



Type W□L Off-Circuit Tap Changer Operation Instructions

HM0.460.602



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1. General

Type WSL Off-Circuit Tap Changers are used for adjusting the voltage of oil-immersed transformers. It is designed like a cage without oil compartment and can be vertically installed on the transformer tank cover through top flange directly.

As per different operating modes, there're three types of tap changer: motor drive, manual drive and top hand wheel Refer to fig.1, fig.2 and fig.3.

As per different internal structures, and regulating mode there are six types of tap changer: Type Linear off-circuit tap changer for neutral application; Type Single-bridging off-circuit tap changer; Type Star-delta off-circuit tap changer; Type Double-bridging off-circuit tap changer; Type Reversing off-circuit tap changer; Type Serial-parallel off-circuit tap changer

As per different sizes, there are two types of tap changer: type A and type B.

There are two type of flange mounting: tank cover type and bell type.

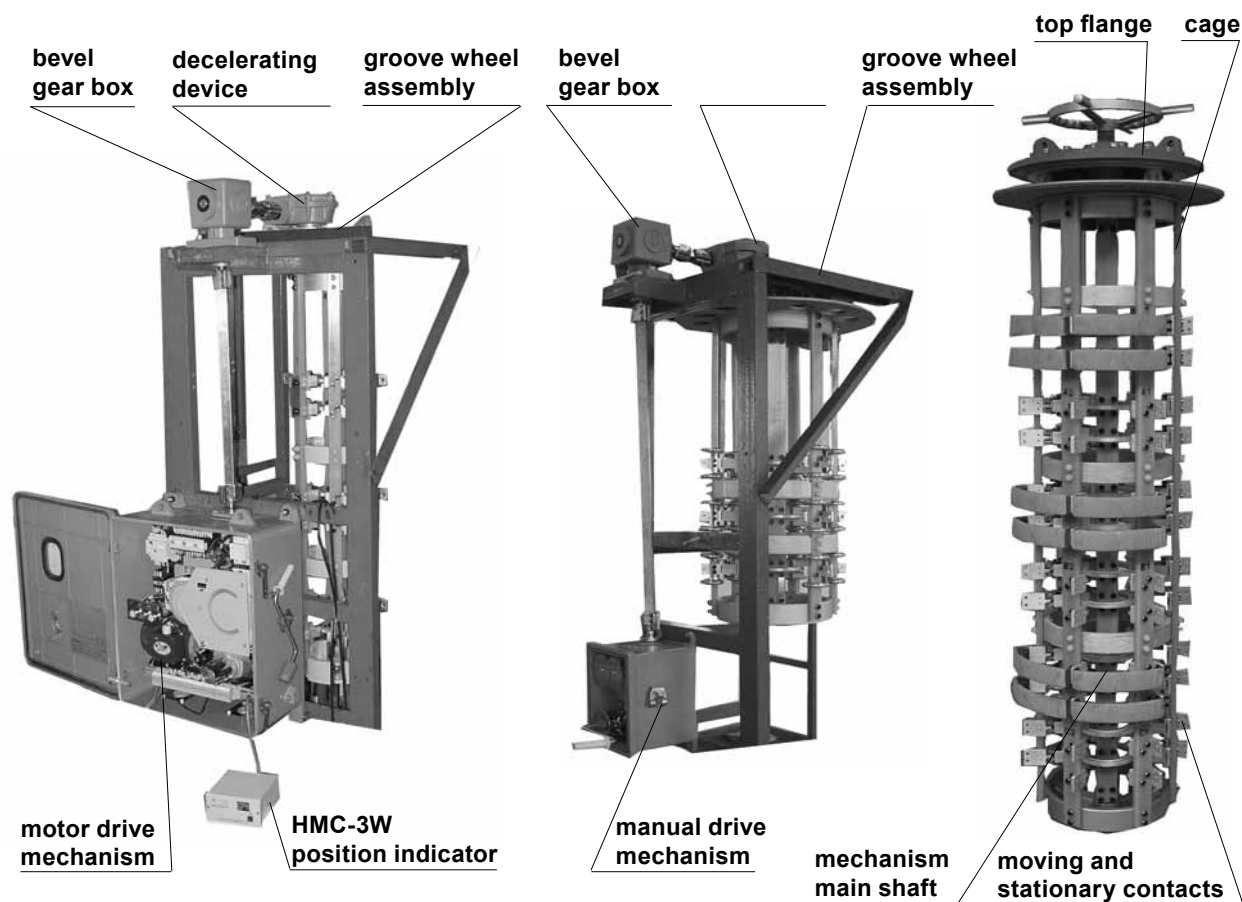


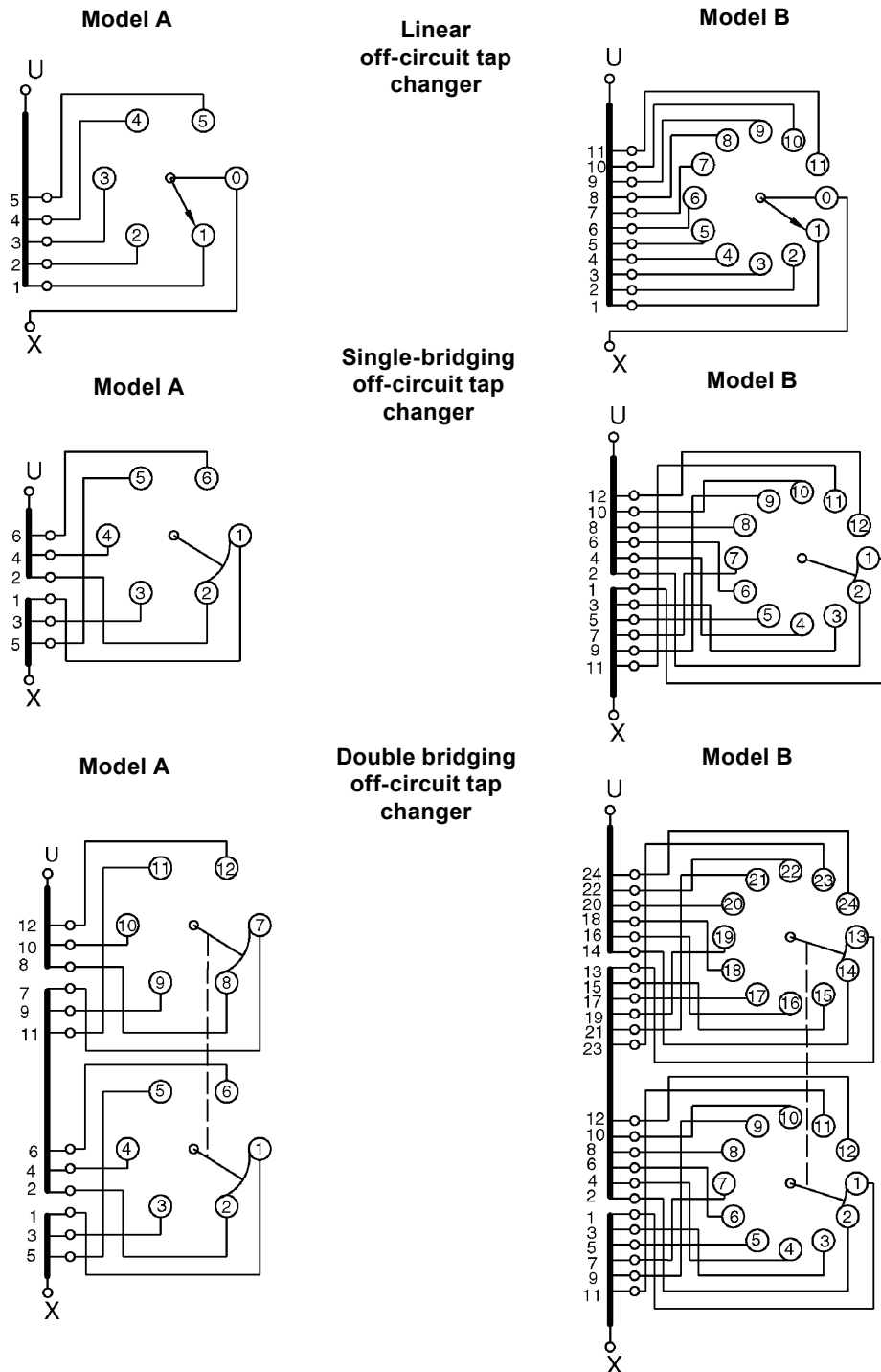
Fig.1 Ground motor drive type tap changer

Fig.2 Ground manual drive type

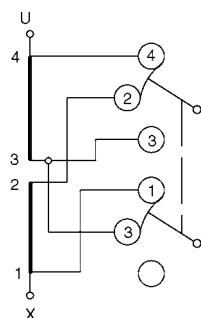
Fig.3 Cover hand wheel type

The ground motor drive tap changer is equipped with a motor drive unit. See fig.15 for connection and "CMA9 Motor Drive Unit Instructions" specifies the operating instructions for the motor drive unit.

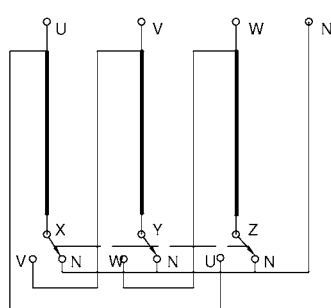
This instruction contains all the information for installing and operating of the three types off circuit tap changer.



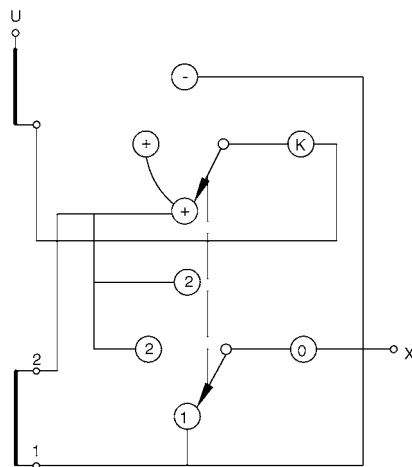
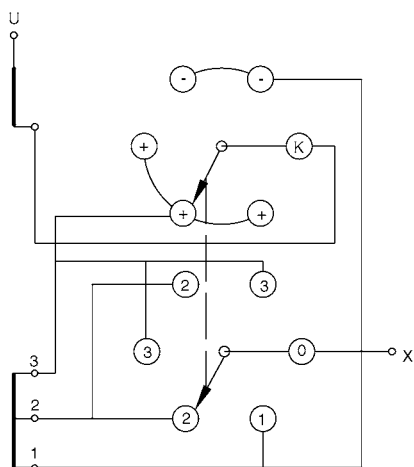
Serial-parallel transform



Y-D transform



Reversing



Tap position	1	2	3	4	5
Position for regulation	+2	+1	0	-1	-2
Connection mode	(K)-(+)	(K)-(+)	(K)-(+)	(K)-(-)	(K)-(-)
Connection mode	(0)-1	(0)-2	(0)-3	(0)-2	(0)-3

WSLII-XXX/XX-6×5

Tap position	1	2	3
Position for regulation	+1	0	-1
Connection mode	(K)-(+)	(K)-(+)	(K)-(-)
Connection mode	(0)-1	(0)-2	(0)-2

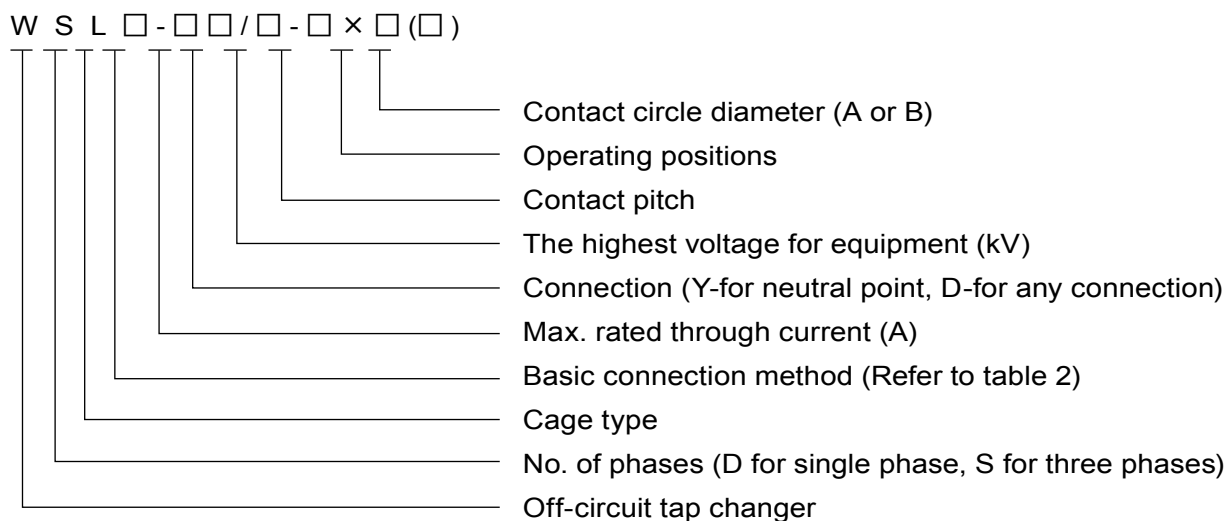
WSLII-XXX/XX-4×3

Fig.4(b) Basic connection diagram

Table 1

Code	IV	V	VI	VII	V III	II
Connection	Linear off-circuit tap changer for neutral application	Single-bridging off-circuit tap changer	Star-delta off-circuit tap changer	Double-bridging off-circuit tap changer	Series-parallel off-circuit tap changer	Reversing off-circuit tap changer

1.1 Designation of tap changer model



1.2 Functions and Application

Type WSL off-circuit tap changers apply to single pole or three poles oil immersed transformers with the max. rated through current of 300A,600A,800A,1000A,1200A and highest voltage for equipment of 12 kV, 72.5 kV and 126kV. And the operating position is: model A is 5; mode B is 11. The rated frequency is 50Hz~60Hz.

1.3 Normal service condition of the tap changer

1.3.1 The storage ambient temperature of OLTC is from -25℃ to 40℃ . The storage humidity of the OLTC should be no more than 85 percent.

The service temperature of standard designed OLTC is -25℃ to 40℃

If the temperature exceeds the range of above (-25℃ to 40℃), please specify when ordering.

1.3.2 To meet the ordering requirements and comply with the operating environment, if the requested service temperature is out of the range of -25℃ to 40℃ , the material and accessories of the OLTC will be specially designed and selected.

1.3.3 Vertical inclination of the tap changer should not be over 2% when it is installed on the transformer.

1.3.4 The tap changer shall be operated in areas without any corrosive or explosive gases.

2. Technical Data

All technical data are given in table 2, table 3, and table 4.

Overall dimensions of the tap changers refer to Appendix 1~22.

Table 2 Technical data of the tap changer

Item	Type		WSL, WDL							
1	No. of Phases		3-phase (WSL), single-phase (WDL)							
2	Max. rated through current(A)		600	800	1000	1200	1600	2000	2400	3000
3	Short-circuit current test (kA)	Thermal (3s)	9	12	15	15	20	24	26	30
		Dynamic (Peak)	22.5	30	37.5	37.5	50	60	65	75
4	Rated frequency (Hz)		50 or 60							
5	Insulation to ground (kV)	The highest voltage for equipment	12 72.5 126							
		Rated separate source AC withstand voltage(kV/50Hz,1min)	36 140 230							
		Rated lightning impulse withstand voltage (kV,1.2/50μs)	75 325 550							
6	Internal insulation		Refer to table 3							
7	Contact circle diameter		Type A: Ø350 Type B: Ø500 or Ø550							
8	Max. operating positions		Max. 5 for type A and max. 11 for type B, see appendix							
9	Mechanical life		Not less than 10,000 operations for manual driving Not less than 100,000 operations for motor driving							
10	Weight (kg)		Type A Max.: 100				Type B Max.: 195			

Remark: The tap changer can be designed and produced according to special requirements, please contact us accordingly Single-phase W □ L OCTC drawings are not including in this Technical Data, please contact us if you require single-phase W □ L OCTC.

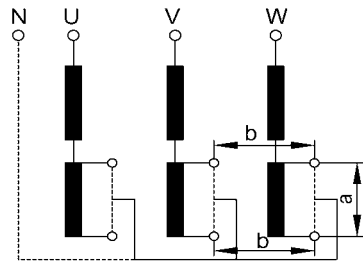
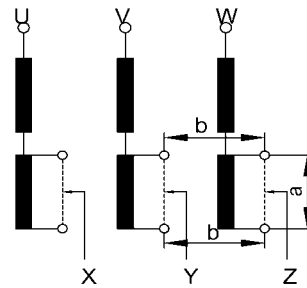
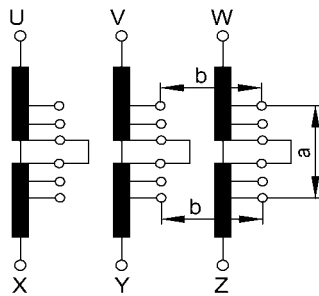
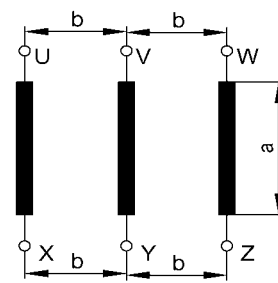
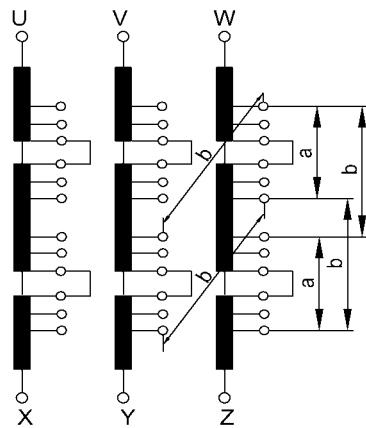
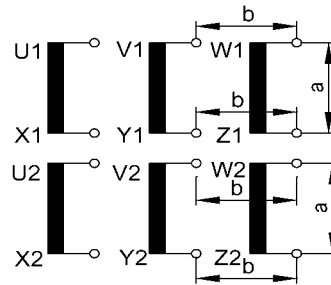
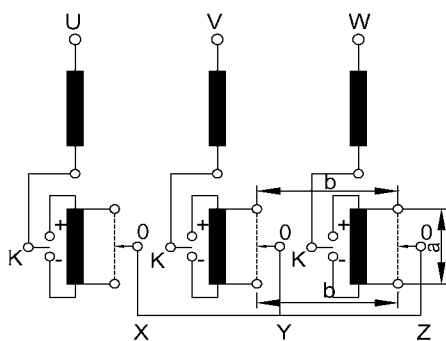
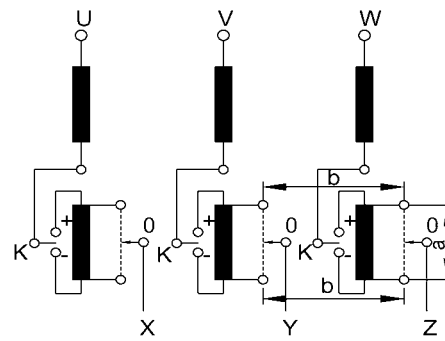
Table 3 Specific voltage stress of the transformer winding**Linear neutral point****Linear delta connection****Single-bridging****Y-D transform****Double-bridging****Serial-parallel****Y connection reversing****D connection reversing**

Table 4 Internal insulation level

Basic connection mode		Linear for Y connection (IVY)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-3	65	158	2-5	90	216
		4-5	65	158	6-11	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	72	226	-	72	226
126	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	92	272	-	92	272

Basic connection mode		Linear D connection (IVD)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-3	65	158	2-5	90	216
		4-5	65	158	6-11	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	260	575	-	260	575

Basic connection mode		Single bridging (V)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	260	575	-	260	575

Table 4-1 Internal insulation level

Basic connection mode		Y connection reversing (VIID)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-3	65	158	2-5	90	216
		4-5	-	-	6-11	65	158
	b	-	53	130	-	53	130
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	140	325	-	140	325
126	a	2-5	70	216	2-5	85	258
		-	-	-	6-11	45	200
	b	-	260	575	-	260	575

Basic connection mode		Serial-parallel transform (VIII)			
Contact diameter		ø350mm		ø500mm	
Highest voltage for equipment kV	Insulation gap	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	65	158	90	216
	b	53	130	53	130
72.5	a	-	-	90	216
	b	-	-	185	405
126	a	-	-	-	-
	b	-	-	-	-

Basic connection mode		Y-D transform (VI)			
Contact diameter		ø350mm		ø500mm	
Highest voltage for equipment kV	Insulation gap	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	75	170	90	216
	b	53	130	53	130
72.5	a	-	-	-	-
	b	-	-	-	-
126	a	-	-	-	-
	b	-	-	-	-

Remark: other requirements to internal insulation upon request.

