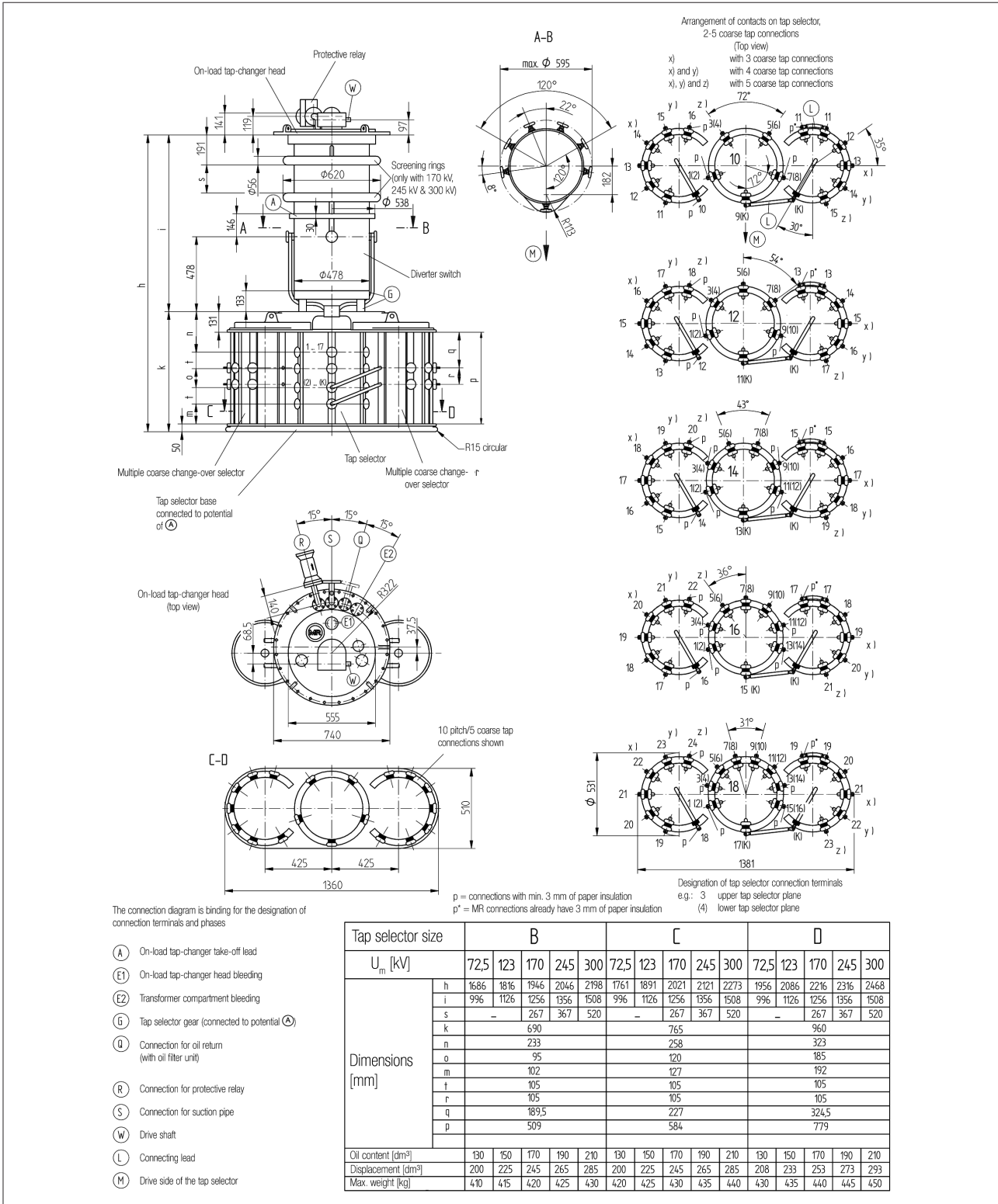
4.1.11 VACUTAP® VM III 650 Y with multiple coarse change-over selector (746226)



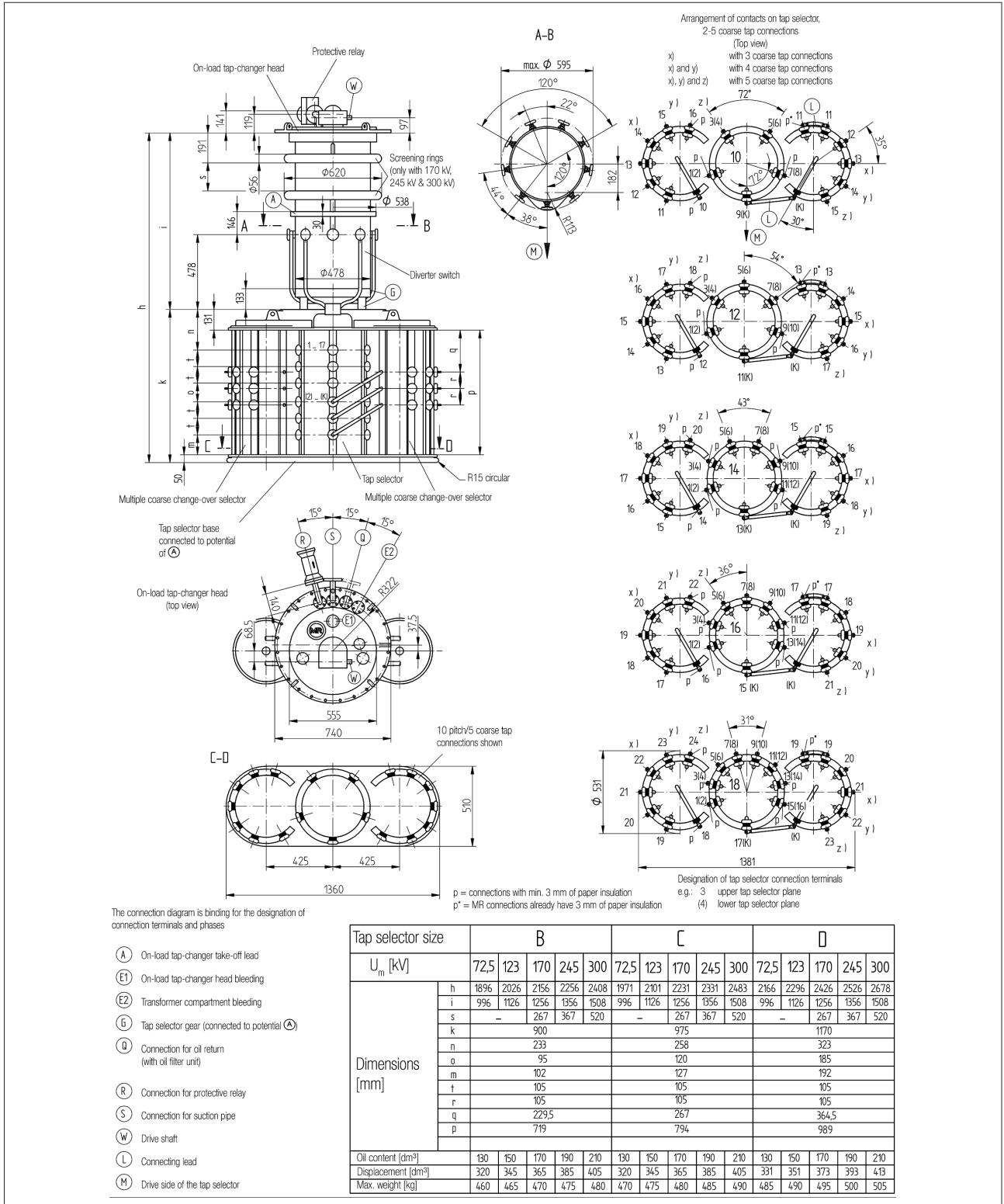
4.1.12 VACUTAP® VM I 651 with multiple coarse change-over selector (746227)



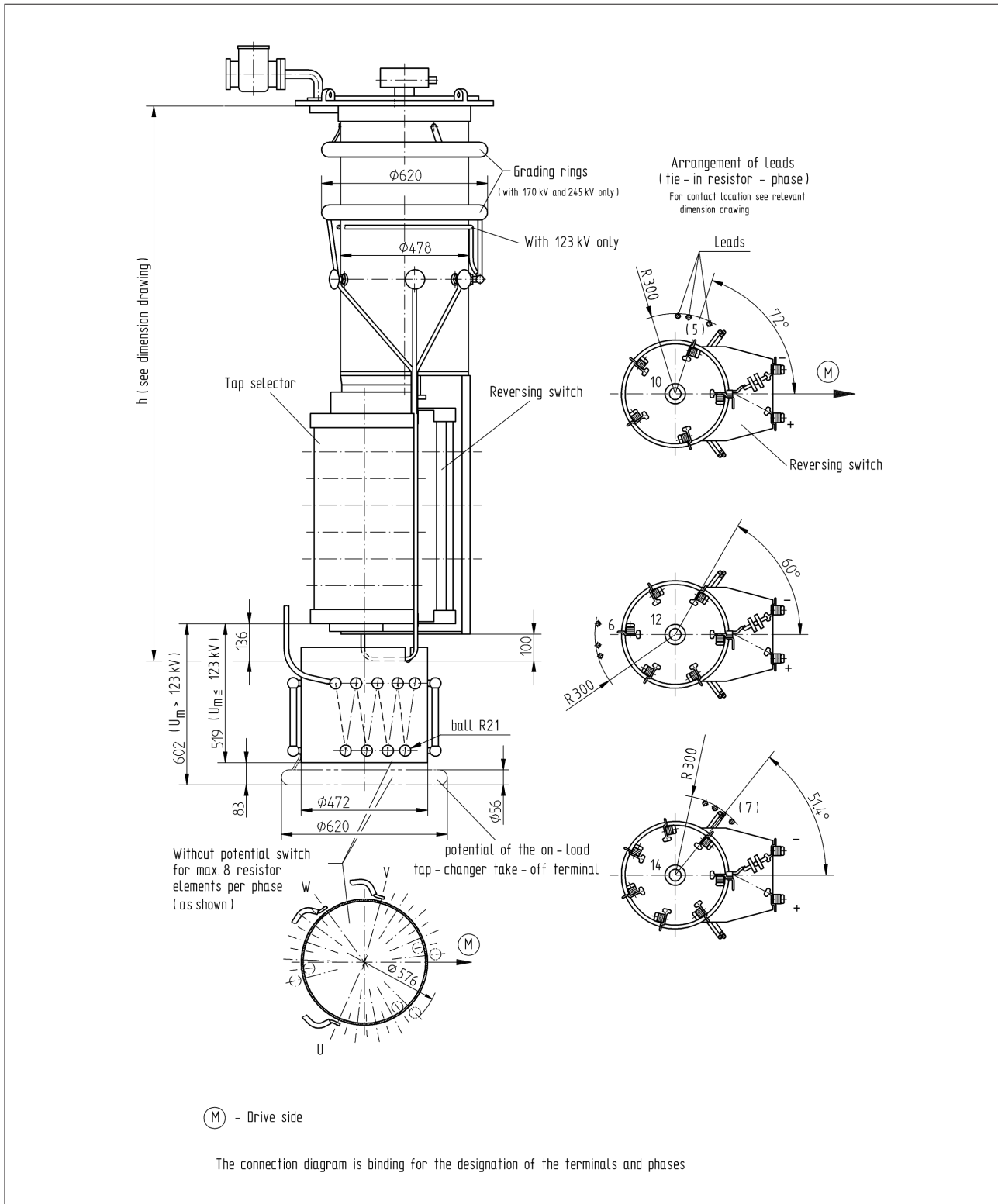
4.1.13 VACUTAP® VM I 802/1002 with multiple coarse change-over selector (746228)



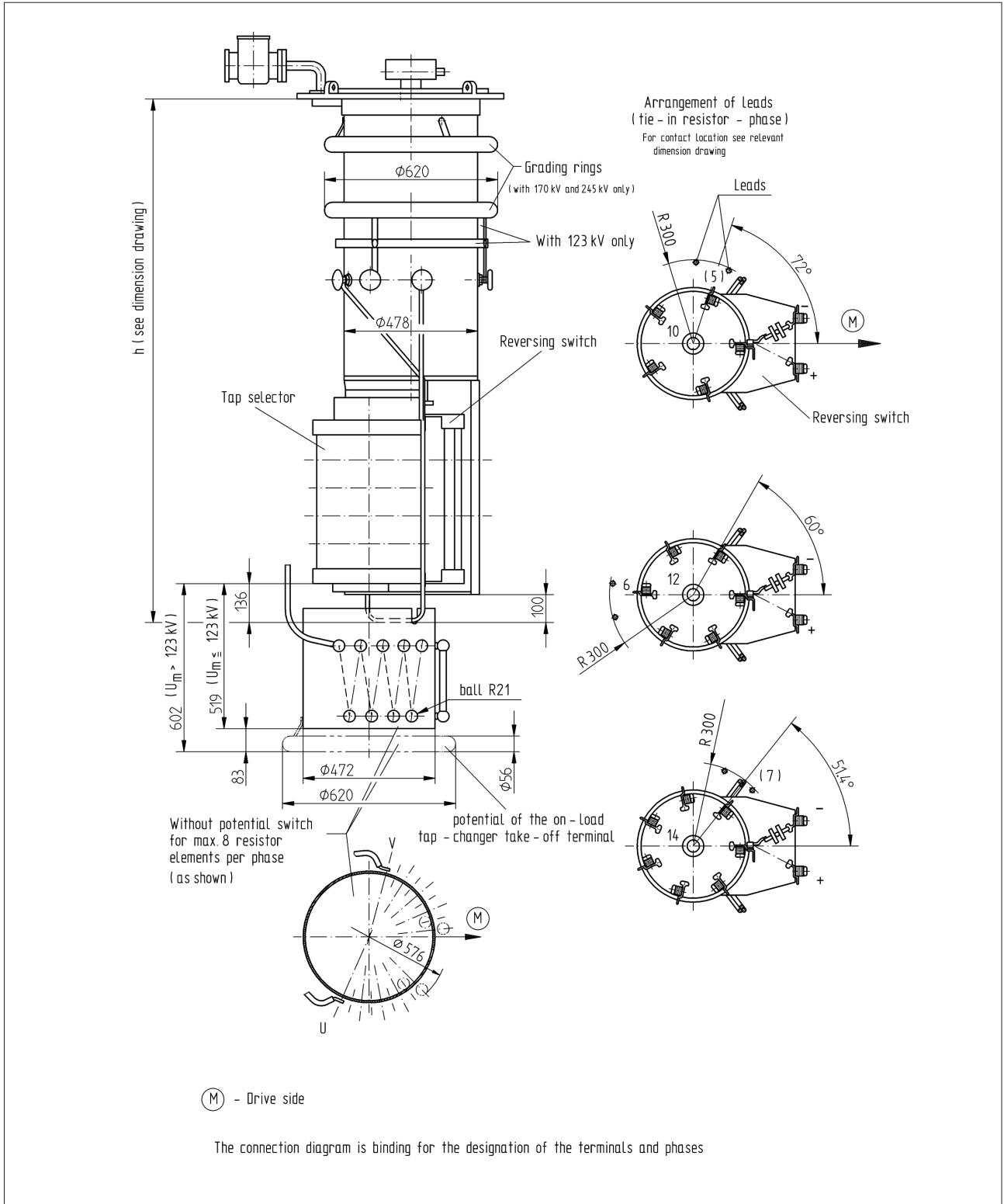
4.1.14 VACUTAP® VM I 1203/1503 with multiple coarse change-over selector (746229)



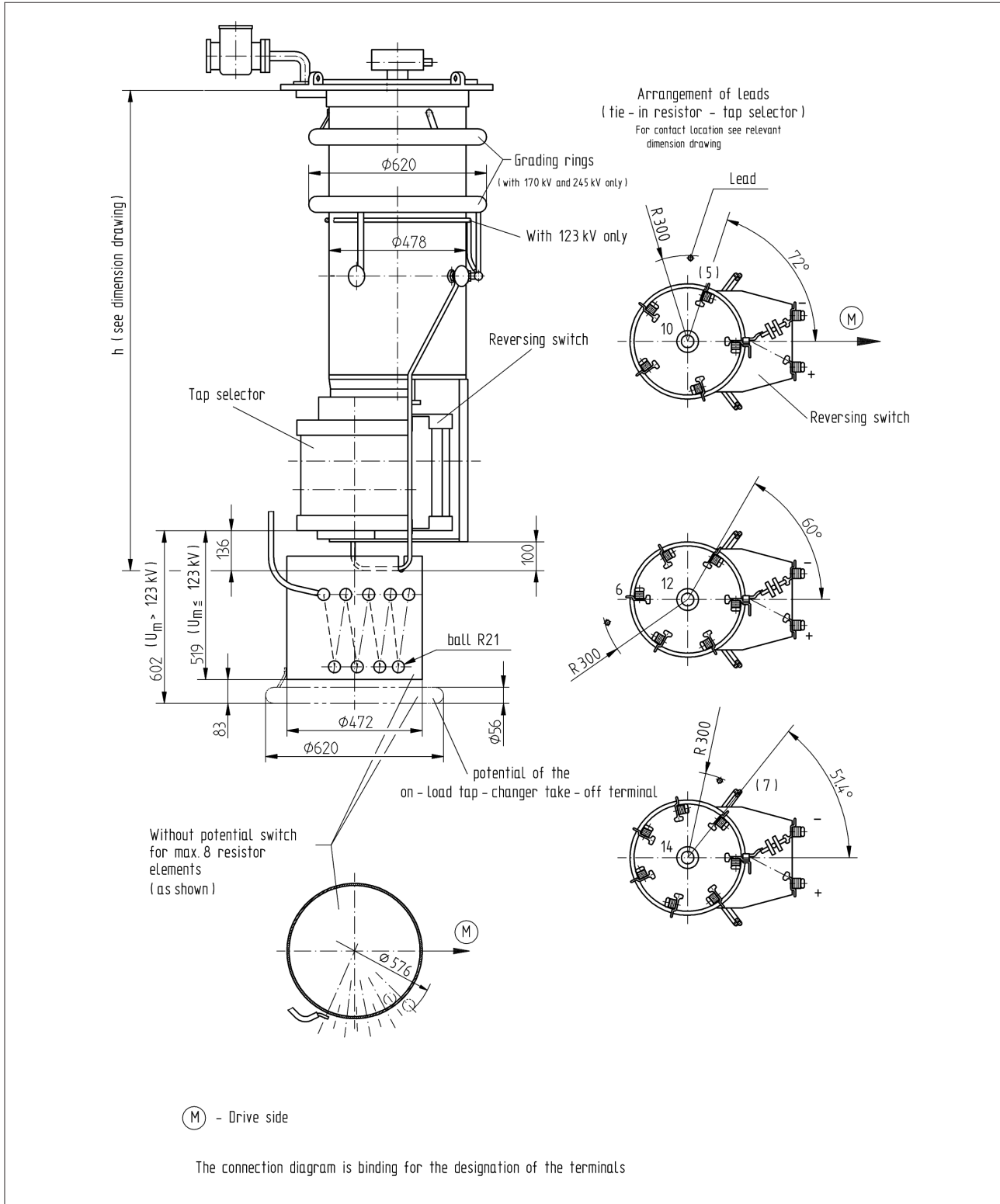
4.1.15 VACUTAP® VM III 300 tie-in resistors without potential switch (898695)



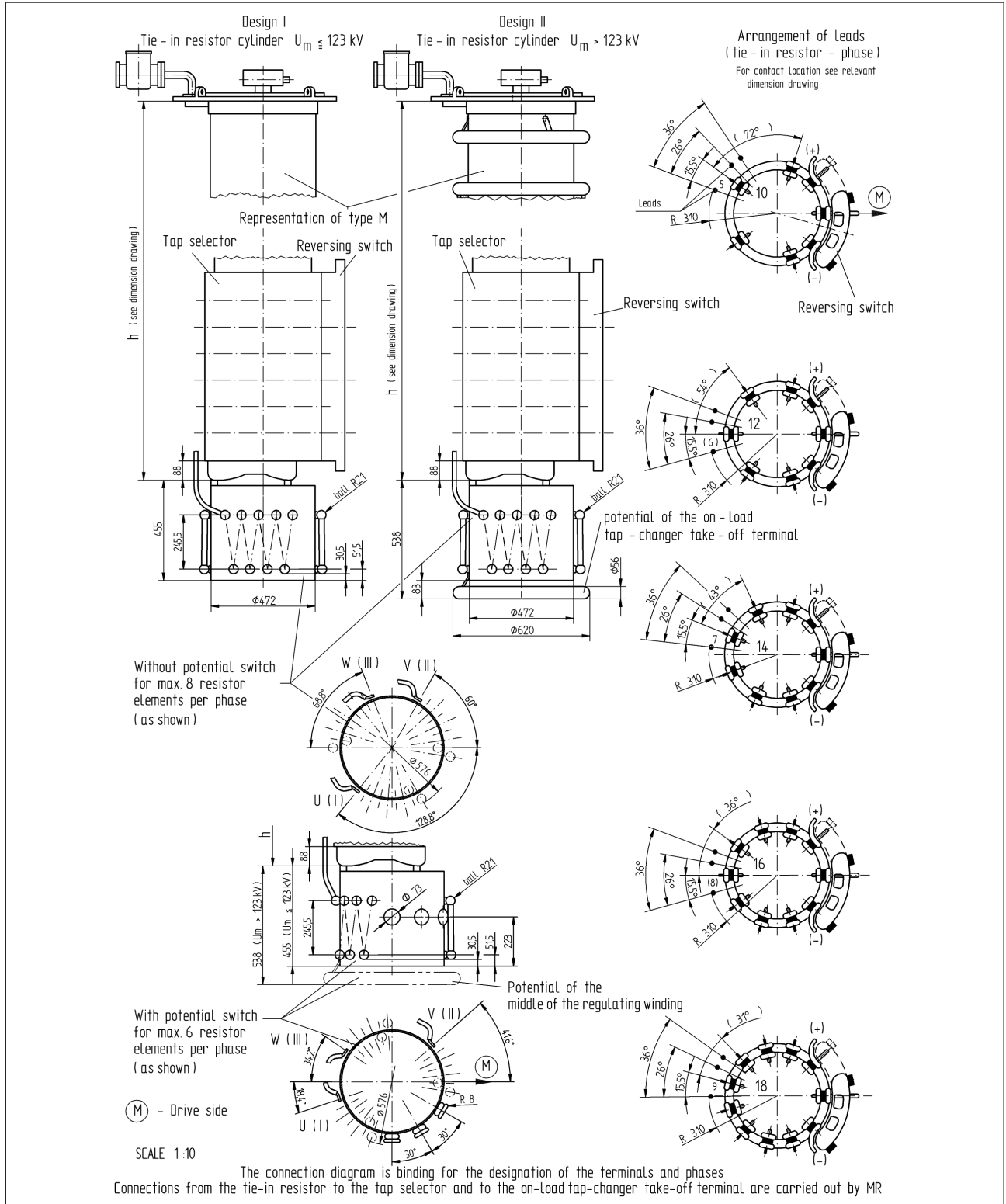
4.1.16 VACUTAP® VM II 302 tie-in resistors without potential switch (898694)



