

ON LOAD TAP CHANGERS

TYPE RSV 6.3



VOLTA P
E L P R O M

ON LOAD TAP CHANGERS RSV 6.3 TECHNICAL DATA

Elprom Heavy Industries

2023

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Notes:

- 1) This technical data catalog is intended to be used by transformer designers as well as other technical personnel responsible for maintenance, diagnostics, and operation of OLTCs.
- 2) Elprom Heavy Industries reserves the right to make changes in the overall dimension drawings and connection diagrams without prior notice. Updated drawings are provided as part of the technical documentation received by the customer at the time of the product delivery; updated drawings can be provided also to potential customers on request.
- 3) Every OLTC is manufactured according to the specific data in the order specification sheet filled in by the client.
- 4) Elprom Heavy Industries is not responsible for the client choice in the selection of an OLTC expected to meet specific transformer requirements.

1. Basic characteristics

The Voltap OLTCs meet the requirements of the IEC 60214-1: 2003 standard.

1.1. Basic technical data

Table 1: Basic technical data

OLTC model		RSV 6.3 – III – 1200 A				
Number of phases and application		3 (in the neutral)				
Maximum rated through current (A)		1200				
Short circuit withstand current (kA):	r.m.s. value, 3 sec. duration	15				
	peak value	37,5				
Maximum rated step voltage per phase (See Fig.1), (V)		2500				
Rated switching capacity (kVA)		3000				
Breaking capacity (kVA)		6000				
Rated frequency (Hz)		50..60				
Insulation to earth:	Highest voltage for equipment U _m (kV, r.m.s.)	41,5	72,5	123	170	245(300)
	Rated separate source AC withstand voltage, 1 min duration (kV, r.m.s.)	95	140	230	325	460
	Rated switching impulse withstand voltage (kV, 250/2500 μs)	-	-	-	-	850
	Rated lightning impulse withstand voltage (kV, 1,2/50 μs)	250	350	550	750	1050
Number of operation positions	without change-over selector	max of 14				
	with change-over selector	max of 27				
Tap selector		Three different tap selector sizes (K, L, M) are available depending on the requirements of the voltage stress across the regulating winding. The tap selector insulation level can be chosen independently from the insulation level to earth. For the rated withstand test voltages, see Section 1.4.				
Diverter switch oil compartment		Pressure-proof up to 0,3.10 ⁵ Pa (continuous differential prresure); test pressure 0,6.10 ⁵ Pa; endures vacuum drying				
Siphon for oil draining from the diverter switch oil compartment		Standard equipment				
Drying		Vacuum autoclave drying – max. of 110 °C Kerosene vapor-phase drying – max. of 125 °C				
Tap selector size		K		L		M
Weight in kg (approx.)	without change-over selector	460		470		492
	with change-over selector	480		490		512
Displaced by the OLTC volume in dm ³ (approx.)	41,5 kV	255		260		265
	72,5 kV	280		285		290
	123 kV	314		320		325
	170 kV	364		370		375
	245 kV	390		395		400
Oil-filled volume of the diverter switch oil compartment ¹⁾ – V _s (dm ³)	41,5 kV	215				
	72,5 kV	240				
	123 kV	274				
	170 kV	324				
	245 kV	350				

Notes: ¹⁾ Due to the thermal expansion of the oil volume for temperature changes from -30°C to +100°C, the minimum volume of the OLTC conservator should be as follows: $\delta V = 0,1 \cdot V_s + 5$ (dm^3).

The RSV 6.3 OLTC can operate with a rated load at oil temperature from -25°C to +115°C.

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R1.2.2.0000.0000.e

1.2. Rated through current (I_u), rated step voltages (U_i), rated switching capacity (P_{stN})

The values of the maximum rated through-current I_{um} and its relevant rated step voltage U_i and the rated switching capacity P_{stN} are given in Table 2.

Table 2: Maximum rated through-current (I_{um}), rated step voltages (U_i), rated switching capacity (P_{stN})

OLTC	RSV 6.3 - III
I_{um} (A)	1200
U_i (V)	2500
P_{stN} (kVA)	3000

The rated through-current (I_u) and its relevant rated step voltage (U_i) are determined from the curve of the rated switching capacity (Fig. 1).

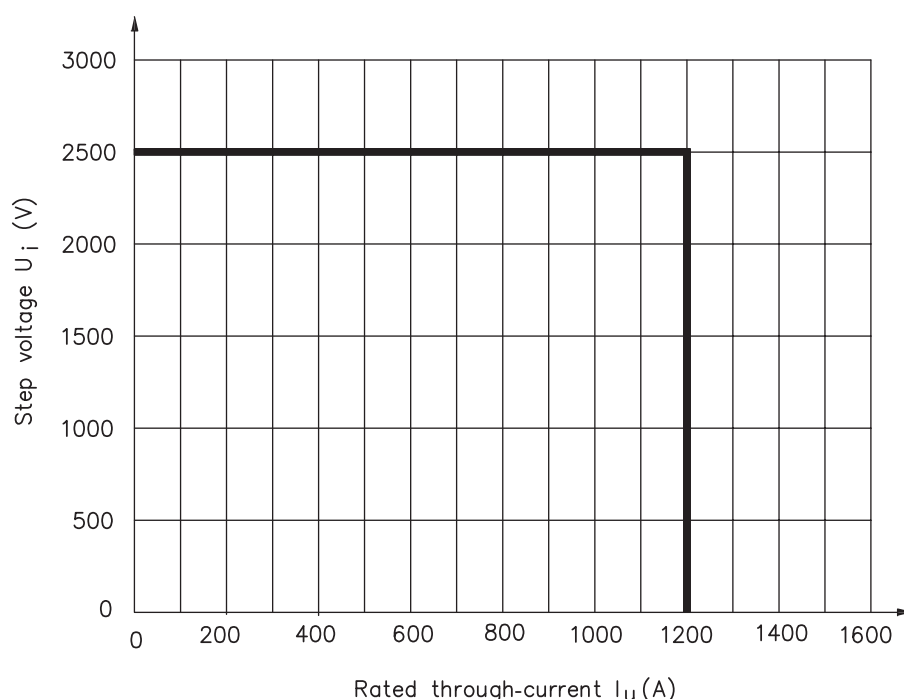


Fig. 1: Rated switching capacity (Rated through-current I_u [A]; Rated step voltage U_i [V])

In case of transformer over excitation, a maximum 10 % increase of the rated step voltage is permissible provided that the breaking capacity does not exceed its rated value. The breaking capacity P_{stmax} is the maximum power at which the OLTC can switch the regulating winding from one tap to the adjacent one. According to IEC 60214-1:2003, Section 5.2.2.2, the value of the breaking capacity P_{stmax} is verified at a current corresponding to twice the maximum rated through-current and its relevant rated step voltage. Thus the breaking capacity is equal to twice the rated switching capacity P_{stN} .

$$P_{stmax} = 2I_{um}.U_i = 2 P_{stN}$$

For special tap-changing modes of the OLTC, see the general Voltap catalog containing information about the basic characteristics of all OLTC series made by Elprom Heavy Industries.

1.3. Electrical and mechanical endurance

Table 3 gives the average values for the number of switching operations till inspection of the diverter switch and replacement of the vacuum interrupters. These values have been obtained as a result of experimenting with real loads under maximum rated through current I_{um} (A), rated step voltage U_i (V), and $\cos\phi = 1$.

