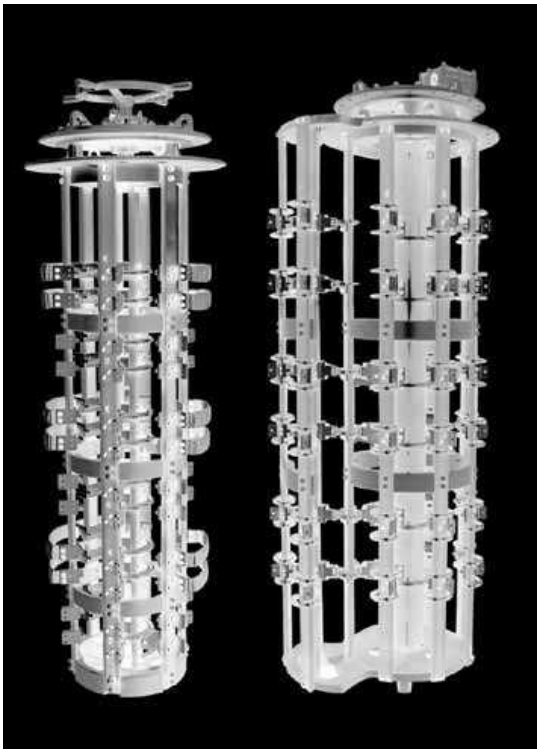
W □ L De-energized Tap Changer Technical Instructions

HM0.154.602/2021



Shanghai Huaming Power Equipment Co.,Ltd.

General

1. General

Type W□L Off-Circuit Tap Changer (herein referred as tap changer) is of in-tank structure and without separate oil compartment. It is mounted to transformer tank by a tap changer head flange.

By the operation method, tap changer can be divided into motor driving at man position, and manual drive mechanism operating at man position as well as hand wheel manual operation on the top.

By the dimensions of contact circle diameter, tap changer can be divided into type A, type B, type D and Type E.

Tap changer head flange can be either bell type mounting or standard tank mounting type.

By tap changer internal structure, it can be divided into linear, single-bridging, double-bridging, Y-D change-over, series-parallel change-over and reversing. Refer to table 2 for the basic connection methods code and Fig. 2 for connection schematic diagrams. For special design, please contact HM technical department.

2. Technical specifications

It is designed and produced according to IEC60214-1 Standard and GB100230.1. Tap changer technical data is listed in Table 1 below.

Table 1 W□L DETC TECHNICAL DATA

Item	Type		WSL, WDL							
1	No. of Phases		3-phase, single-phase							
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							

	Insulation to ground (kV)	The highest voltage for equipment	12	72.5	126	145	170	252
			I/III	I/III	I/III	I/III	I/III	I/III
		Rated separate source AC withstand voltage(kV/50Hz, 1min))	35	140	230	275	325	460
		Rated lightning impulse withstand voltage (kV,1.2/50μs)	75	325	550	650	750	1050
6	Internal insulation		Refer to Table 4					
7	Contact circle diameter		Type A: Ø350 Type B: Ø500 Type D: Ø600 Type E: Ø750					
8	Max. operating positions		Max. 5 for type A, Max. 5 for type B, Max. 11 for type D, Max. 17 for type E					
9	Mechanical life		Not less than 20,000 operations for manual driving Not less than 100,000 operations for motor driving					
10	Weight (kg)		Type A			Type B, D, E		
			Max:100			Max: 195		

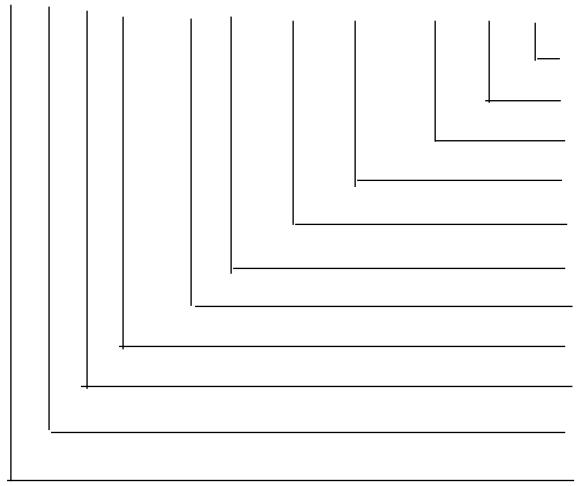
Remark: The tap changer can be designed and produced according to special requirements, please contact with HM Technical Department.