Table 4-2 Internal insulation level

Basic connection mode		Y connection reversing (II)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50μs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50μs)
12	a	2-3	65	158	2-3	90	216
		4-5	65	158	4-5	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	72	226	-	72	226
126	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	92	272	-	92	272

Basic connection mode		D connection reversing (II)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50μs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50μs)
12	a	2-3	65	158	2-5	90	216
		4-5	65	158	-	-	-
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	260	575	-	260	575

Table 5 Motor Drive Unit Technical Data

Motor drive unit		CMA9
Motor	Rated power (W)	370
	Rated voltage (V)	380/3AC
	Rated current (A)	1.1
	Rate frequency(Hz)	50 or 60
	Rotate speed (r.p.m.)	1400
Rated torque on drive shaft (Nm)		40
Revolution of the drive shaft per switching operation		2
Revolution of the hand crank per switching operation		30
Running time per switching operation (S)		About 4
Max. operation positions		27
Voltage for control circuit and heater circuit (V)		220/AC
Heater power (W)		30
A.C. voltage test to ground (kV/50Hz, 1min)		2
Approx. weight (kg)		70
Protective degree		IP56
Mechanical endurance (operations)		≥80

3. Structure of the tap changer

This tap changer adopts cage structure and is categorized into three types by operation made: motor drive, ground manual drive and cover hand wheel. The cover hand wheel tap changer composes of a cover and a cage and the former two types tap changer also contain a motor operating cabinet or a manual operating cabinet. .

3.1 Cover hand wheel type tap changer (Fig.3)

Cover hand wheel type tap changer composes of head flange and contacts system.

3.1.1 Cover: see fig.6 for the head flange of cover hand wheel type tap changer. The force is transmitted through the hand wheel to the driving shaft and then to the moving contacts of the contacts system through coupling box.

3.1.2 Contacts system: the contacts system consists of moving contacts on a shaft and stationary contacts attached to a cage.

3.2 Ground manual drive type tap changer (Fig.2)

Ground manual drive type tap changer composes of head flange, contacts system, manual

operating unit and bevel gear box.

3.2.1 This head flange is different from the hand flange of cover hand wheel type tap changer. It has a set of groove wheels and a gear decelerating device.

3.2.2 Contacts system: This contacts system is the same as the contacts system of cover hand wheel type tap changer.

3.2.3 Manual operating unit (Fig.5) Manual operating unit consists of tank, tank cover, internal gear mechanism and position indicator. 33 turns manual operation makes one position tap change.

3.2.4 Distance switch positioning provides double protections which make the off circuit tap changer more reliable.

3.3 Ground motor drive type tap changer (Fig.1)

The head flange and contacts system are the same as those of ground manual drive type tap changer. "CMA9 operating instruction" specifies the motor drive unit (Fig.6).

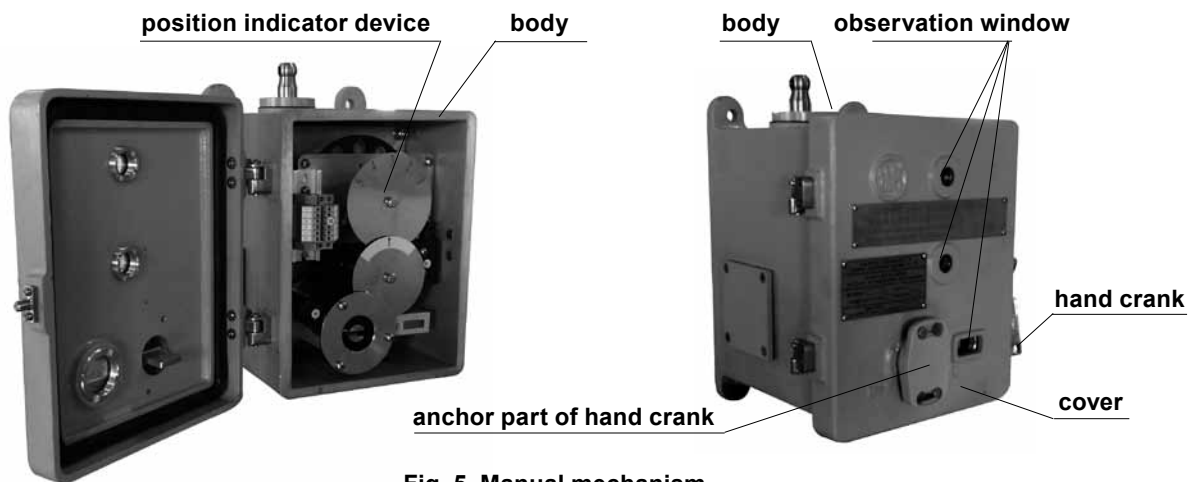


Fig .5 Manual mechanism

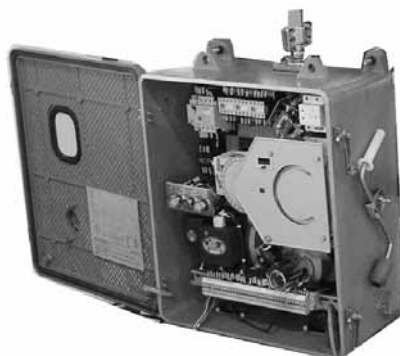


Fig.6 CMA9 motor drive mechanism

4. Technical Requirements

4.1 No mechanical malfunctions within 10 after tap changer is connected with the motor drive unit at the adjustment position.

4.2 Measure the contact pressure and contact resistance after they are assembled, the pressure should be $50\text{N} \pm 10\text{N}$, the pressure of the upper and lower contact point should be even and the contact resistance $\leq 350\mu\Omega$.

4.3 Perform gas pressure test after the flange is mounted on the top. There shall not be any leakage within 24 hours under the air pressure of 0.08MPa.

4.4 As for head hand wheel type tap changer, when the head position indicator is at the middle position, the moving contact should be at the middle of fixed contact accordingly.

4.5 As for ground motor drive type tap changer, when the motor drive unit stops, the moving contact should be at the same position as the motor drive unit indicates and at the middle position of fixed contact.

4.6 As for ground manual drive type tap changer, when unit operates 10 turns, the moving contact should be at the same position as the manual drive unit indicates and at the middle position of the fixed contact.

4.7 After the tap changer is connected with the motor drive unit, one tap change is complete at manual 30 turns, that is, the motor drive indicative red line is back at its original position (to the middle of the window), for both directions, the differences between the turns when the tap changer's contacts are at positions and the turns when the red line in the indicator is at the window is not more than 3.75 turns.

4.8 When the tap changer in the transformer oil undergoes through 1.2 times of rated current, the temperature rise of oil over contacts should not be over 15K.

5 Storage and Transportation

5.1 Tap changer should be kept in a warehouse where it is clean, dry and free of corrosive gas with anti-dust and anti-moisture protection. Temperature is between -25°C and $+40^{\circ}\text{C}$. The relative humidity should not be over 85%.

5.2 Temporary mounting is necessary during transportation for tap changer over 2 meters long in order to prevent tap changer from distortion or damage due to wobble. Dismantle the

temporary mounting before putting the equipment into service.

6. Documents

6.1 Quality certificate

6.2 Packing list

6.3 Operating instructions

7. Scope of delivery

The tap changer equipment is shipped as follows:

7.1 Off circuit tap changer

7.2 For the tap changer driven by motor drive unit, the tap changer will be delivered with Motor drive Unit type CMA9, middle drive gear box, drive shaft

7.3 For ground manual drive type off-circuit tap changer, the tap changer will be delivered with hand wheel crank, middle drive gear box and drive shaft

8. Installation

8.1 Initial check

8.1.1 Check the tap changer's specification against the requirements of the transformer and make sure the approval, operating instruction packing list and other technical documents are all available.

8.1.2 Check and make sure that the tap changer is in good condition and free of distortion or damage.

8.1.3 Operate the tap changer for one complete operation cycle to make sure that the tap changer work properly and the contact work position should be the same as what the position indicator shows.

8.1.4 Measure contact resistance for each position, Make sure the results are in accordance with those on the certificate.

8.2 Mounting

This type of tap changer doesn't contain oil compartment and can be directly mounted into the transformer oil tank.

8.2.1 Installation of the off-circuit tap changer onto the tank cover type transformer (fig. 7)

Clean all the surfaces for the gaskets (head bottom, mounting flange). Put on oil-proof gasket on the mounting flange. Slowly lower the tap changer into the transformer. Be careful not to damage the tap changer terminals.

After the confirmation of its right position, the tap changer can be mounted over the installation flange of the transformer.

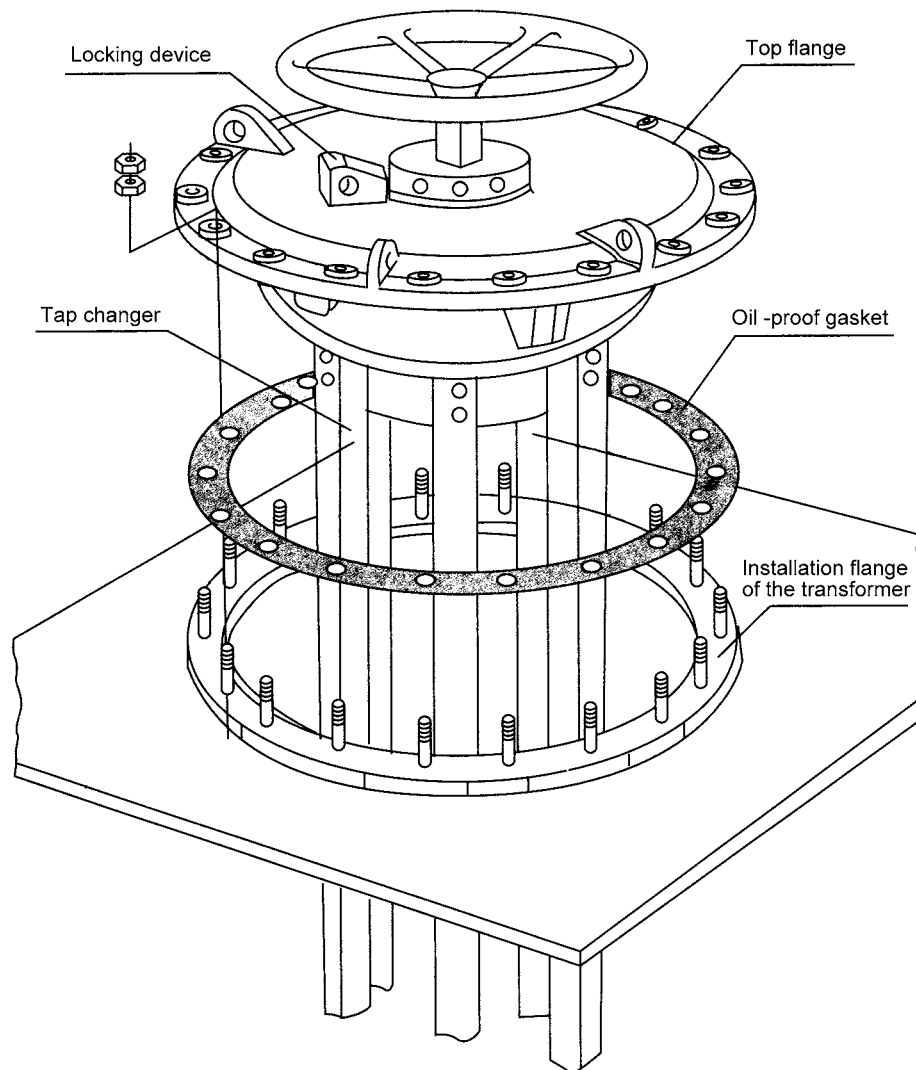


Fig.7 Installation diagram of the tap changer on the tank cover type transformer

8.2.2 Installation of the off-circuit tap changer onto the Bell type cover (fig. 8)

8.2.2.1 Place the tap changer vertically and dismantle the cover flange.

8.2.2.2 Loosen the three hex screws which connect between the middle flange and the supporting flange. Take out the middle flange; make sure to keep all the demounted parts.

8.2.2.3 Lift the tap changer up and place the supporting flange onto the supporting shelf. Adjust the relative position between the supporting flange and the cover flange before their mounting.

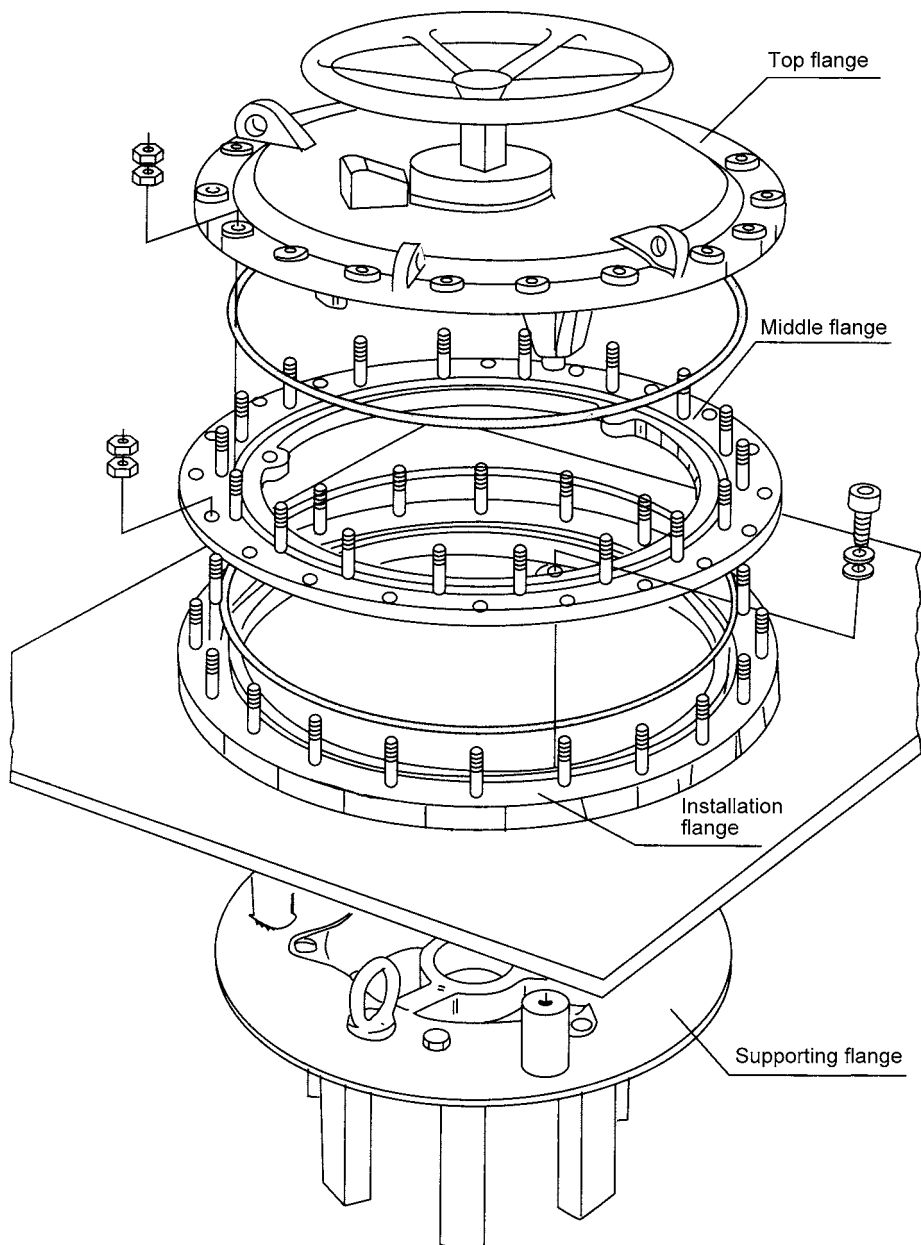


Fig.8 Installation diagram of the tap changer mounting on the bell type transformer

If it's difficult to verify the relative position of supporting flange and cover flange, pre-mounting of the bell type cover to the transformer can be arranged in order to adjust.

Pre-mounting Process

Lift up the bell type cover and put it down covering the transformer; clean the sealing surface and put on gasket, fasten the middle flange onto the transformer mounting flange. Lift up the tap changer through two rings on the supporting flange and adjust the relative position so that the tap changer is mounted on the middle flange. Clean the sealing surface and put on the gasket, then finally install the top cover flange.

Caution: During mounting, the three triangle marks on the supporting flange, middle flange and cover flange should lined up towards each other (Appendix 13,14)

(a) All of the tap leads should be carefully handled and properly fastened.

(b) There should be no pulling force between any tap leads and the tap changer.

(c) The leads between flange of the tap changer cover and the transformer cover are to be grounded.

Caution!

The transformer cannot be energized until the drive unit and the off-circuit tap changer are in the same operating position. That is, the connection between the tap changer and the motor drive unit must be checked before energizing the transformer.

8.2.3.1 The tap changer is installed according to 8.2.1 and 8.2.2

8.2.3.2 Mount the bevel gear box on the supporting plate of the transformer head; make sure the horizontal output shaft of the bevel gear box is lined up with the output shaft of the head gear box. Set the size of the drive shaft by leaving a 2 mm gap. After machining the drive shaft to its specified length, connect the bevel gearbox with the tap changer headgear box. Pay attention to the adjustment of the horizontal position. Make sure that the gearbox output shaft, drive shaft and the bevel gearbox output shaft are all lined-up.

8.2.3.3 Install the motor drive unit or the manual unit onto the side tank of the transformer, (caution: the surface must be flat otherwise the tank could become warped or even cannot close after mounting the bolts). The output shaft must be vertical to the ground and in alignment with the vertical output shaft of the bevel gearbox on the transformer head supporting plate. Set the size of the drive shaft by leaving a 2 mm gap. After machining the drive shaft to its specified

length, connect the motor drive unit or the manual unit to the bevel gearbox and fasten the bolts.

8.2.4 Connection of the motor unit and the tap changer

8.2.4.1. The indicated position in the motor unit should be in accordance with the indicated position in the tap changer and then couple horizontal shaft with vertical shaft.