Table 3: Electrical and mechanical endurance

OLTC	RSV 6.3 - III
Number of switching operations till inspection (oil replacement) ¹⁾	150 000
Number of switching operations till replacement of the vacuum interrupters	300 000
Mechanical endurance – number of switching operations	500 000

¹⁾ or in operation for maximum 3 years

Detailed information about the number of switching operations till inspection for the different tap changers is given in the RSV 6.3 Installation and Operation Manual.

1.4. Rated insulation level

The rated insulation level of an OLTC is determined by a series of withstand voltage values. The rated withstand voltage values of the OLTC insulation to earth are given in Table 1. These values are specified in national and international standards.

The internal insulation is dimensioned depending on the voltages supplied by the transformer winding taps to different parts of the tap selector, the change-over selector, and the diverter switch. The basic connection diagrams, including their typical insulation distances, are shown in Fig. 3. The withstand voltage values for the different insulating distances are given in Table 4.

In order to select a suitable OLTC for a given transformer, it is necessary to ensure that these values are equal to or higher than those of the voltages occurring during the lightning impulse test, the induced voltage test, and the power frequency voltage test of the transformer. In the selection process, the least favorable service tap position of the OLTC should be taken into account.

The insulation to earth and the tap selector insulation size are not interdependent and can be selected in accordance with the client's specific requirements.

ON LOAD TAP CHANGERS RSV 6.3 – III – 1200A

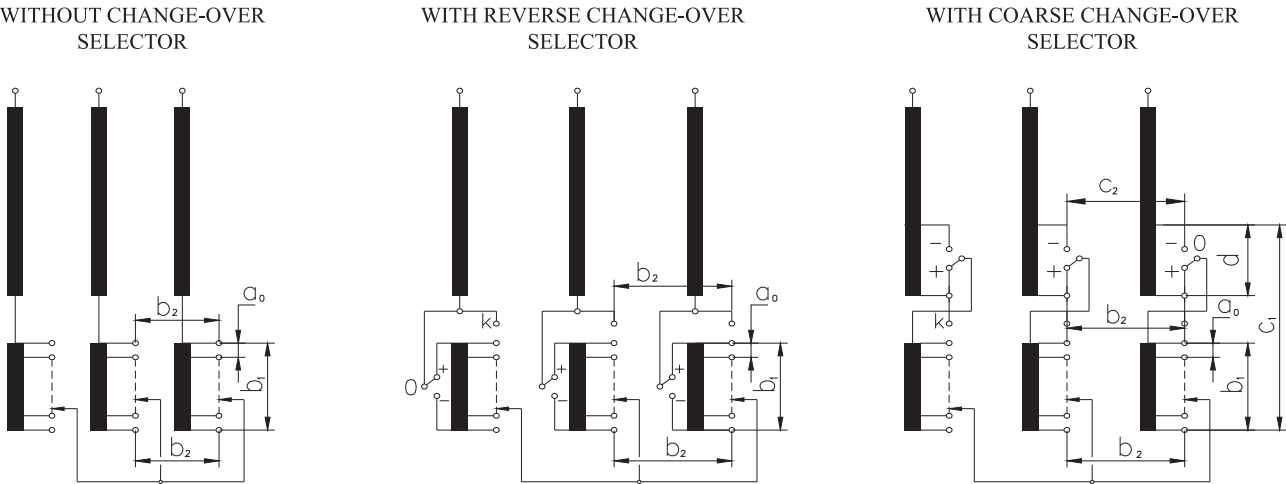


Fig. 2: Specific insulation distances of the transformer windings

Table 4: Withstand voltages

Insulation distances	Rated withstand voltage (kV)					
	Selector size K		Selector size L		Selector size M	
	1.2/50 µs	50Hz 1min	1.2/50 µs	50Hz 1min	1.2/50 µs	50Hz 1min
a ₀	100	25	120	35	130	40
b ₁	200	55	275	80	330	100
b ₂	200	55	280	80	320	100
c ₁	290	65	390	120	450	130
c ₂	290	65	390	120	450	130
d	300	80	300	80	320	120

2. Overview of the different RSV 6.3 models

2.1. Main dimensions ¹⁾

Fig. 3 shows the main dimensions of the different RSV 6.3 types.

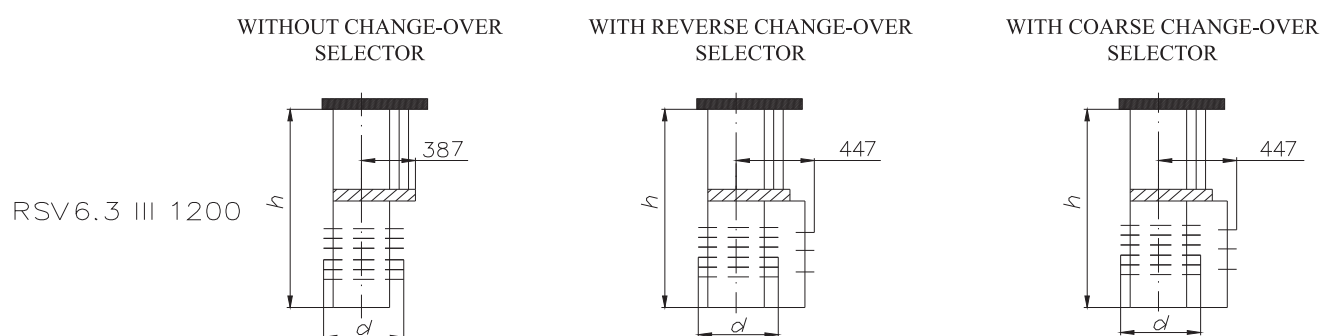


Fig.3: Main dimensions of RSV 6.3

Table 5: RSV 6.3 III

Um (kV)	SELECTOR SIZE					
	K		L		M	
	h	d	h	d	h	d
41.5	2142	481	2322	481	2472	481
72.5	2212	481	2392	481	2542	481
123	-	481	2448	481	2598	481
170	-	-	-	-	2741	481
245	-	-	-	-	2840	481

¹⁾ For the rest of the dimensions, see Drawing № 1156.

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2.2. Basic connection diagrams

2.2.1. Designation and range of regulation

Fig. 4 and 4a show the basic connection diagrams where the selector contacts are designated according to the overall dimension drawings.