3. Type designation

3.1. Type explanation

Due to the different combinations of number of phases, maximum rated through current, the highest voltage for equipment and connection, type W□L off-circuit tap changer comes with various models. Hence, the type designation shall provide all the above all the above technical parameters and below is detailed explanation in Fig. 1.

W □ L □ - □ □ / □ - □ X □ (□) □



Installation
Contact circle diameter (A/B/D/E)
Operating positions
Contact pitch
The highest voltage for equipment (kV)
Connection (Y-for neutral point. D-for any connection)
Max. rated through current (A)
Basic connection method (Refer to table 1)
Cage Type
No. of Phases(D for I phase, S for three phases)
Off-circuit tap changer

Fig. 1 Tap Changer Model Explanation

Table 2 Tap Changer Basic Connection Method and Mark

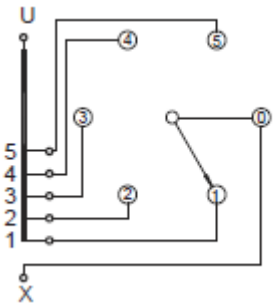
Code	IV	V	VI	VII	VIII	II
Connection	Linear	Single-bridging	Y-D change-over	Double-bridging	Series-paralle change-over	Reversing

3.2. Tap changer basic connection diagram

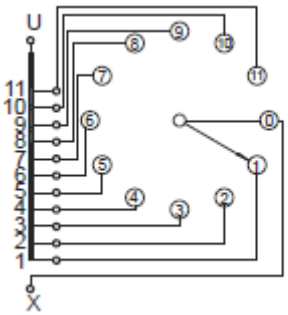
Different transformer winding corresponds to different tap changer basic connection diagram. Fig.2 shows commonly used connections. It can also be specially designed as per customer requirement.

Linear

TYPE A and B



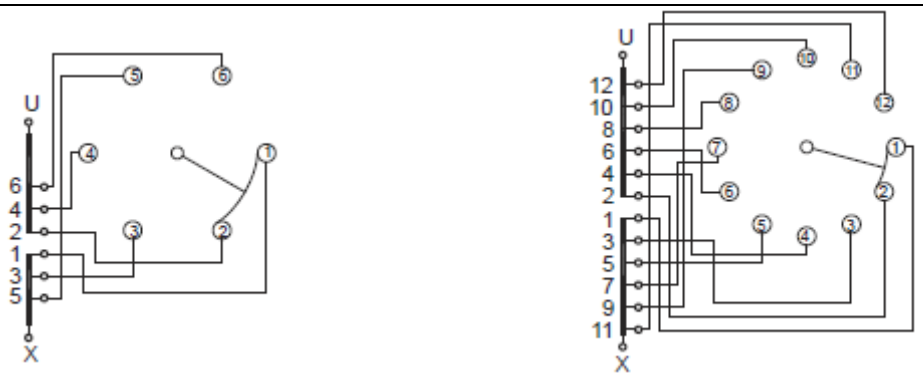
TYPE D and E



Single-bridging

TYPE A and B

TYPE D and E



Double-bridging

TYPE A and B

TYPE D and E

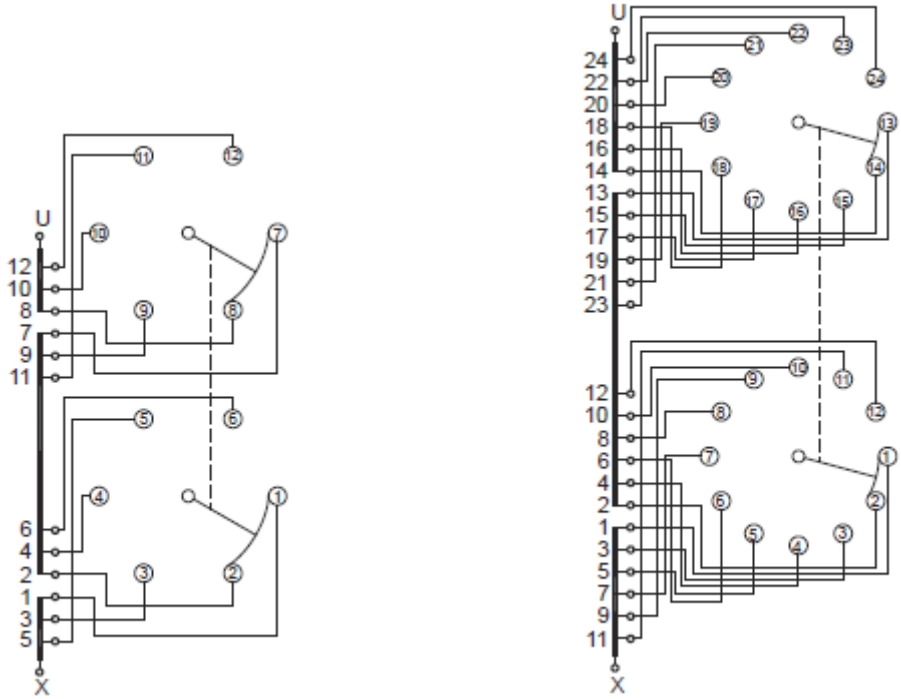
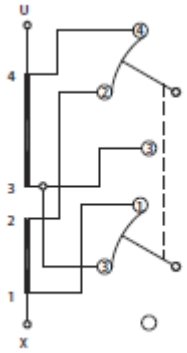