8.2.4.2 Manually operate the motor unit in both directions with the following method and record moving turns of the tap changer:

Operate the motor unit in one direction until the red arrow in the center of the tap changer's cover stops at a number. Then keep on operating and start recording the operating turns until the middle of the green zone is shown in the center of the displaying window. "m" is the turns needed. Likewise "n" is the recorded turns needed in the opposite direction. (See fig. 9)

8.2.4.3 Adjustment: if m-n or n-m 3.75 turns, no adjustment is required. Otherwise, the following method may be applied: disconnect the vertical shaft from the motor drive unit and operate the motor unit by 3.75 turns towards the bigger number direction then reconnect the vertical shaft to meet the "m-n or n-m 3.75" requirement.

8.2.4.4 Measure the transformer's transforming ratio at each tap position.

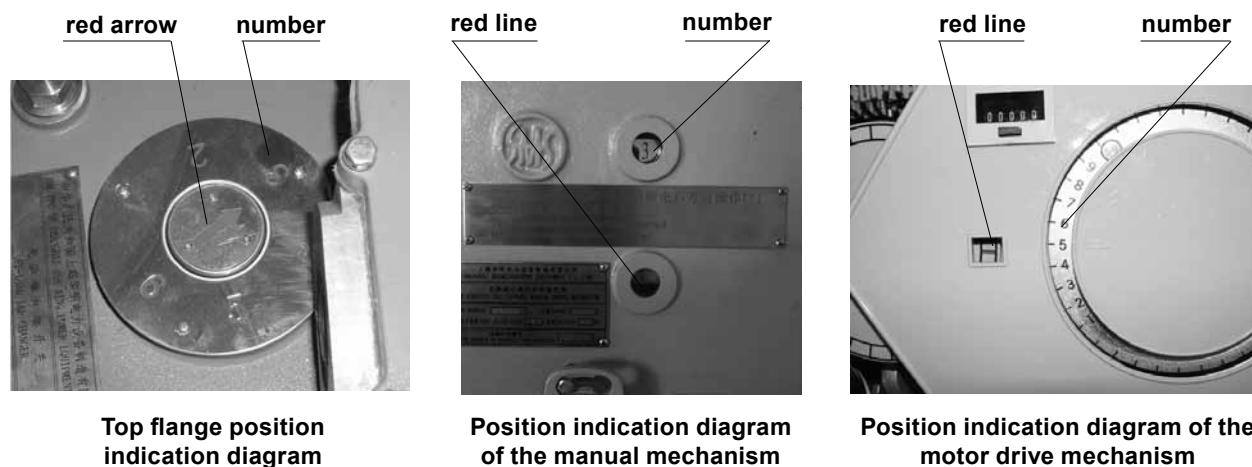


Fig.9 Position indication diagram

9. Drying Procedure

The tap changer is to be dried with the transformer; the drying temperature and time are the same as that of the transformer. The electric insulation level of the tap changer can only be guaranteed after the drying procedure.

Note:

- a. Do not operate the tap changer without oil after drying. If necessary, smear all contacts with some transformer oil before operation
- b. The tap changer should be immersed into the transformer oil immediately after the drying process.
- c. Loosen the bleeder on the head flange of the tap changer to release gas during oil refilling of the transformer tank. The transformer oil should strictly adhere to the standard, especially regarding the insulation level and the water percentage level.

10. Operation

The off-circuit tap changer can only be operated when the transformer is de-energized.

10.1 Type hand wheel on the head tap changer operation

Make sure the transformer is disconnected. Loosen the stop-screw on the tap changer head so that the hand wheel can be turned. Operate the tap changer to the desired operating position by turning the hand wheel. After each tap changing, the red arrow on the cover must be aligned. Check the position of the tap changer through the inspection window on the tap changer head. Align the stop screw with the locking hole and fasten the stop screw to finish the operation. (See Fig. 10)

10.2 Type Ground Manual tap changer operation

Open the hand crank cover, take out the fixture part and insert into the hand crank then turn 33 cycles. Observe through the window whether the position indication is right. Keep turning until the red arrow lined up with the red line of the indication plate. Take out the hand crank and insert the fixture part so that one tap change is completed, the transformer can resume operating. (See Fig. 5)

10.3 Operating the tap changer by means of the motor drive unit

The transformer must be de-energized before changing the tap position of the motor drive type off-circuit tap changer.



Caution: The stop screws must be placed into the position-locking holes over the perimeter of the locking wheel.

Fig.10 Stop screw

The motor drive unit is designed with cable leads inside. The cable leads are connected to the auxiliary non-source leads of the transformer circuit breaker so that the motor drive unit cannot be operated when the circuit breaker is at its closing position. After making sure the transformer is de-energized, by pressing the raise button or lower button on the motor drive cabinet, the off-circuit tap changer can go from one tap position to the next to finish one tap change.

11. Maintenance

11.1 Operate the tap changer through its complete operating cycle at least once a year to refresh contact surface.

11.2 If the tap changer has not been operated for a long time, several pre-run operating cycles are recommended before setting it to the desired position.

11.3 Careful alignment of connection position is needed before operation

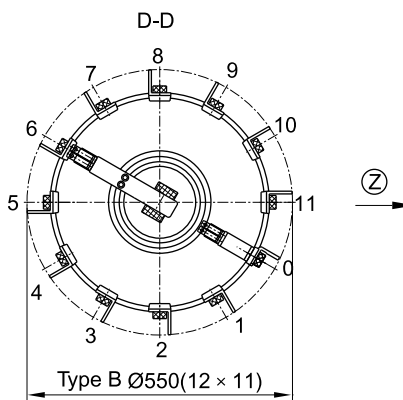
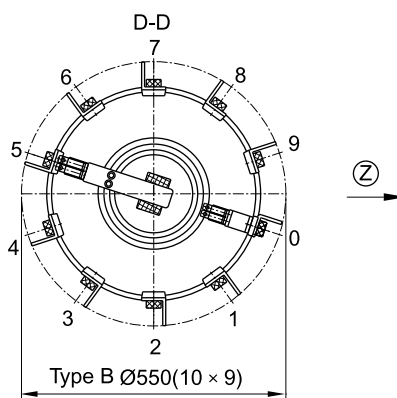
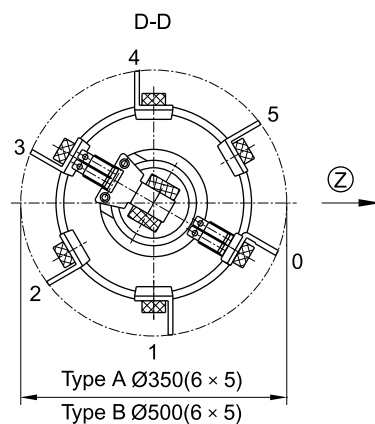
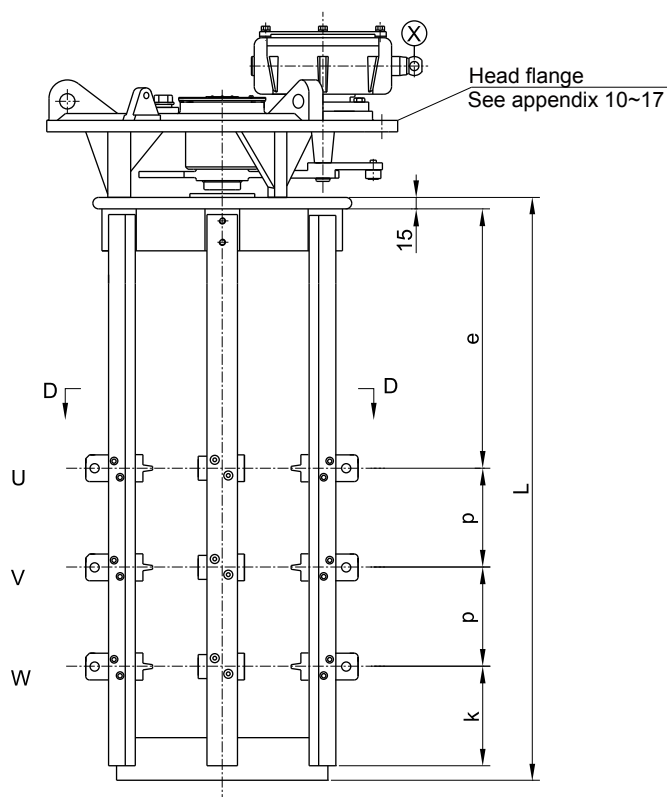
11.4 Check the reliability of the grounding connection

11.5 Check the interlock function between the tap changer motor drive unit and the transformer circuit breaker at least once a year to ensure its reliability.

12. Appendix

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Appendix 1 600A-1200A Linear regulation, overall dimension



⊗ Driving shaft(with bevel gear)

⊙ Direction of driving shaft(with bevel gear)

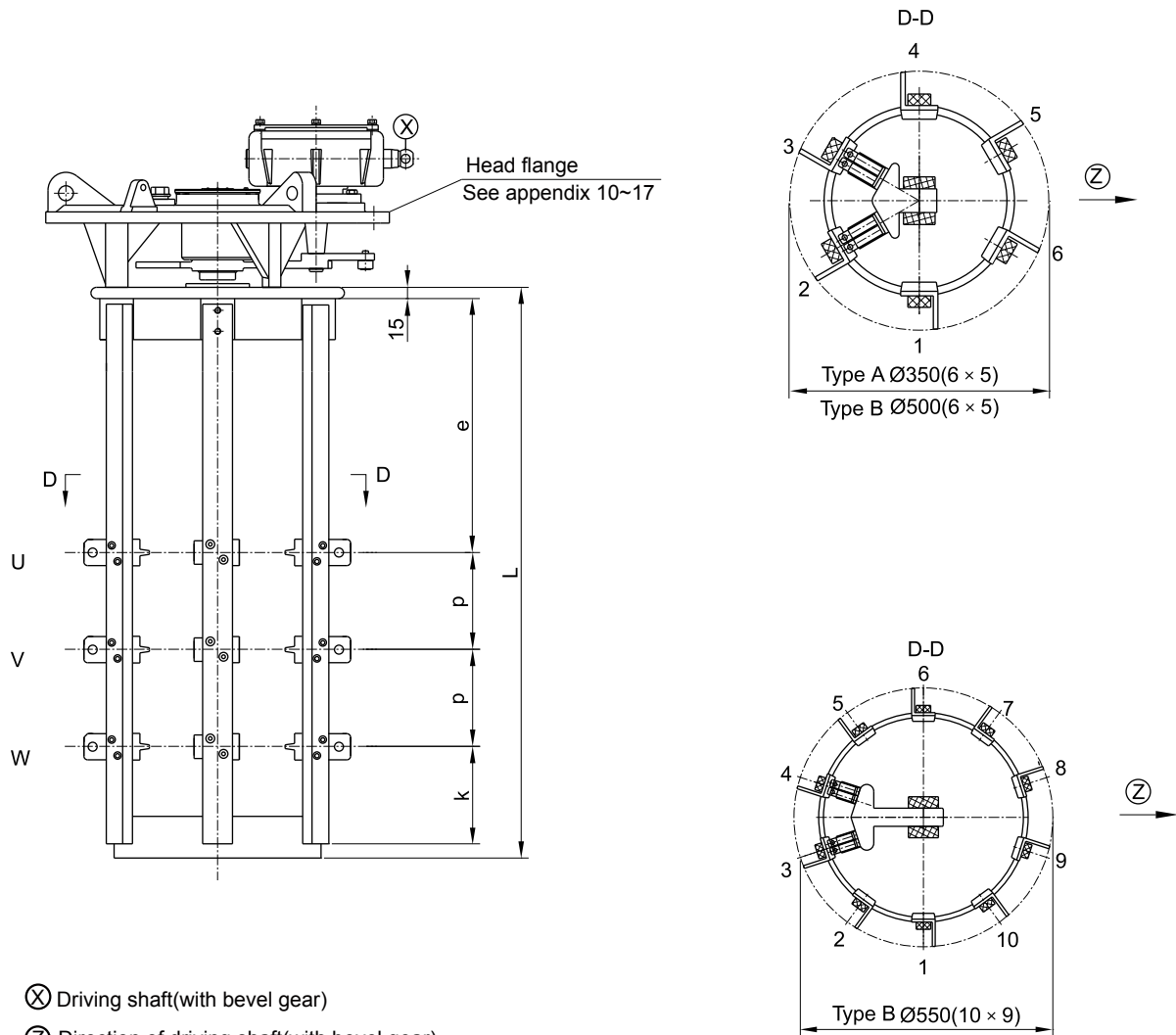
3-phase	Y				D			
Highest voltage for equipment	e	p	k	L	e	p	k	L
12kV	200	130	130	624	200	130	130	624
72.5kV	340	130	140	774	340	280	140	1074
126kV	470	170	150	994	470	410	150	1474

Note: ① : Type A only for I ≤ 800A

② : Contact size see appendix 20

Unit: mm

Appendix 2 600A-1200A Single-bridging regulation, overall dimension

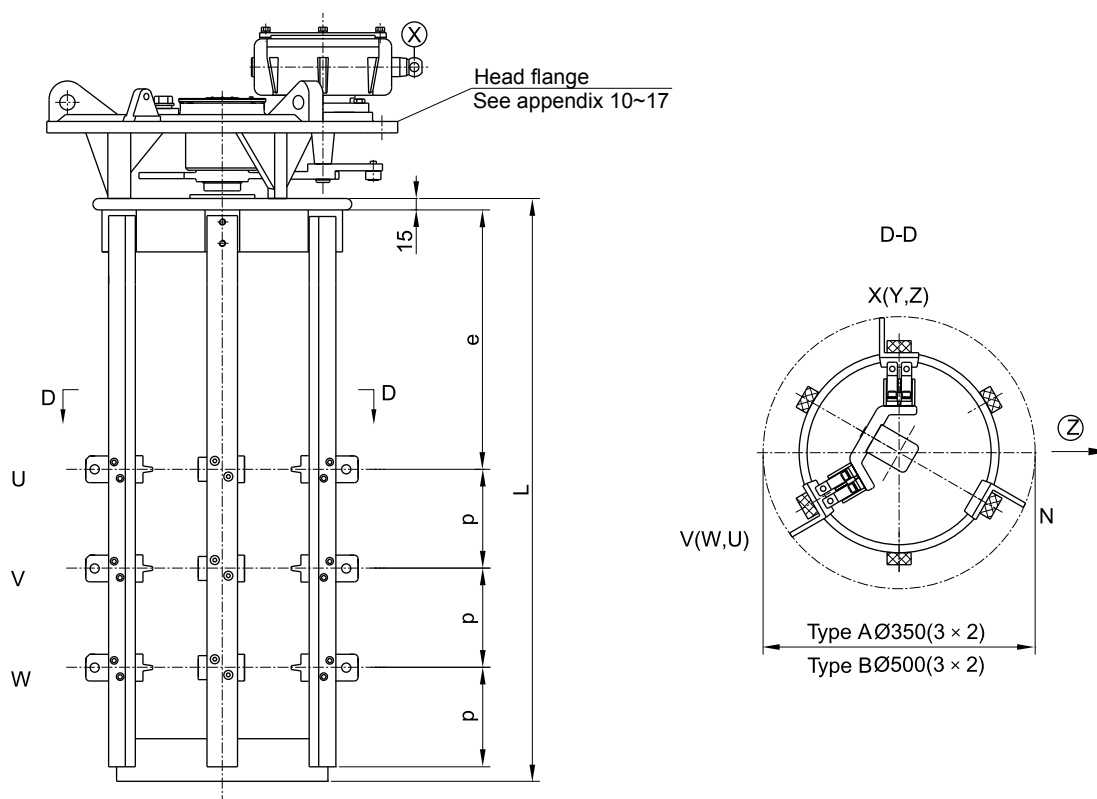


3-phase	D			
Highest voltage for equipment	e	p	k	L
12kV	200	130	130	624
72.5kV	340	280	140	1074
126kV	470	410	150	1474

Note: ① : Type A only for $I \leq 600A$
 ② : Contact size see appendix 20

Unit: mm

Appendix 3 600A-1000A Y-D transform regulation, overall dimension



⊗ Driving shaft(with bevel gear)

⊙ Direction of driving shaft(with bevel gear)

Highest voltage for equipment	e	p	L
12kV	200	130	624
72.5kV	340	280	1214

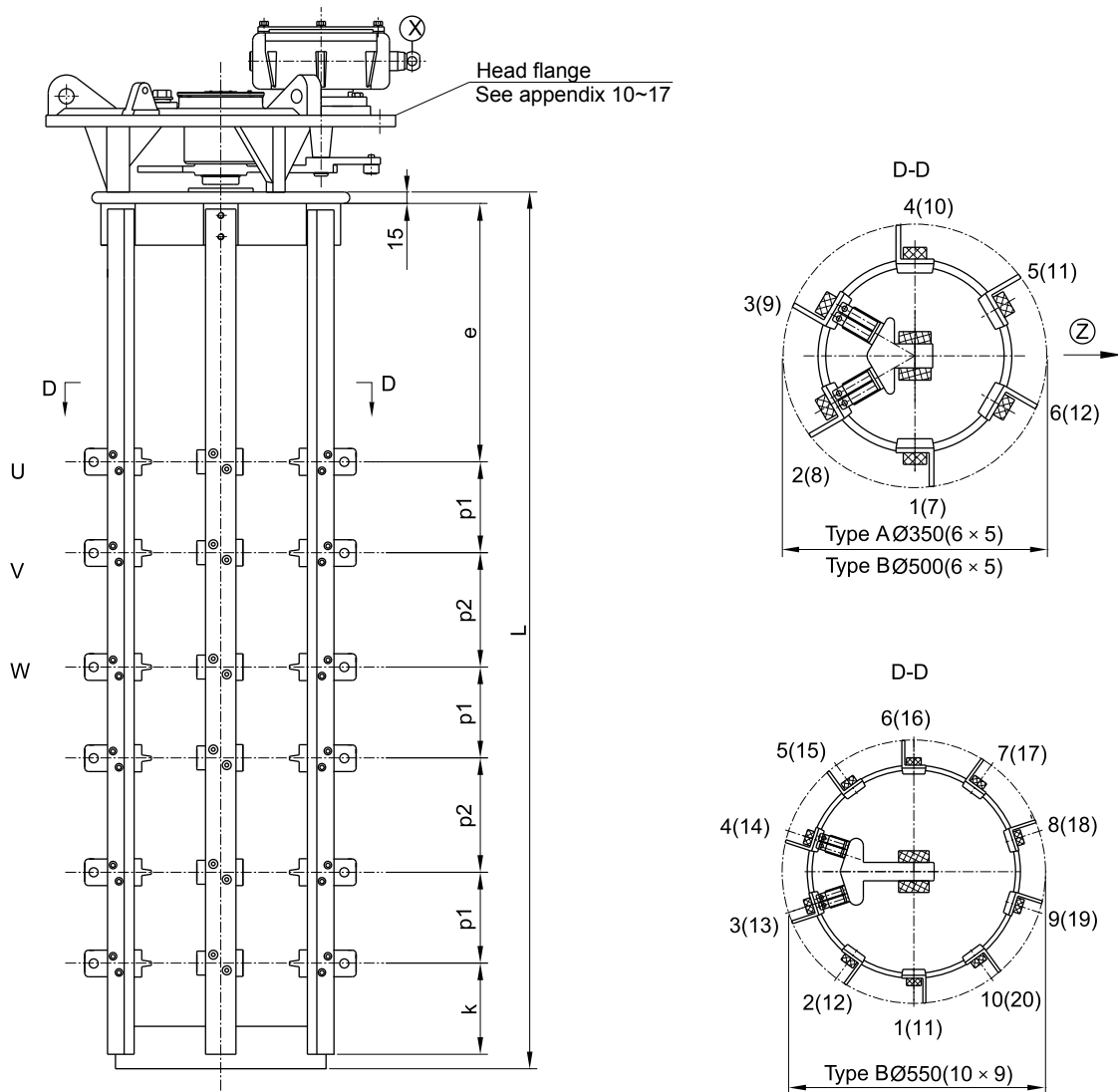
Outer dia, $\varnothing 750$ upon special request