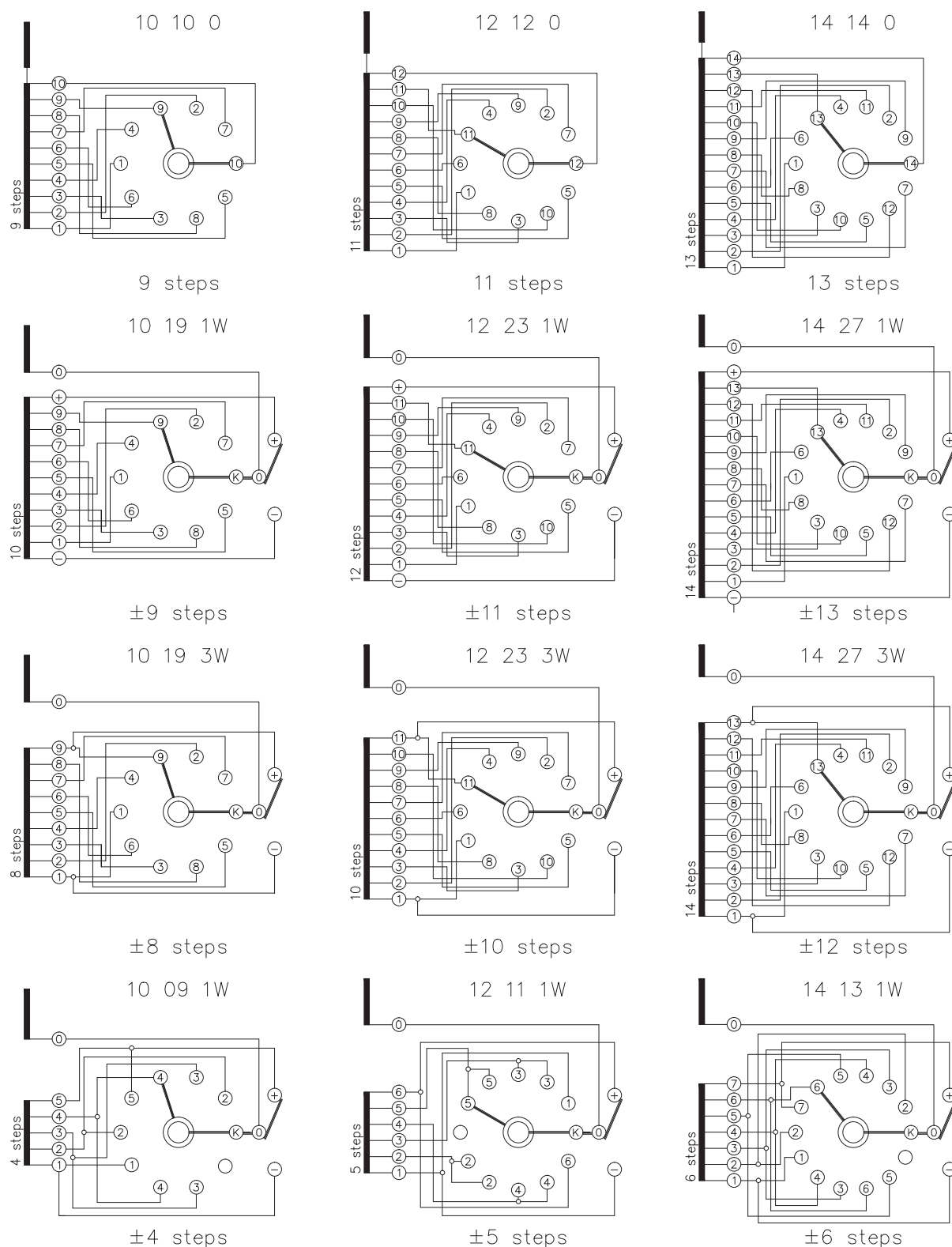


Fig. 4: Basic connection diagrams

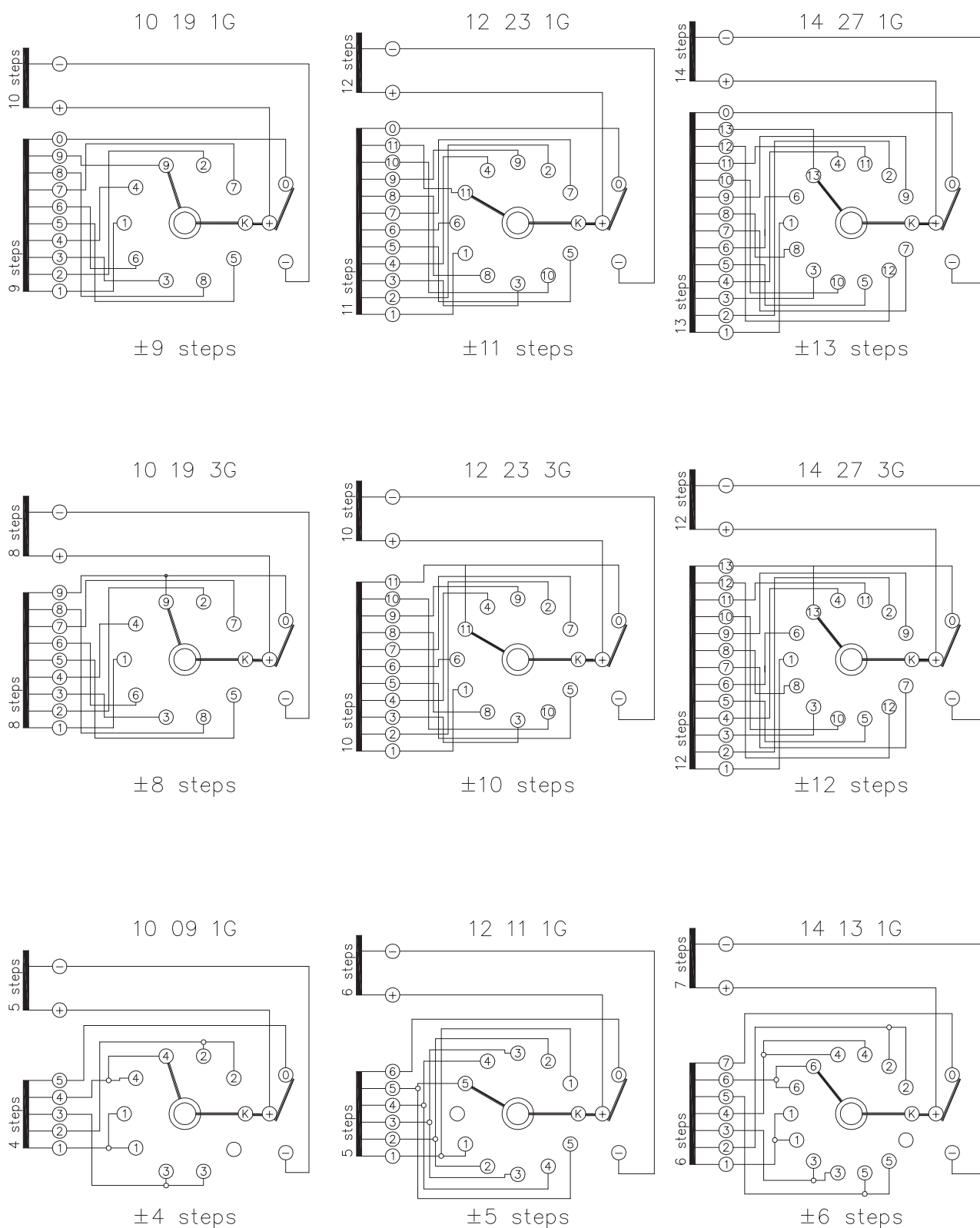


Fig. 4a: Basic connection diagrams

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R1.2.2.0000.0000.e

2.2.2. Examples of basic connection diagrams

Figures 5, 6, 7 and 8 show examples of basic connection diagrams; they also show the designation of the operating positions and the respective positions of the selector and change-over selector contacts.