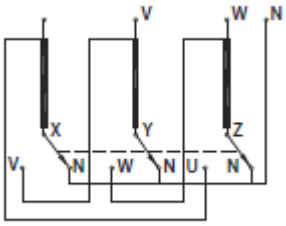
Fig. 2 Tap Changer Basic Connection Diagram

Series-parallel change-over

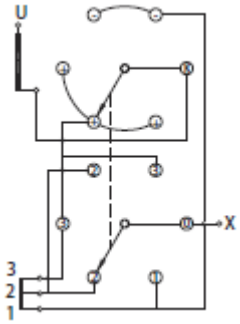


Tap position	1	2	3	4	5
Regulating position	+2	+1	0	-1	-2
Connection type	Ⓚ-⊕	Ⓚ-⊕	Ⓚ-⊕	Ⓚ-⊖	Ⓚ-⊖
Connection type	⓪-①	⓪-②	⓪-③	⓪-②	⓪-③

Y-D change-over



Reversing



Tap position	1	2	3
Regulating position	+1	0	-1
Connection type	Ⓚ-⊕	Ⓚ-⊕	Ⓚ-⊖
Connection type	⓪-①	⓪-②	⓪-②

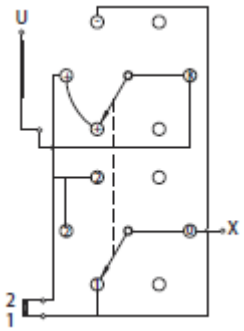


Fig. 2 Tap Changer Basic Connection Diagram (Continued)

4. Terms and definitions

4.1. Rated through-current

Rated through current Iu: The current flowing through the tap changer toward the external circuit, which can be carried continuously while meeting the requirement.

The maximum rated through current Ium: The highest rated through current for which the tap changer is designed for and which forms the basis for all current related tests.

4.2.Short circuit current test

According to IEC 60214-1: 2003, all contacts continuously carrying the current shall be able to withstand 2s (±10%) short circuit test current without melting, deformation or mechanical damage. Meanwhile the starting peak current value shall be 2.5 (±5%) times of the root means square value of rated short circuit test current. Refer the short circuit test current values to Table 1 Type WSL Series of Off-Circuit Tap Changer Technical Data.

4.3.Service condition of tap changers

4.3.1. Service temperature range of the tap changer in oil is -25℃~ +100℃.

4.3.2. Service ambient air temperature range of tap changer is -25℃~ +40℃. Relative humidity is less than 85%.

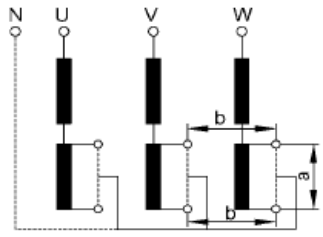
4.3.3. Perpendicular deflection between ground and tap changer after being mounting on transformer shall be less than 2%.

4.3.4. There shall be no serious dust, explosive gas or corrosive gas on service site.

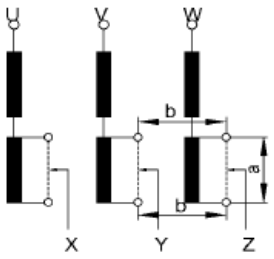
Remark: Please contact us if special application required.