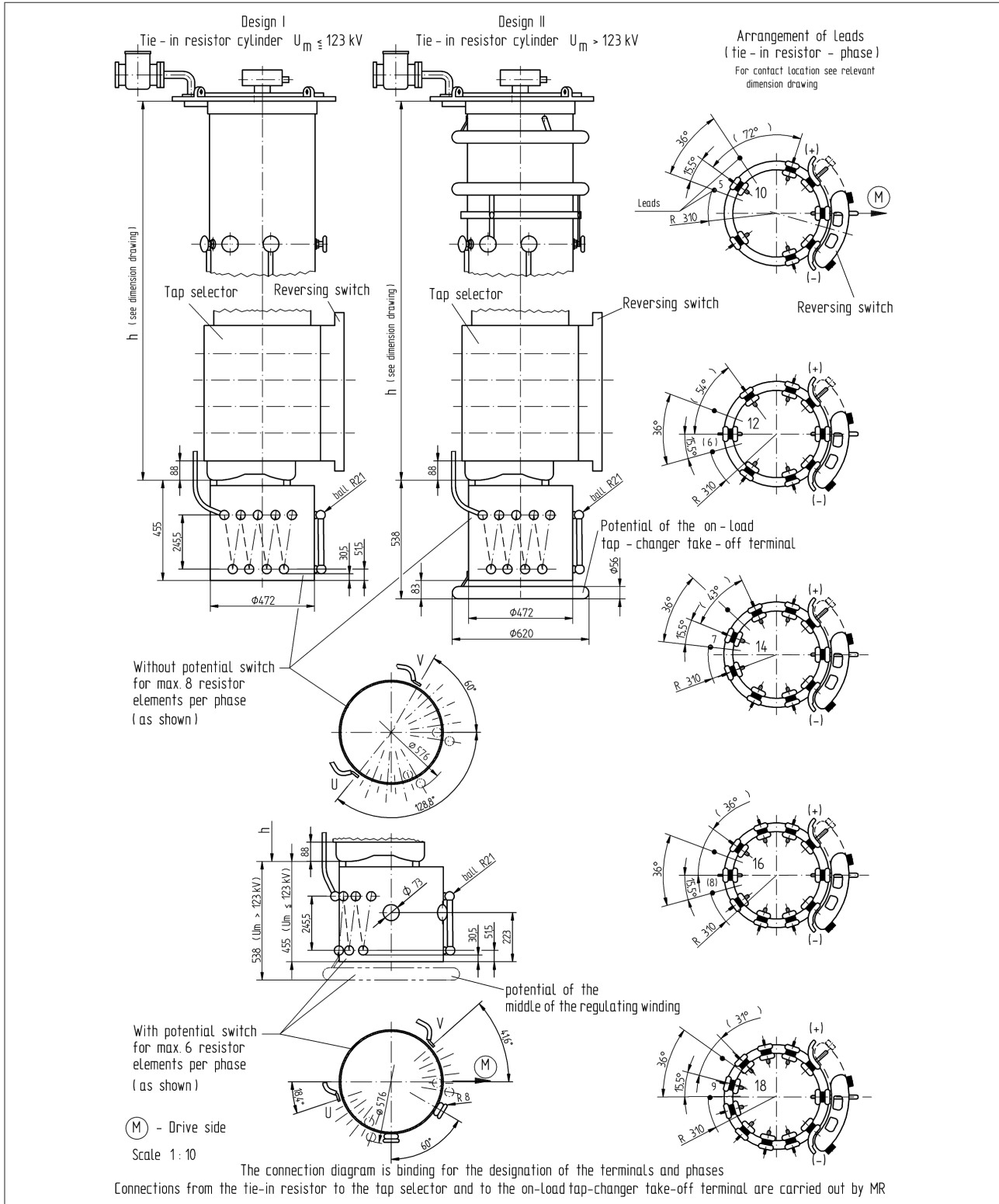
4.1.17 VACUTAP® VM I 301 tie-in resistors without potential switch (898693)



4.1.18 VACUTAP® VM III Y tie-in resistors with/without potential switch (898692)

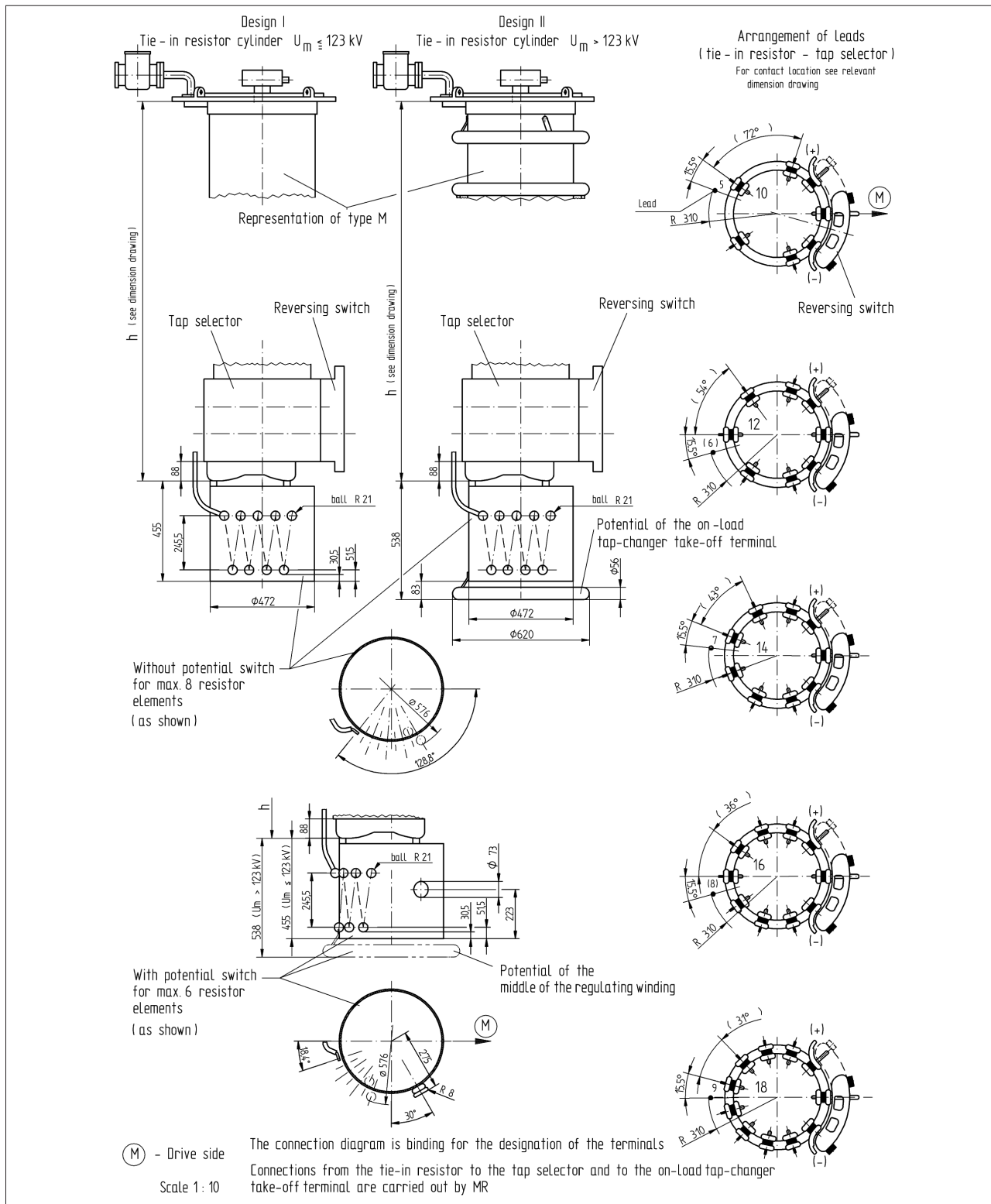


4.1.19 VACUTAP® VM II tie-in resistors with/without potential switch (898691)

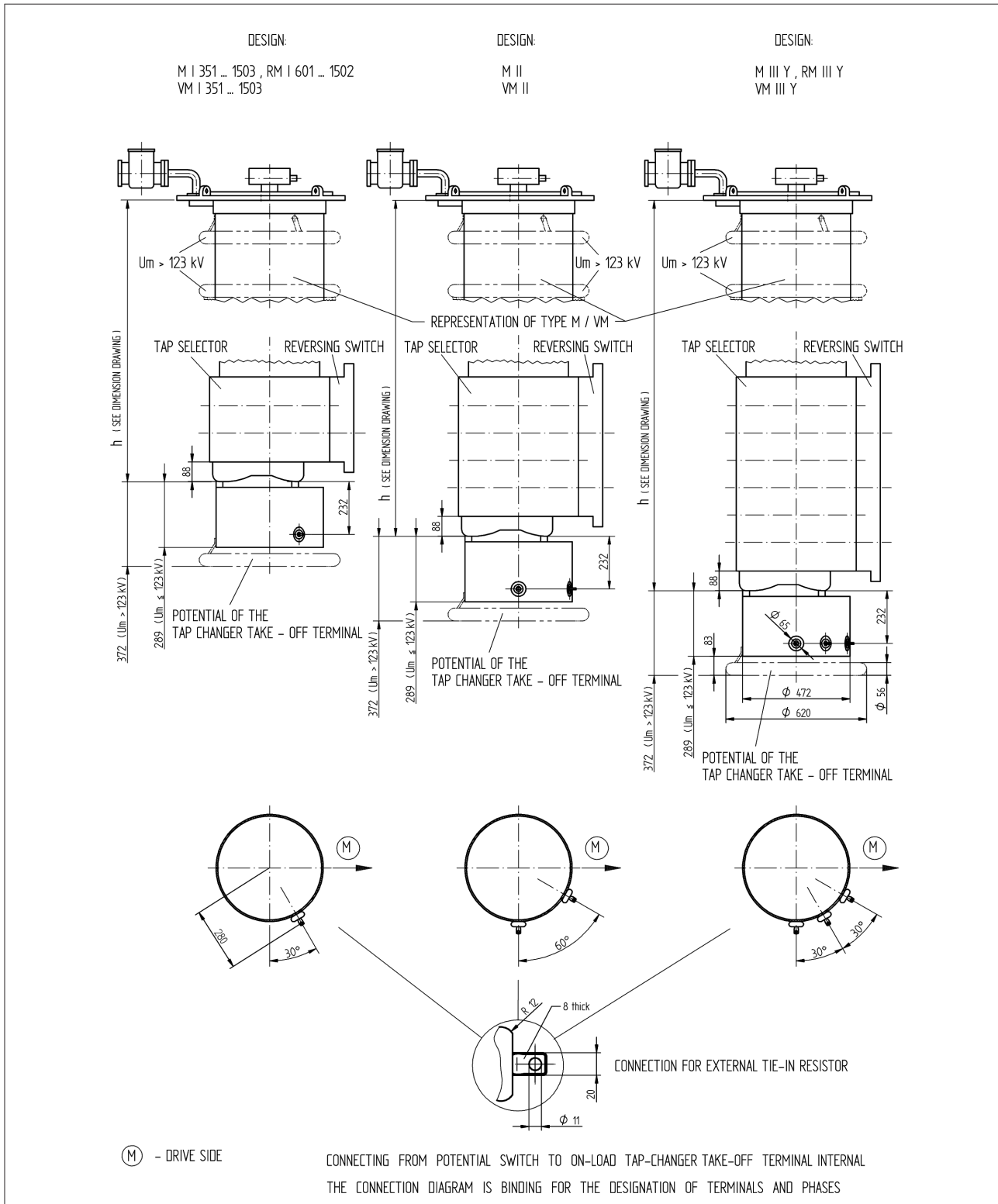




4.1.20 VACUTAP® VM I tie-in resistors with/without potential switch (898690)



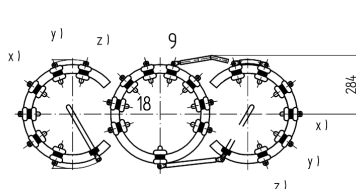
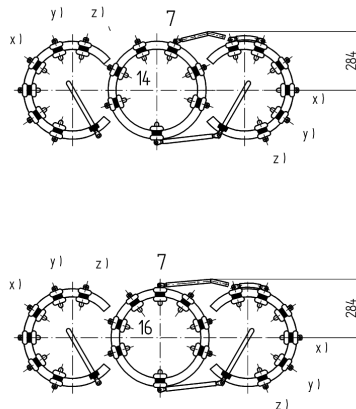
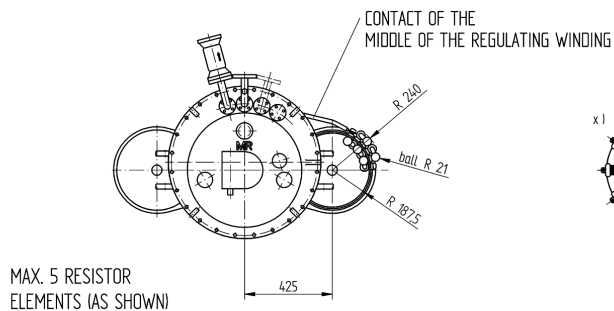
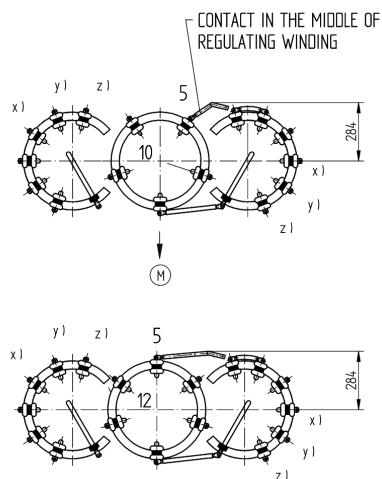
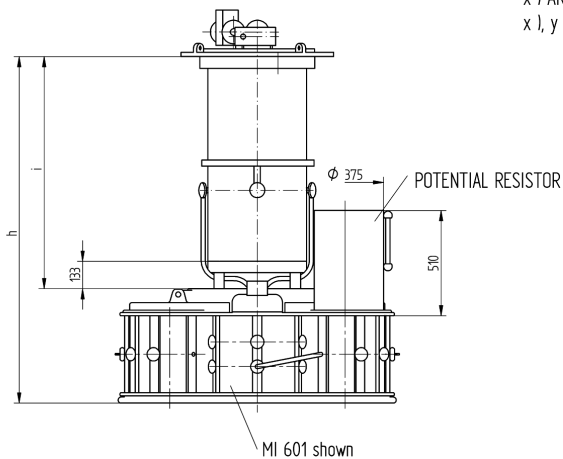
4.1.21 VACUTAP® VM I 351...1503 tie-in resistor cylinder with potential switch without tie-in resistors (898804)



4.1.22 VACUTAP® VM I 651...1503 tie-in resistor cylinder with multiple coarse change-over selector (719733)

ARRANGEMENT OF TAP SELECTOR CONTACTS, 2-5 COARSE TAPS (PLAN VIEW)

- x) FOR 3 COARSE TAPS
- x) AND y) FOR 4 COARSE TAPS
- x), y) AND z) FOR 5 COARSE TAPS



THE CONNECTION DIAGRAM IS BINDING FOR THE DESIGNATION OF THE TERMINALS AND PHASES

(M) DRIVE SIDE

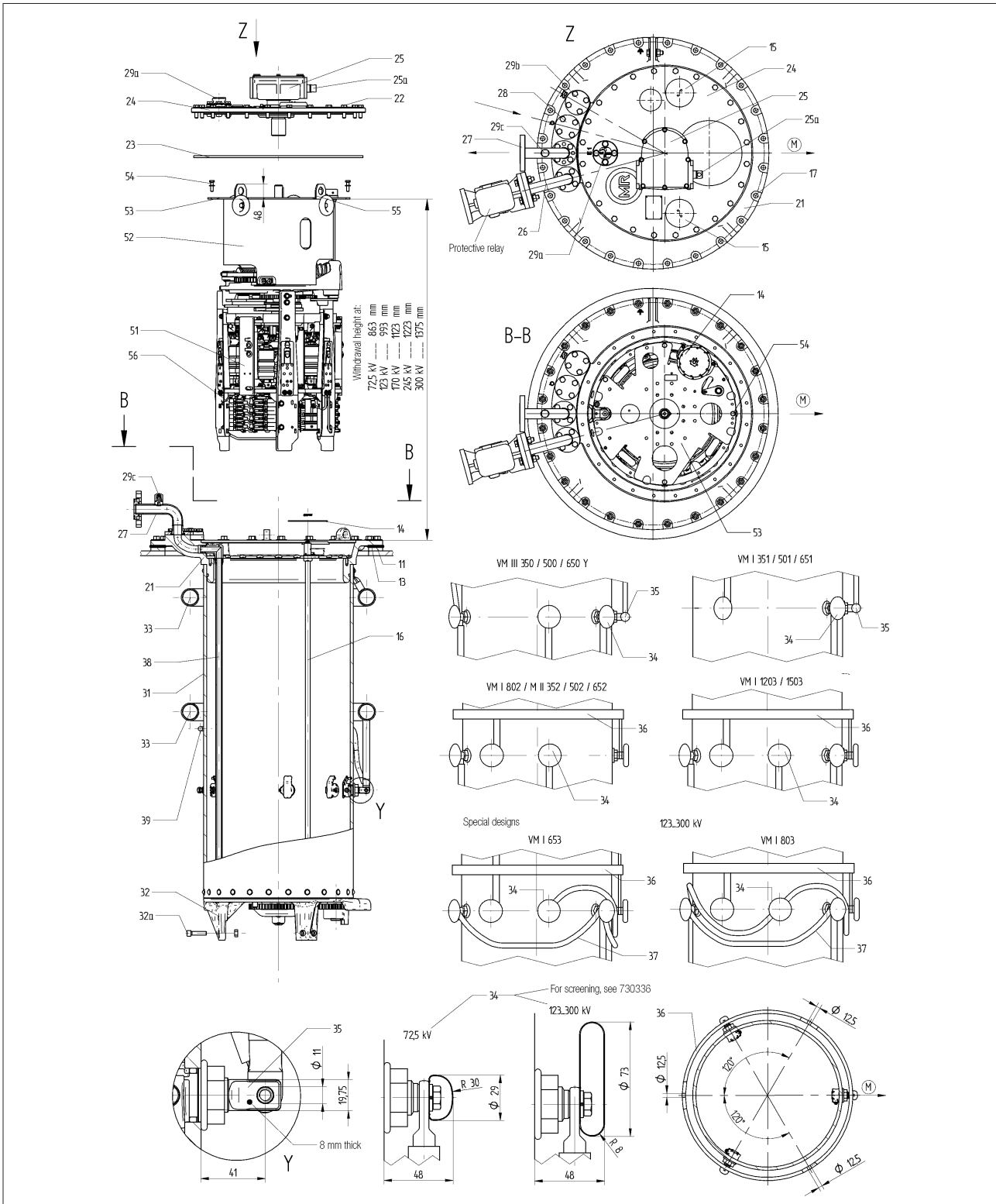
**4.1.23 VACUTAP® VM® associated drawings (898012)**

BASIC CONNECTION DIAGRAMS	890 616
INSTALLATION DRAWINGS	
M III 350 Y ... M I 1503	893 978
VM III 350 Y ... VM I 1503	746 230
ON-LOAD TAP-CHANGER HEAD M III 350 Y ... M I 1503 AND VM III 350 Y ... VM I 1503	
VARIANTS OF THE ON-LOAD TAP-CHANGER HEAD	720 026
SWIVELLING RANGE OF THE GEAR UNIT	720 027
SCREENINGS ON OIL COMPARTMENT TERMINALS	730 336
CONTACT ARRANGEMENT ON TAP SELECTOR	898 013
MOUNTING POSITION OF THE TAP SELECTOR TERMINALS	890 477
CONNECTING LEAD 3W, 1G, 3G	723 590
SCREENINGS AT TAP SELECTOR AND CHANGE- OVER SELECTOR	730 335
PARALLEL BRIDGES	899 598
HORIZONTAL DRIVE SHAFT	893 896
ARRANGEMENT OF TAP SELECTOR CONTACTS	
M III 350 / 500 / 600 Y, M II 352 / 502 / 602 VM III 350 / 500 / 650 Y, VM II 352 / 502 / 652	891 107
M I 351 / 501 / 601 VM I 351 / 501 / 651	891 108
M I 1203 / 1503 VM I 1203 / 1503	891 109
M I 802 VM I 802 / 1002	891 110