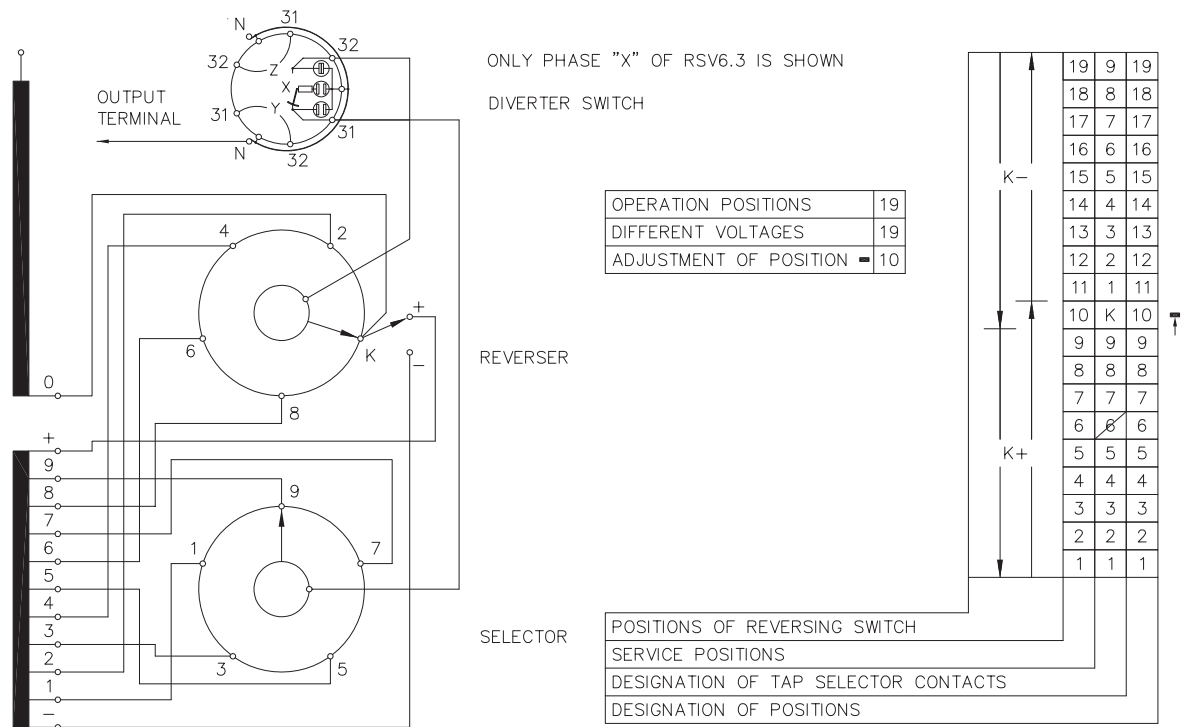


Fig. 5: Connection diagram 10 19 1W

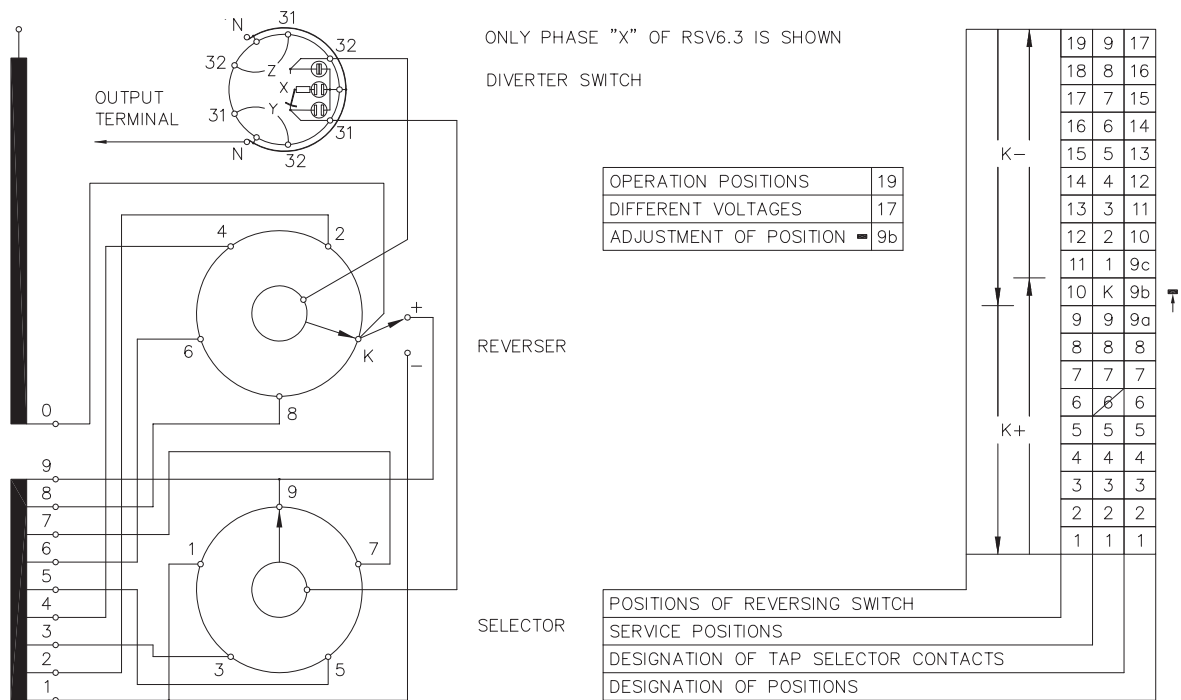


Fig. 6: Connection diagram 10 19 3W

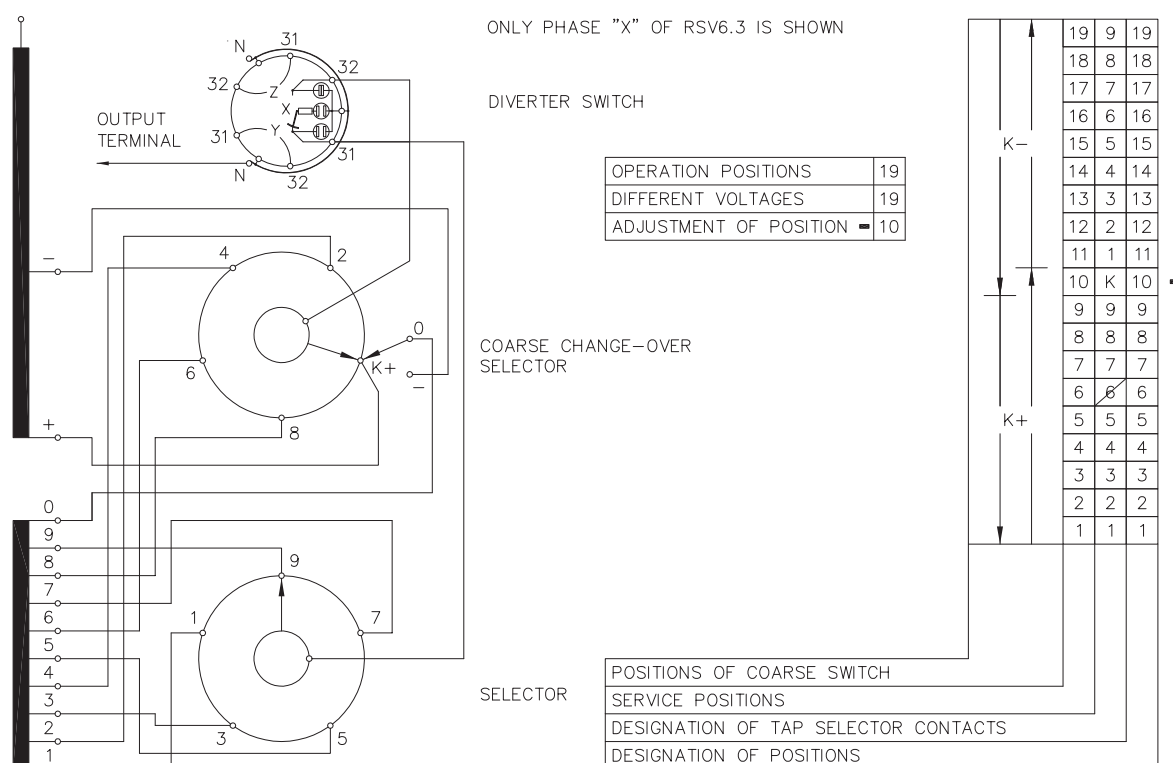


Fig. 7: Connection diagram 10.19.1G

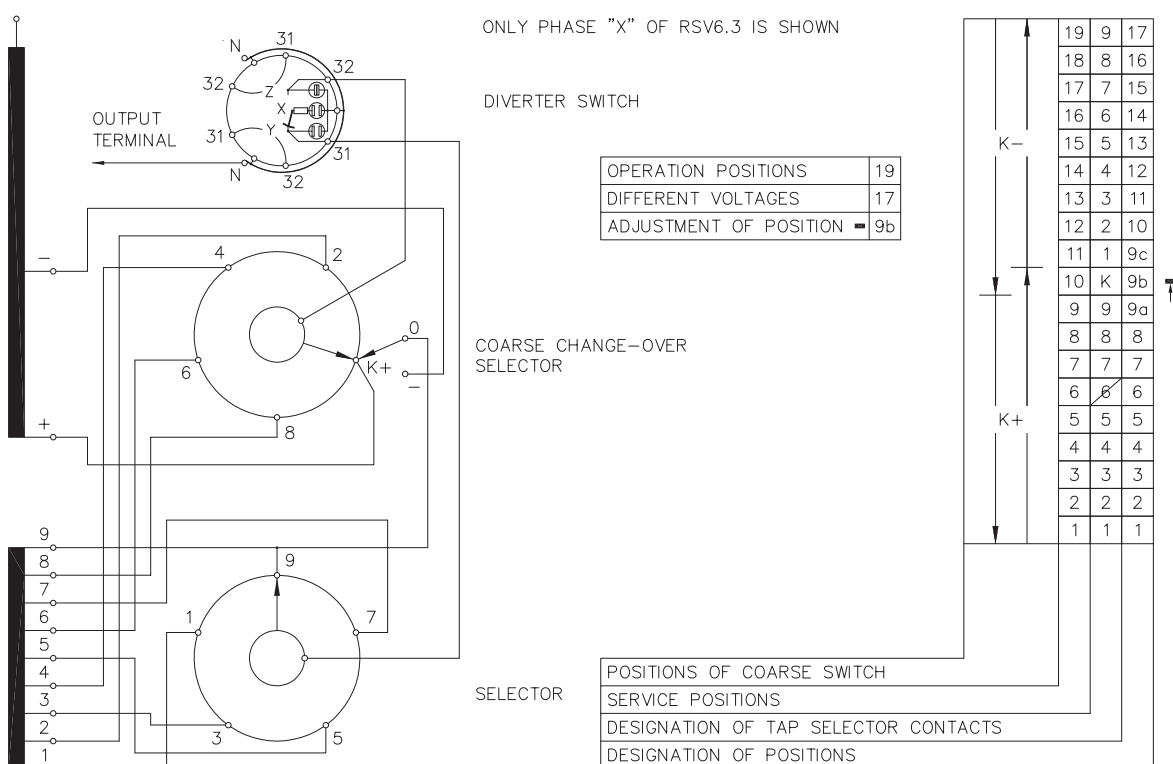


Fig. 8: Connection diagram 10.19.3G

3. Appendices

3.1. Overall dimension drawings of OLTCs