4.4.Internal insulation of tap changer

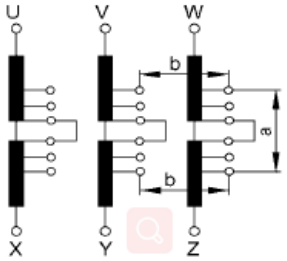
The internal insulation of WSL off-circuit tap changer is mainly depending on the rated withstand voltage of actual required gradient. Voltage gradient of tap changer internal insulation usually occurs during the transformer lightning impulse test and inductive withstand voltage test. It changes with the tap positions. Refer to table 3 for the internal insulations and fig. 3 for basic connection diagram and insulation distance mark. It must be checked when selecting the tap changer to ensure the conformity with insulation requirement.



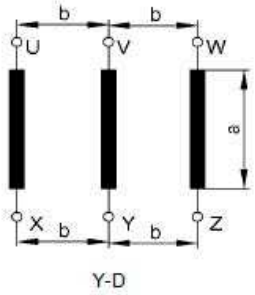
Linear for neutral point



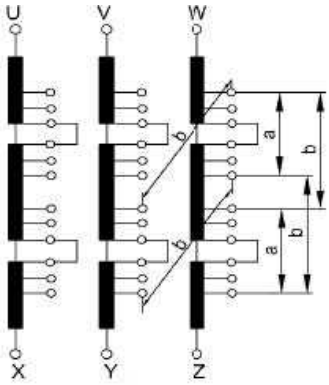
Linear for any connection



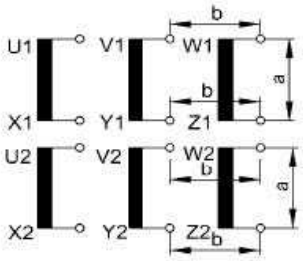
Single-bridging



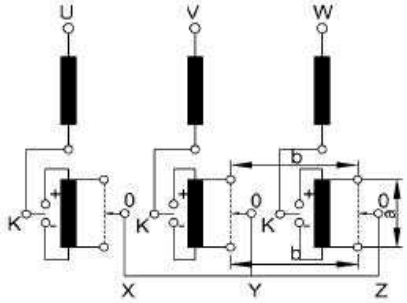
Y-D



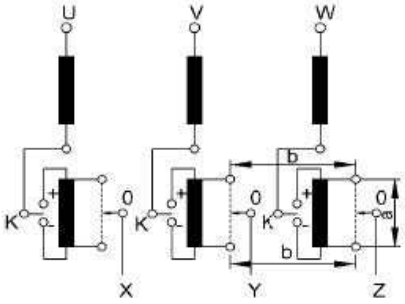
Double-bridging



Series-parallel change-over



Reversing for neutral point



Reversing for any connection

a: Between max. and min. taps of the same phase

b: Between any winding taps of different phases or between start and end of the same tap winding for double-bridging

Table 3: Tap changer Internal Insulation Level (Unit: kV) -1

Basic Connection mode Contact circle diameter		Y connection linear (IV Y)					
		A Ø 350mm			B Ø 500mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
12	a	2-5	65	158	2-5	90	258
	b	-	50	125	-	50	125
72.5	a	2-5	65	158	2-5	90	258
	b	-	70	170	-	70	170
126	a	2-5	65	158	2-5	90	258
	b	-	90	258	-	90	258
170	a	-	-	-	2-5	90	258
	b	-	-	-	-	105	240
252	a	-	-	-	2-5	90	258
	b	-	-	-	-	118	270

		D Ø 600mm			E Ø 750mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
72.5	a	2-5	185	450	2-5	275	650
		6-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	70	170	-	70	170
126	a	2-5	185	450	2-5	275	650
		6-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	90	258	-	90	258
170	a	2-5	185	450	2-5	275	650
	b	-	325	750	-	325	750
252	a	2-5	185	450	2-5	275	650
	b	-	118	270	-	118	270

Table 3: Tap changer Internal Insulation Level (Unit: kV) -2

Basic Connection mode Contact circle diameter		D connection linear (IV D)					
		A Ø 350mm			B Ø 500mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
12	a	2-5	65	158	2-5	90	258
	b	-	50	125	-	50	125
72.5	a	2-5	65	158	2-5	90	258
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	258
	b	-	230	550	-	230	550
170	a	-	-	-	2-5	90	258
	b	-	-	-	-	325	750
252	a	-	-	-	2-5	90	258
	b	-	-	-	-	-	-

		D Ø 600mm			E Ø 750mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
72.5	a	2-5	185	450	2-5	275	650
		6-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	140	325	-	140	325
126	a	2-5	185	450	2-5	275	650
		6-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	230	550	-	230	550
170	a	2-5	185	450	2-5	275	650
	b	-	325	750	-	325	750
252	a	2-5	185	450	2-5	275	650
	b	-	-	-	-	-	-