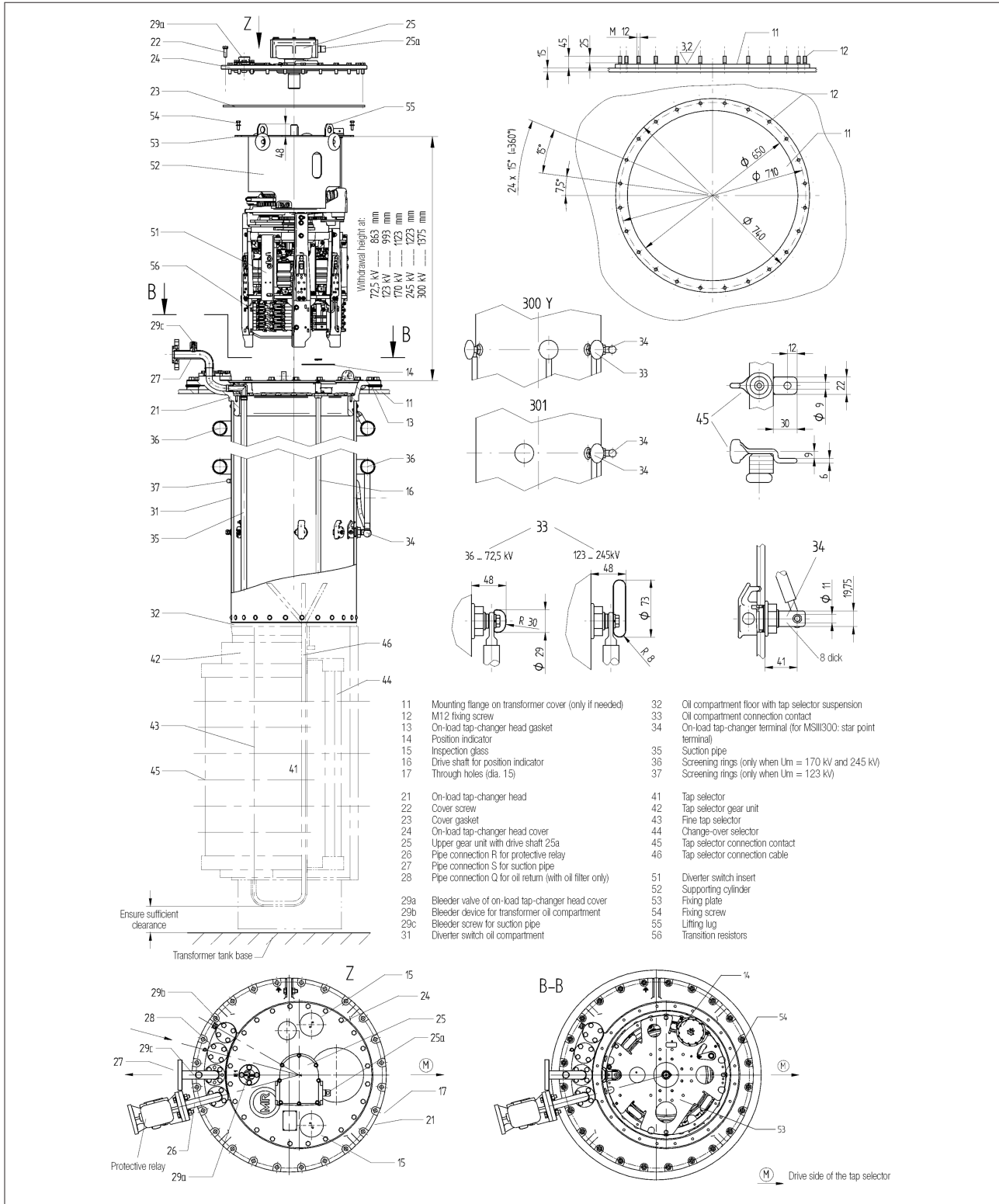
**4.1.24 VACUTAP® VM 300 associated drawings (898026)**

CONTACT ARRANGEMENT ON TAP SELECTOR	_____898 041
BASIC CONNECTION DIAGRAMS	_____893 819
ARRANGEMENT OF TAP SELECTOR CONTACTS	_____891 114
ON-LOAD TAP-CHANGER HEAD	_____893 899
VARIANTS OF ON-LOAD TAP-CHANGER HEAD	_____720 026
INSTALLATION DRAWING	
MS	_____893 900
VM 300	_____765 192
HORIZONTAL DRIVE SHAFT	_____893 896

4.1.25 VACUTAP® VM® installation drawing of central drive (746230)

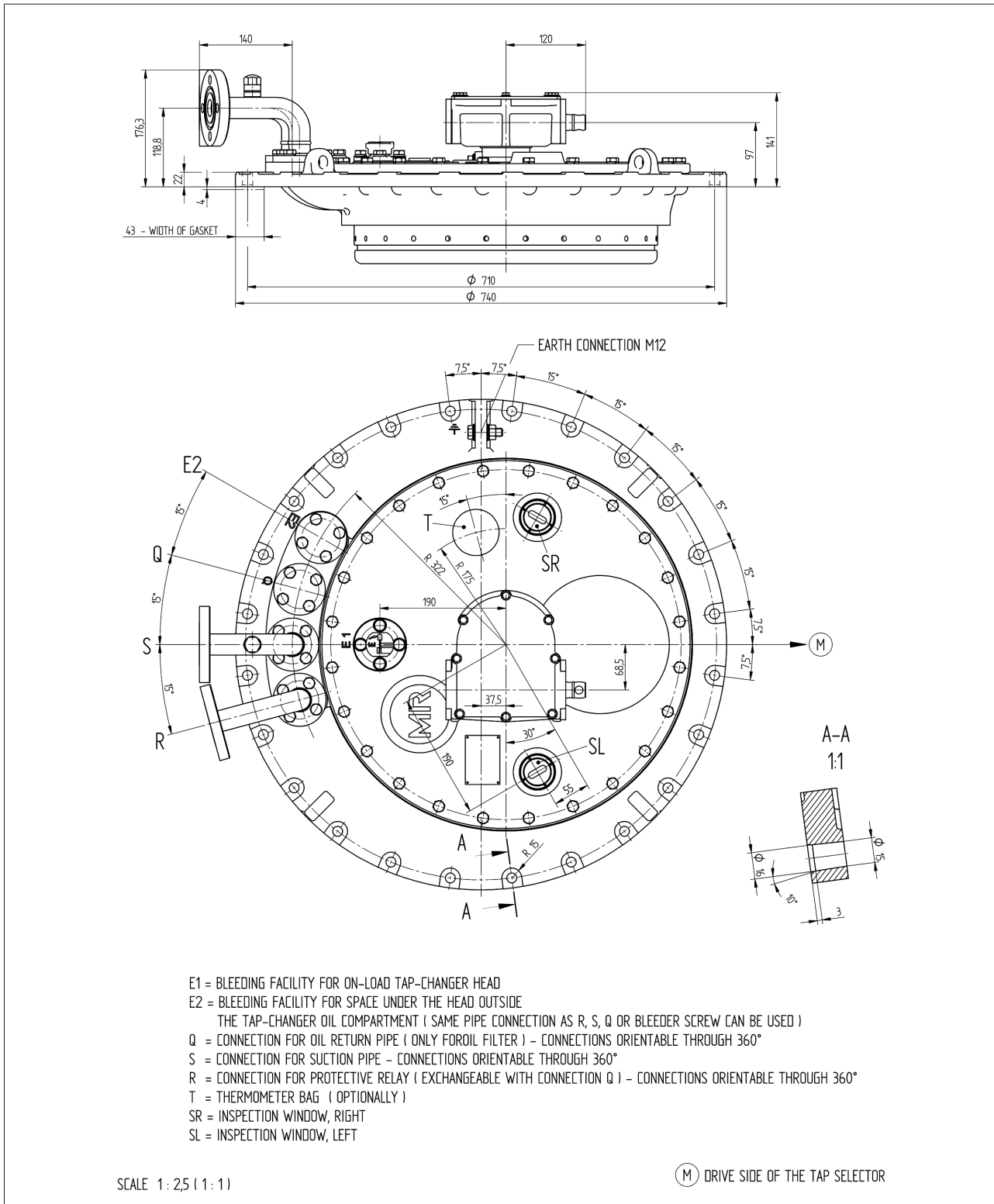


4.1.26 VACUTAP® VM 300 installation drawing of central drive (765192)

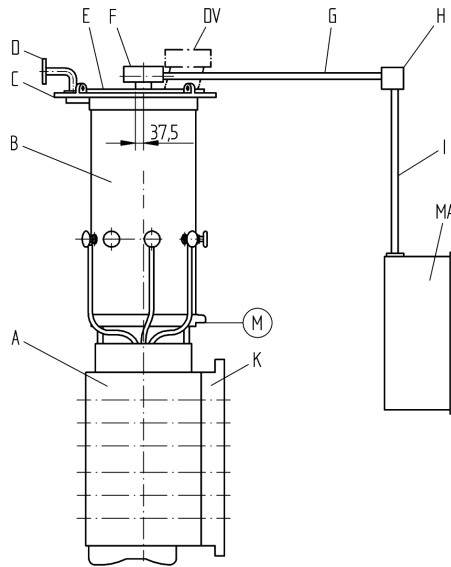




4.1.27 VACUTAP® VM® on-load tap-changer head, central drive (893899)

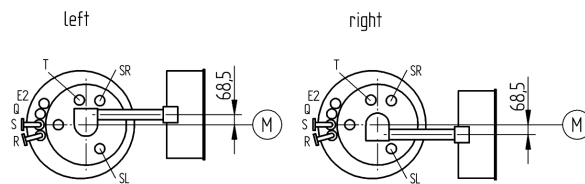


4.1.28 VACUTAP® VM® variants of on-load tap-changer head (720026)

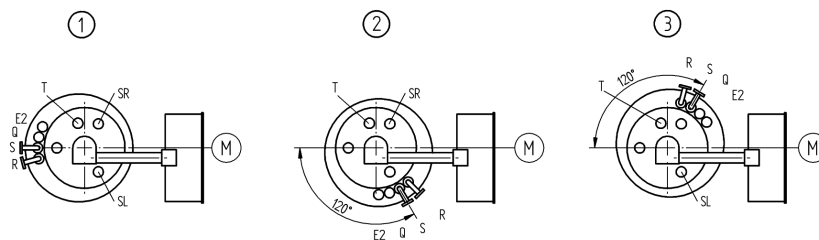


- A = tap selector
 - K = change-over selector
 - B = diverter switch oil compartment
 - C = on-load tap-changer head
 - D = pipe connections (R, S, Q, E2)
 - DV = pressure relief valve
 - E = on-load tap-changer head cover
 - F = upper gear unit
 - G = drive shaft, horizontal
 - H = bevel gear
 - I = drive shaft, vertical
 - MA = motor drive unit
 - (M) = drive side of tap selector
 - SR = inspection window on the right
 - SL = inspection window on the left
 - T = temperature sensor
- } the represented version
Typ M

Position of drive shaft of gear unit



Head variants



Swivelling ranges

A considerable number of variants of the on-load tap-changer head are available for adapting the horizontal part of the drive shaft to the transformer tank.

The mounting position of the tap selector A and diverter switch oil compartment B is determined by the drive side of tap selector (M).

The on-load tap-changer head C together with its pipe connections D may be turned through 120 degrees clockwise or anti-clockwise. This results in the variants 1, 2 and 3.

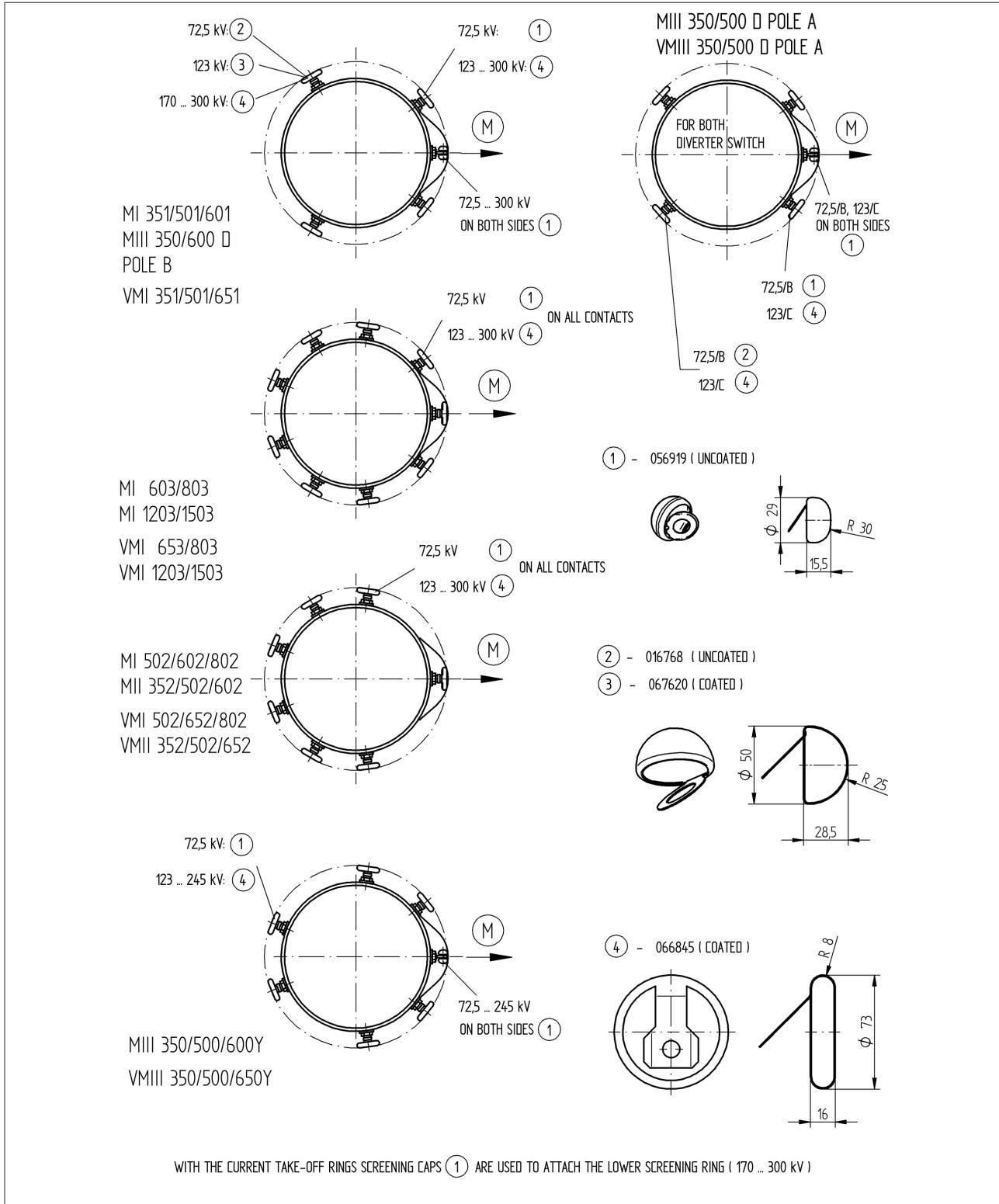
The upper gear unit F can be turned continuously on its own axis. Table 720027: lists the limitation of the swivelling range for the particular head variant. The angle specifications refer to the center of rotation of the gear unit. Pay particular attention to the offset of the drive shaft.

4.1.29 VACUTAP® VM® swivel range of gear unit (720027)

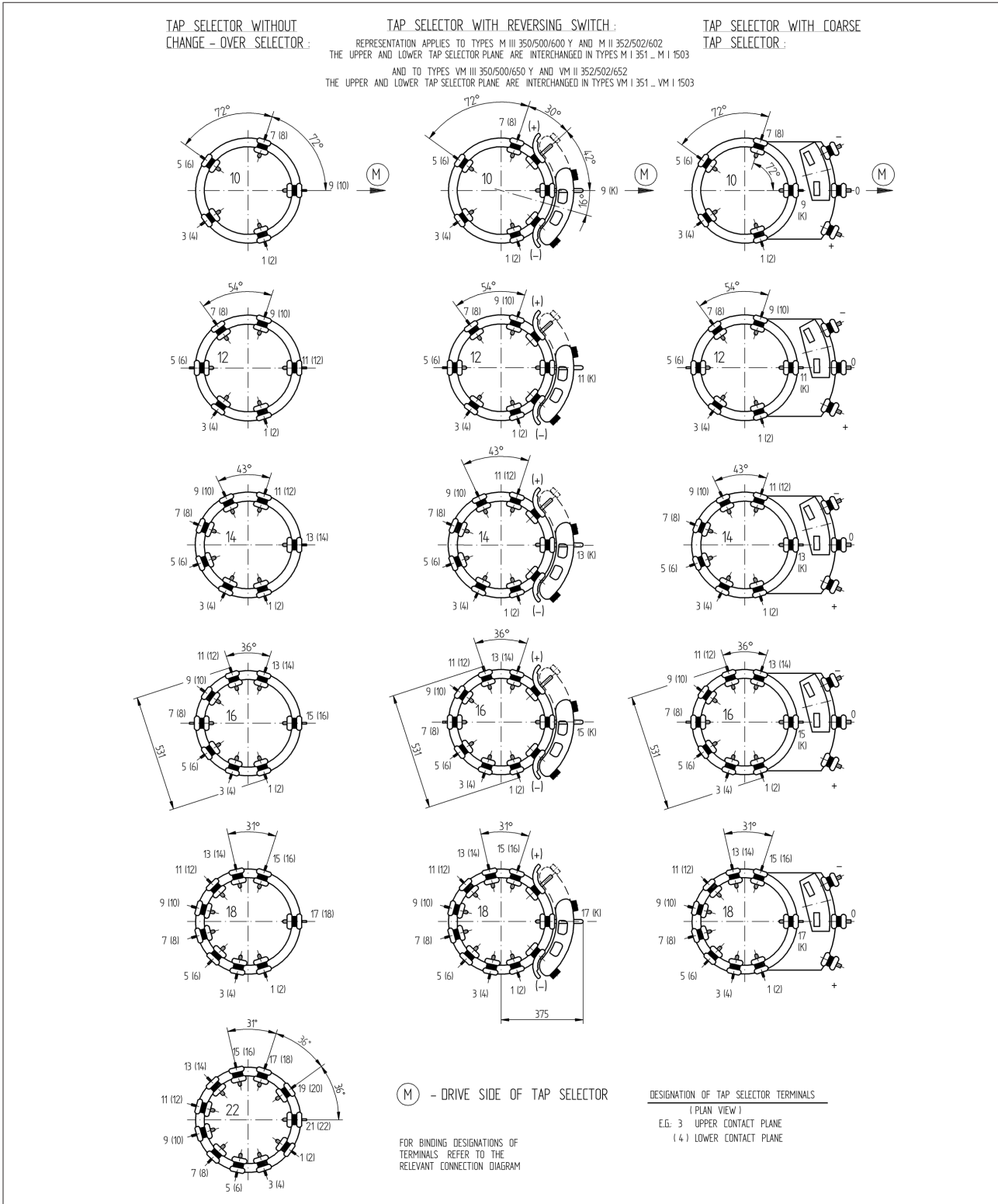
SKETCH	HEAD VERSION COMPONENTS USED	LIMITATION OF THE SWIVELLING RANGE
	DRIVE SHAFT RIGHT HEAD VERSION 1	-180° 0° 180°
	PIPE CONNECTION R	-168° -140°
	PIPE CONNECTION S	-155° 177°
	PIPE CONNECTION Q	-171° 162°
	PIPE CONNECTION E2	147° 174°
	PRESSURE RELIEF VALVE DV	-150° -35°
	TEMPERATURE SENSOR T	96° 175°
INSPECTION WINDOW SL / SR	-64° SL -8° 56° SR 112°	
	DRIVE SHAFT RIGHT HEAD VERSION 2	-180° 0° 180°
	PIPE CONNECTION R	-48° -21°
	PIPE CONNECTION S	-63° -36°
	PIPE CONNECTION Q	-78° -51°
	PIPE CONNECTION E2	-93° -66°
	PRESSURE RELIEF VALVE DV	-150° -35°
	TEMPERATURE SENSOR T	96° 175°
INSPECTION WINDOW SR	56° SR 112°	
	DRIVE SHAFT RIGHT HEAD VERSION 3	-180° 0° 180°
	PIPE CONNECTION R	72° 99°
	PIPE CONNECTION S	57° 84°
	PIPE CONNECTION Q	42° 69°
	PIPE CONNECTION E2	27° 54°
	PRESSURE RELIEF VALVE DV	-150° -35°
	TEMPERATURE SENSOR T	96° 175°
INSPECTION WINDOW SL	-64° SL -8°	
	DRIVE SHAFT LEFT HEAD VERSION 1	-180° 0° 180°
	PIPE CONNECTION R	-162° 171°
	PIPE CONNECTION S	-177° 156°
	PIPE CONNECTION Q	141° 168°
	PIPE CONNECTION E2	126° 153°
	PRESSURE RELIEF VALVE DV	35° 150°
	TEMPERATURE SENSOR T	34° 114°
INSPECTION WINDOW SL / SR	-112° SL -56° 8° SR 64°	
	DRIVE SHAFT LEFT HEAD VERSION 2	-180° 0° 180°
	PIPE CONNECTION R	-69° -42°
	PIPE CONNECTION S	-84° -57°
	PIPE CONNECTION Q	-99° -72°
	PIPE CONNECTION E2	-114° -87°
	PRESSURE RELIEF VALVE DV	35° 150°
	TEMPERATURE SENSOR T	34° 114°
INSPECTION WINDOW SR	8° SR 64°	
	DRIVE SHAFT LEFT HEAD VERSION 3	-180° 0° 180°
	PIPE CONNECTION R	50° 78°
	PIPE CONNECTION S	35° 62°
	PIPE CONNECTION Q	21° 48°
	PIPE CONNECTION E2	6° 33°
	PRESSURE RELIEF VALVE DV	35° 150°
	TEMPERATURE SENSOR T	34° 114°
INSPECTION WINDOW SL	-112° SL -56°	

	LIMITATION OF THE SWIVELLING RANGE TROUGH PIPE CONNECTIONS R AND S
	LIMITATION OF THE SWIVELLING RANGE TROUGH OPTIONAL EXISTING PIPE CONNECTIONS Q, E2 AND PRESSURE RELIEF VALVE DV
	SWIRELLING RANGE POSSIBLE, BUT THE TEMPERATURE SENSOR T AND THE INSPECTION WINDOW SL / SR ARE NOT VISIBLE