RSV 6.3 III 1200 on load tap changer №1156e

RSV 6.3 on load tap changer with a pressure relief device “Qualitrol”
and tie-in resistors №1157e

3.2. Additional drawings of OLTCs

OLTC standard set №1159e

RS 5 / RS 5.3 up to 630 A and 1250 A; RSV 5.3; RS 6 / RS 6.3 / RSV 6.3 OLTCs
– arrangement of tap selector terminals №1160e

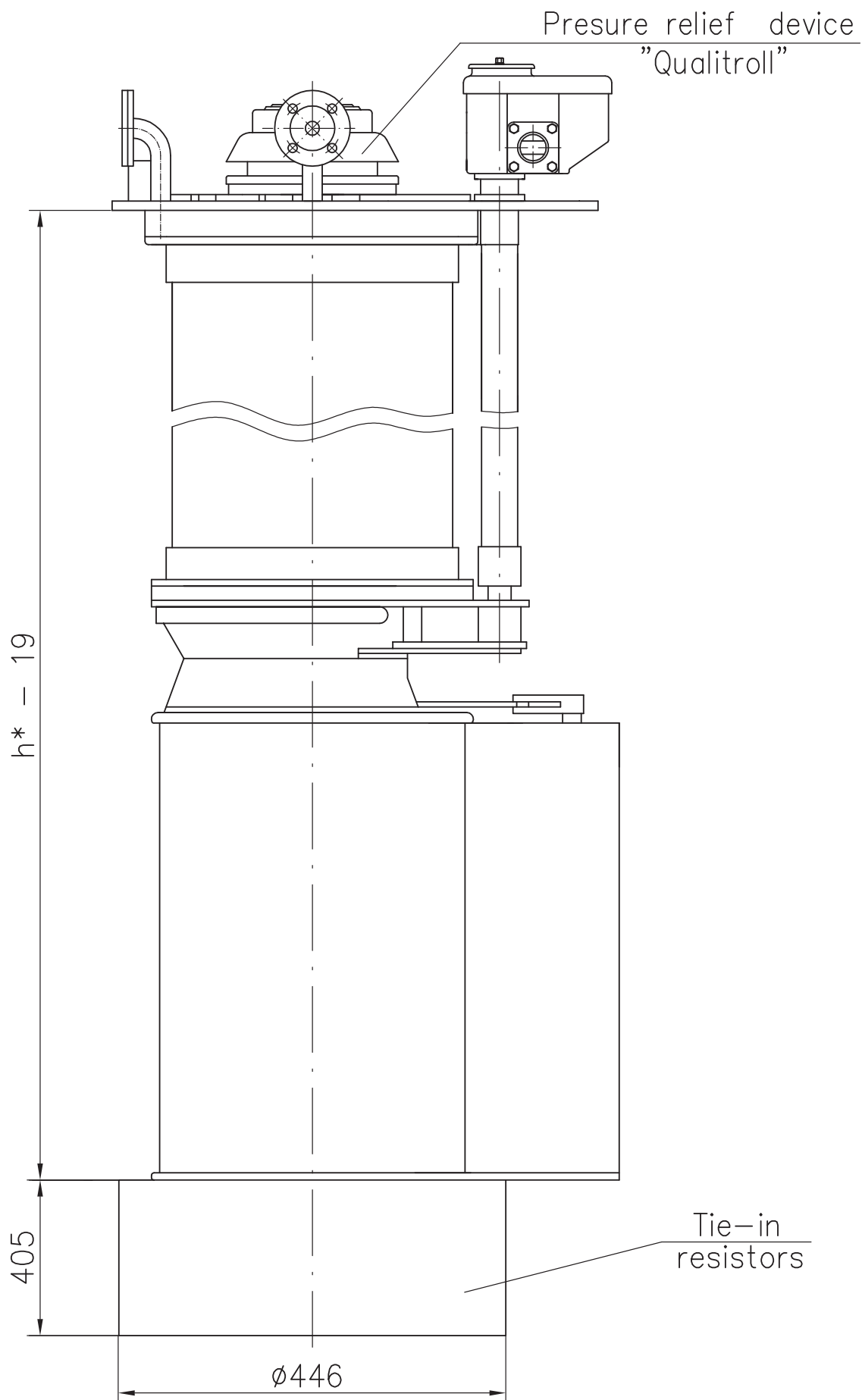
Pressure relief device type “Qualitrol” №174Q