Note: ⊕ : Type A only for $I \leq 600A$

⊙ : Contact size see appendix 20,

Unit: mm

Appendix 4 600A-1000A Double-bridging regulation, overall dimensions



⊗ Driving shaft(with bevel gear)

Ⓐ Direction of driving shaft(with bevel gear)

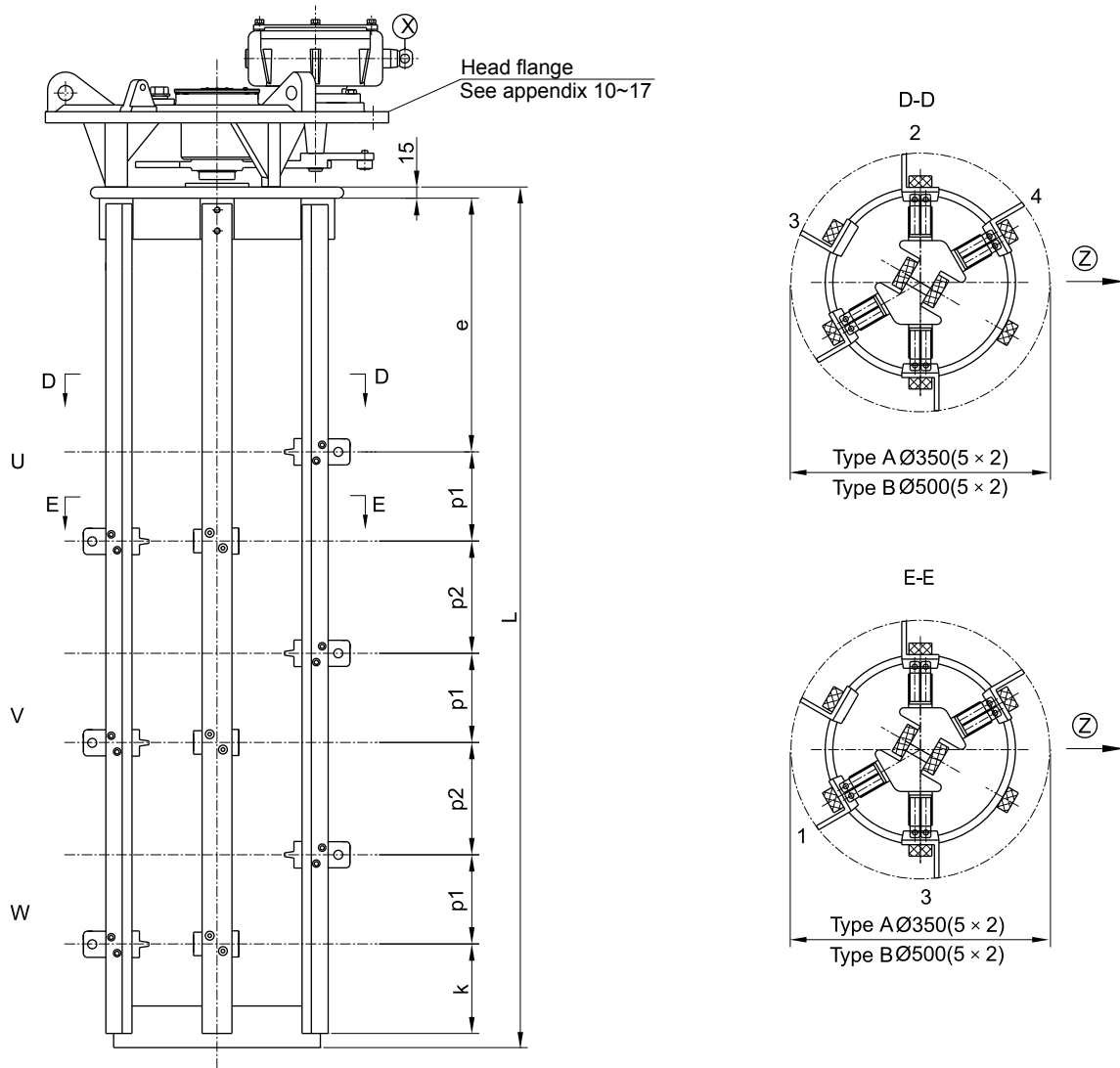
Highest voltage for equipment	e	p1	p2	k	L
12kV	200	120	150	120	1014
72.5kV	340	160	280	140	1554
126kV	470	170	410	150	1984

Note: Ⓐ : Type A only for I ≤ 600A

Ⓑ : Contact size see appendix 20,

Unit: mm

Appendix 5 600A-1000A Serial-parallel transform regulation, overall dimension



⊗ Driving shaft(with bevel gear)

⊙ Direction of driving shaft(with bevel gear)

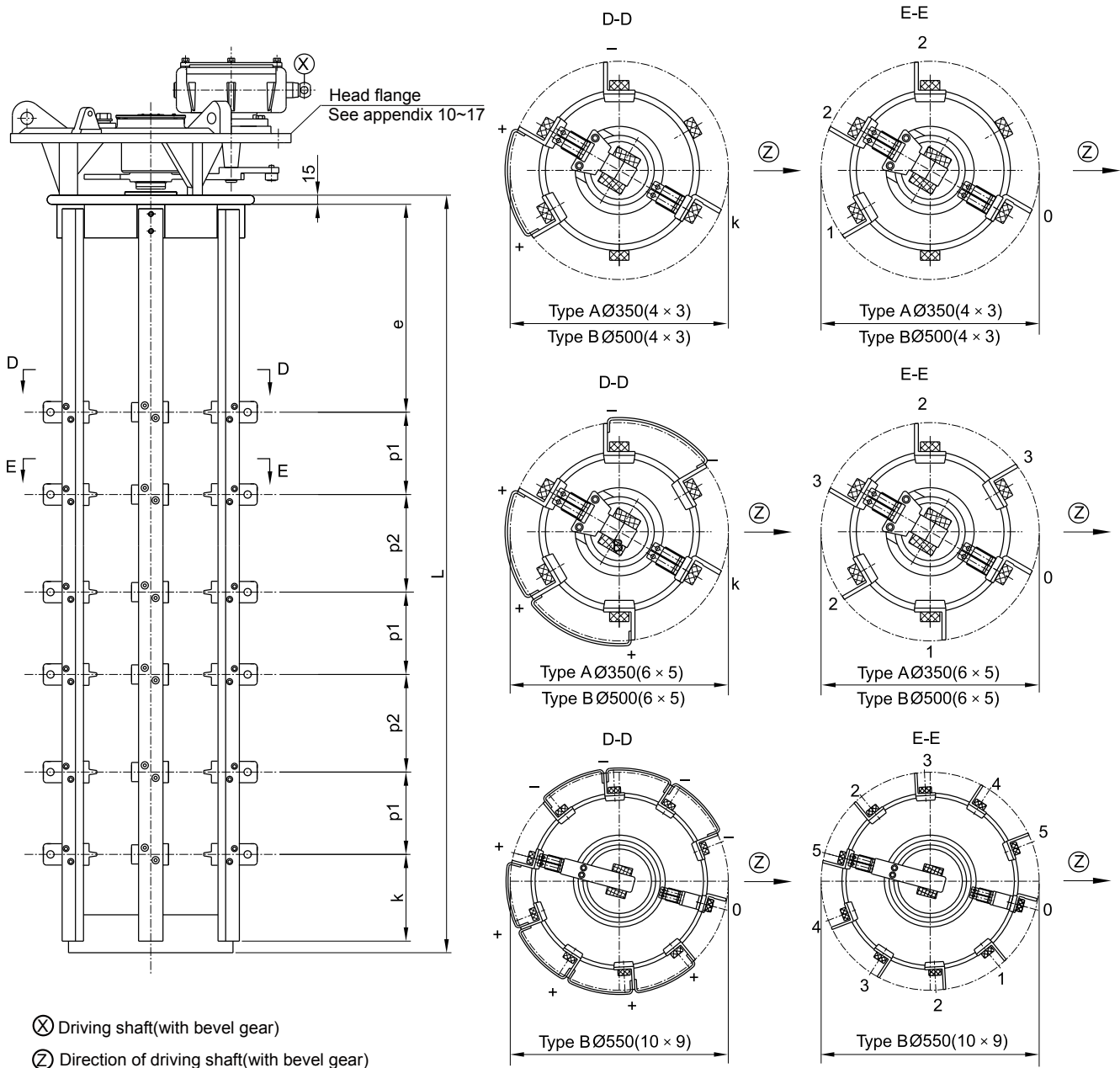
Highest voltage for equipment	e	p1	p2	k	L
12kV	200	120	150	120	1014
72.5kV	340	160	280	140	1554

Note: ① : Type A only for $I \leq 600A$. Highest voltage for equipment is 12kV

② : Contact size see appendix 20

Unit: mm

Appendix 6 600A-1000A Reversing regulation, overall dimensions



3-phase	Y					D				
Highest voltage for equipment	e	p1	p2	k	L	e	p1	p2	k	L
12kV	170	120	120	120	904	200	120	150	120	1014
72.5kV	340	135	160	145	1244	340	160	280	140	1554
126kV	470	170	170	150	1504	470	170	410	150	1984

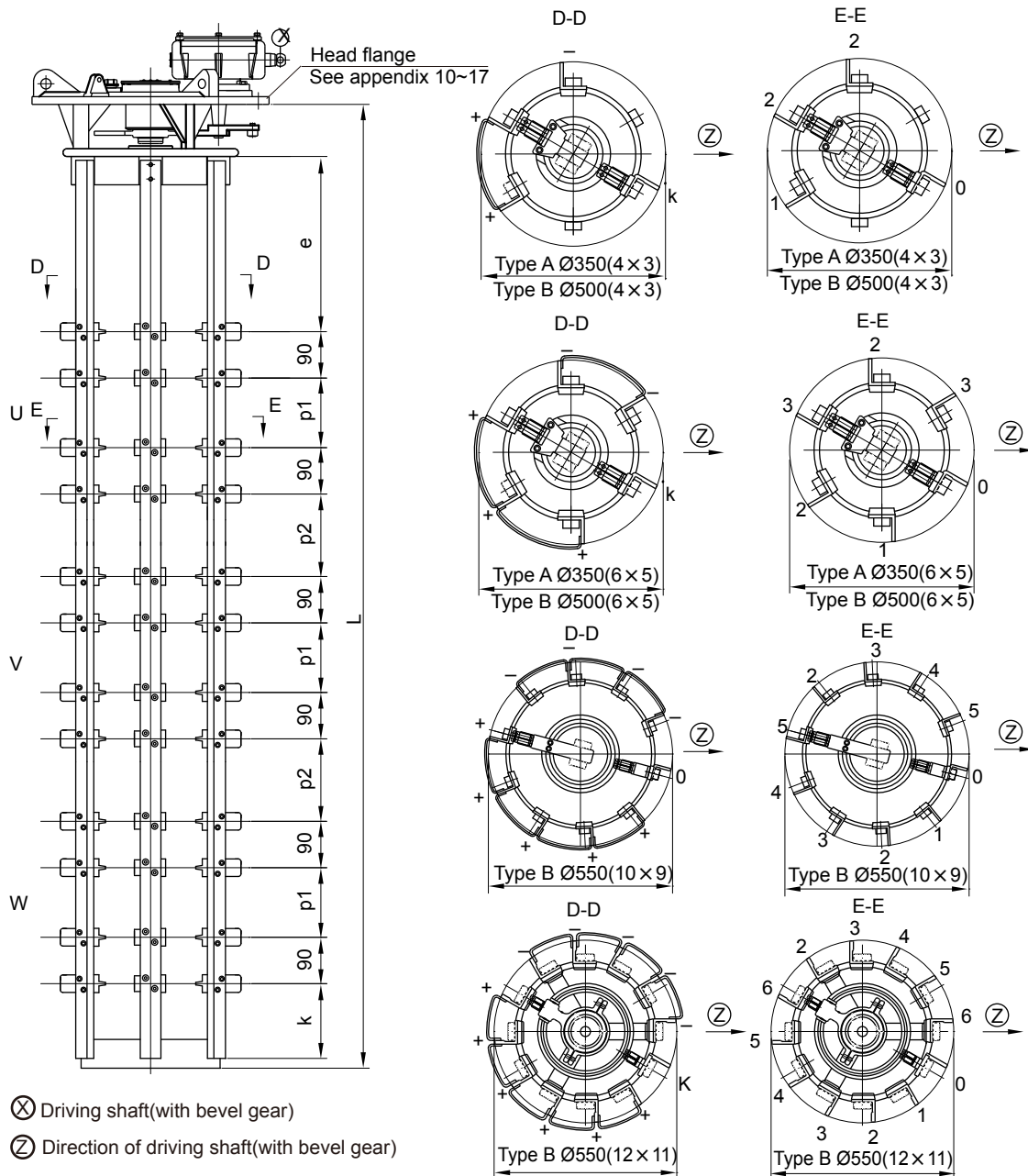
Note: ①: Type A only for $I \leq 800A$

②: Contact size see appendix 20

③: Standard product, only "+" connects with "+" and "-" with "-", like showing in "D-D", other connection by user themselves.

Unit: mm

Appendix 7 1000A-2000A Reversing regulation, overall dimensions



3-phase	Y				
Highest voltage for equipment	e	p1	p2	k	L
12kV	170	135	135	100	1586
72.5kV	340	135	160	145	1870

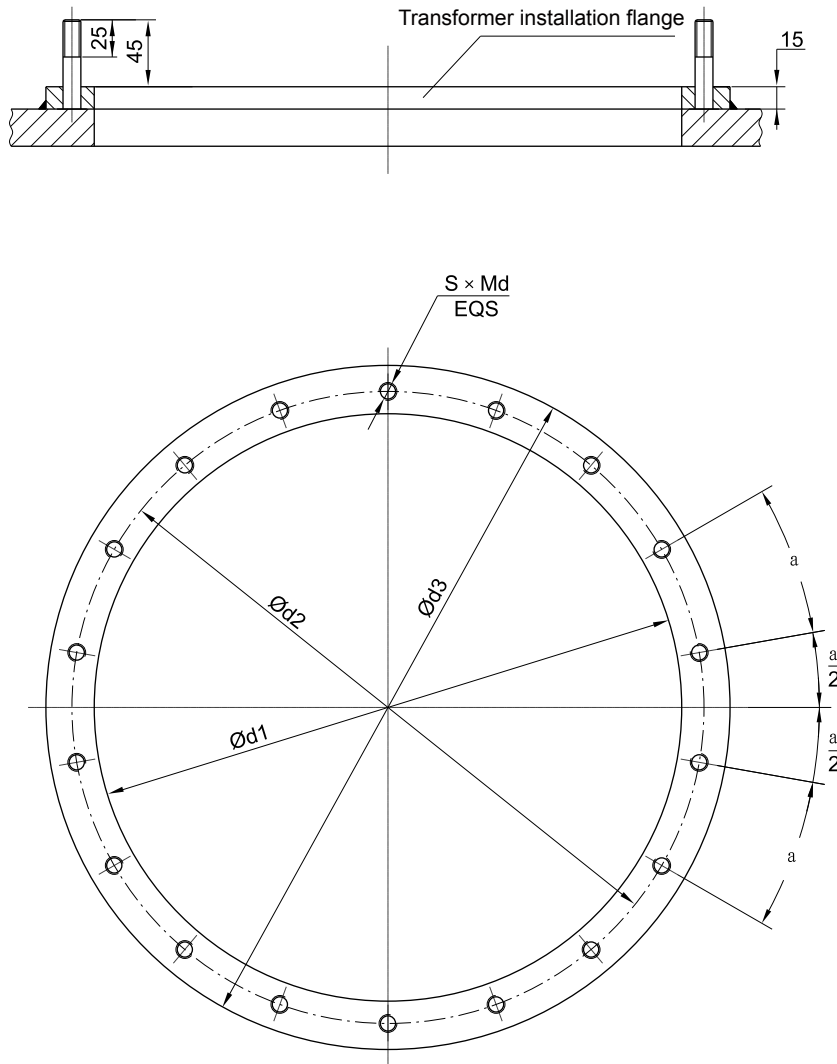
Note: ①: Type A only for I :1000A-1200A

②: Contact size see appendix 20

③: Standard product, only "+" connects with "+" and "-" with "-", like showing in "D-D", other connection by user themselves.