4.1.30 VACUTAP® VM® screenings on oil compartment contacts (730336)

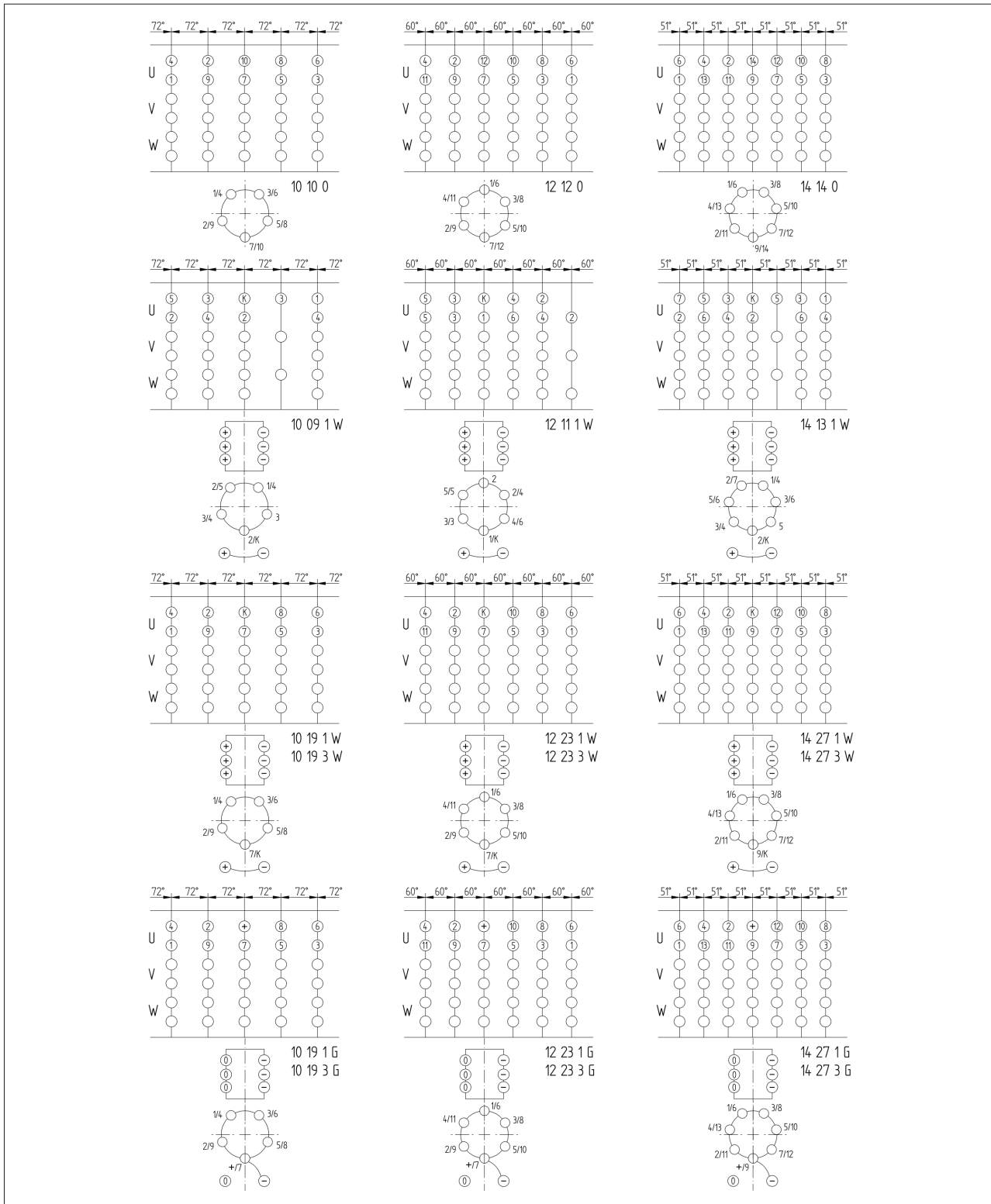


4.1.32 VACUTAP® VM® arrangement of contacts on tap selector, tap selector division 10...22 (898013)

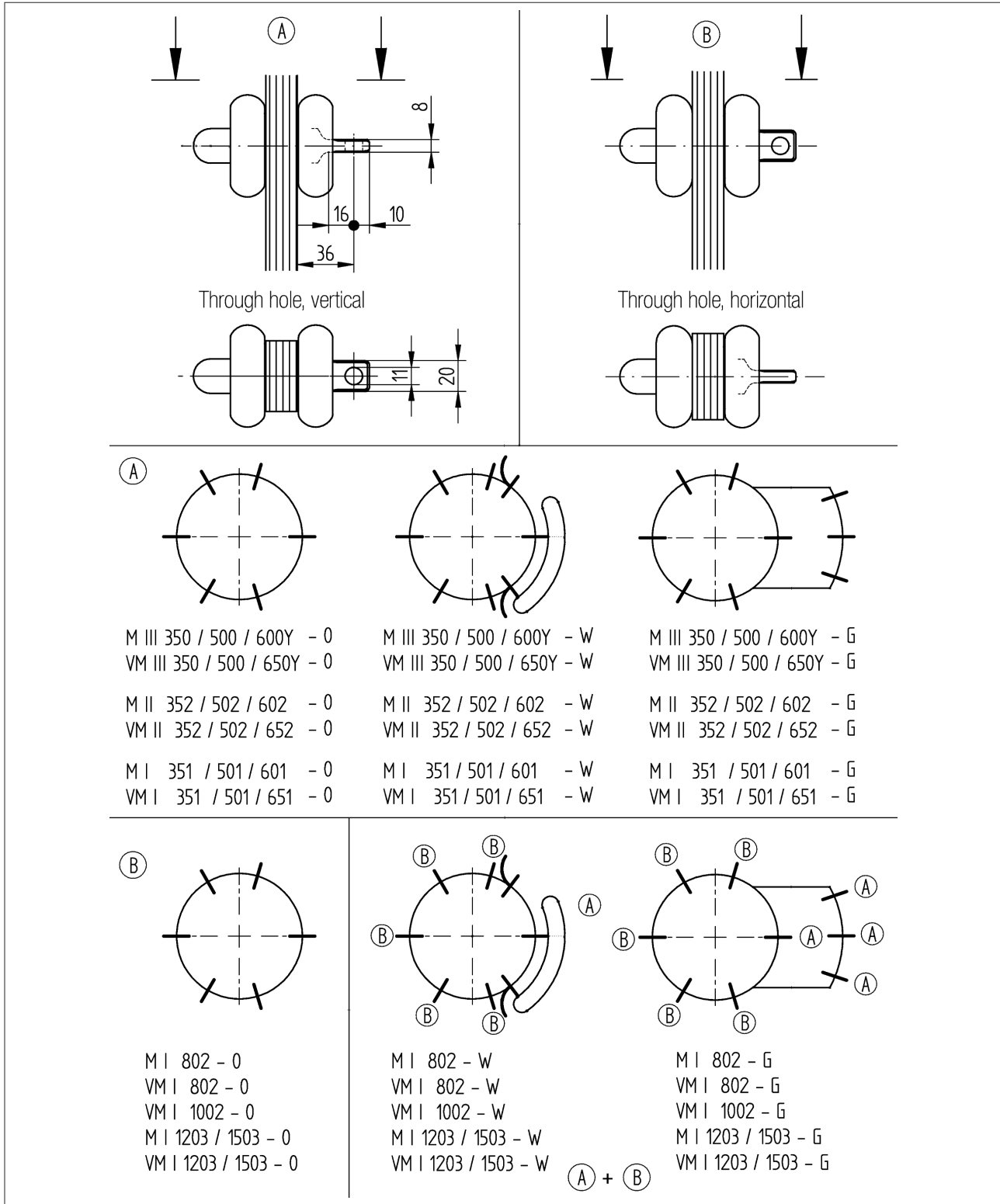




4.1.33 VACUTAP® VM 300 arrangement of contacts on tap selector (blanks, 891114)



4.1.34 VACUTAP® VM® installation position of tap selector connection contacts (890477)



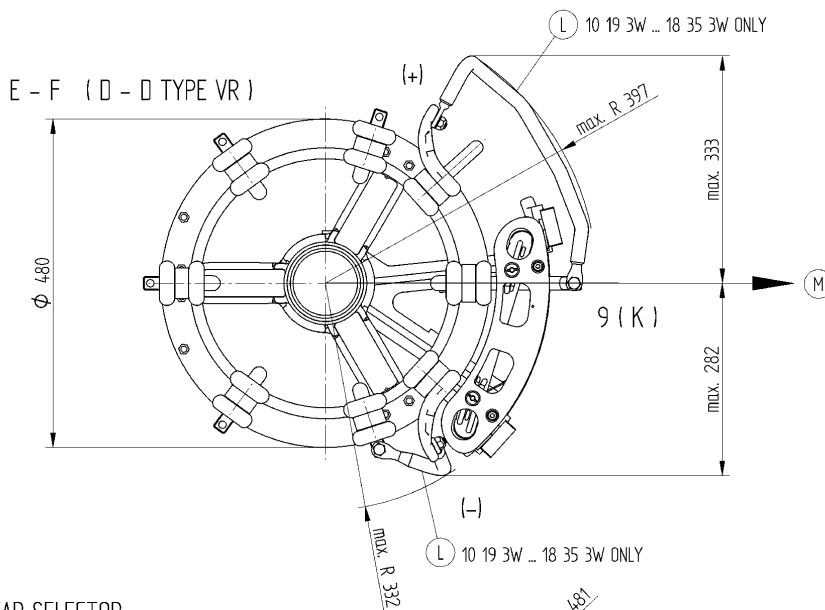


4.1.35 VACUTAP® VM® connecting leads 3W, 1G, 3G (723590)

REVERSING SWITCH:

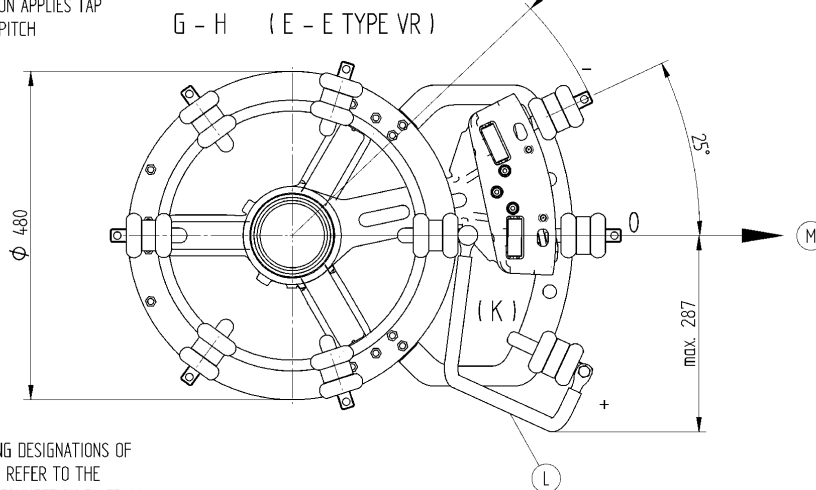
REPRESENTATION APPLIES TO TYPES M III 350/500/600Y AND M II 352/502/602, 12-PITCH
 THE UPPER AND LOWER TAP SELECTOR PLANE ARE INTERCHANGED IN TYPES M I 351 ... M I 1503

AND REPRESENTATION APPLIES TO TYPES VM III 350/500/650Y AND VM II 352/502/652, 12-PITCH
 THE UPPER AND LOWER TAP SELECTOR PLANE ARE INTERCHANGED IN TYPES VM I 351 ... VM I 1503



COARSE TAP SELECTOR

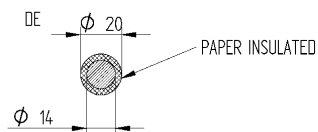
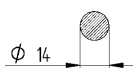
REPRESENTATION APPLIES TAP SELECTOR, 12-PITCH



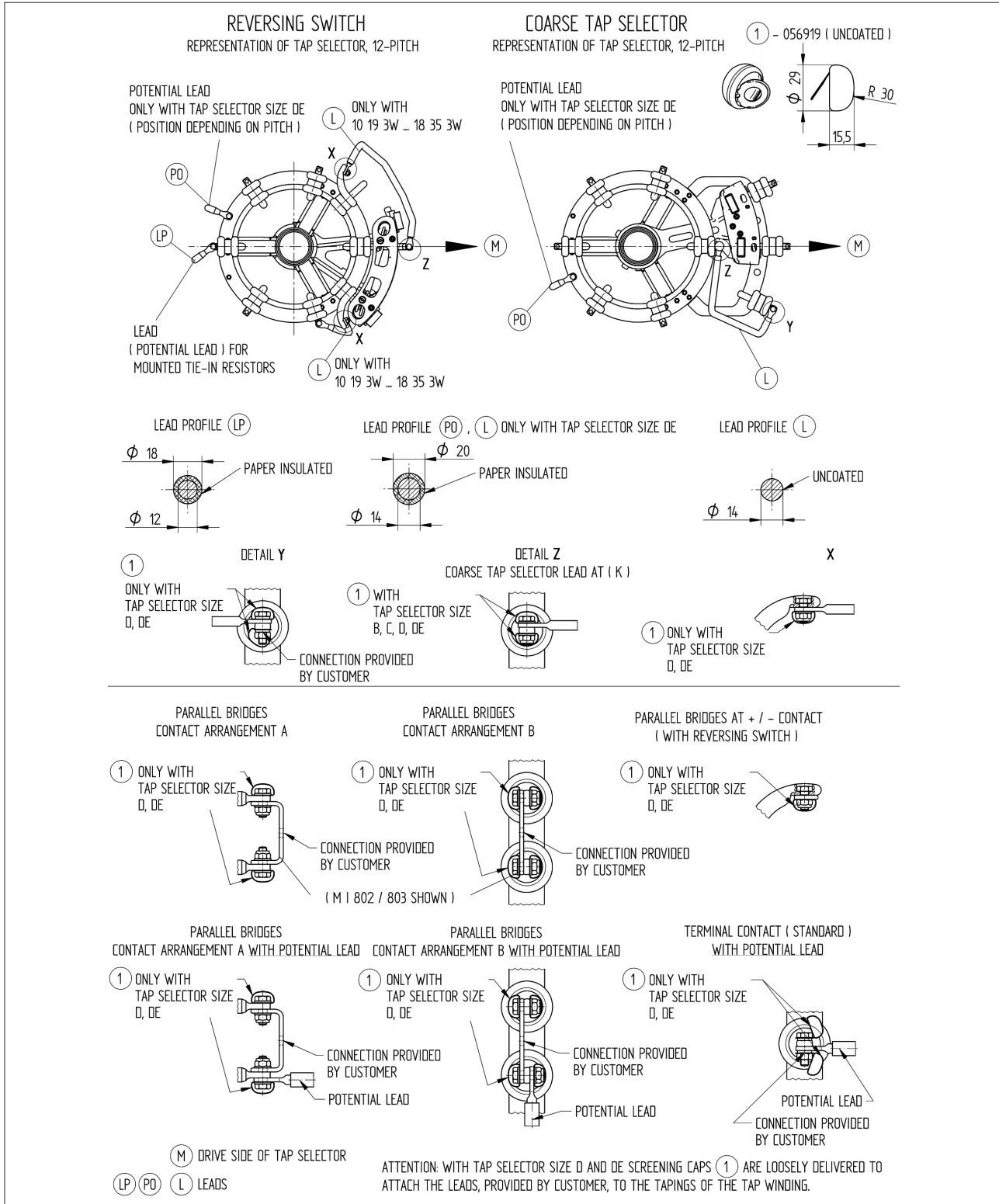
FOR BINDING DESIGNATIONS OF TERMINALS REFER TO THE RELEVANT CONNECTION DIAGRAM

- (M) DRIVE SIDE OF TAP SELECTOR
- (L) CONNECTING LEAD

TAP SELECTOR SIZE
 B, C, D



4.1.36 VACUTAP® VM® screenings on fine tap selector and change-over selector (730335)





4.1.37 VACUTAP® VM 802/1002/1203/1503 bridges for parallel connection of tap selector connection contacts (899598)

CONTACT ARRANGEMENT B

M I 802 / 803
VM I 802 / 1002

PART NO. 064719

CONTACT ARRANGEMENT A

M I 802 / 803 / 1203 / 1503
VM I 802 / 1002 / 1203 / 1503

PART NO. 064717 AND 711167

CONTACT ARRANGEMENT (see 890477:)	PART NO.	DIMENSION b	DIMENSION c	DIMENSION d
A WITHOUT CONNECTING LEAD	064717	97	48,5	48,5
A WITH CONNECTING LEAD	711167	91	48,5	42,5