3.3. RSV 6.3 OLTCs – driving shafts arrangement

RS 5.3 / RS 6.3 / RSV 5.3 / RSV 6.3 – driving shafts arrangement №M 6.3.100.002.00e

Please note:

The overall dimension drawings can be changed without prior notice.



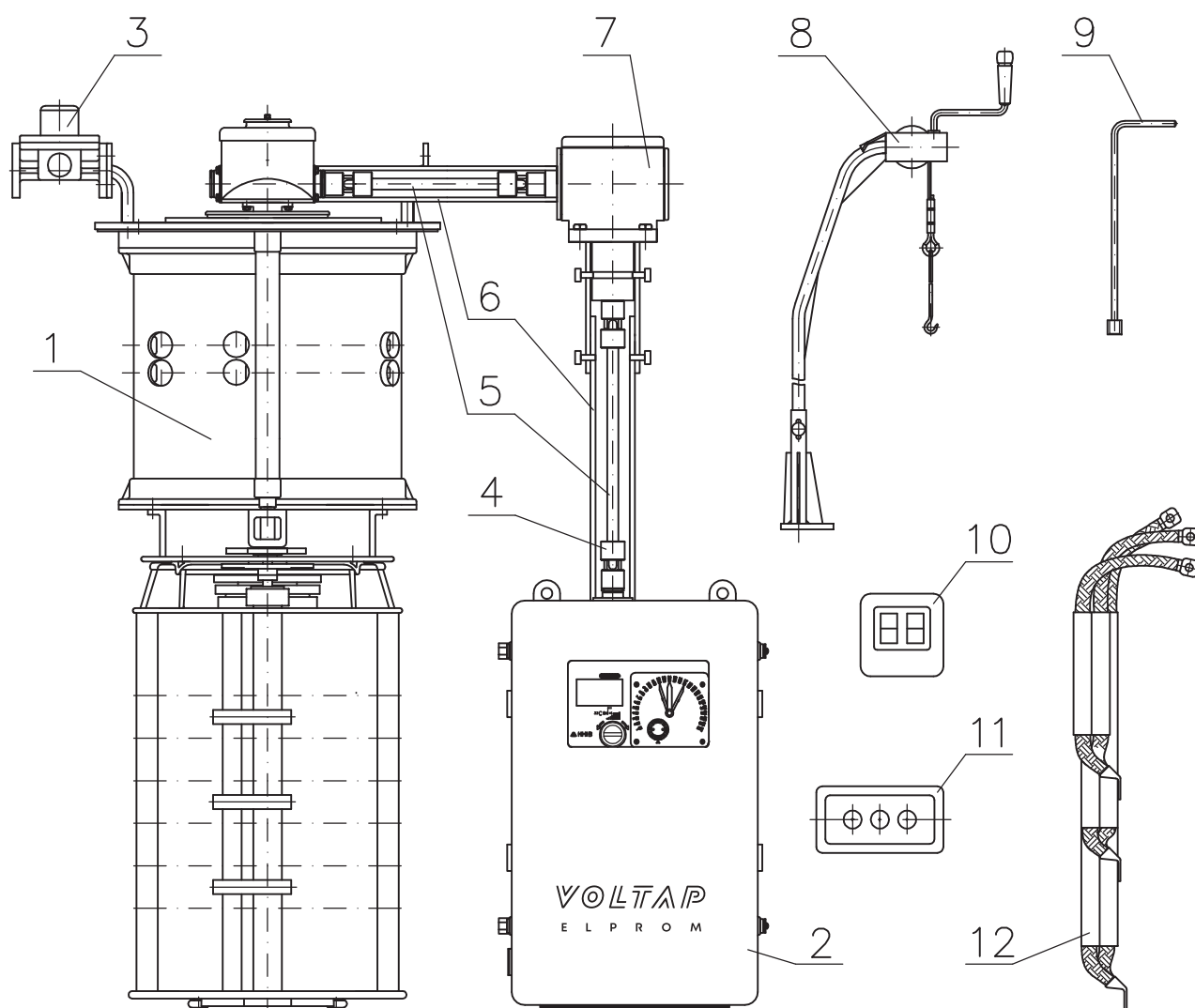
h^* – see drawing № 1156

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ELPROM

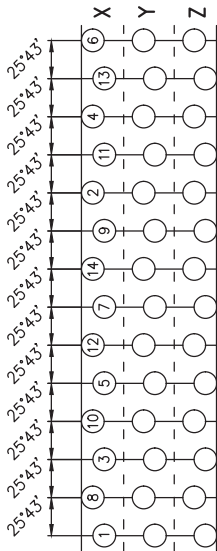
**ON LOAD TAP CHANGER WITH A
PRESSURE RELIEF DEVICE "QUALITROL"
AND TIE-IN RESISTORS**

№1157e

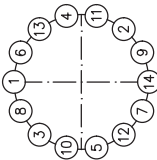
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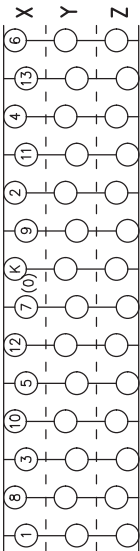
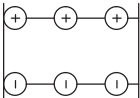
1. On Load Tap Changer
2. Motor drive unit
3. Protective relay
4. Cardan coupler
5. Vertical and horizontal driving shaft
6. Protective pipe
7. Bevel gear
8. Lifting crane
9. Special wrench key S14
10. Remote position indicator
11. Remote push buttons
12. External connections of the OLTC



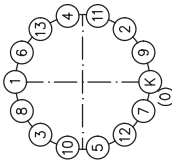
14 14 0



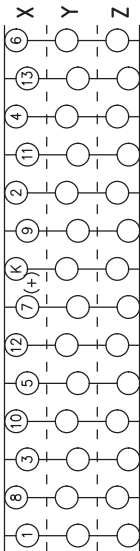
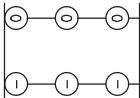
REVERSER



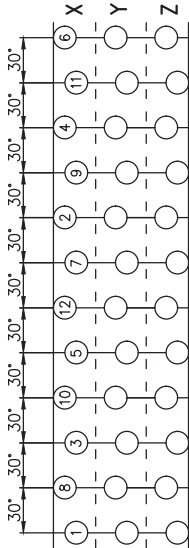
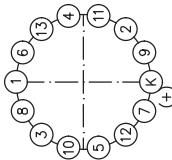
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14 27 3W