Table 3: Tap changer Internal Insulation Level (Continued 1) (Unit: kV

Basic Connection mode Contact circle diameter		Single-bridging (V)					
		A Ø 350mm			B Ø 500mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
12	a	2-5	65	158	2-5	90	258
	b	-	50	125	-	50	125
72.5	a	2-5	65	158	2-5	90	258
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	258
	b	-	230	550	-	230	550
170	a	-	-	-	2-5	90	258
	b	-	-	-	-	325	750
252	a	-	-	-	2-5	90	258
	b	-	-	-	-	-	-

		D Ø 600mm			E Ø 750mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
72.5	a	2-5	185	450	2-5	275	650
		6-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	140	325	-	140	325
126	a	2-5	185	450	2-5	275	650
		6-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	230	550	-	230	550
170	a	2-5	185	450	2-5	275	650
	b	-	325	750	-	325	750
252	a	2-5	185	450	2-5	275	650
	b	-	-	-	-	-	-

Table 3: Tap changer Internal Insulation Level (Continued 2) (Unit: kV)

Basic Connection mode Contact circle diameter		Double-bridging (VII)					
		A Ø 350mm			B Ø 500mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
12	a	2-5	65	158	2-5	90	258
	b	-	50	125	-	50	125
	c	-	38	95	-	38	95
72.5	a	2-5	65	158	2-5	90	258
	b	-	140	325	-	140	325
	c	-	65	158	-	65	158
126	a	2-5	65	158	2-5	90	258
	b	-	230	550	-	230	550
	c	-	70	170	-	70	170

		D Ø 600mm			E Ø 750mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
72.5	a	2-5	185	450	2-5	275	650
		10-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	140	325	-	140	325
	-	-	65	158	-	65	158
126	a	2-5	185	450	2-5	275	650
		10-11	50	125	6-11	115	280
		-	-	-	12-17	38	75
	b	-	230	550	-	230	550
	c	-	70	170	-	70	170

Table 3: Tap changer Internal Insulation Level (Continued 3) (Unit: kV)

Basic Connection mode Contact circle diameter		Series-parallel (VIII)			
		A Ø 350mm		B Ø 500mm	
Highest Voltage for equipment	Insulation gap	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us
12	a	65	158	90	258
	b	50	125	90	125
72.5	a	-	-	90	258
	b	-	-	140	325
126	a	-	-	90	258
	b	-	-	230	550
170	a	-	-	90	258
	b	-	-	-	-
252	a	-	-	90	258
	b	-	-	-	-

		D Ø 600mm		E Ø 750mm	
Highest Voltage for equipment	Insulation gap	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us
72.5	a	185	450	275	650
	b	140	325	140	325
126	a	185	450	275	650
	b	230	550	230	550
170	a	185	450	275	650
	b	-	-	-	-
252	a	185	450	275	650
	b	-	-	-	-

Basic Connection mode Contact circle diameter		Y-D (VI)			
		A Ø 350mm		B Ø 500mm	
Highest Voltage for equipment	Insulation gap	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us
12	a	50	125	140	325
	b	50	125	50	125
72.5	a	-	-	140	325
	b	-	-	140	325

Table 3: Tap changer Internal Insulation Level (Continued 4) (Unit: kV)

D Ø 600mm					
Highest Voltage for equipment	Insulation gap	Power frequency withstand voltage 50Hz/1min (Kv)	Impulse test voltage (Kv) 1.2/50us		
12	a b	275 50	650 125		
72.5	a b	275 140	650 325		
126	a b	275 230	650 550		

Basic Connection mode		Y Reversing for neutral point (II Y)					
Contact circle diameter		A Ø 350mm			B Ø 500mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
12	a b	2-5 -	65 50	158 125	2-5 -	90 50	258 125
72.5	a b	2-5 -	65 70	158 170	2-5 -	90 70	258 170
126	a b	2-5 -	65 90	158 258	2-5 -	90 90	258 258
170	a b	- -	- -	- -	2-5 -	90 325	258 750
252	a b	- -	- -	- -	2-5 -	90 118	258 270