**INSTALLATION OF PARALLEL BRIDGES FOR CONTACT ARRANGEMENT A
WITH AND WITHOUT CONNECTING LEAD FOR 3W CONNECTION**

M I 802 / 803
VM I 802 / 1002

WITHOUT LEAD

WITH LEAD

M I 1203 / 1503
VM I 1203 / 1503

WITHOUT LEAD

WITH LEAD

⊗ ONLY FOR TAP SELECTOR SIZE D AND DE

ATTENTION: PARALLEL BRIDGES ARE NOT INCLUDED IN THE STANDARD DELIVERY

SCALE 1:1

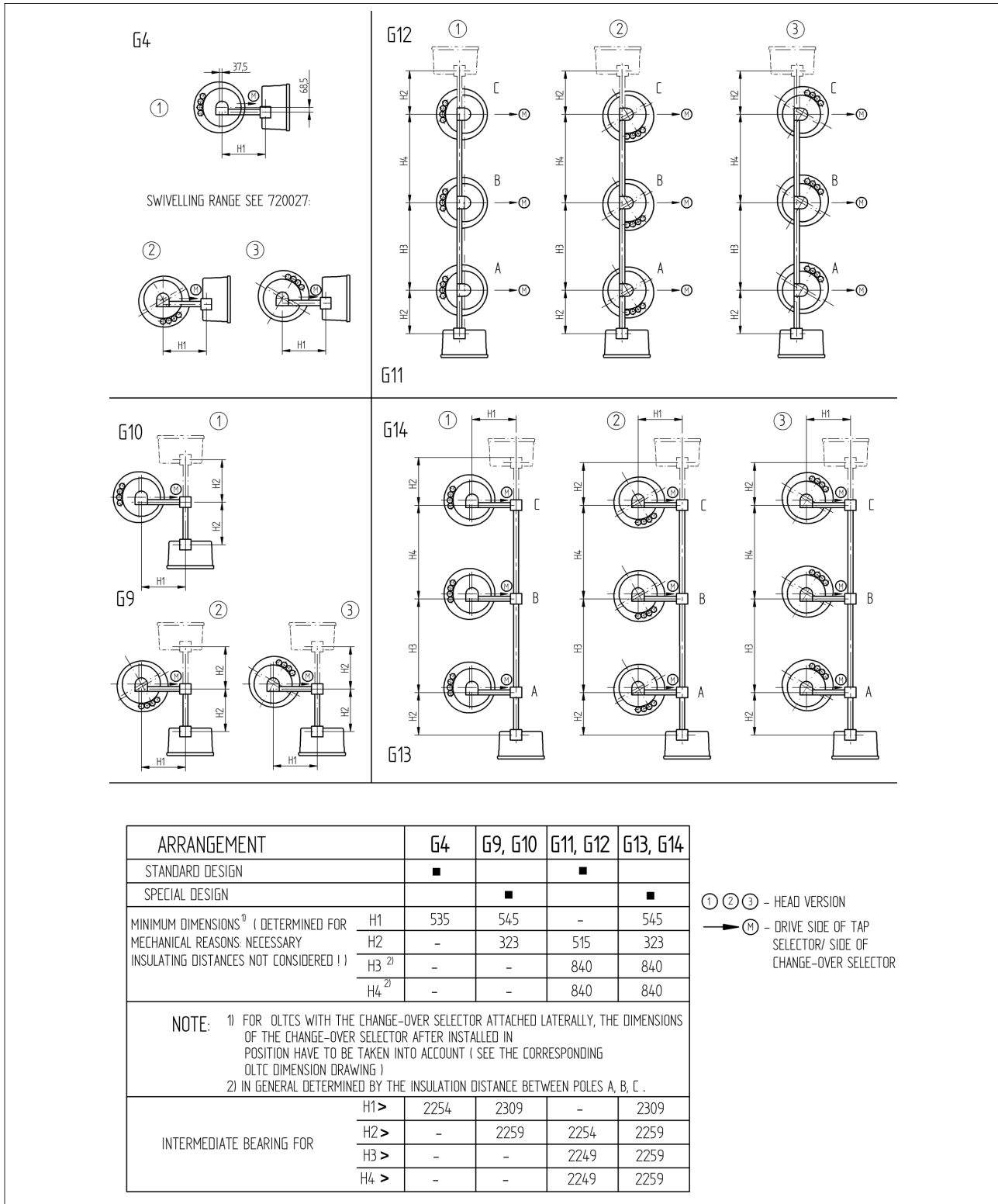
Maschinenfabrik Reinhausen 2013

2332907/03 EN

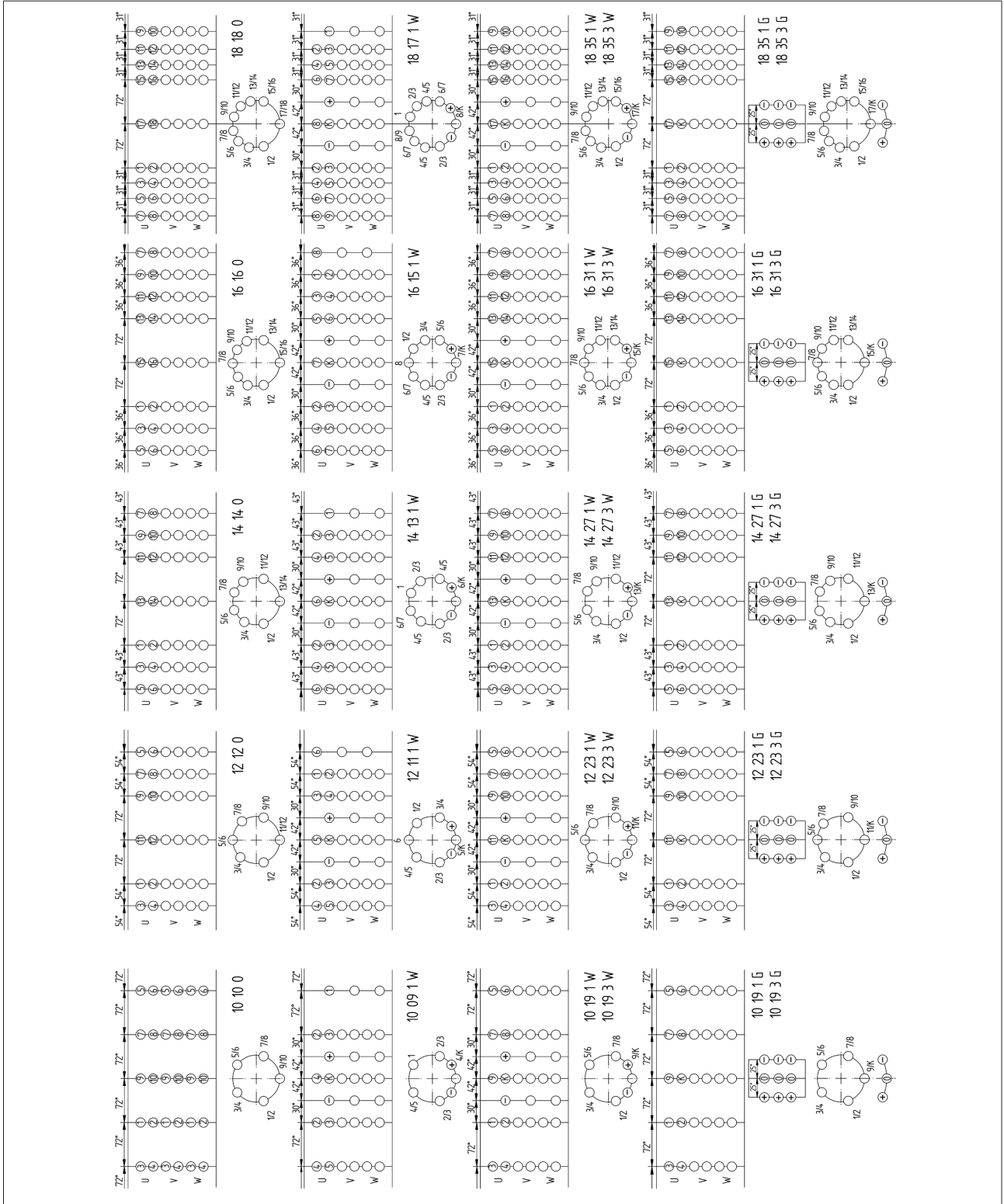
VACUTAP® VM®

57

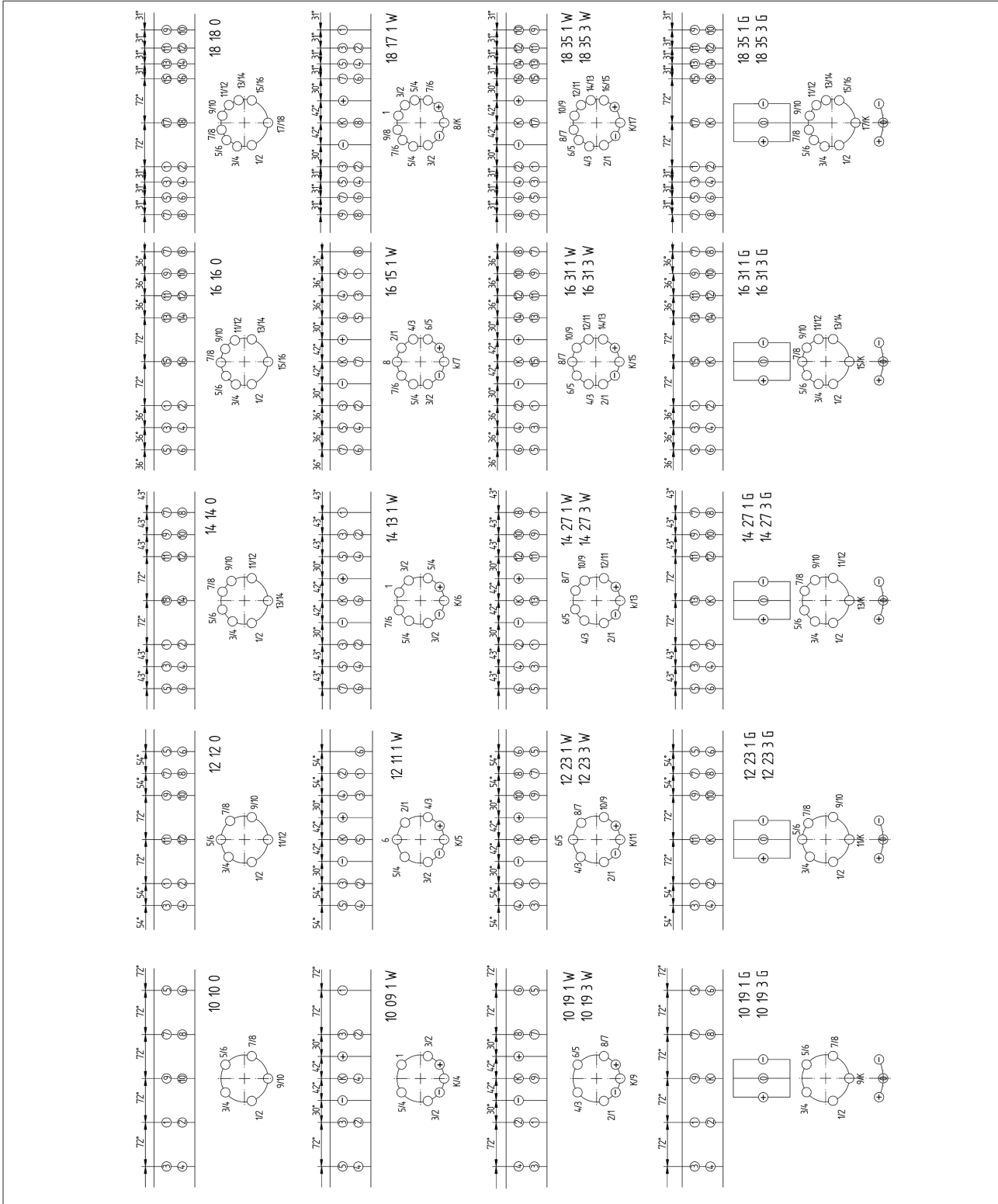
4.1.38 VACUTAP® VM® horizontal drive shaft, central drive (893896)



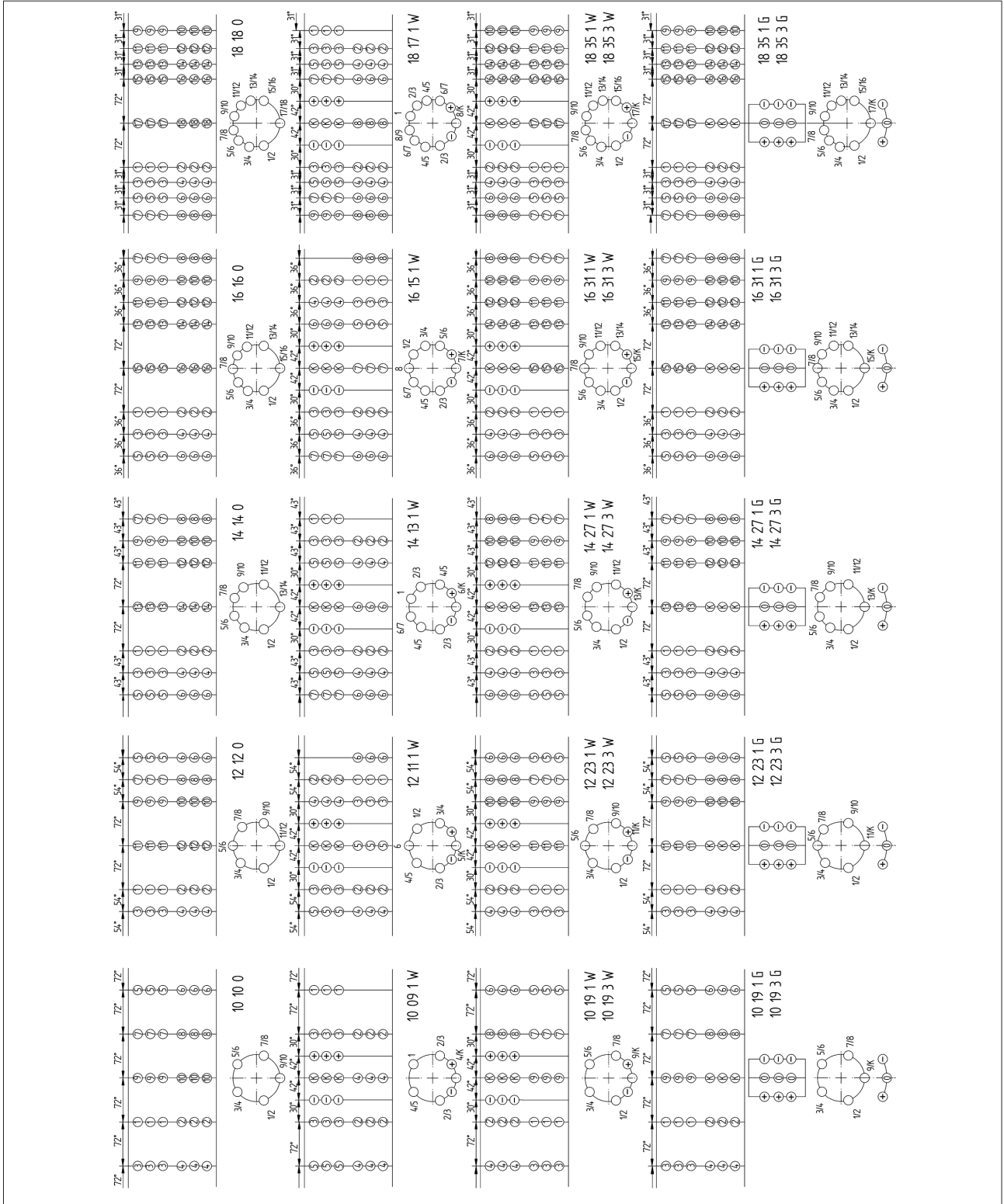
4.1.39 VACUTAP® VM III 350/500/650 Y contact arrangement of tap selector (891107)



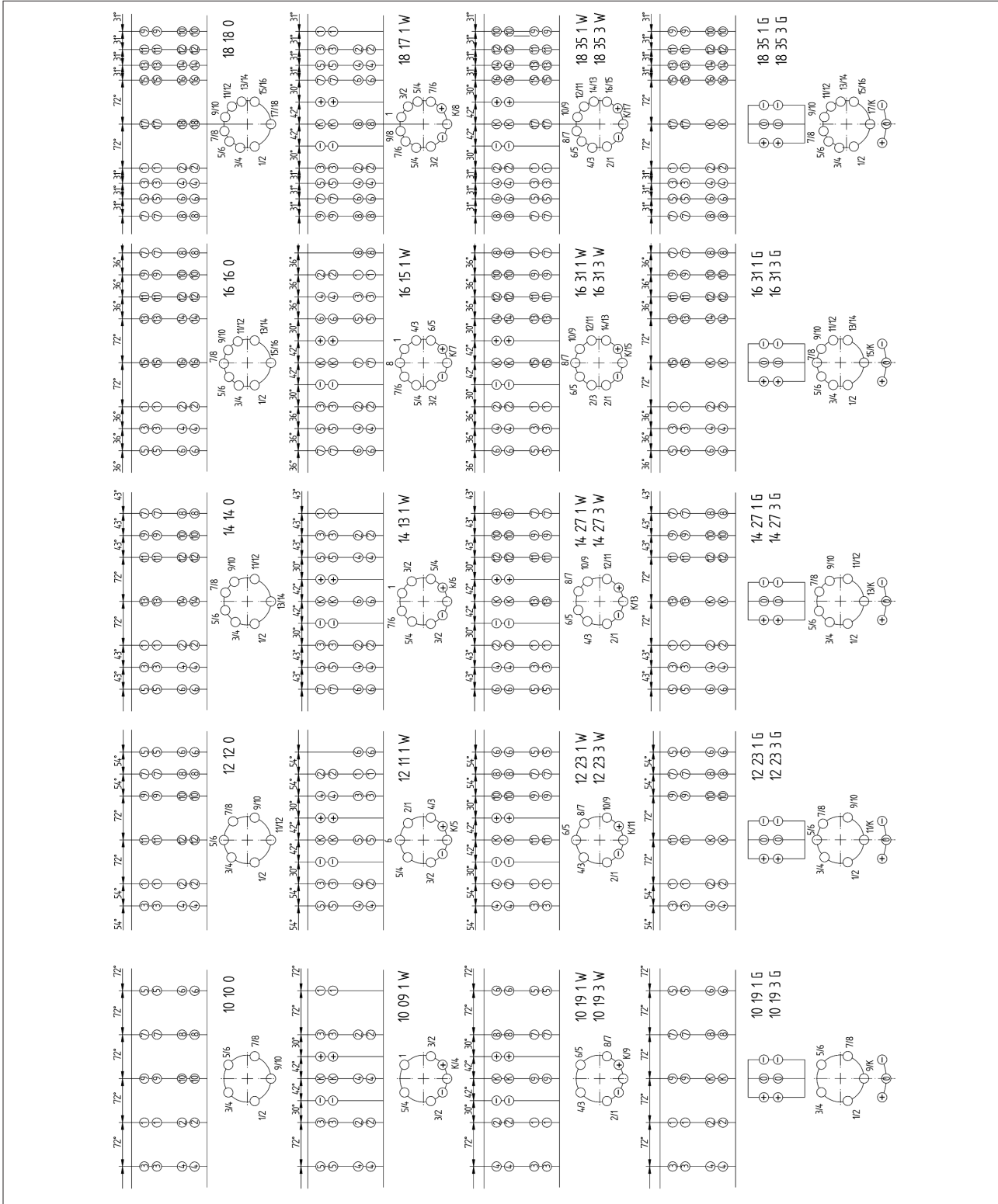
4.1.40 VACUTAP® VM I 351/501/651 contact arrangement of tap selector (891108)



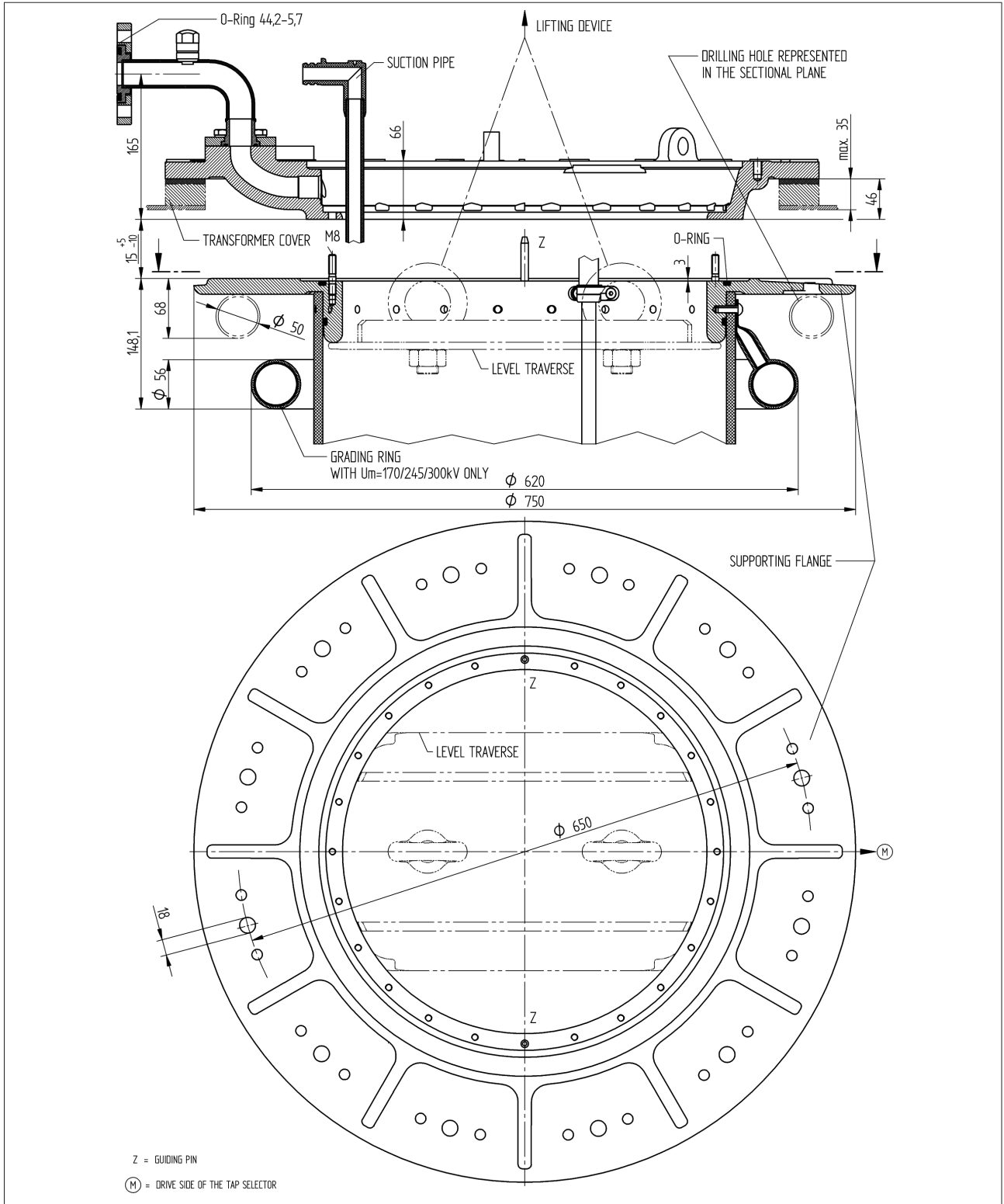
4.1.41 VACUTAP® VM I 1503 connection arrangement of tap selector (891109)



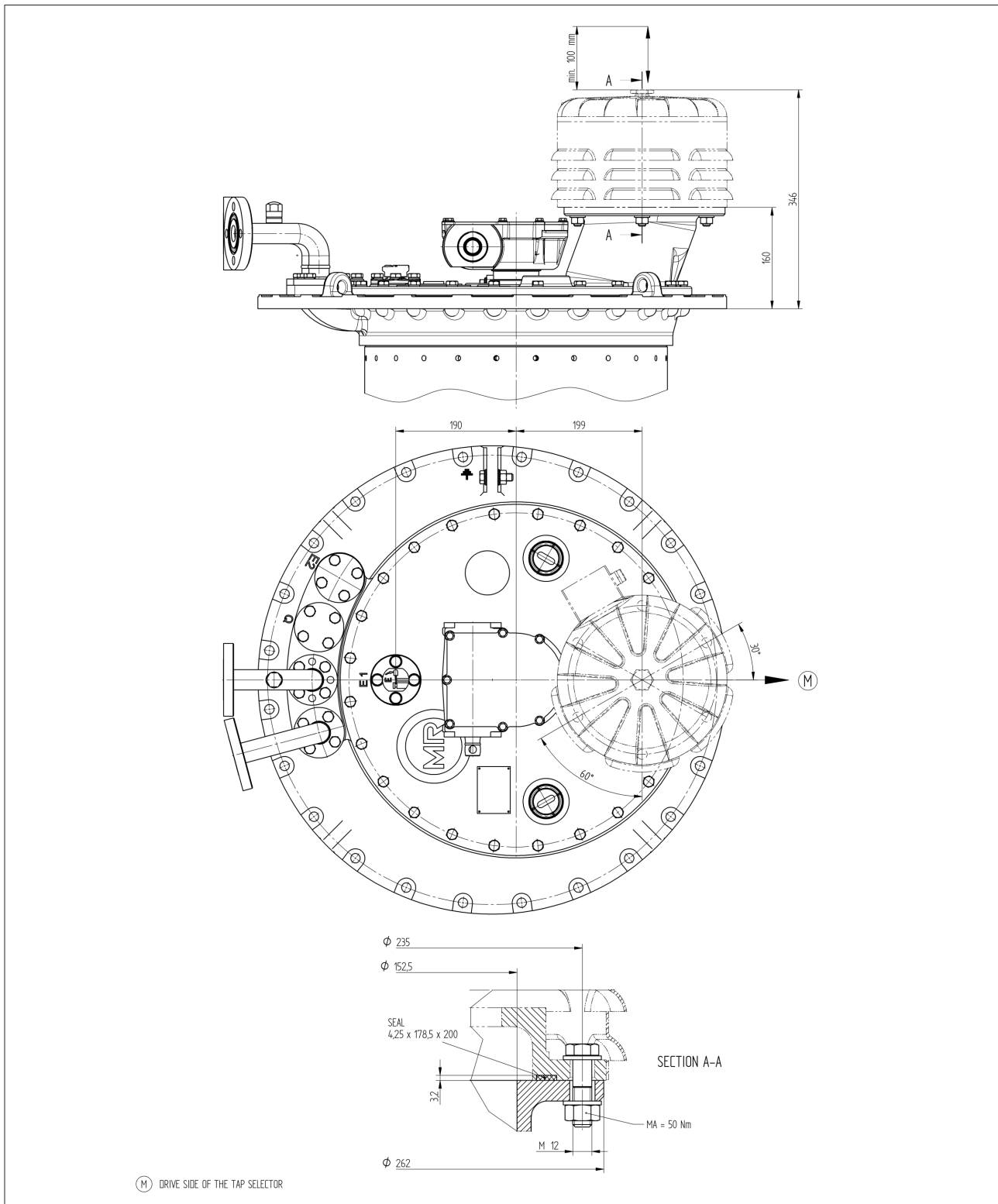
4.1.42 VACUTAP® VM I 802/1002 connection arrangement of tap selector (891110)



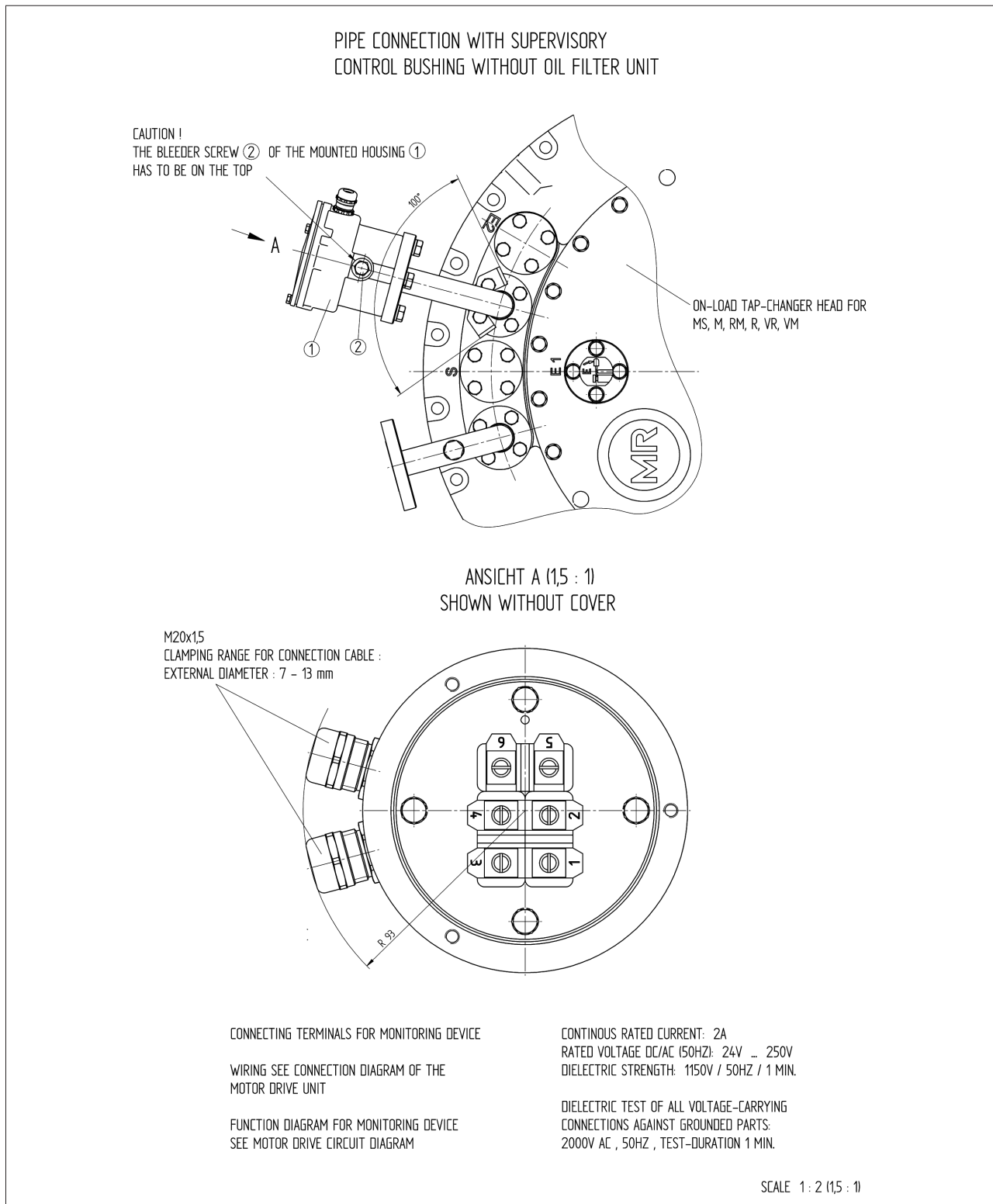
4.1.43 VACUTAP® VM® supporting flange, special design for bell-type tank installation for Vm up to 300 kV (896762)