Unit: mm

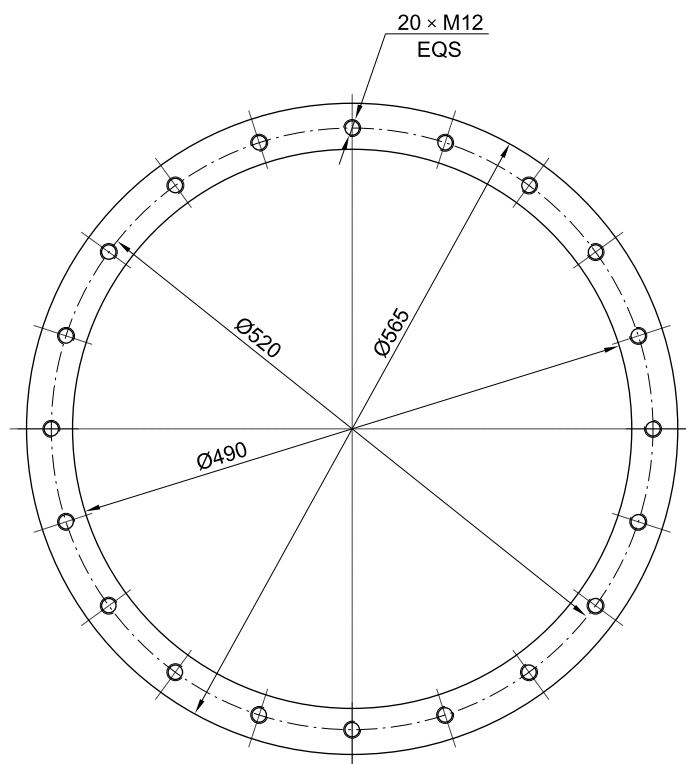
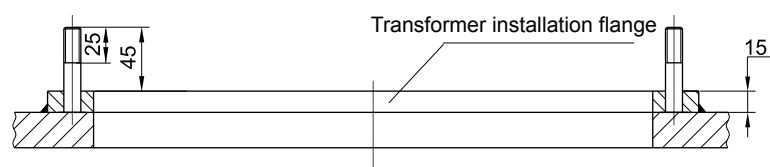
Appendix 8 Installation flange for standard tank type cover, overall dimensions



	d1(Dia)	d2(Dia)	d3(Dia)	Screw distribution S-Md	Distribution angle a
Type A	Ø395	Ø425	Ø460	18-M12	20°
Type B(Ø500)	Ø520	Ø550	Ø590	20-M12	18°
Type B(Ø550)	Ø570	Ø600	Ø640	20-M12	18°

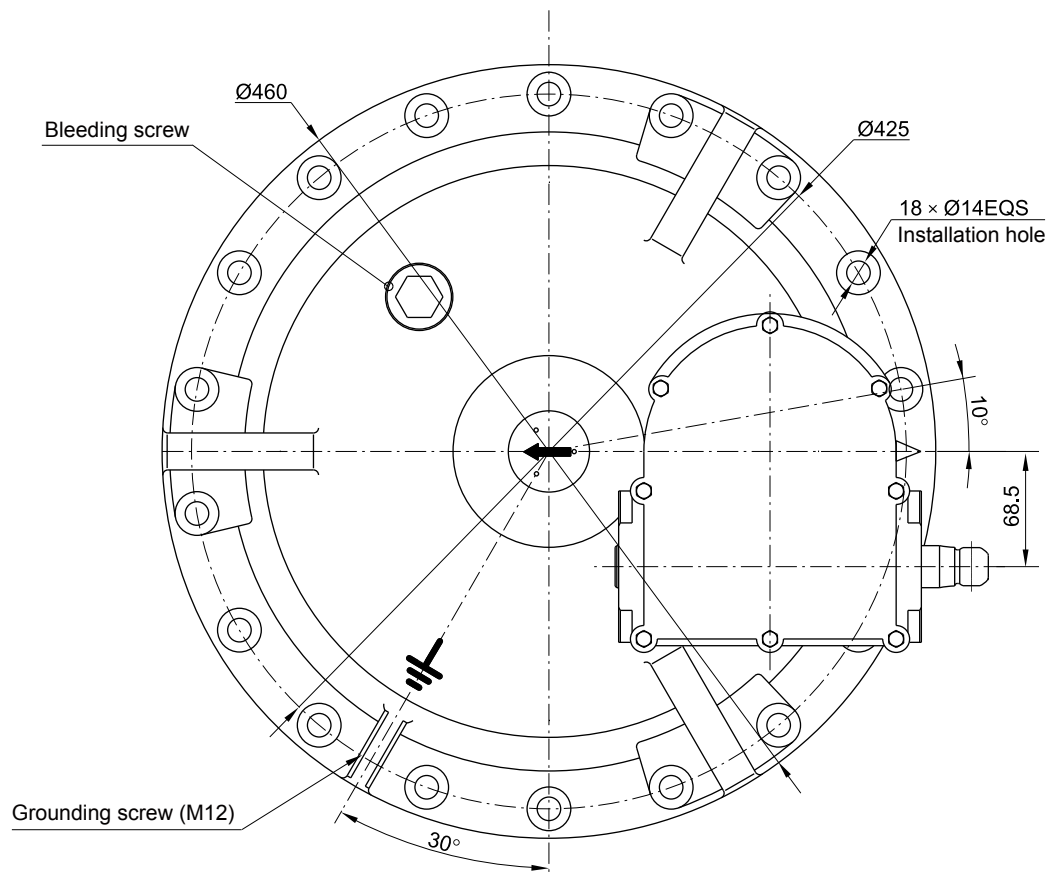
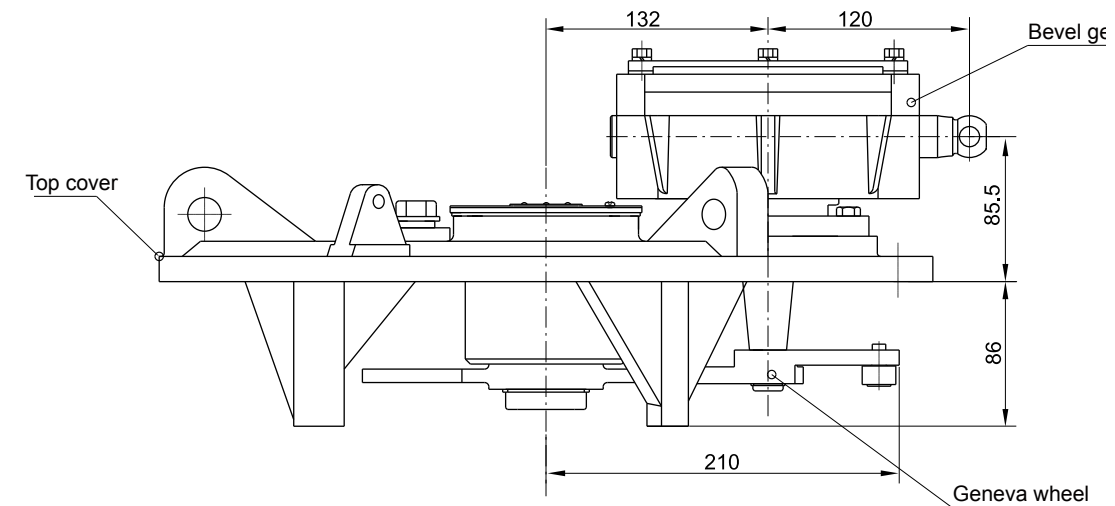
Unit: mm

Appendix 9 Installation flange for bell type tank cover, overall dimensions



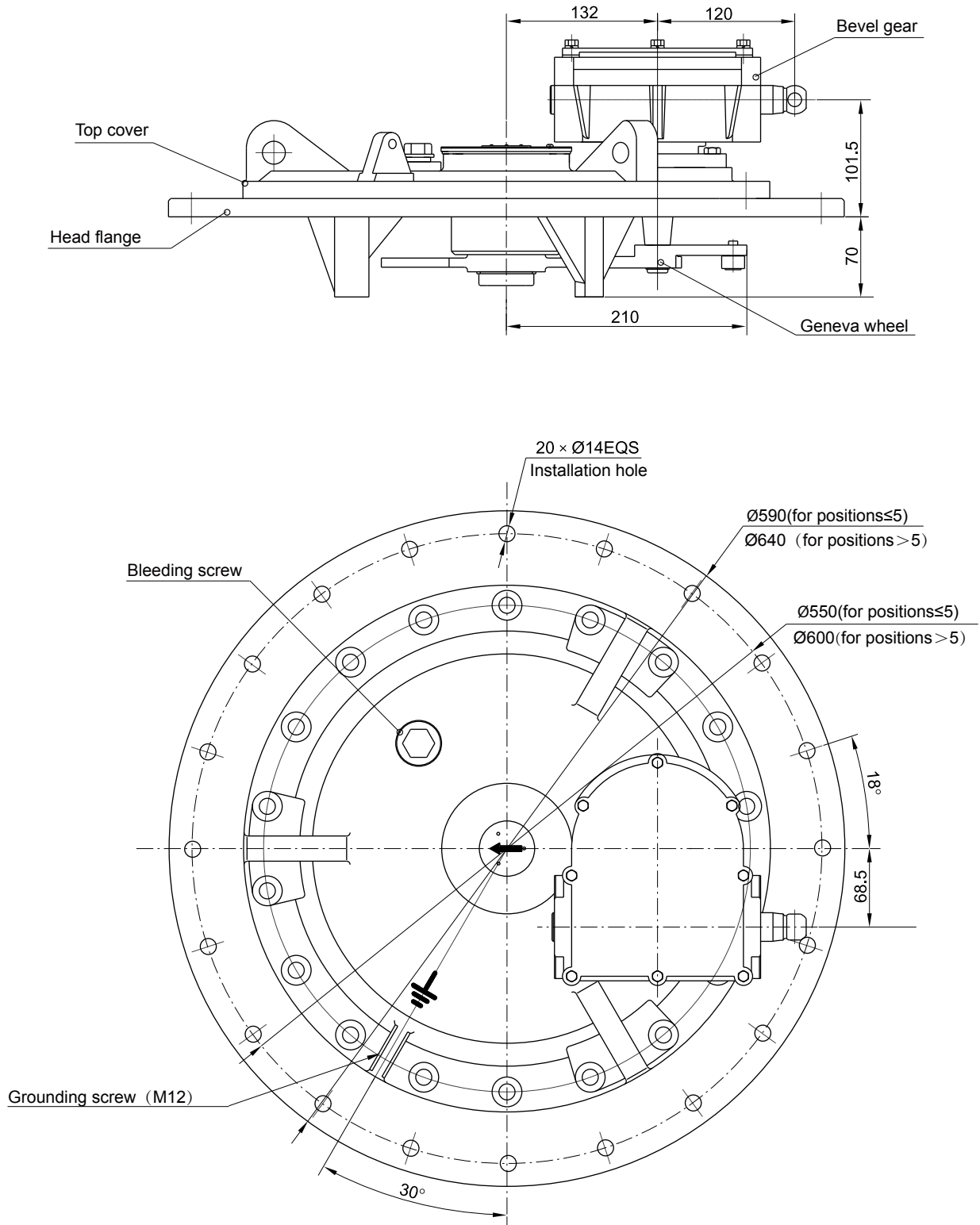
Unit: mm

**Appendix 10 Ground motor drive (manual),
Type A for standard tank, Head flange dimensions**



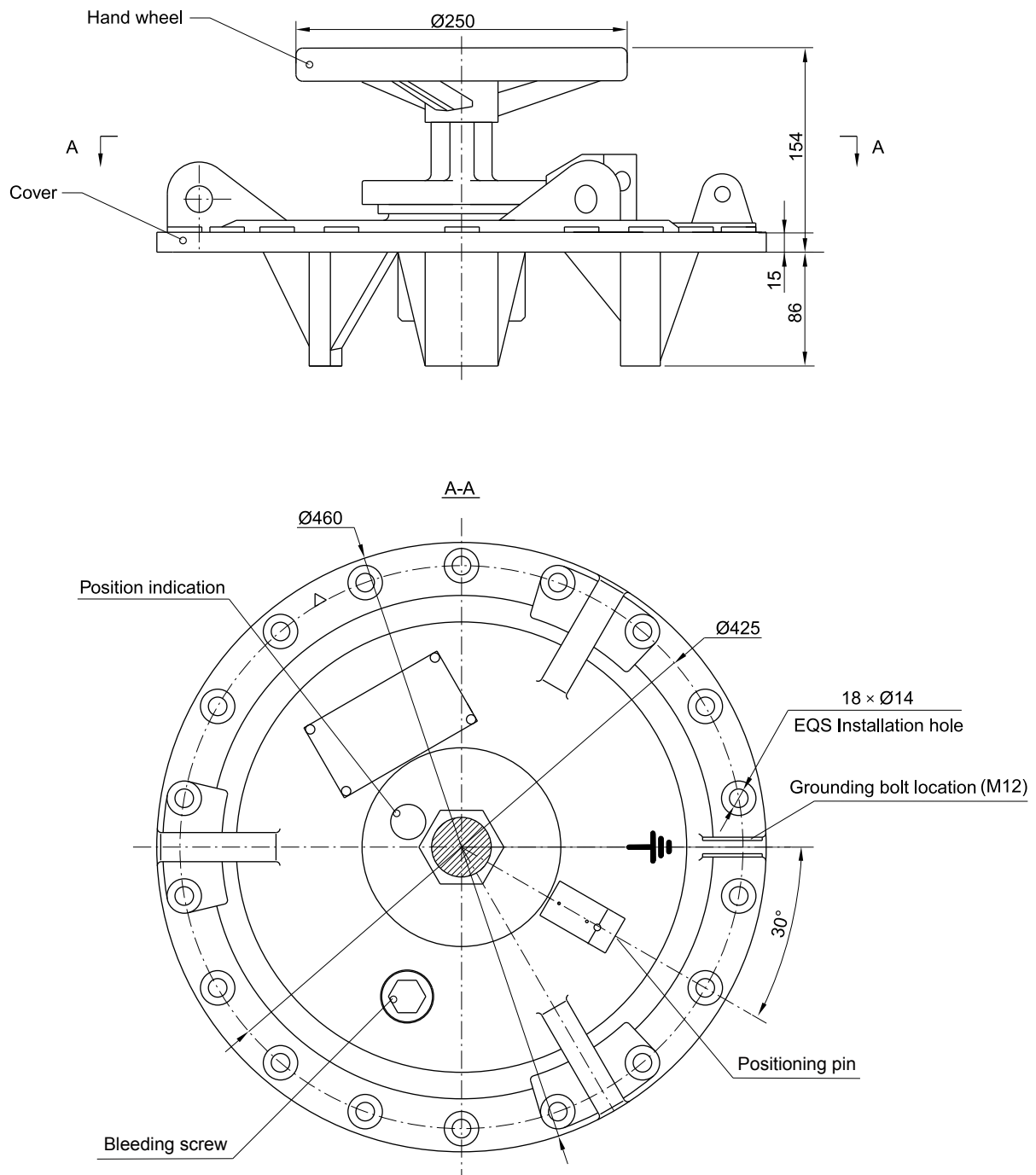
Unit: mm

Appendix 11 Ground motor drive(manual), Type B for standard tank, Head flange dimensions



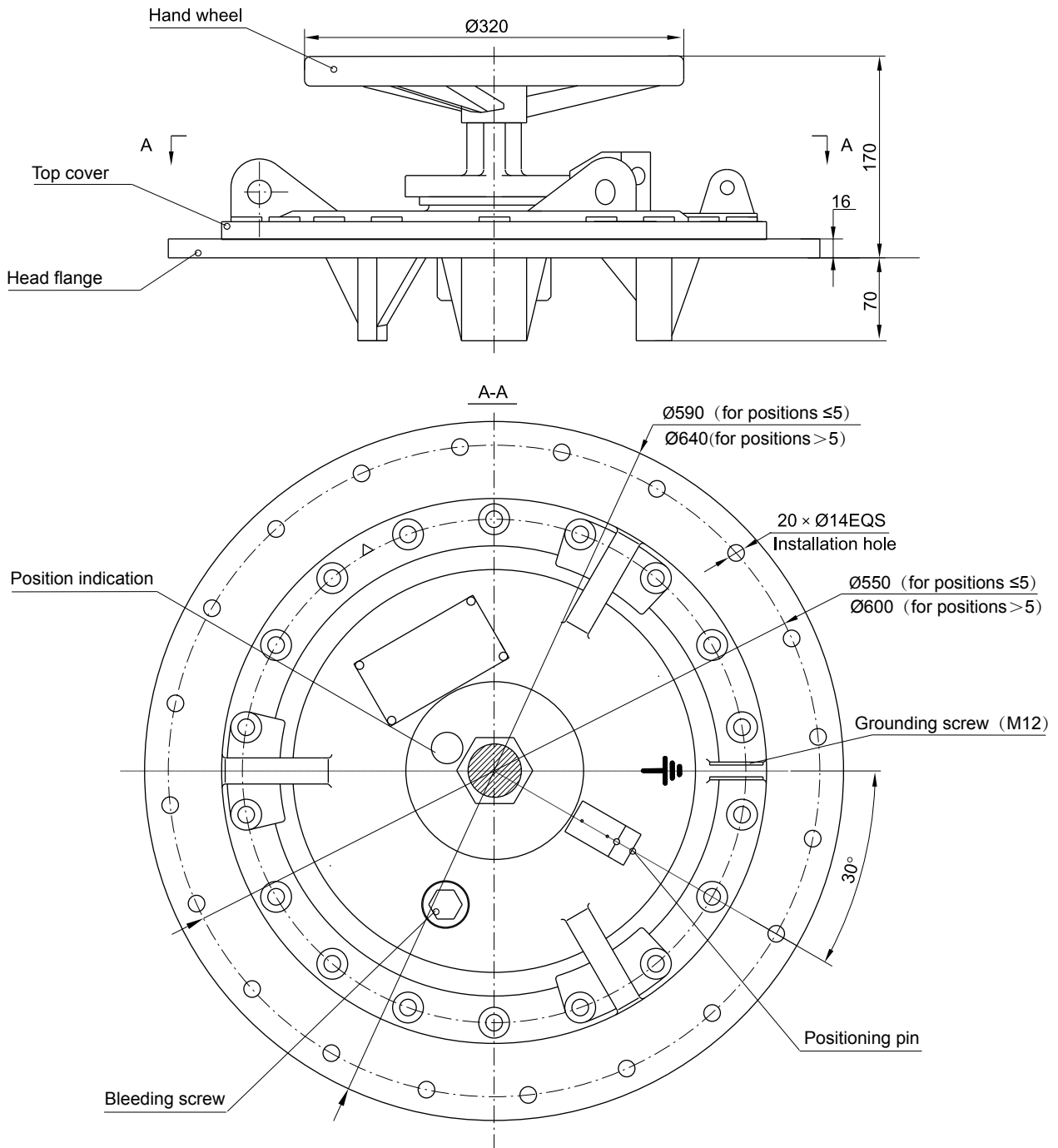
Unit: mm

Appendix 12 Top cover hand wheel, Type A for standard tank, Head flange dimensions



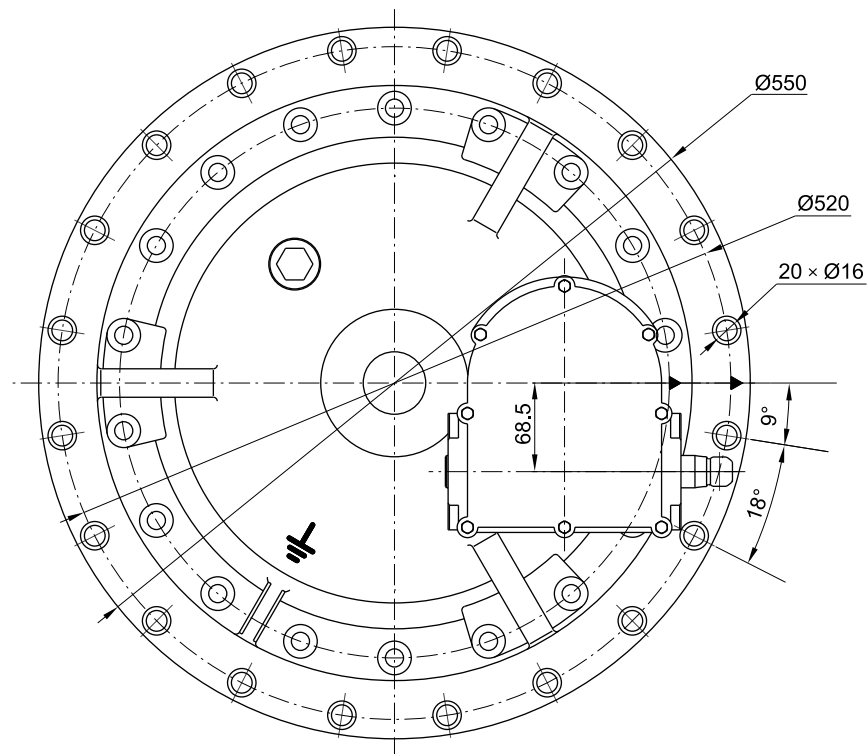
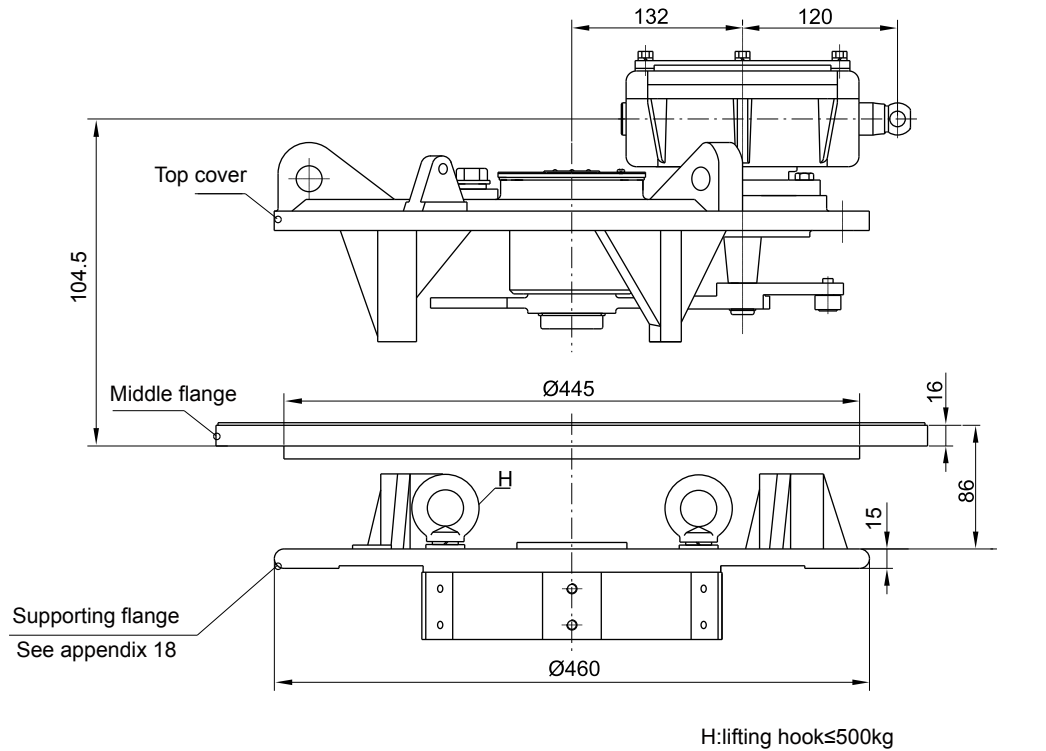
Unit: mm