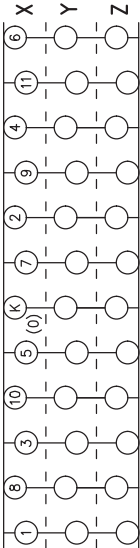
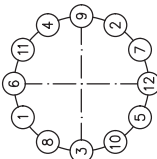
COARSE CHANGE—
OVER SELECTOR



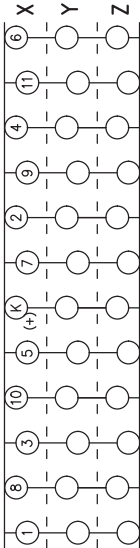
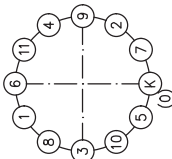
14 27 1G
14 27 3G



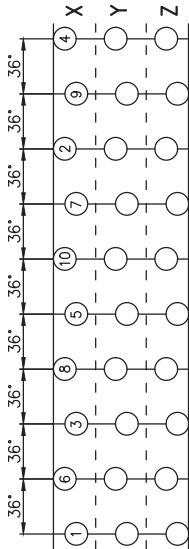
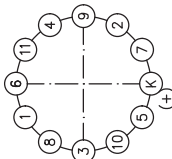
12 12 0



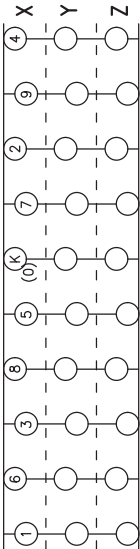
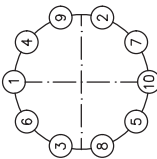
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12 23 3W



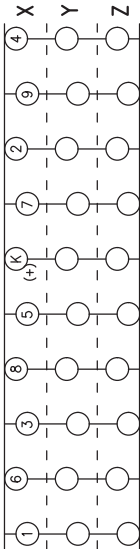
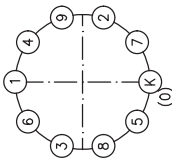
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12 23 3G



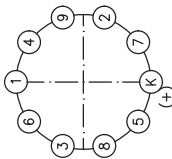
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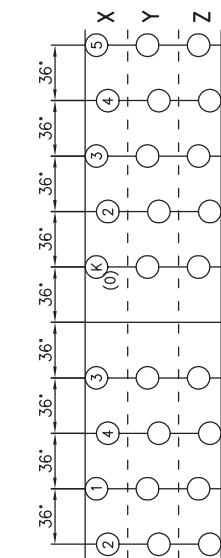


10 19 1W
10 19 3W

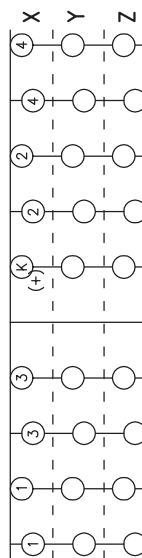
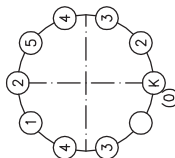


10 19 1G
10 19 3G

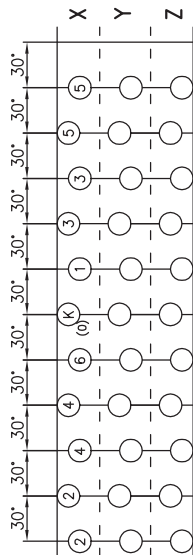
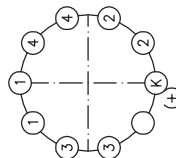




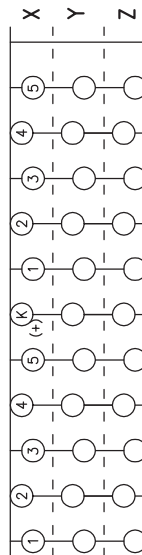
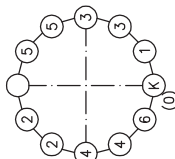
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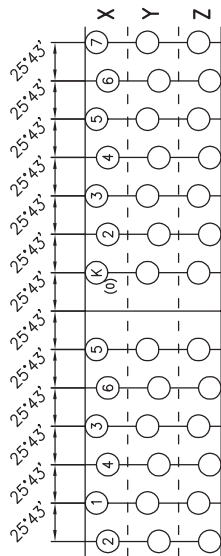
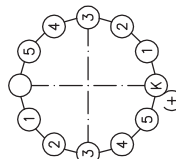
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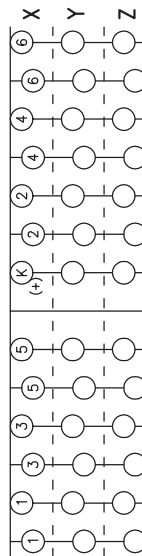
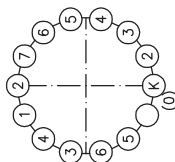
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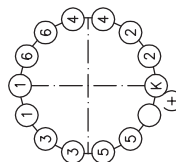
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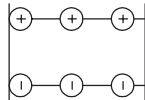
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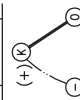
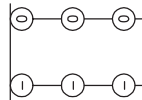
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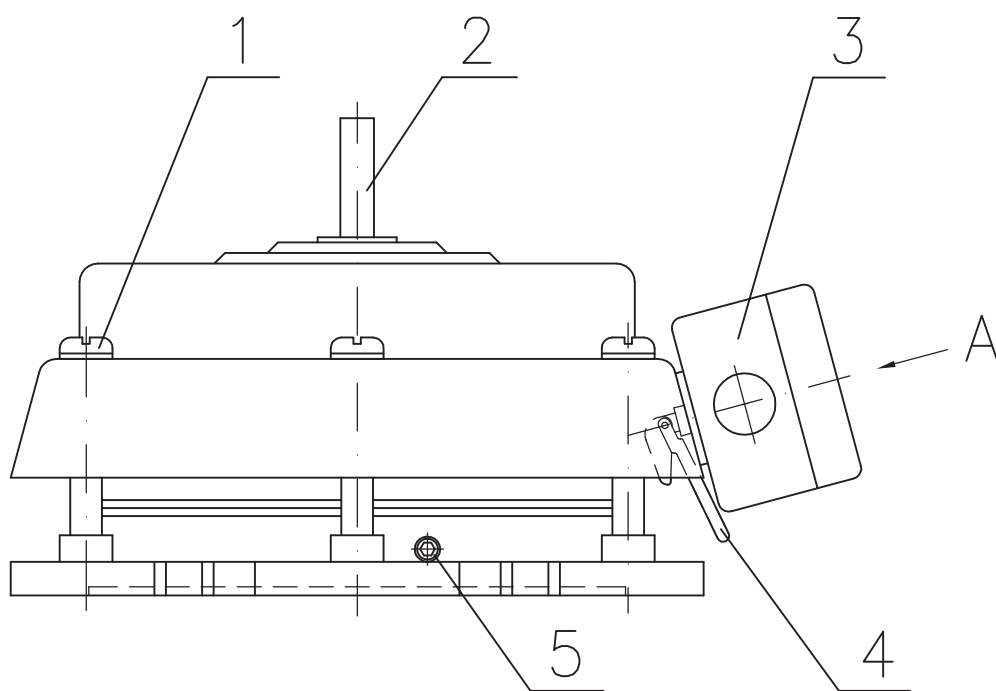