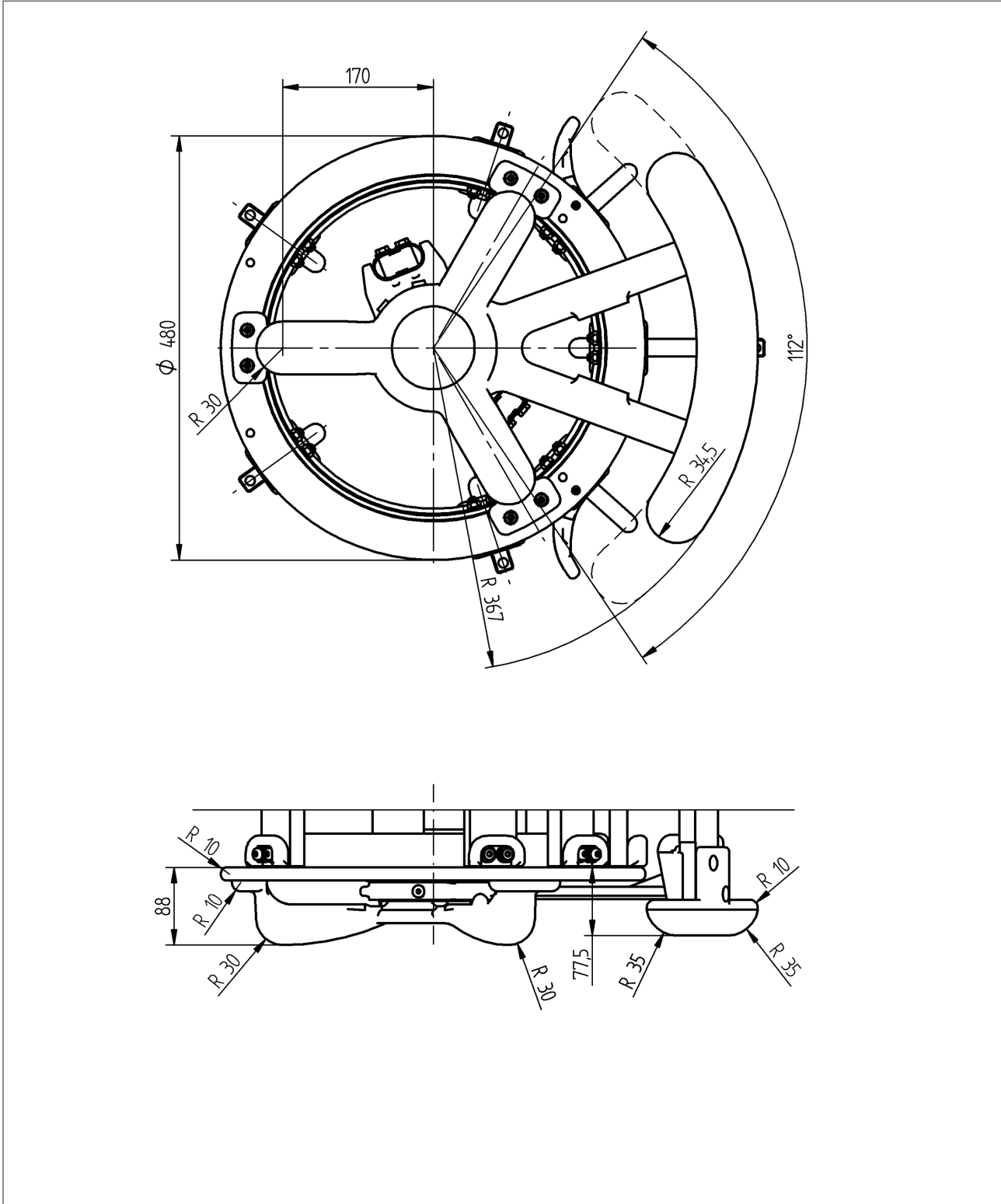
4.1.44 VACUTAP® VM® flange for pressure relief device (895168)



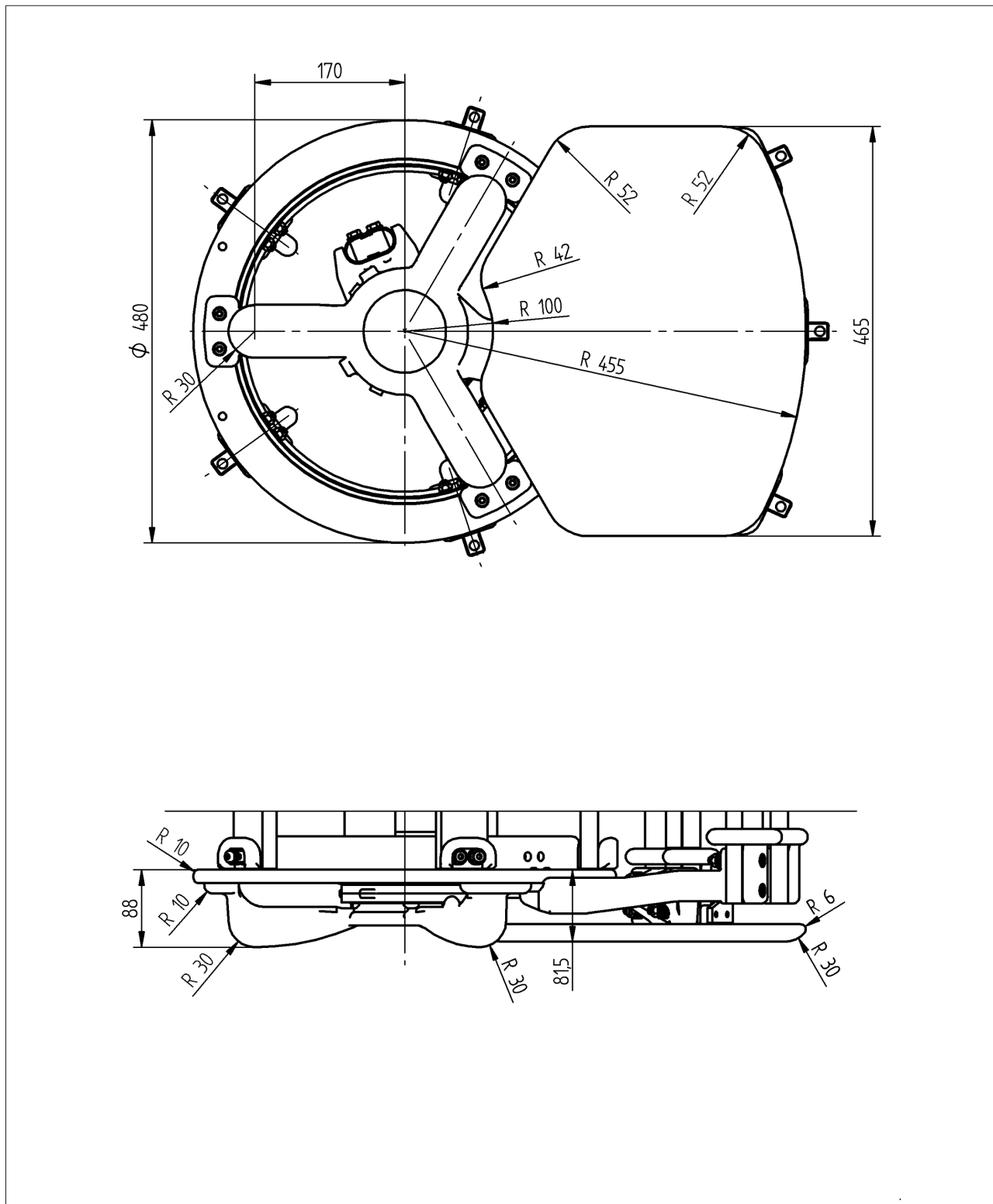
4.1.45 VACUTAP® VM® pipe connection Q with tap-change supervisory control (766161)



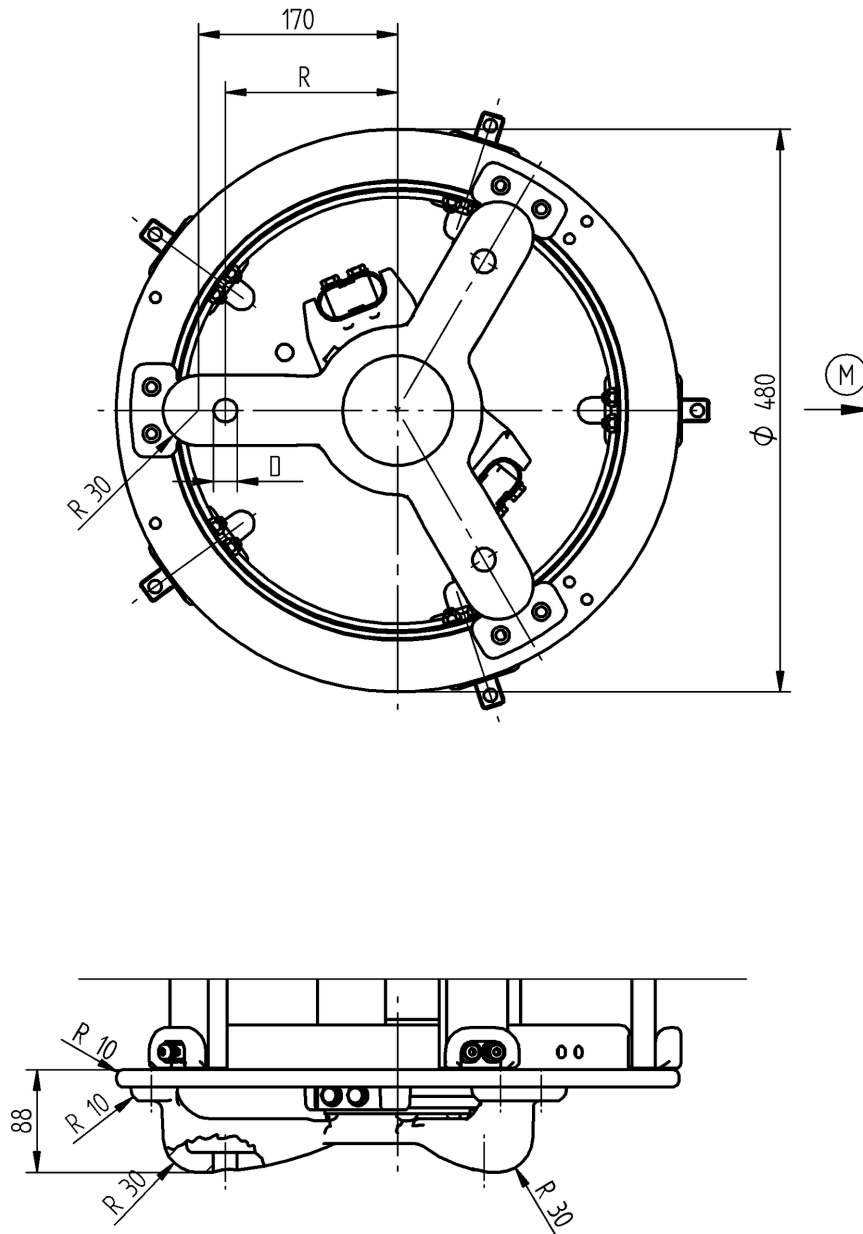
4.1.46 VACUTAP® VM® tap selector base with additional screening, reversing change-over selector design (893934)



4.1.47 VACUTAP® VM® tap selector base with additional screening, coarse tap design (893935)



4.1.48 VACUTAP® VM® tap selector base with through hole D20 and D13 (725649)



R	D	BOTTOM OF TAP SELECTOR
147	20	097251
160	13	097252

(M) DRIVE SIDE OF TAP SELECTOR



4.2 VACUTAP® VM® overview of on-load tap-changer models (899740)

Installation length h in mm

		Tap selector size					
		B		C		D/DE	D
U _n	0/W/G	MG	0/W/G	MG	0/W/G	MG	
72,5	1894	1856	2069	2031	2524	2486	
123	2024	1986	2199	2161	2654	2616	
170	2154	2116	2329	2291	2784	2746	
245	2254	2216	2429	2391	2884	2846	

		Tap selector size					
		B		C		D/DE	D
U _n	0/W/G	MG	0/W/G	MG	0/W/G	MG	
72,5	1514	1476	1589	1551	1784	1746	
123	1644	1606	1719	1681	1914	1876	
170	1774	1736	1849	1811	2044	2006	
245	1874	1836	1949	1911	2144	2106	
300	2026	1988	2101	2063	2296	2258	

		Tap selector size			
		B	C	D/DE	
U _n	0/W/G	0/W/G	0/W/G		
72,5	1704	1829	2154		
123	1834	1959	2284		
170	1964	2089	2414		
245	2064	2189	2514		
300	2216	2341	2666		

		Tap selector size					
		B		C		D/DE	D
U _n	0/W/G	MG	0/W/G	MG	0/W/G	MG	
72,5	1724	1686	1799	1761	1994	1956	
123	1854	1816	1929	1891	2124	2086	
170	1984	1956	2059	2021	2254	2216	
245	2084	2046	2159	2121	2354	2316	
300	2236	2198	2311	2273	2506	2468	

		Tap selector size					
		B		C		D/DE	D
U _n	0/W/G	MG	0/W/G	MG	0/W/G	MG	
72,5	1934	1896	2009	1971	2204	2166	
123	2064	2026	2139	2101	2334	2296	
170	2194	2156	2269	2231	2464	2426	
245	2294	2256	2369	2331	2564	2526	
300	2446	2408	2521	2483	2716	2678	

Without change-over selector With reversing change-over selector With coarse change-over selector with multiple coarse change-over selector (MG) only size B, C and O

M III 350 Y *)
 M III 500 Y *)
 M III 600 Y
 *) not as MG
 VM III 350 Y *)
 VM III 500 Y *)
 VM III 650 Y
 *) not as MG

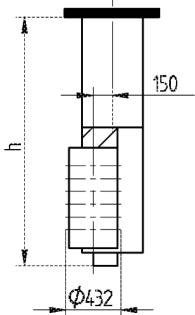
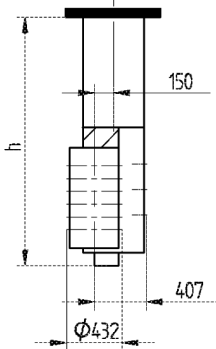
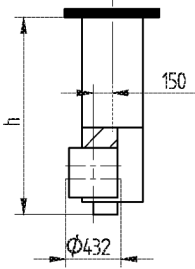
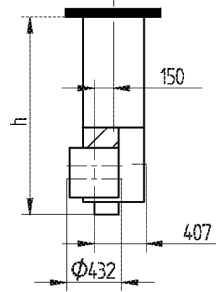
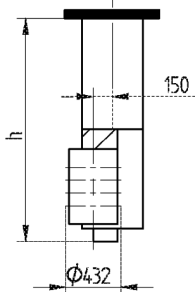
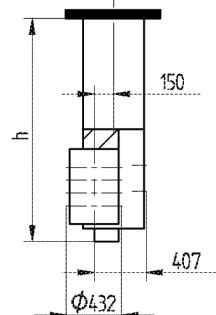
M I 351 *)
 M I 501 *)
 M I 601
 *) not as MG
 VM I 351 *)
 VM I 501 *)
 VM I 651
 *) not as MG

M II 352
 M II 502
 M II 602
 VM II 352
 VM II 502
 VM II 652

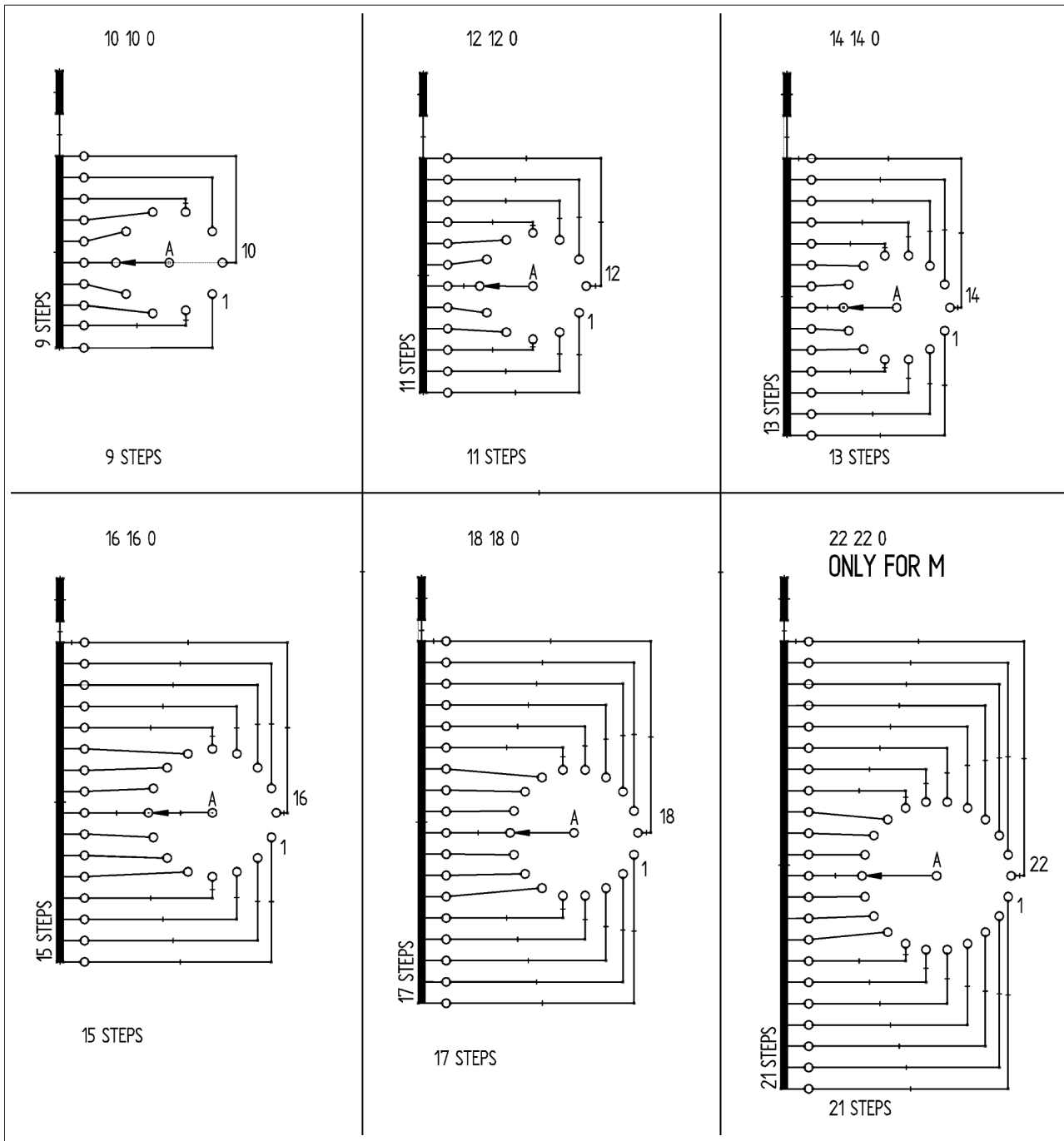
M I 802
 VM I 802
 VM I 1002

M I 1203
 M I 1503
 VM I 1203
 VM I 1503

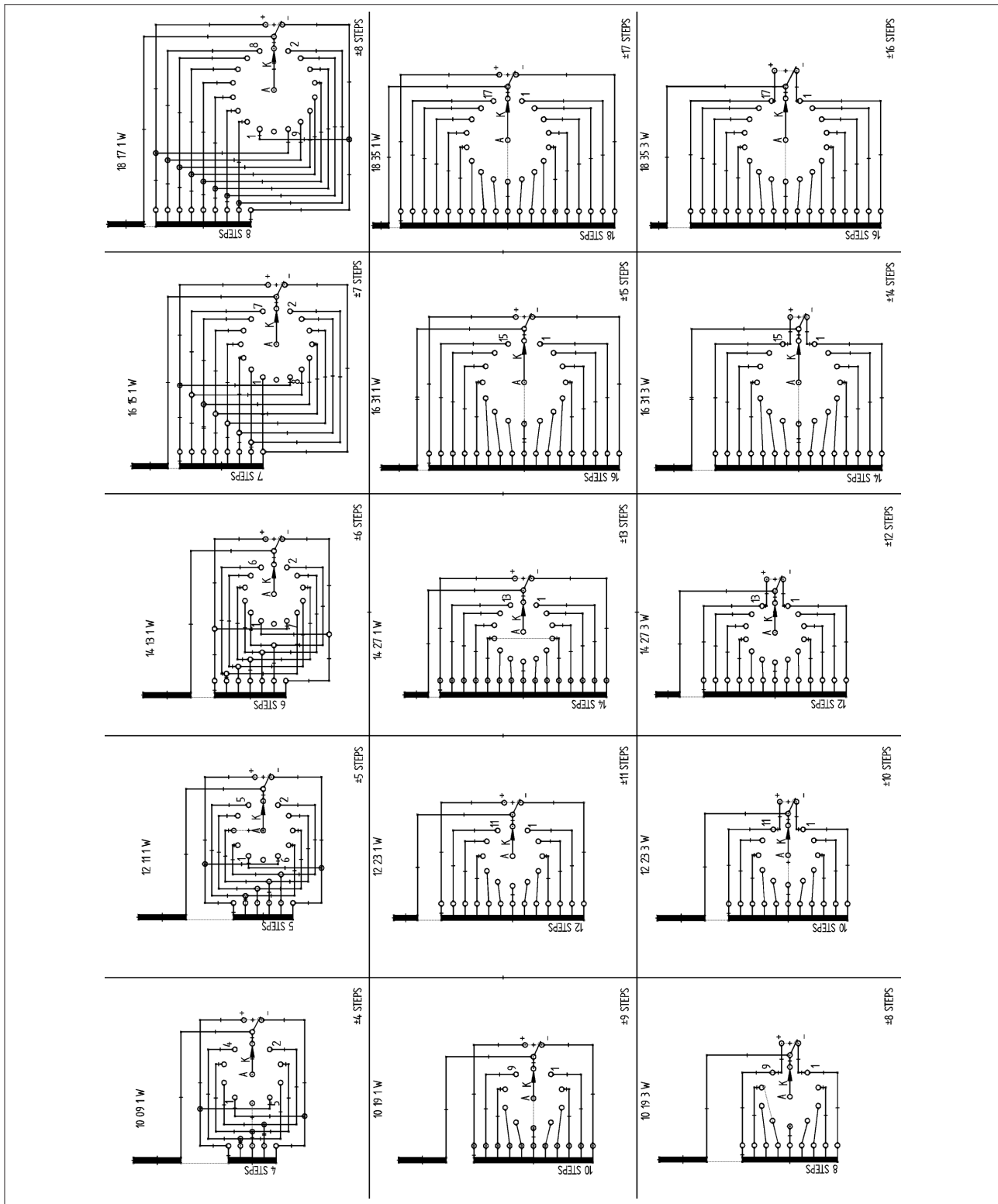
4.3 VACUTAP® VM 300 overview of on-load tap-changer models (765835)

without change-over selector	with change-over selector	Installation length h in mm										
		VM III 300 Y										
		<table border="1"> <thead> <tr> <th>U_m</th> <th>Tap selector size B</th> </tr> </thead> <tbody> <tr> <td>72,5</td> <td>1942</td> </tr> <tr> <td>123</td> <td>2072</td> </tr> <tr> <td>170</td> <td>2202</td> </tr> <tr> <td>245</td> <td>2302</td> </tr> </tbody> </table>	U _m	Tap selector size B	72,5	1942	123	2072	170	2202	245	2302
U _m	Tap selector size B											
72,5	1942											
123	2072											
170	2202											
245	2302											
		<table border="1"> <thead> <tr> <th>U_m</th> <th>Tap selector size B</th> </tr> </thead> <tbody> <tr> <td>72,5</td> <td>1542</td> </tr> <tr> <td>123</td> <td>1672</td> </tr> <tr> <td>170</td> <td>1802</td> </tr> <tr> <td>245</td> <td>1902</td> </tr> </tbody> </table>	U _m	Tap selector size B	72,5	1542	123	1672	170	1802	245	1902
U _m	Tap selector size B											
72,5	1542											
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245	1902											
		<table border="1"> <thead> <tr> <th>U_m</th> <th>Tap selector size B</th> </tr> </thead> <tbody> <tr> <td>72,5</td> <td>1742</td> </tr> <tr> <td>123</td> <td>1872</td> </tr> <tr> <td>170</td> <td>2002</td> </tr> <tr> <td>245</td> <td>2102</td> </tr> </tbody> </table>	U _m	Tap selector size B	72,5	1742	123	1872	170	2002	245	2102
U _m	Tap selector size B											
72,5	1742											
123	1872											
170	2002											
245	2102											