Appendix 13 Top cover hand wheel, Type B for standard tank, Head flange dimensions



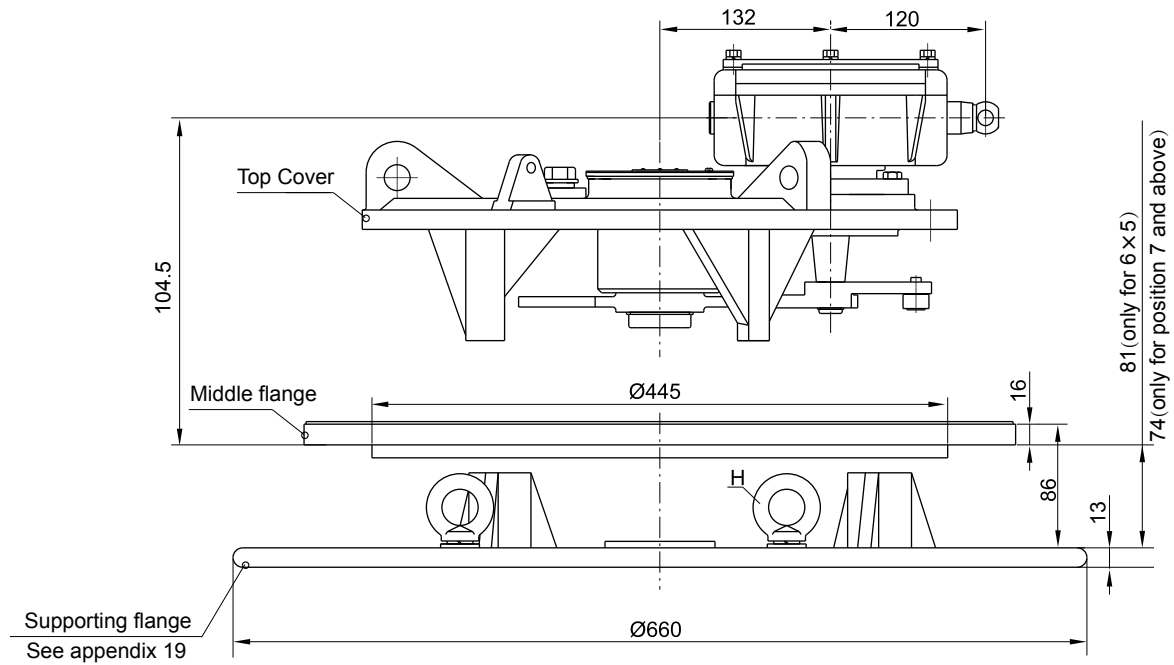
Unit: mm

Appendix 14 Ground motor drive(manual),Type A for bell type, Head flange installation dimension

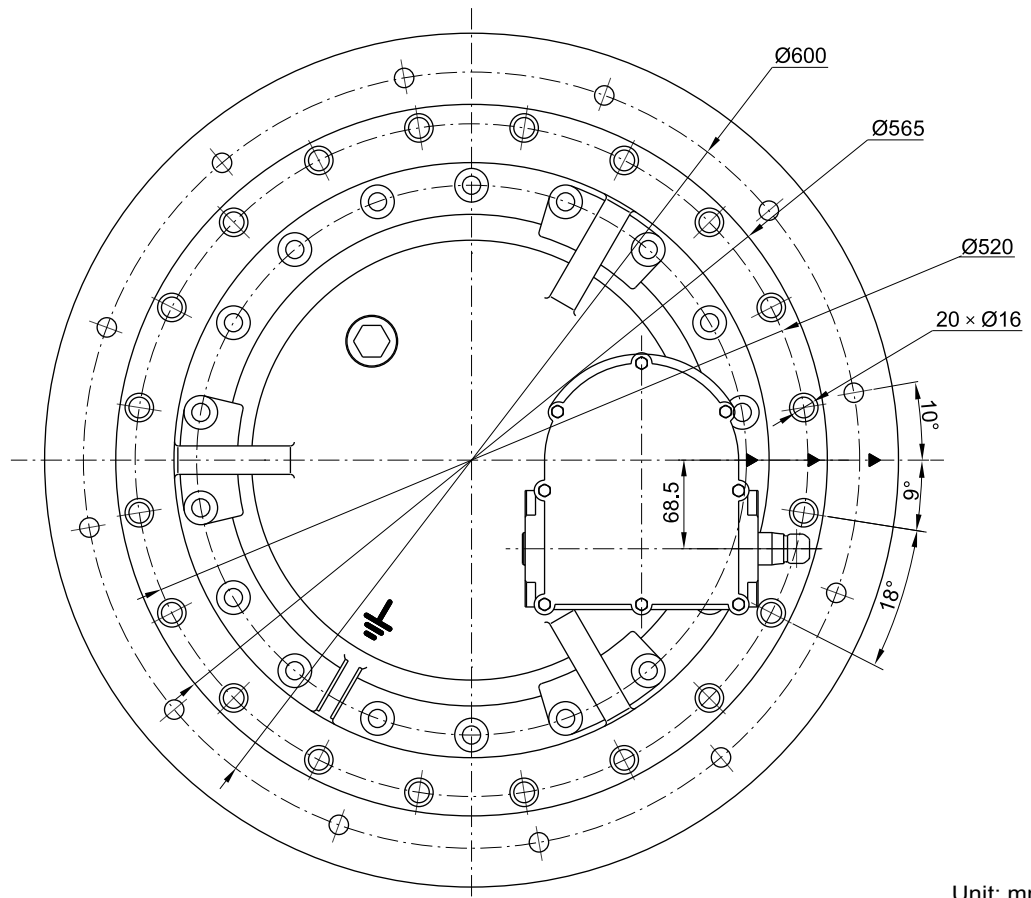


Unit: mm

Appendix 15 Ground motor drive(manual),Type B for bell type, Head flange installation dimension

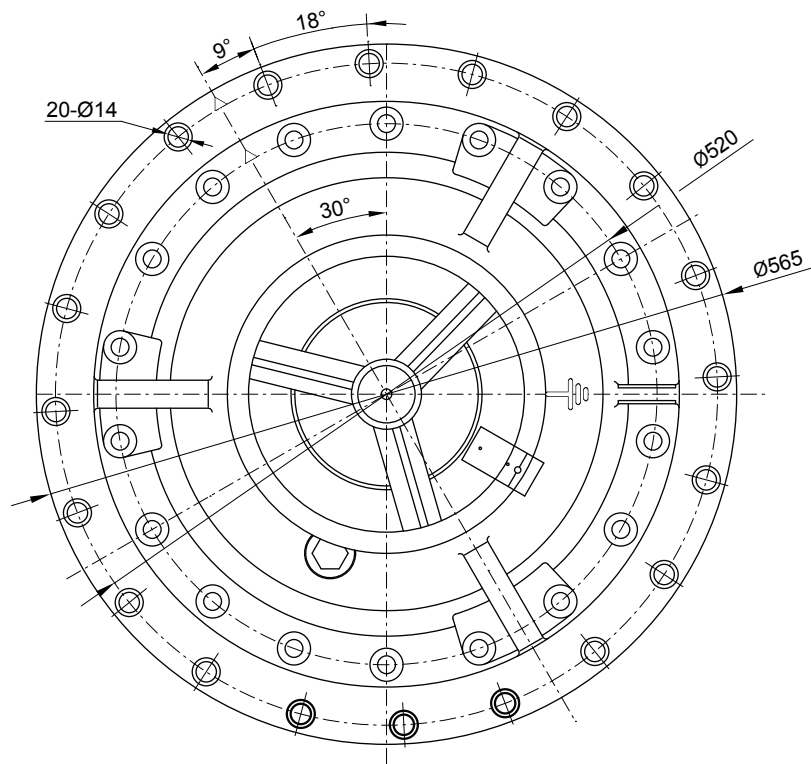
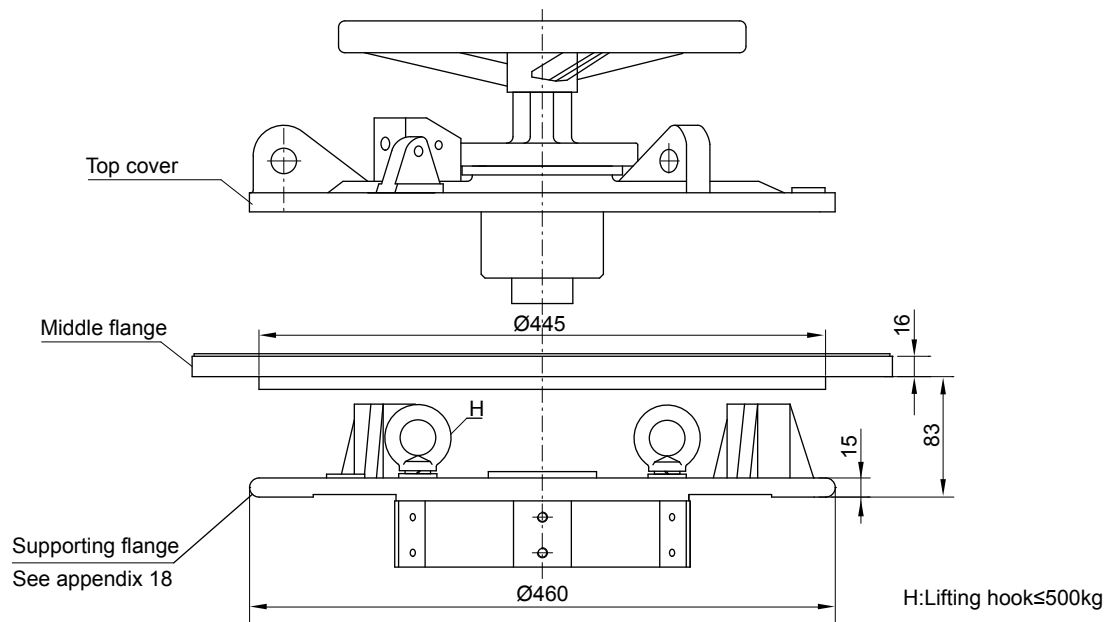


H: Lifting hook $\leq 500\text{kg}$



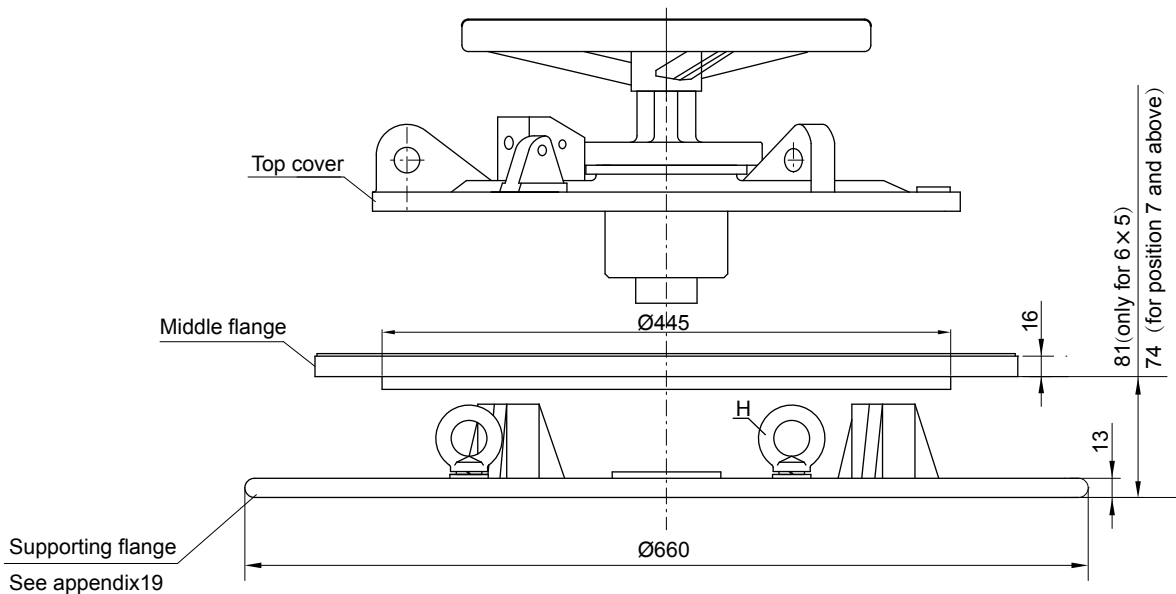
Unit: mm

Appendix 16 Top cover hand wheel, Type A for bell type, Head flange installation dimension

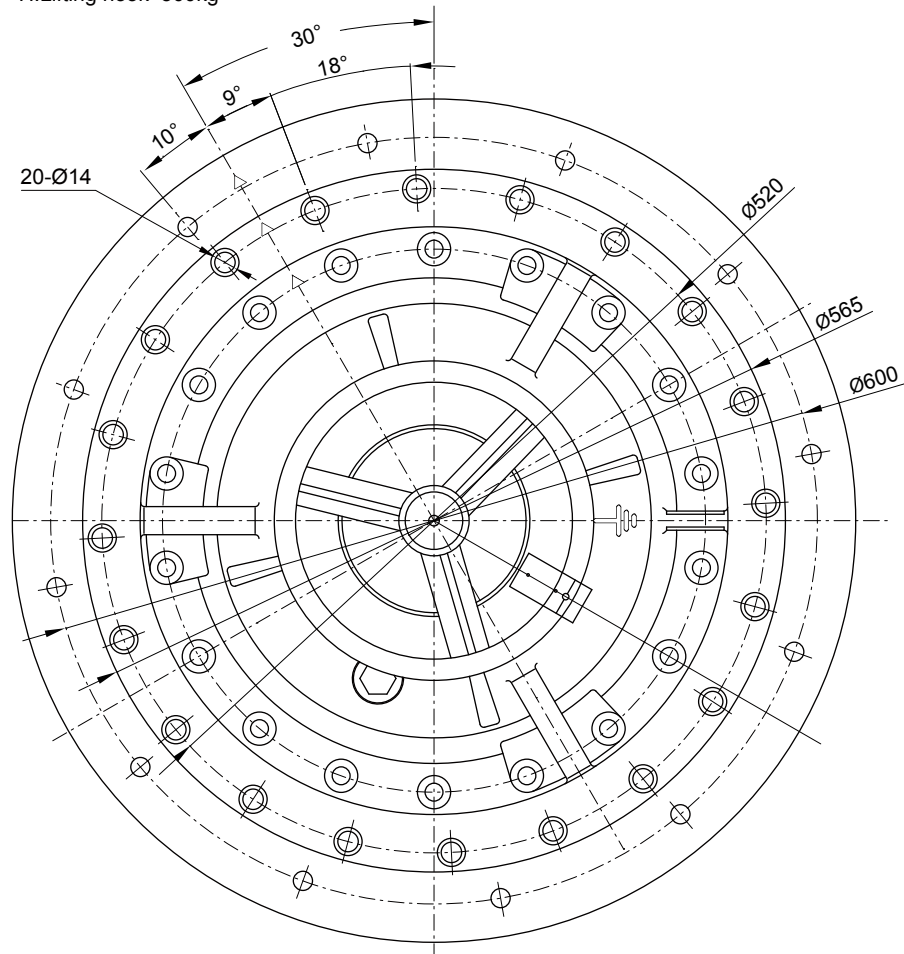


Unit: mm

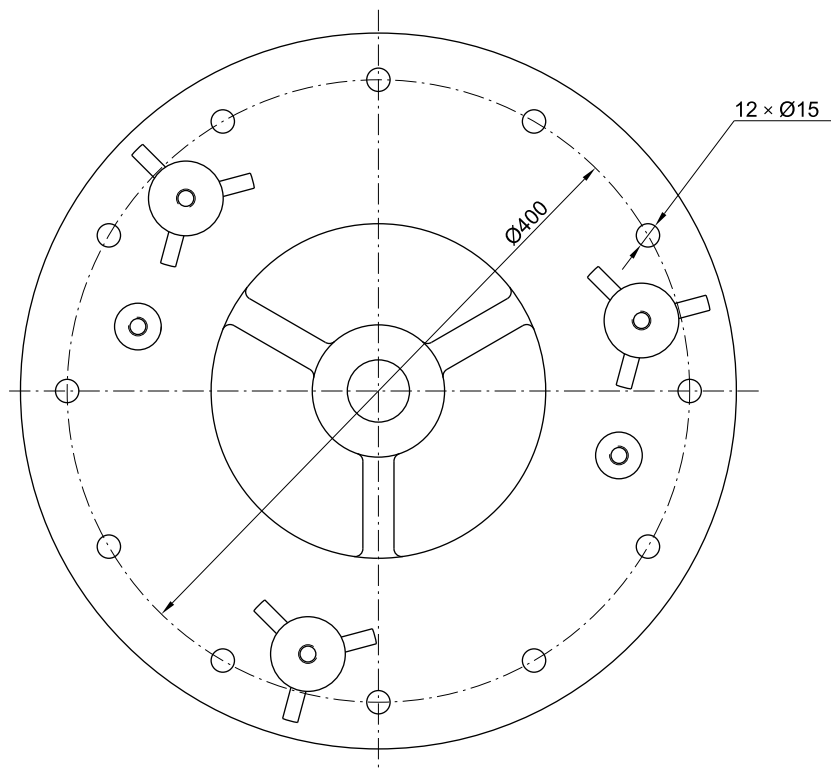
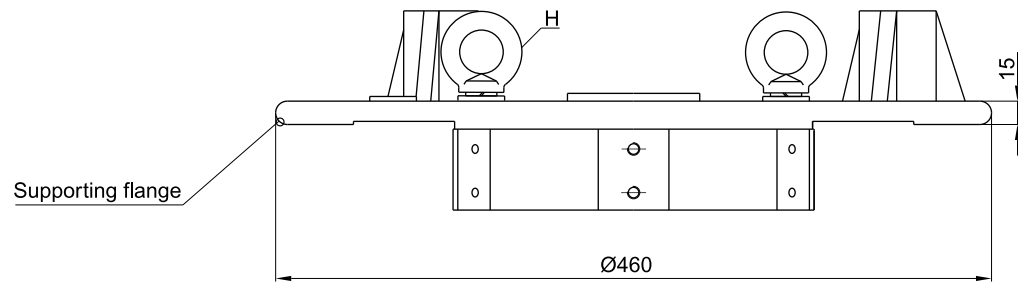
Appendix 17 Top cover hand wheel, Type B for bell type, Head flange installation dimension