REVERSER

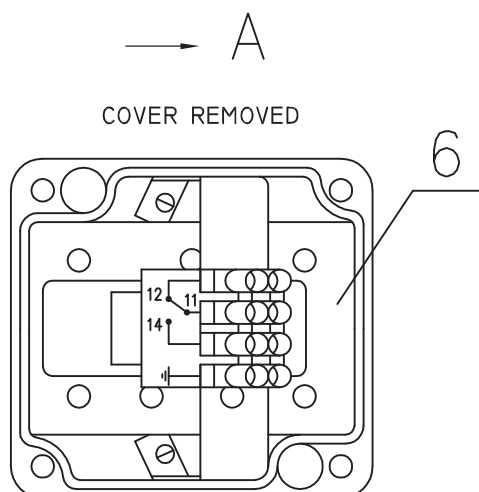


**COARSE CHANGE –
OVER SELECTOR**





- 1. COVER SCREWS
- 2. VISUAL INDICATOR
- 3. SIGNAL DEVICE
- 4. LEVER
- 5. SCREW FOR BLEEDING
- 6. SIGNAL DEVICE TERMINAL BOX

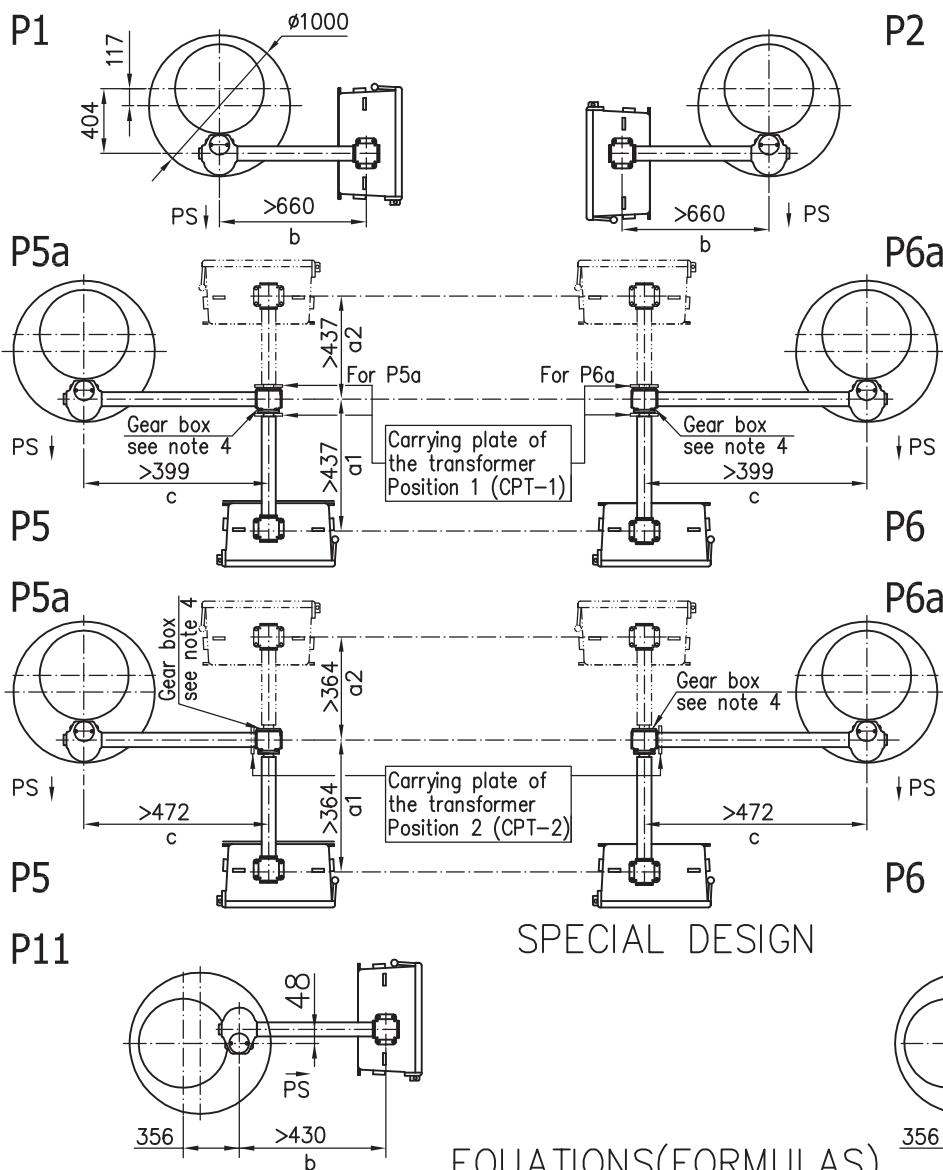


NOTES : - Pos. 2 IS RETURNED IN INITIAL POSITION MANUALLY
 - LEVER (POS. 4) IS USED FOR MANUAL RETURN OF
 THE LEVER IN SIGNAL DEVICE INITIAL POSITION

ATTENTION ! LOOSENING OF BOLTS - POS.1 IS NOT ALLOWED.

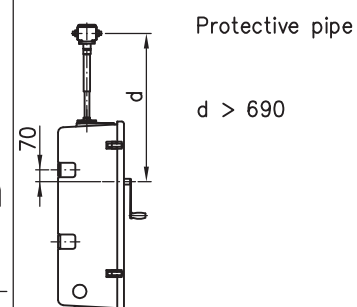
PRODUCER : "QUALITROL" - USA

HORIZONTAL SHAFT DISPOSAL STANDARD DESIGN

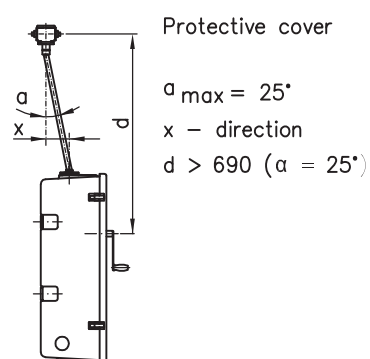


VERTICAL SHAFT DISPOSAL

Variant I



Variant II



SPECIAL DESIGN

EQUATIONS(FORMULAS)

Disposal Shaft length		P1	P2	P5	P6	P5a	P6a	P11	P12
La1	CPT-1	—	—	a1-367		—	—	—	—
	CPT-2	—	—	a1-294		—	—	—	—
La2	CPT-1	—	—	—	—	a2-367		—	—
	CPT-2	—	—	—	—	a2-294		—	—
Lb		b-329		—	—	—	—	b-329	
Lc	CPT-1	—	—	c-329				—	—
	CPT-2	—	—	c-402				—	—
Ld		$\frac{d-615}{\cos\alpha}$							

Notes: 1. "L"— Driving shaft length

2. PS — Disposal of change-over selector

3. Distances are determined by mechanical reasons only.

Insulating distances are not considered

4. Gear box is No202.4.

For more information see Manual EA581.4e.

VOLTA P
E L P R O M

**ON LOAD TAP CHANGER
RS5.3/RS6.3/RSV5.3/RSV6.3
DRIVING SHAFT ARRANGEMENT**

M 6.3.100.002.00e

2023

ON LOAD TAP CHANGERS

TYPE RSV 6.3

VOLTA P
E L P R O M

41 Rojen Blvd. 1271 Sofia, Bulgaria
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