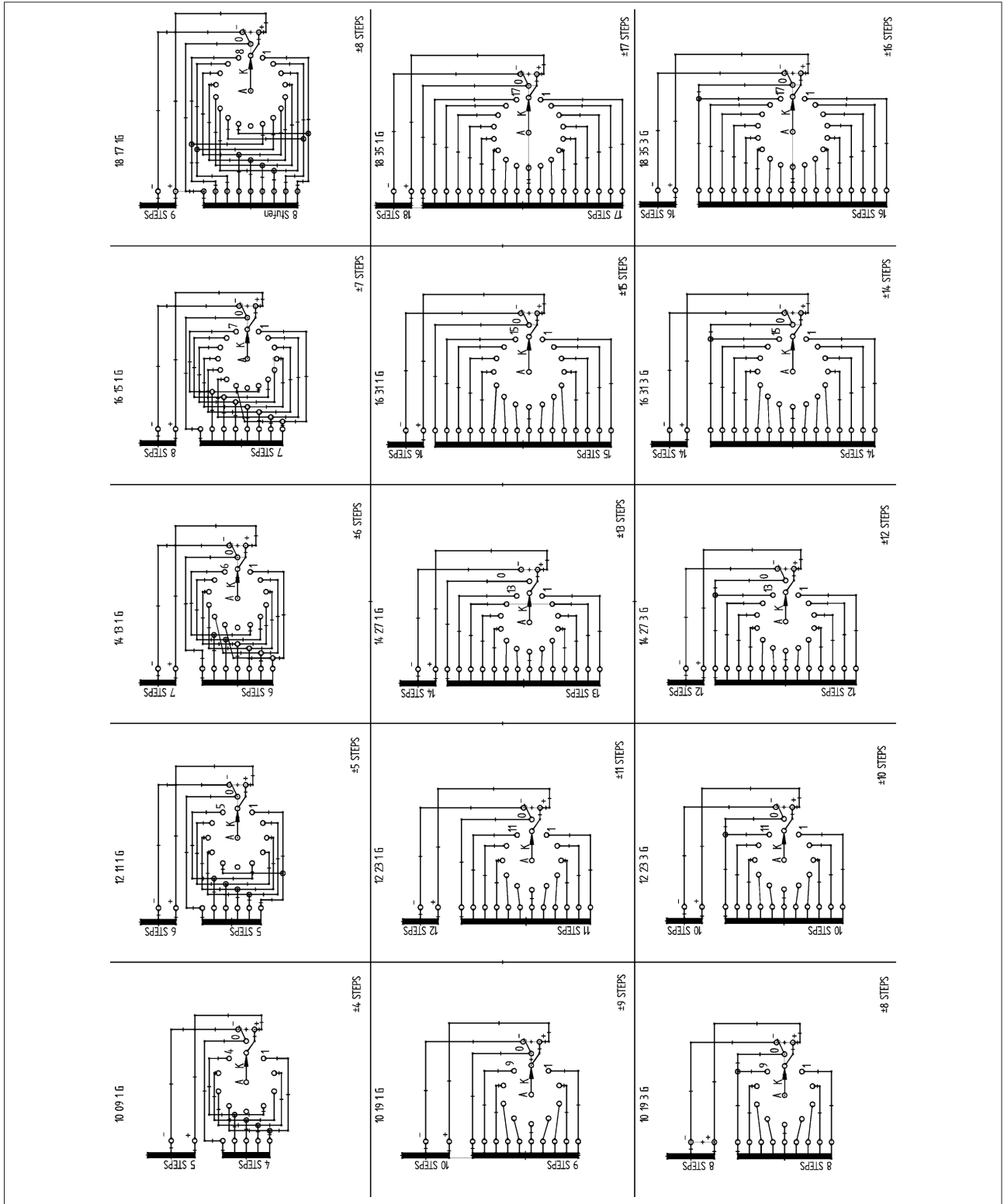
4.4 VACUTAP® VM® overview of basic connection diagrams with designation of tap selector connection contacts in accordance with MR standard (890616)



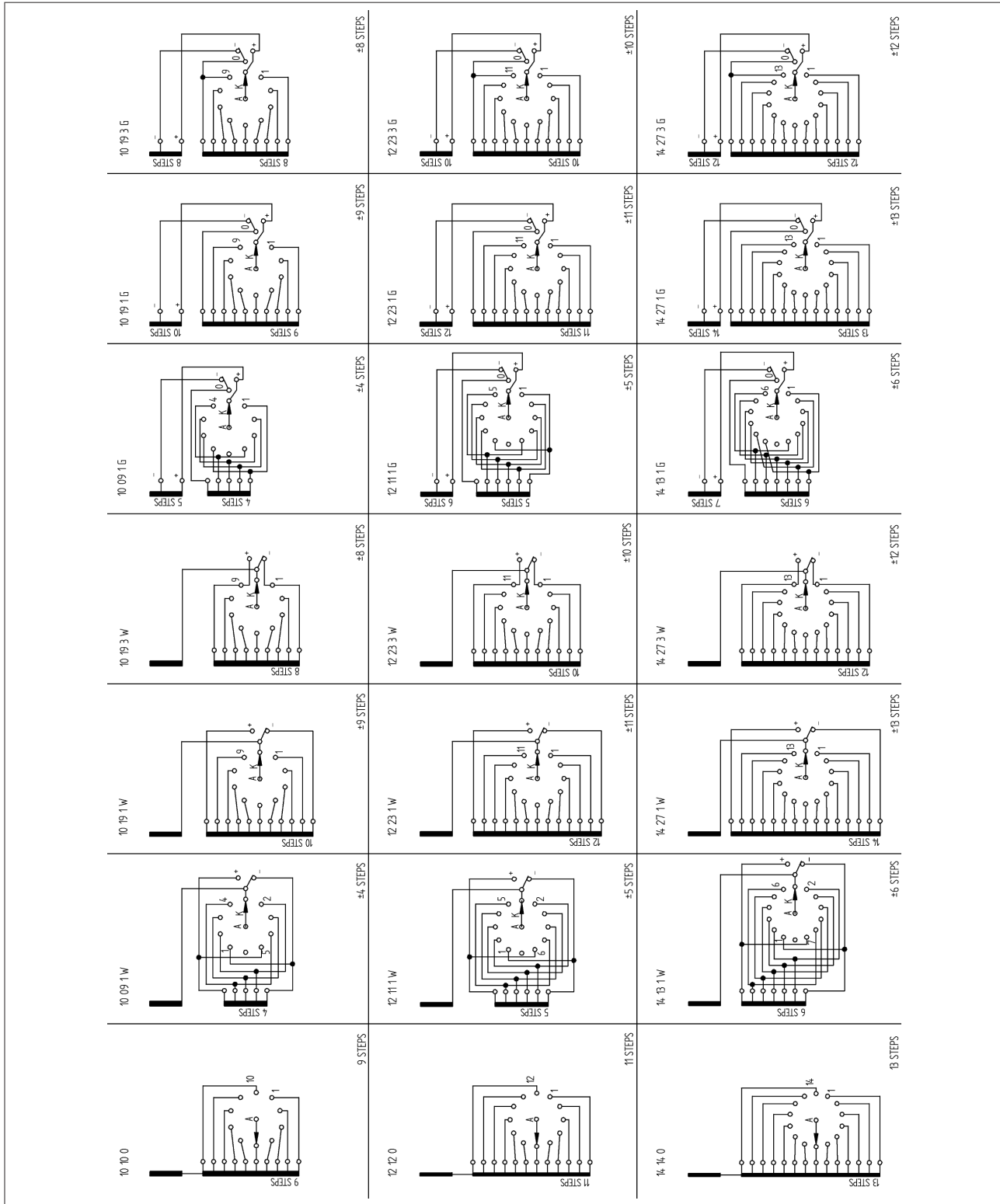
VACUTAP VM® overview of basic connection diagrams with designation of tap selector connection contacts in accordance with MR standard (890616) –2–



VACUTAP VM® overview of basic connection diagrams with designation of tap selector connection contacts in accordance with MR standard (890616) –3–



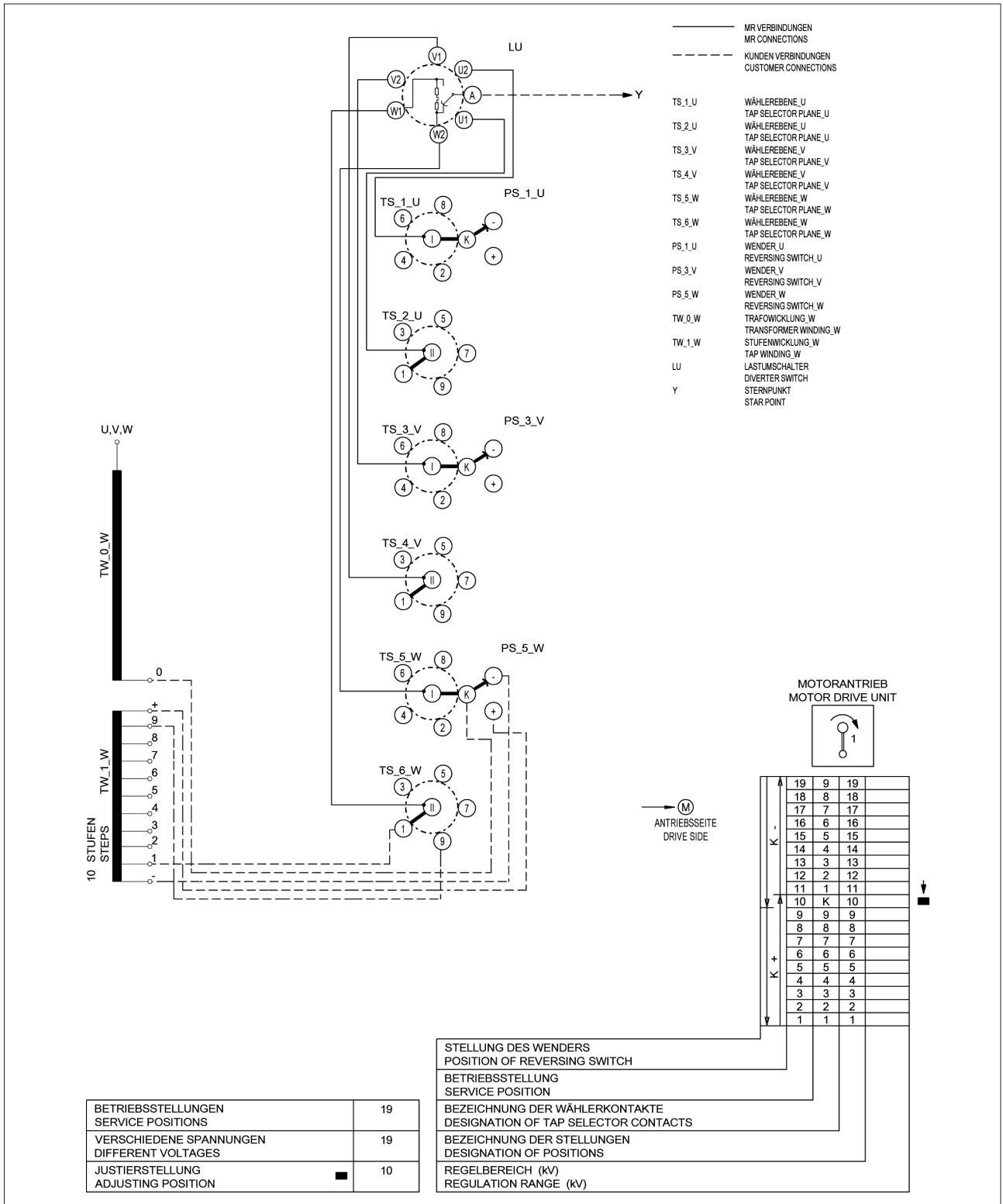
4.5 VACUTAP® VM 300 overview of basic connection diagrams with designation of tap selector connection contacts in accordance with MR standard (893819)