H: Lifting hooks ≤ 500kg

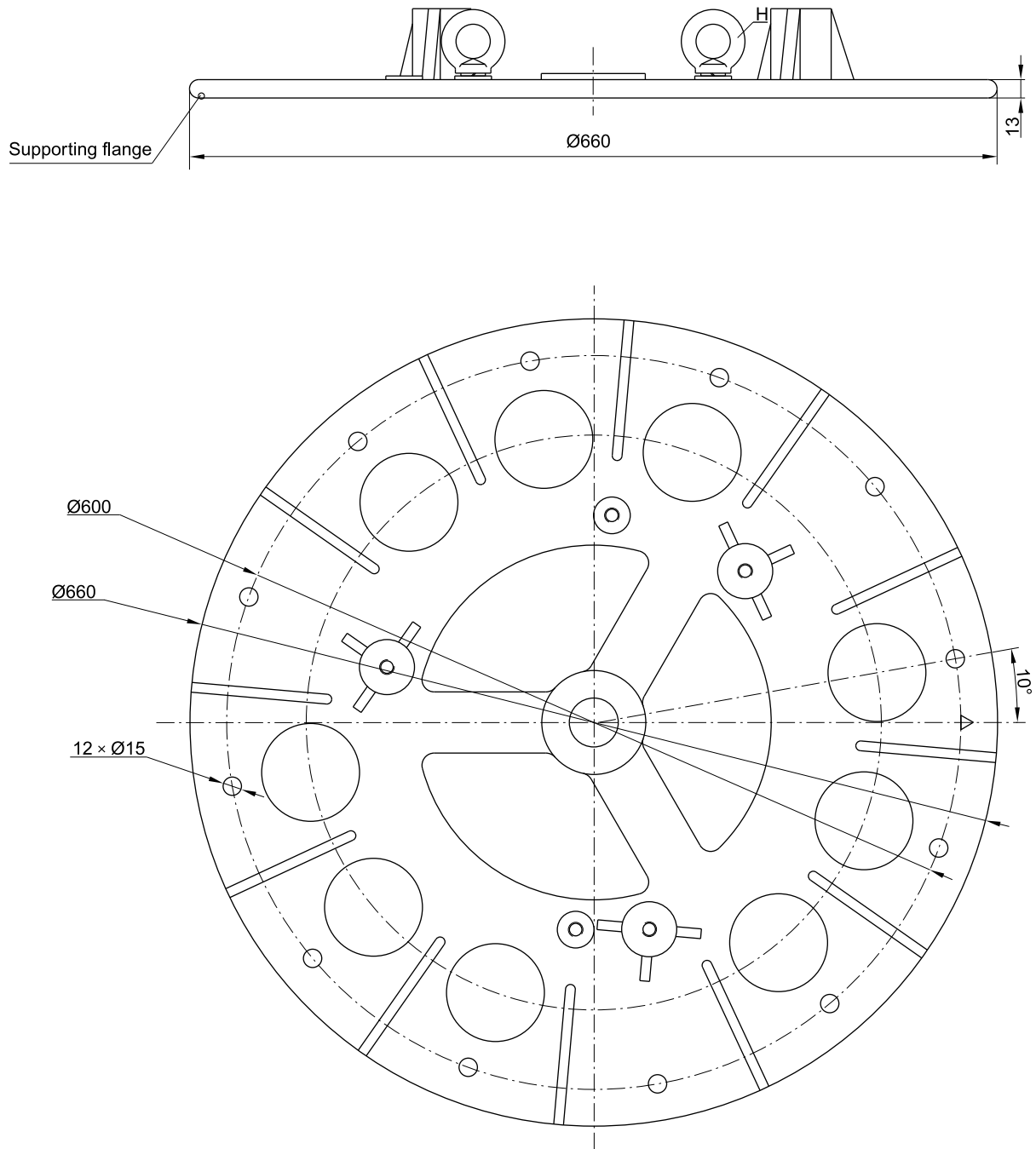


Unit: mm



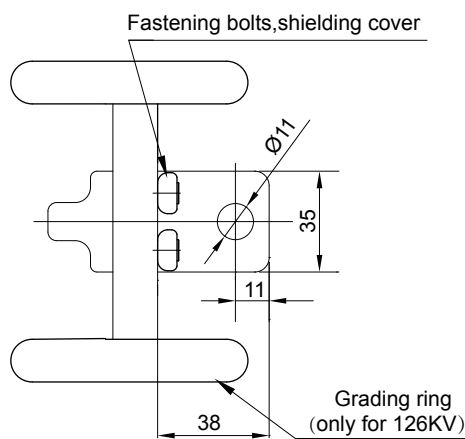
Unit: mm

Appendix 19 Type B for bell type, supporting flange installation drawing

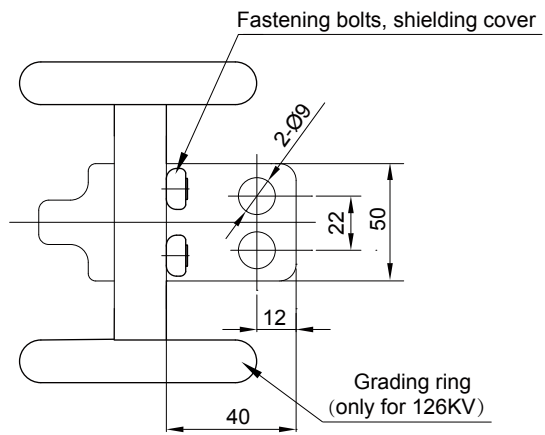


Unit: mm

Appendix 20 Tap changer terminal overall dimension

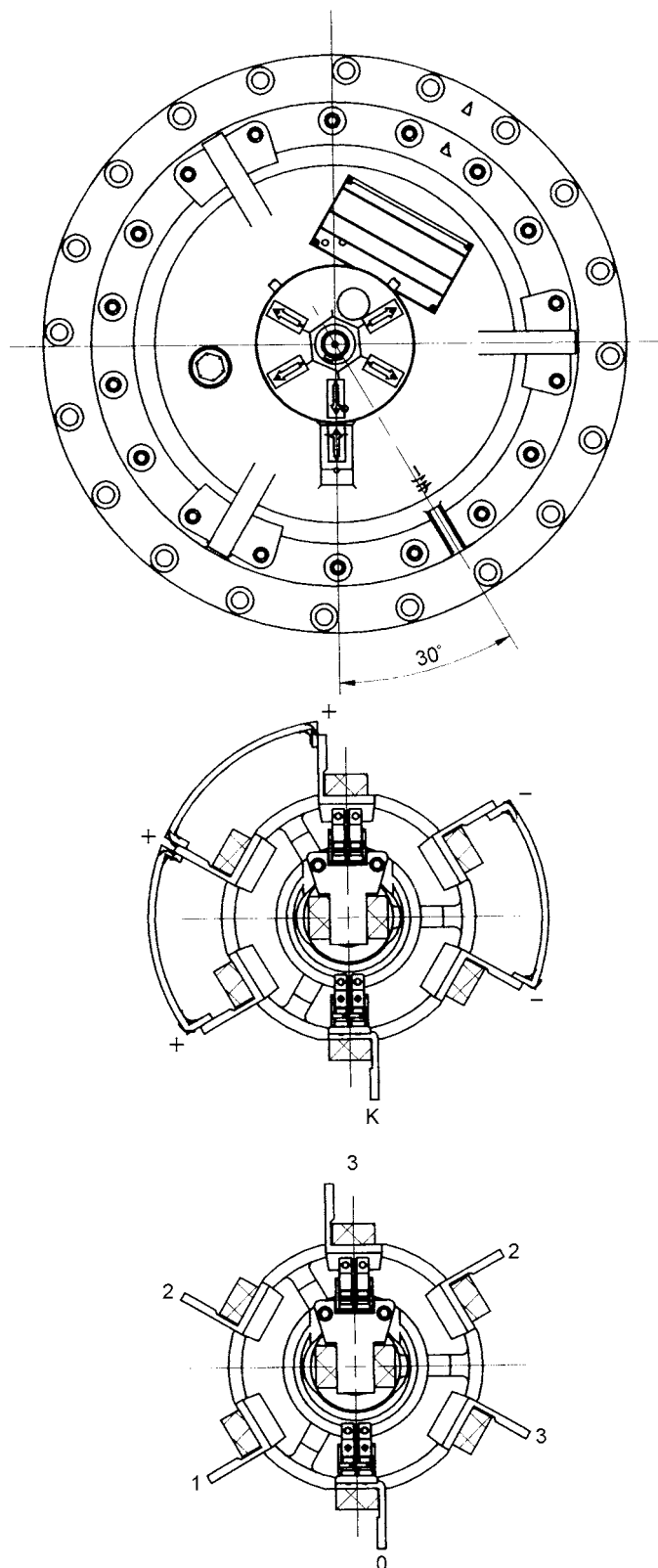


Fixed contact with one hole: $\leq 600A$



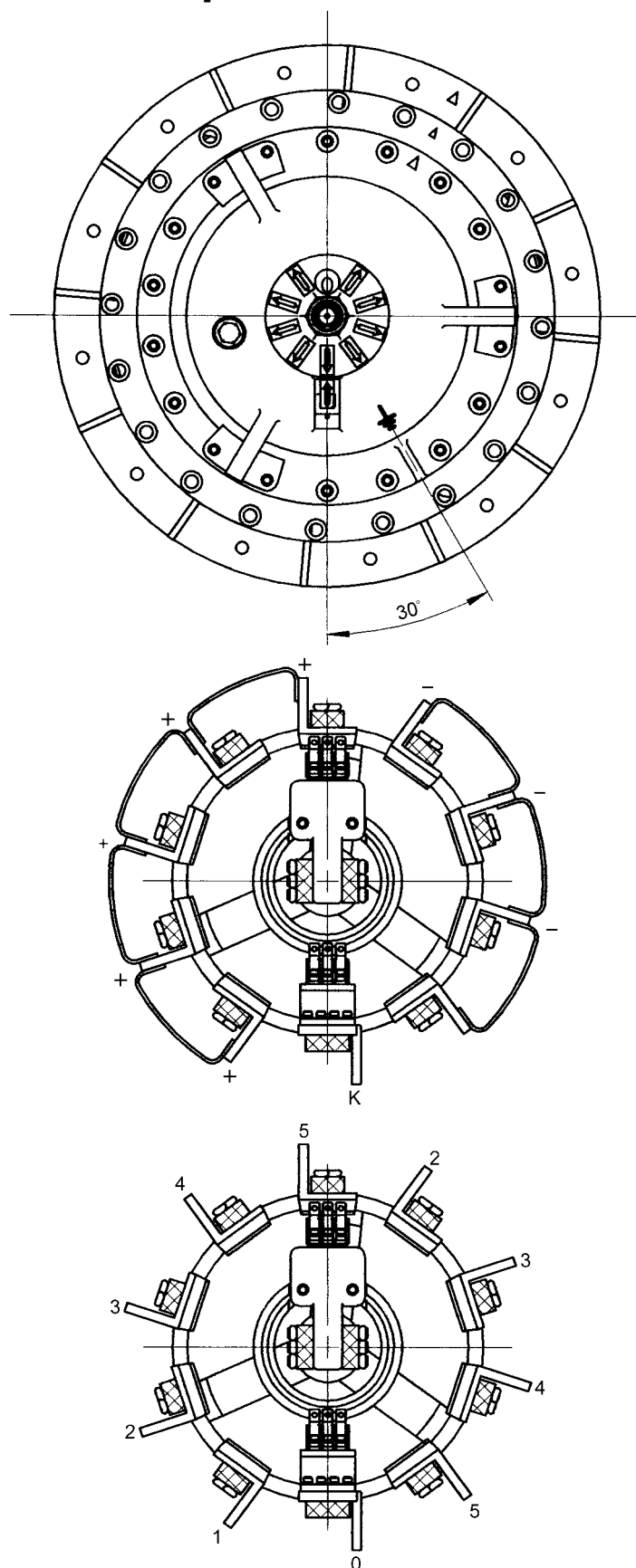
Fixed contact with double holes: $\geq 800A$