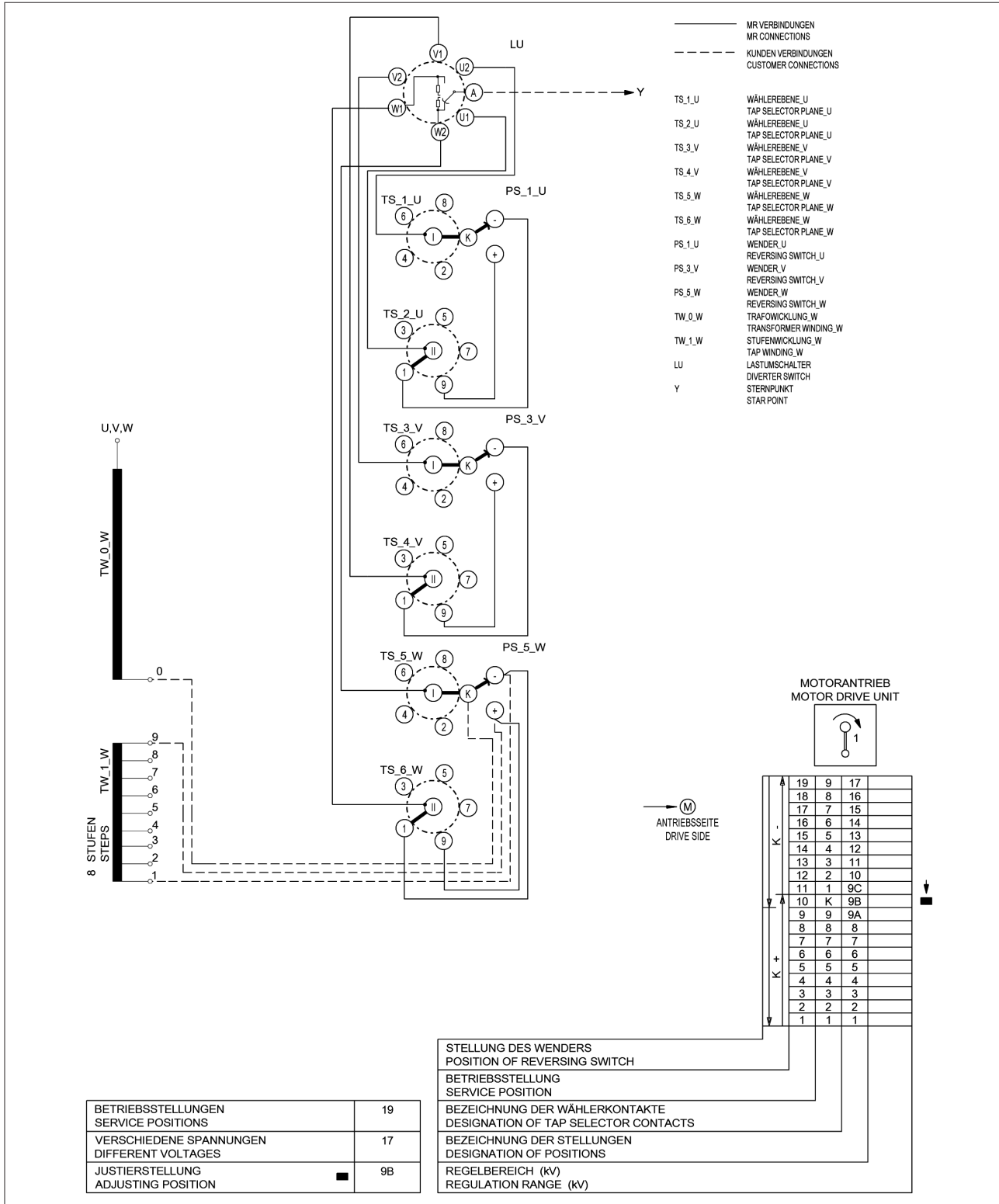


4.6 VACUTAP® VM® detailed connection diagrams (contact designation in accordance with MR standard)

4.6.1 VACUTAP® VM III 300 Y basic connection diagram 10 19 1 W (2414642)

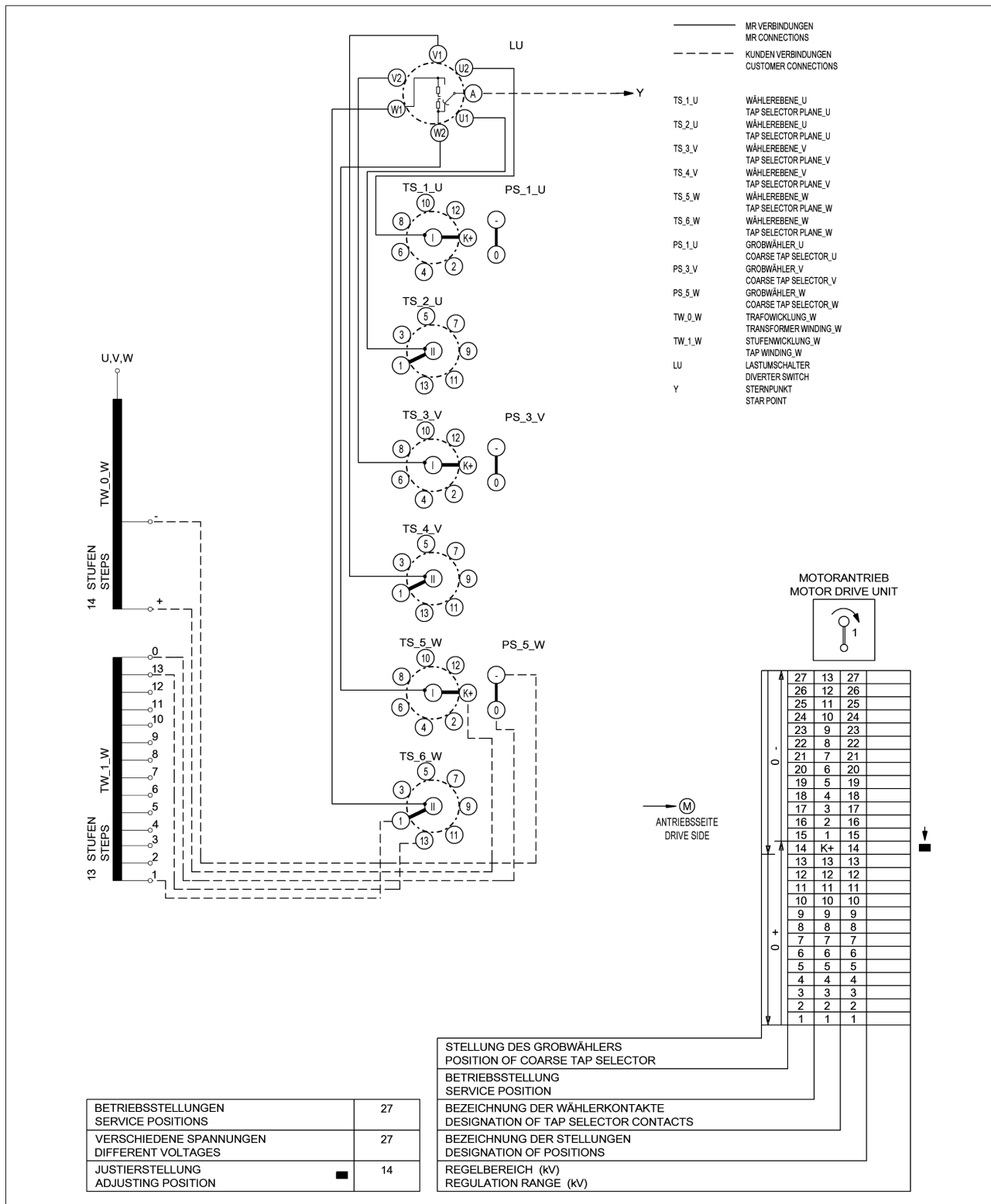


4.6.2 VACUTAP® VM III 300 Y basic connection diagram 10 19 3 W (2414644)

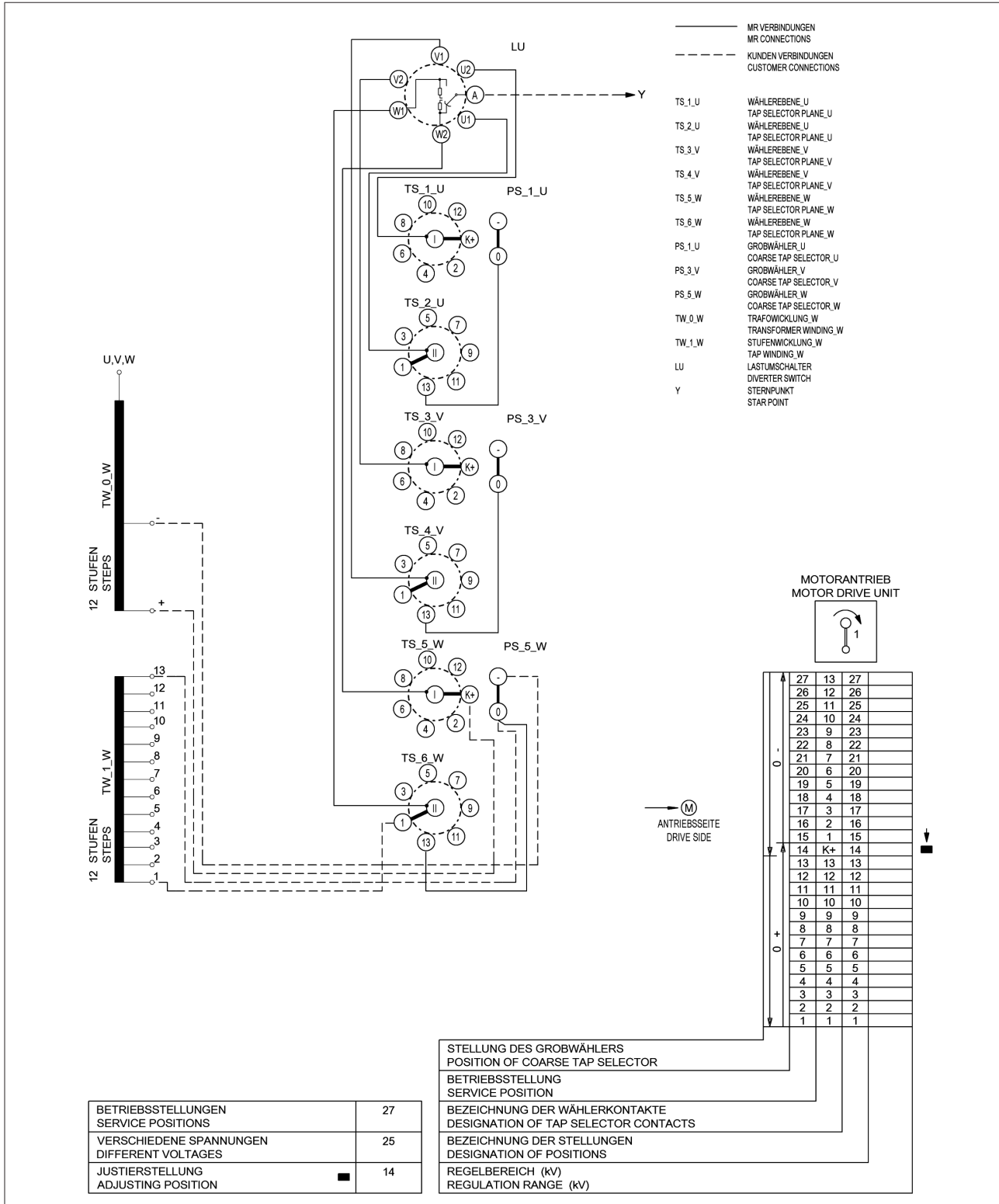




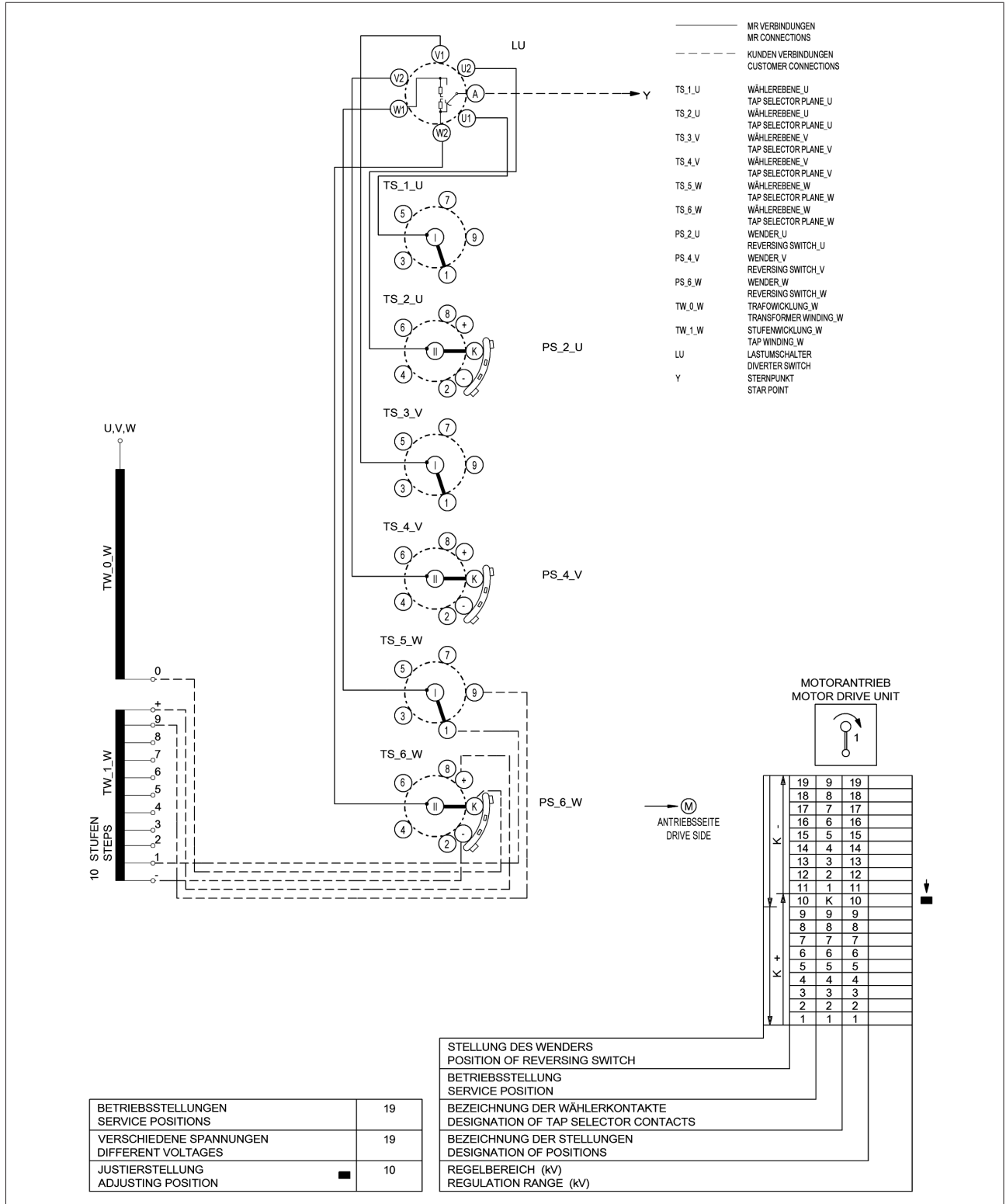
4.6.3 VACUTAP® VM III 300 Y basic connection diagram 14 27 1 G (2414648)



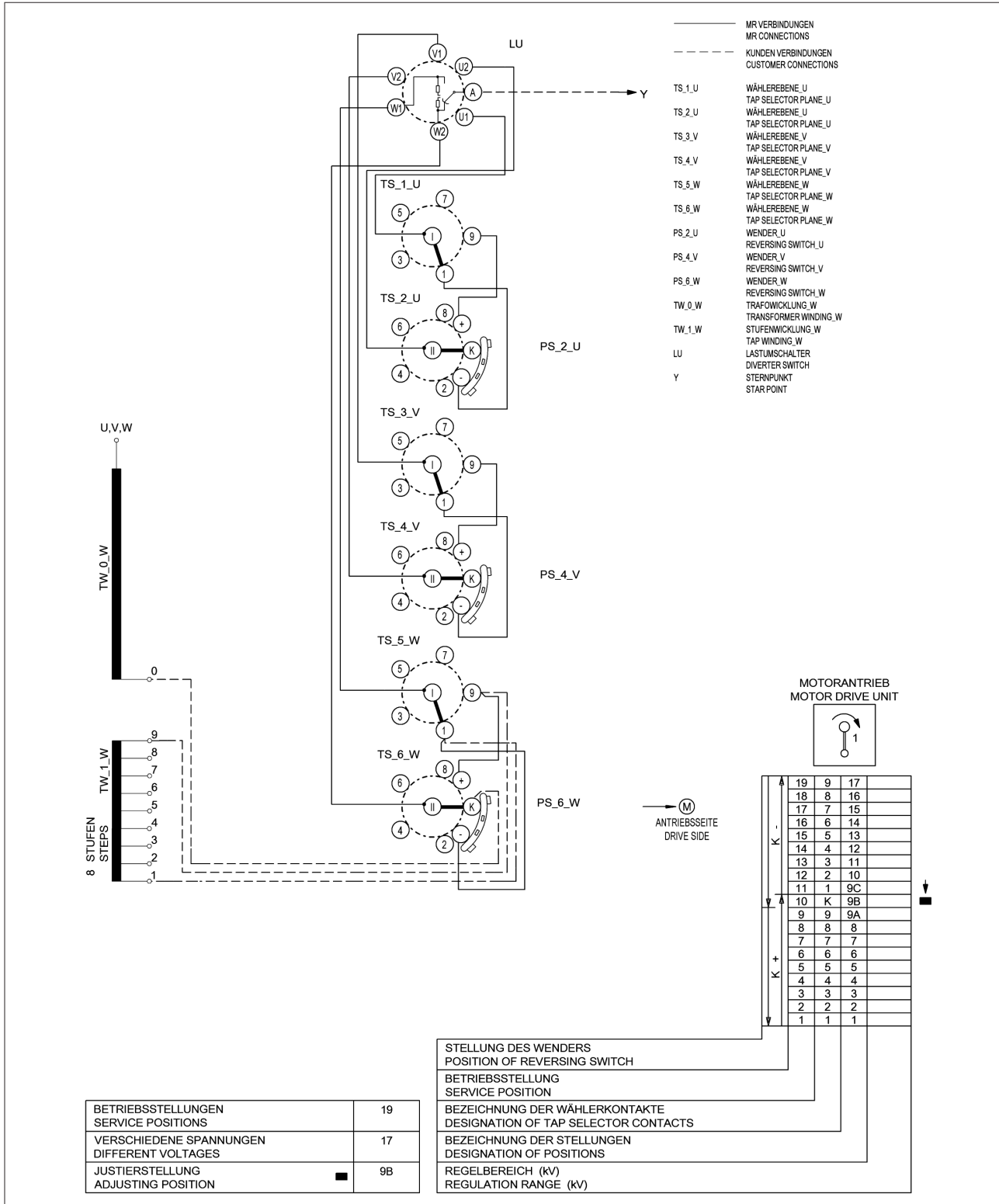
4.6.4 VACUTAP® VM III 300 Y basic connection diagram 14 27 3 G (2414649)



4.6.5 VACUTAP® VM III 350/500/650 Y basic connection diagram 10 19

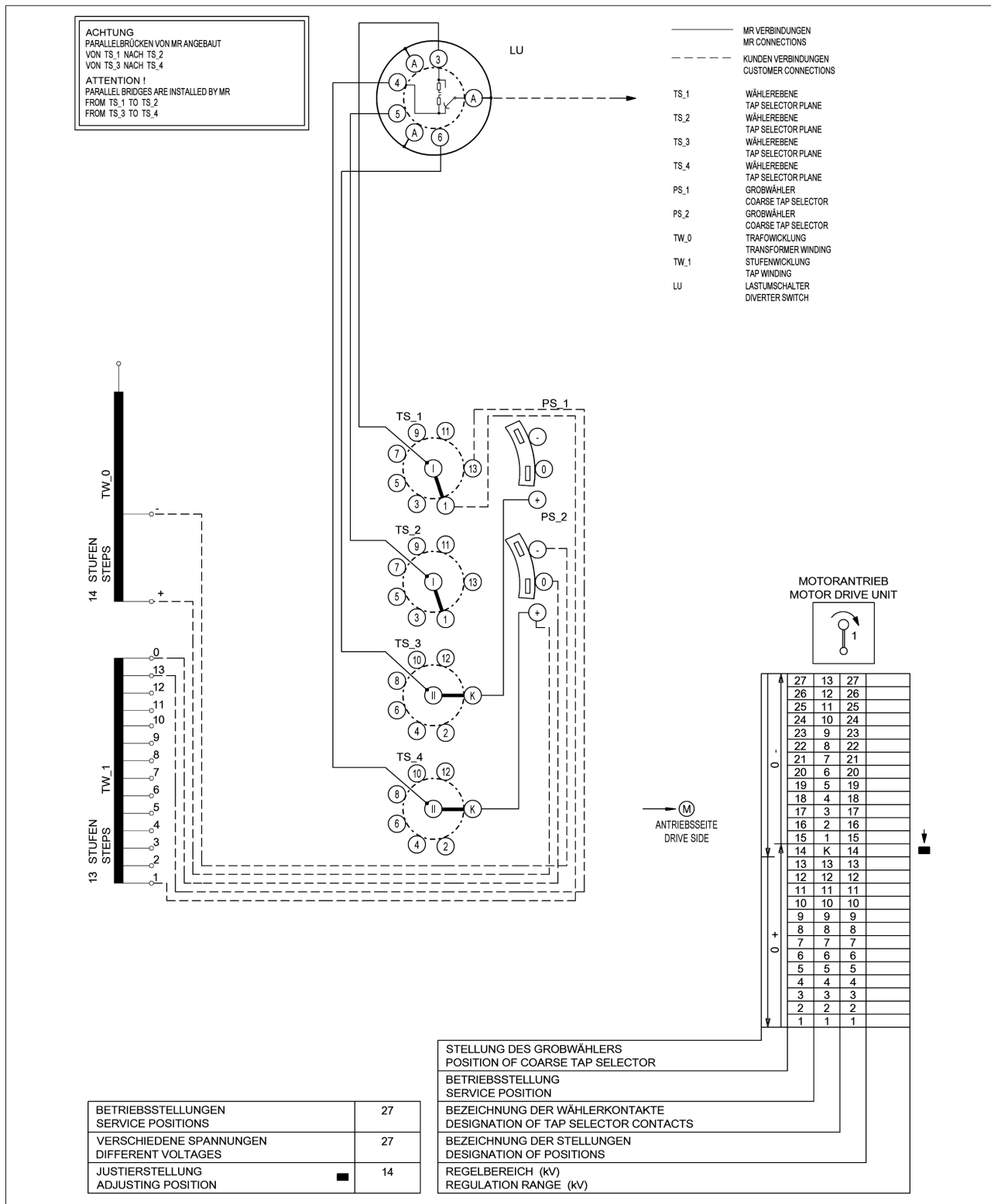


4.6.6 VACUTAP® VM III 350/500/650 Y basic connection diagram 10 19 3 W (2414670)

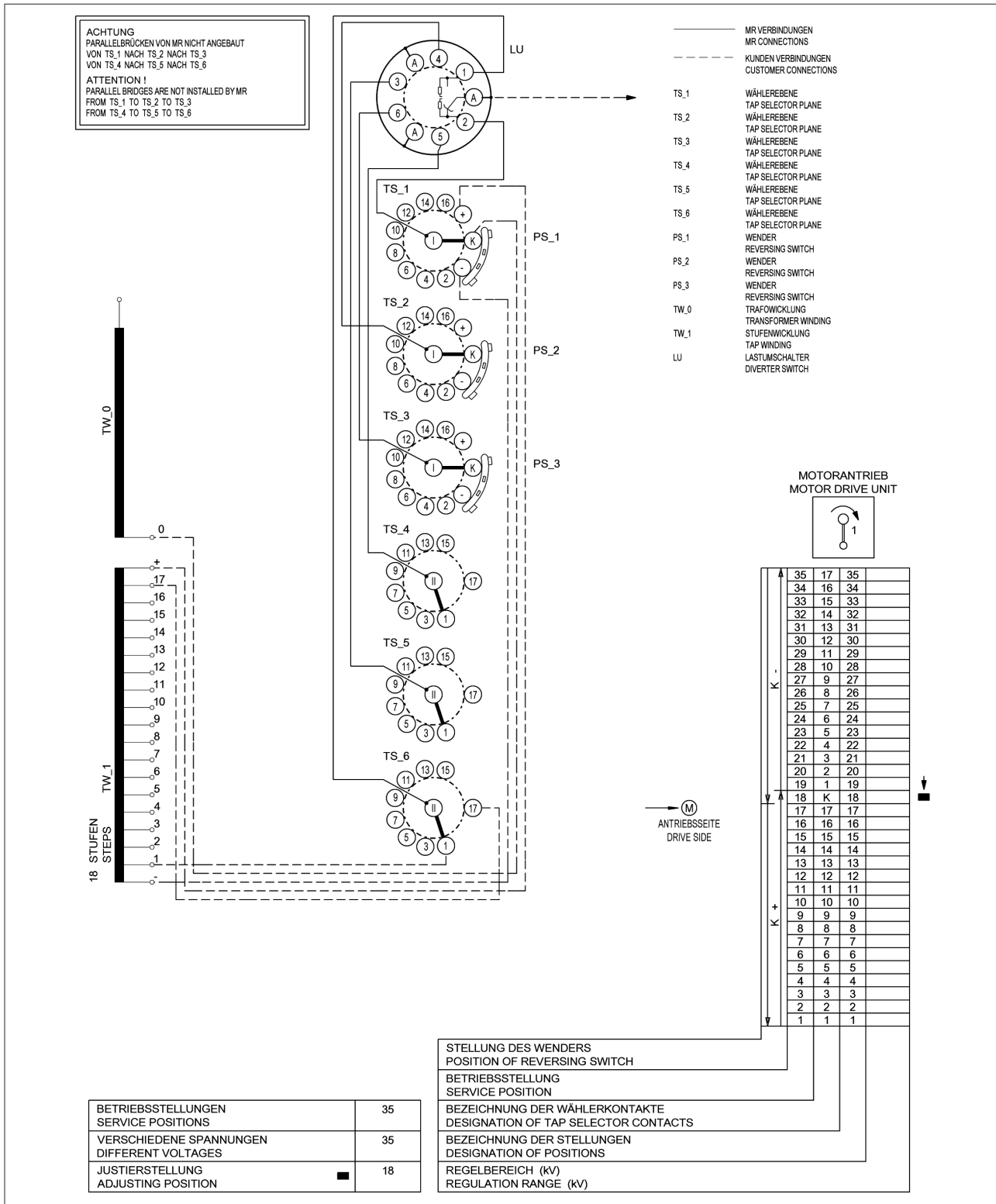




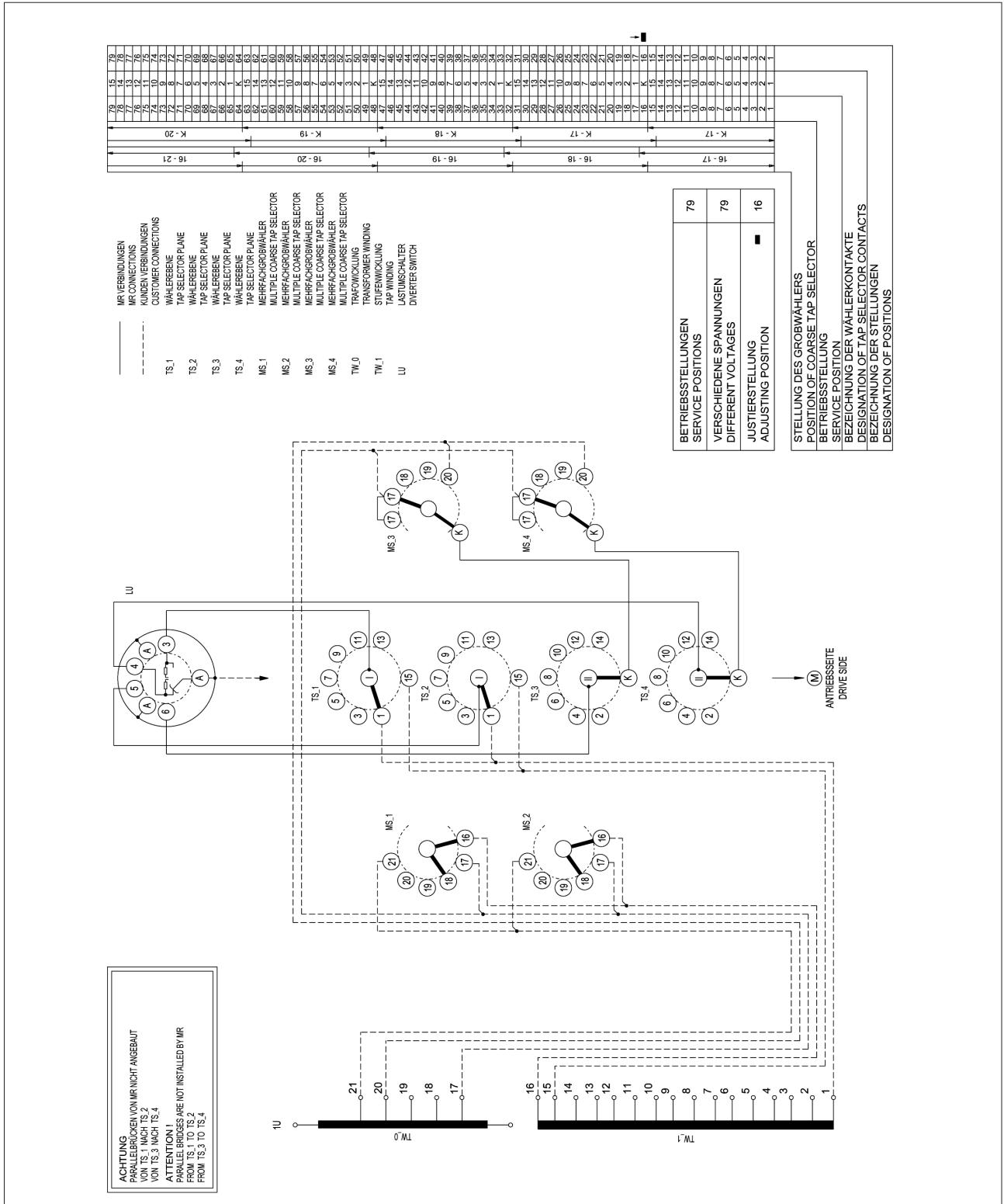
4.6.7 VACUTAP® VM I 802/1002 basic connection diagram 14 27 1 G (2414631)



4.6.8 VACUTAP® VM I 1203/1503 basic connection diagram 18 35 1 W (2414636)



4.6.9 VACUTAP® VM I 802/1002 -basic connection diagram 16 79 1 G, multiple coarse change-over selector design (2407535)



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