Appendix 21 Reversing(6×5),top cover hand wheel, relative position of contacts



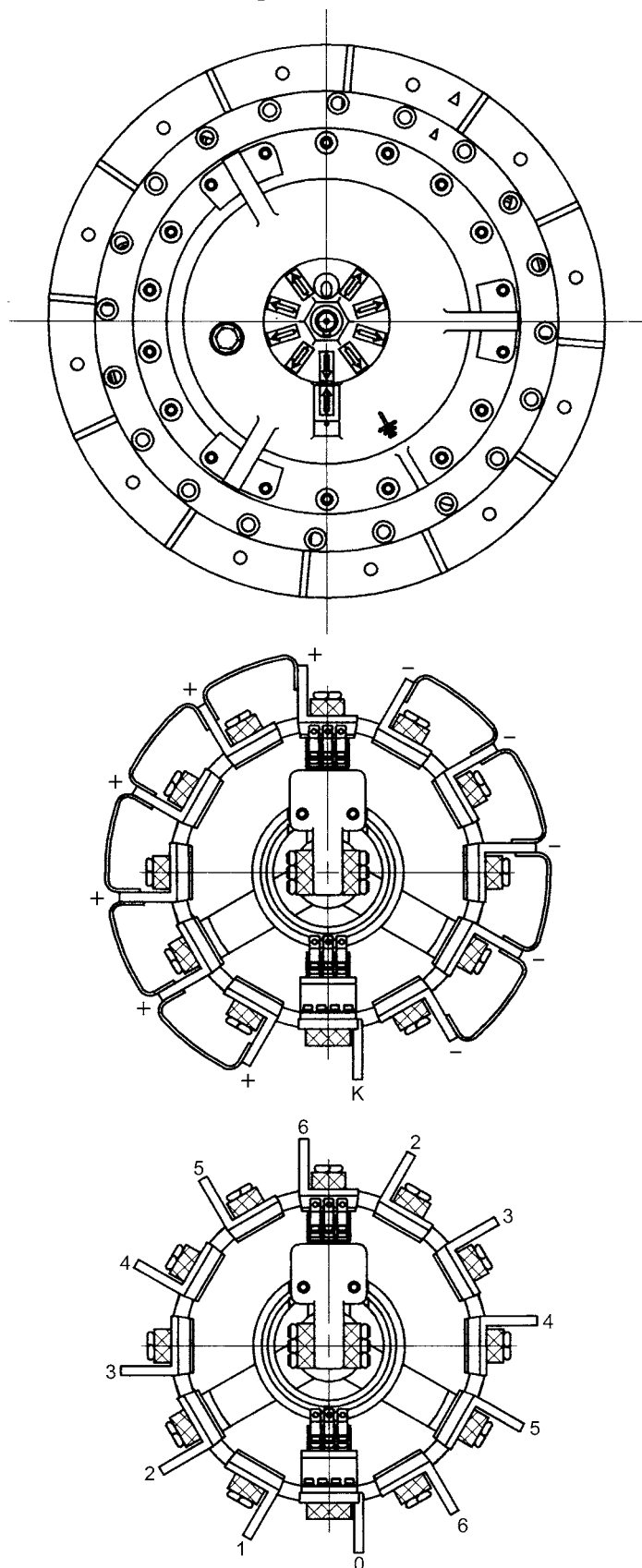
Unit: mm

Appendix 22 Reversing(10×9),top cover hand wheel, relative position of contacts



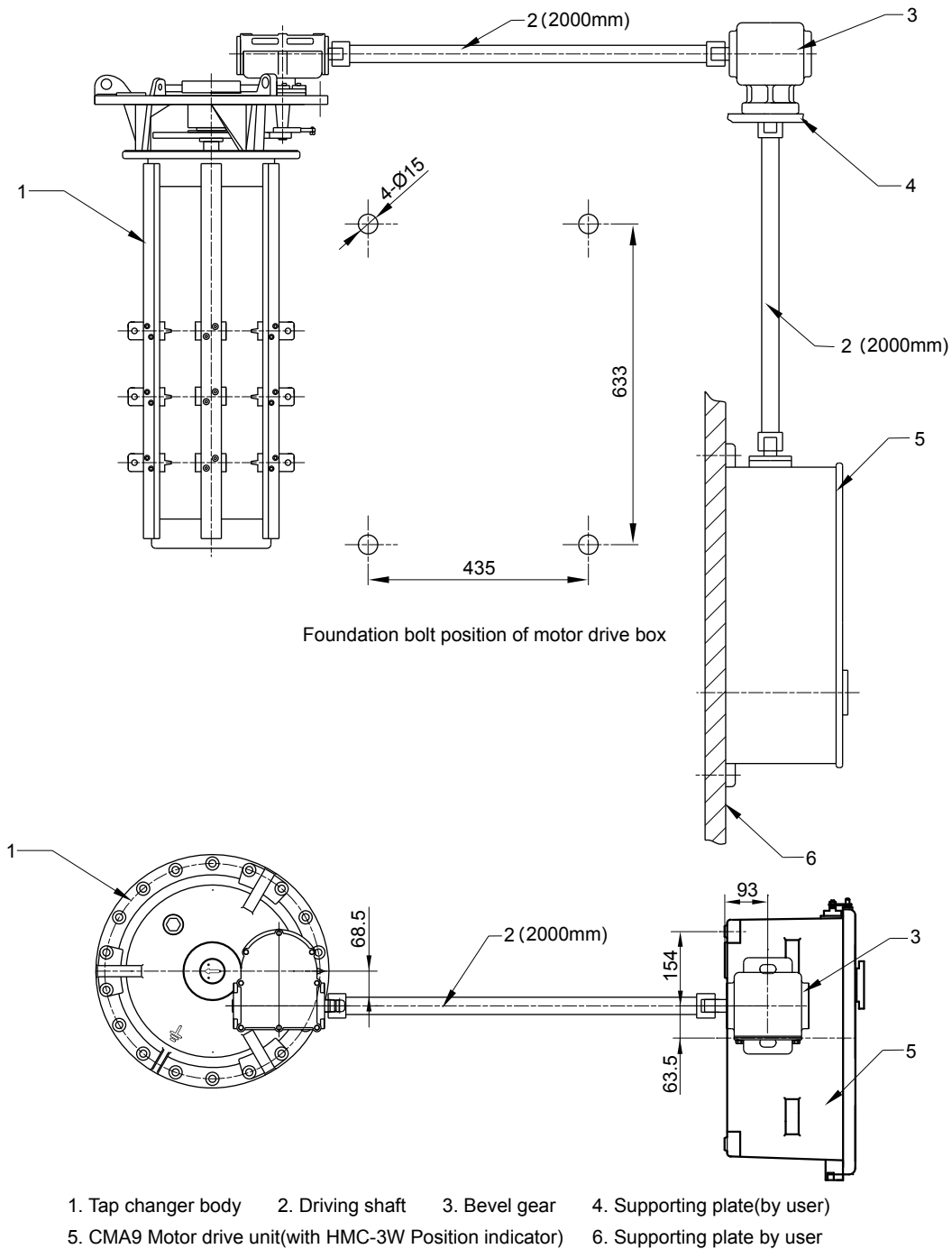
Unit: mm

Appendix 23 Reversing(12×11),top cover hand wheel, relative position of contacts



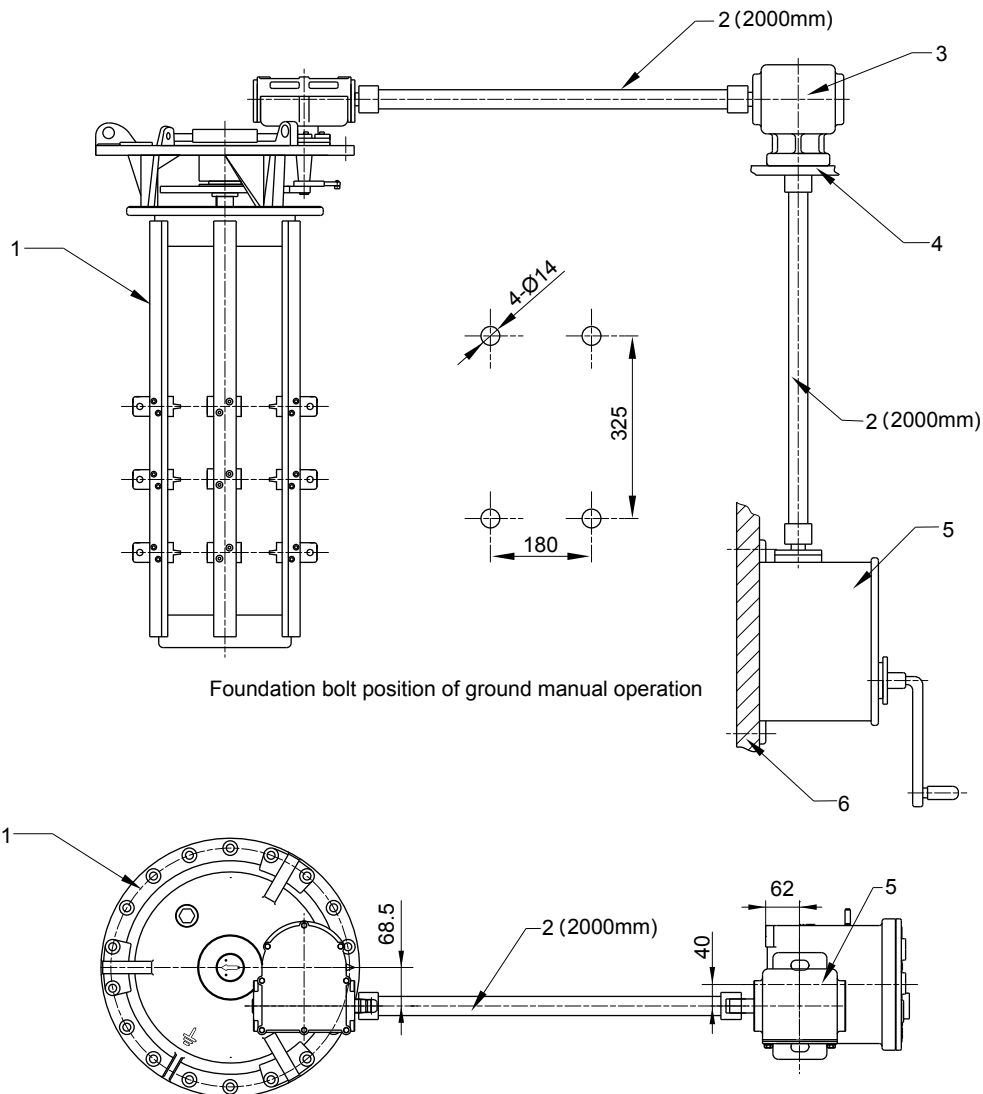
Unit: mm

Appendix 24 Ground motor drive, Tap changer installation illustrating drawing



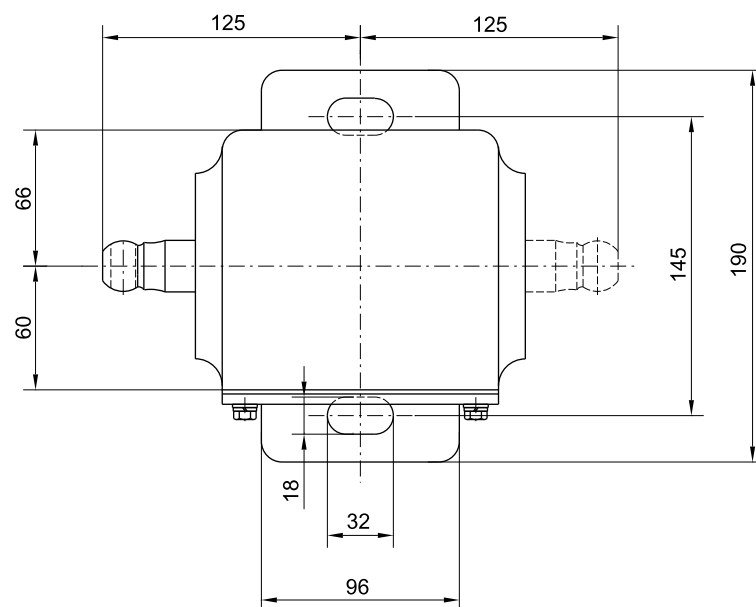
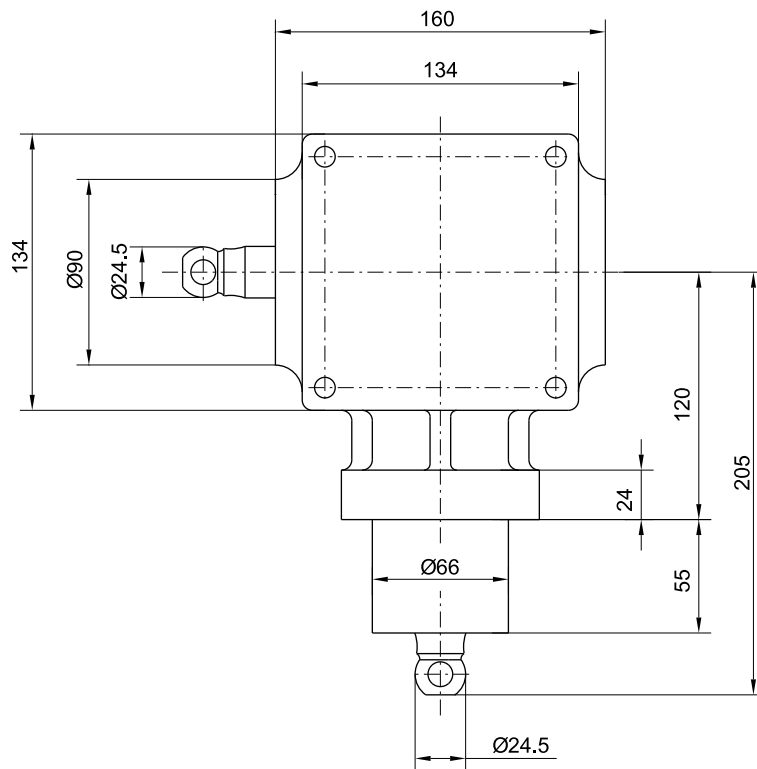
Unit: mm

Appendix 25 Ground manual operation, tap changer installation illustrating drawing



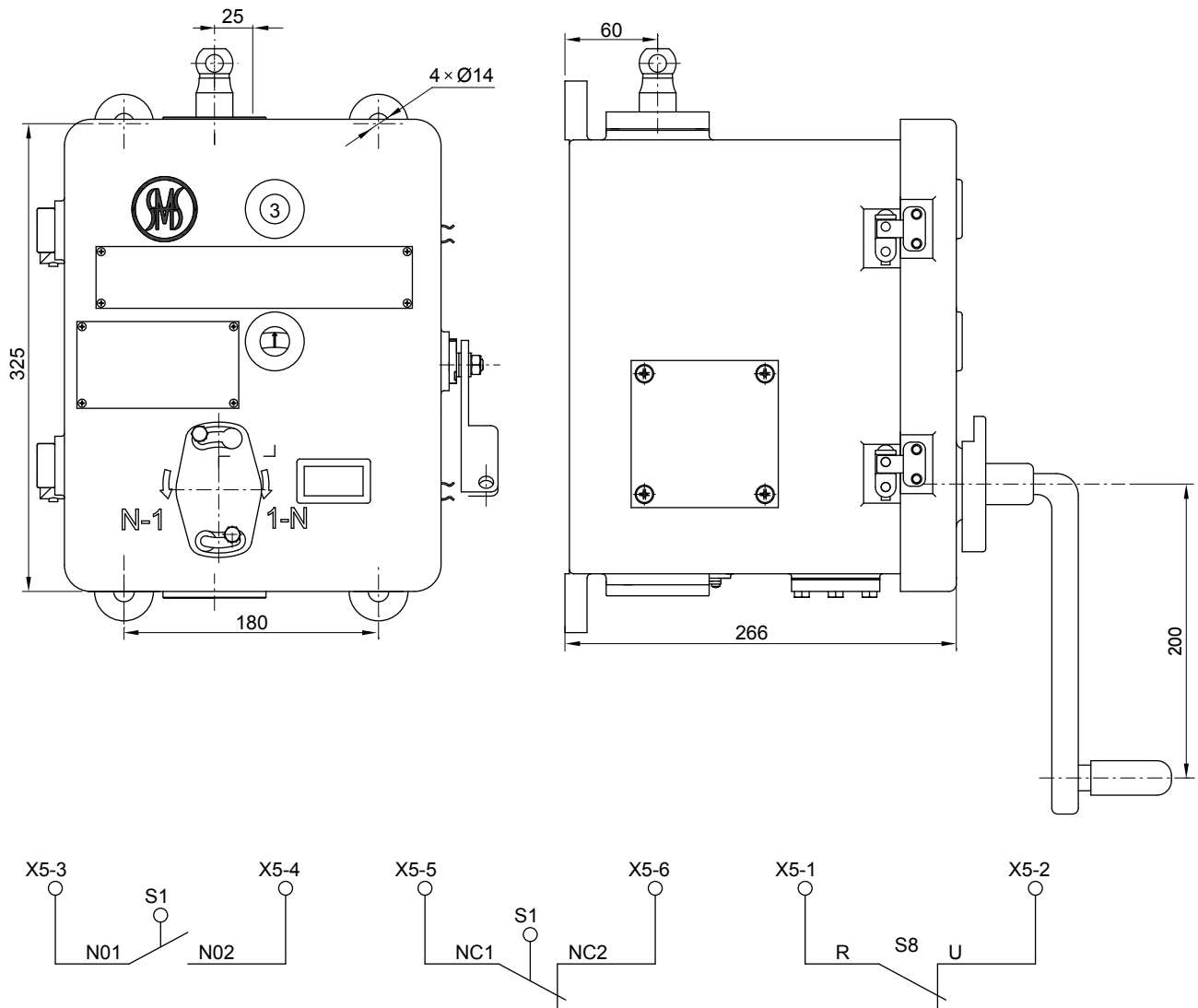
1. Tap changer body 2. Driving shaft 3. Bevel gear 4. Supporting plate(by user)
5. SL mechanism 6. Supporting plate(by user)

Unit: mm

Appendix 26 Bevel gear, Overall dimensions

Unit: mm

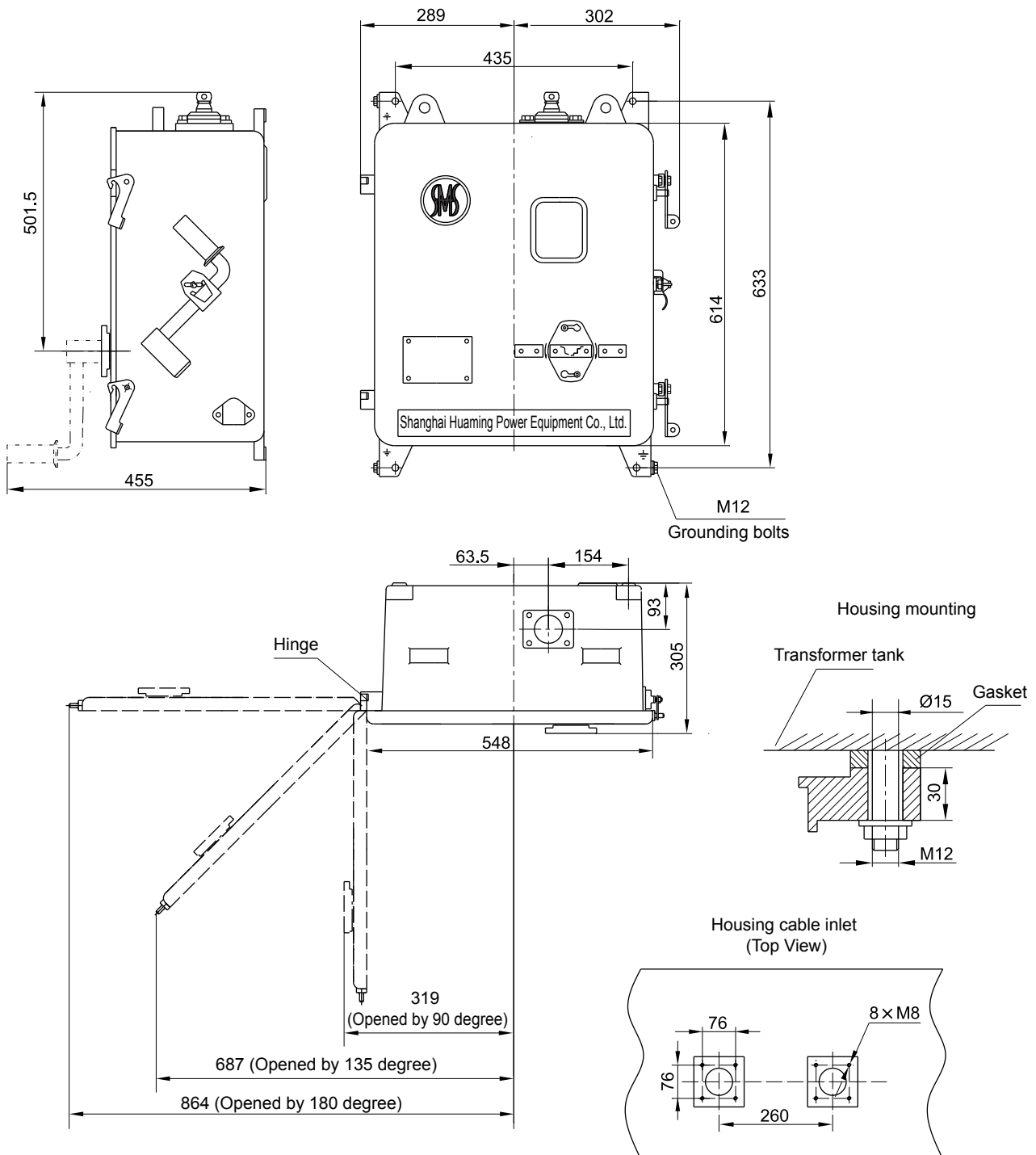
Appendix 27 Side-manual operation, Overall dimensions



S1-N01, S1-N02 for in-operation signal, S1-NC1, S1-NC2 for operation in-position signal Leads out S8-R、S8-U from manual mechanism to terminals X5-1, X5-2, If handle crank is inserted in, then X5-1、X5-2 break; If handle crank is taken out, then X5-1、X5-2 close, User should take this terminal as blockout for manual mechanism and circuit breaker of transformer

Unit: mm

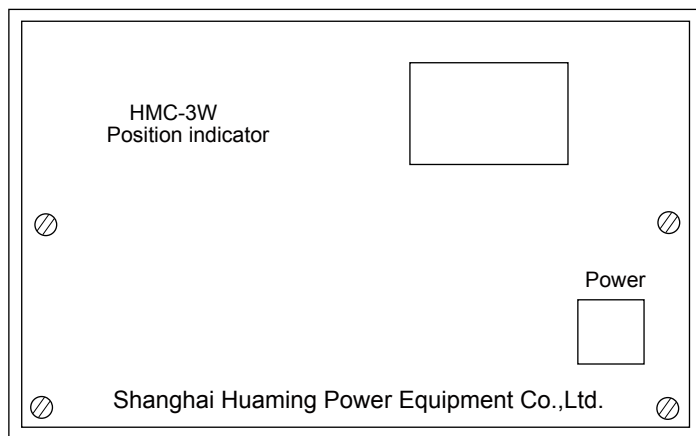
Appendix 28 CMA9 Motor drive unit, overall dimensions



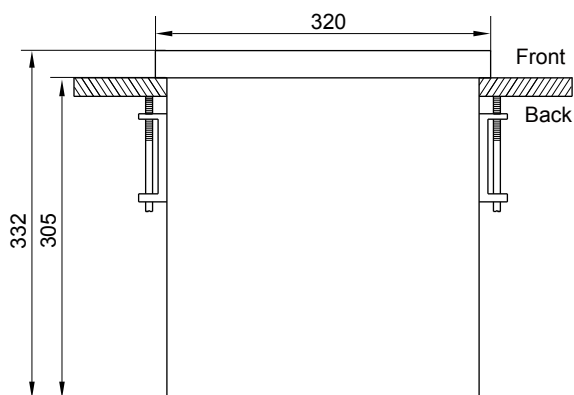
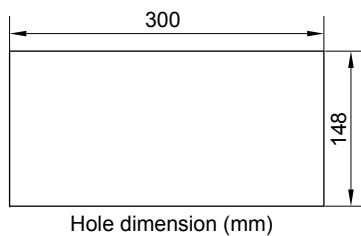
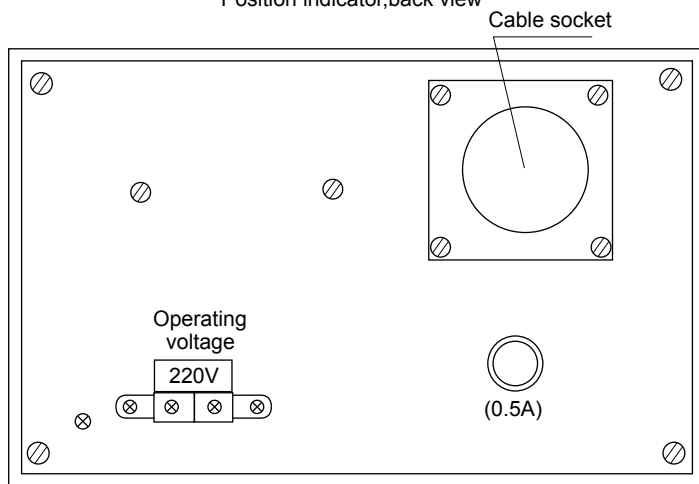
Unit: mm

Appendix 29 HMC-3W Position indicator

Position indicator, front view



Position indicator, back view



Unit: mm

Guideline for operation and ordering

It is recommended that the user keep all the operation and service data and get in touch with us during special occurrence, so that we can intercommunicate with each other concerning the operation and maintenance experience.

If under normal operation, there is any equipment malfunction and damage due to production quality within 18 months of the delivery date, we will perform any necessary repair free of charge for our customers.

The standard length of the leading cable for the display unit is 30 meters. Special requirement can be submitted while ordering.

We will provide our clients with the best quality products, superior service, and favorable price wholeheartedly. Thank you for the support and cooperation. Your suggestions and feedback regarding our products are warmly welcomed.

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