D Ø 600mm					E Ø 750mm		
Highest Voltage for equipment	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us	Tap position	Power frequency withstand voltage 50Hz/1min(Kv)	Impulse test voltage (Kv) 1.2/50us
72.5	a b	2-5 6-11 - -	185 50 - 70	450 125 - 170	2-5 6-11 12-17 -	275 115 38 70	650 280 75 170
126	a b	2-5 6-11 - -	185 50 - 90	450 125 - 258	2-5 6-11 12-17 -	275 115 38 90	650 280 75 258
170	a b	2-5 -	185 325	450 750	2-5 -	275 325	650 750

Table 3: Tap changer Internal Insulation Level (Continued 5) (Unit: kV)

252	a	2-5	185	450	2-5	275	650
	b	-	-	-	-	-	-

4.5. Tap changer insulation to earth

The insulation level of tap changer to earth, namely, the insulation of the live parts of tap changer and the ground, is determined by the AC power frequency one-minute voltage test value and impulse voltage test value. It is related to the tap winding position of transformer, voltage regulation range and voltage regulation method, the connection method and structure arrangement of winding, and the rated voltage of transformer winding, which is determined by the insulation level of transformer winding to ground.

The insulation level to earth of tap changer is selected from the standard specified value (refer to Table 4) by IEC60214 and GB10230.1 according to the highest working voltage Um of tap changer so that insulation value as low as possible can meet the entire range of use.

Table 4 Tap changer insulation level to earth (Unit:Kv)

The highest voltage for equipment (kV)	Rated separate source AC withstand voltage (kV/50Hz, 1min)	Rated lightning impulse withstand voltage (kV, 1.2/50μs)
12	35	75
72.5	140	325
126	230	550
170	325	750
252	460	1050

4.6. Tap changer mounting method

W□L de-energized tap changer is a cage type without oil compartment. It can be mounted in the transformer tank directly. There should be an installation flange on the transformer tank in order to fix tap changer. There are two mounting methods of standard installation and bell type according to the different transformer structure. Please refer to Appendix.

5. Special design

This technical data is including relevant parameters of regular tap changers. Special design will be considered according to the customers' special requirements, such as big current rating or special connections. Please contact us for special requirements with technical data.

6. Operation method

6.1. Hand wheel operation

Drive the main shaft of tap changer directly through hand wheel on the top of tap changer to realize the tap changing.

6.2. Manual drive mechanism at side

The manual drive mechanism is mounted on the side of the transformer tank. Tap changer is driven by the drive shaft and gear box. The dimension and installation are shown in the Appendix.

6.3. Motor drive unit at side

Using CMA7 and SHM-D motor drive to realize the motor driving for tap changer. Refer to Appendix of Motor drive unit dimension and table 5 for technical data. Motor drive unit is mounted on the side of transformer tank, driving tap changer by shaft and gear box. It is suitable for tap changer required frequently tap changing or remote operation. Refer to Appendix of installation drawing.

Table 5: Motor drive unit technical parameters

Motor drive unit			**CMA7**		
Motor	Rated power (W)		750	1100	2200
	Rated voltage (V)		380/3AC 220V/AC		
	Rated current (A)	3 phases	2.0	2.8	5.1
		1 phase	3.4	5.0	8.8
	Rated frequency (Hz)		50 or 60		
	Rated speed (r.p.m)		1400		
Rated torque on drive shaft (Nm)			18		52
Revolution the drive shaft per switching operation			33		
Revolution of the hand crank per switching operation			33		
Running time per switching operation (S)			About 5		
Max. operation positions			35		
Voltage for control circuit and heater circuit (V)			220/AC		
Heater power(W)			50		
A.C. voltage test to ground (kV/50Hz, 1min)			2		
Protective degree			IP66		
Mechanical endurance (operations)			Not less than 800,00		
Motor drive unit			**SHM-D**		
Step Motor	Rated voltage (V)		200-240V/AC		
	Rated current (A)		4		
	Rated frequency (Hz)		50 or 60		

Rated torque on drive shaft (Nm)	35
Revolution the drive shaft per switching operation	33
Revolution of the hand crank per switching operation	33
Automatic operation time of each step (S)	Approx. 6
Max. operation positions	107
Insulation grade (kV/1min,50Hz）	2
Protective degree	IP66

7. Position indicator

7.1. HMC-3W De-energized tap changer position indicator

HMC-3W DETC position indicator is designed for CMA7 motor drive unit. It can be used to indicate the DETC position remote room.

HMC-3W technical parameters:

Working voltage: 85V to 265V

Power frequency: DC 50 Hz or 60Hz

Maximum operation positions: 39, 59, 79, 107 steps

Environment temperature: -10°C ~ +40°C

Note: for special power supply, please inform when ordering.

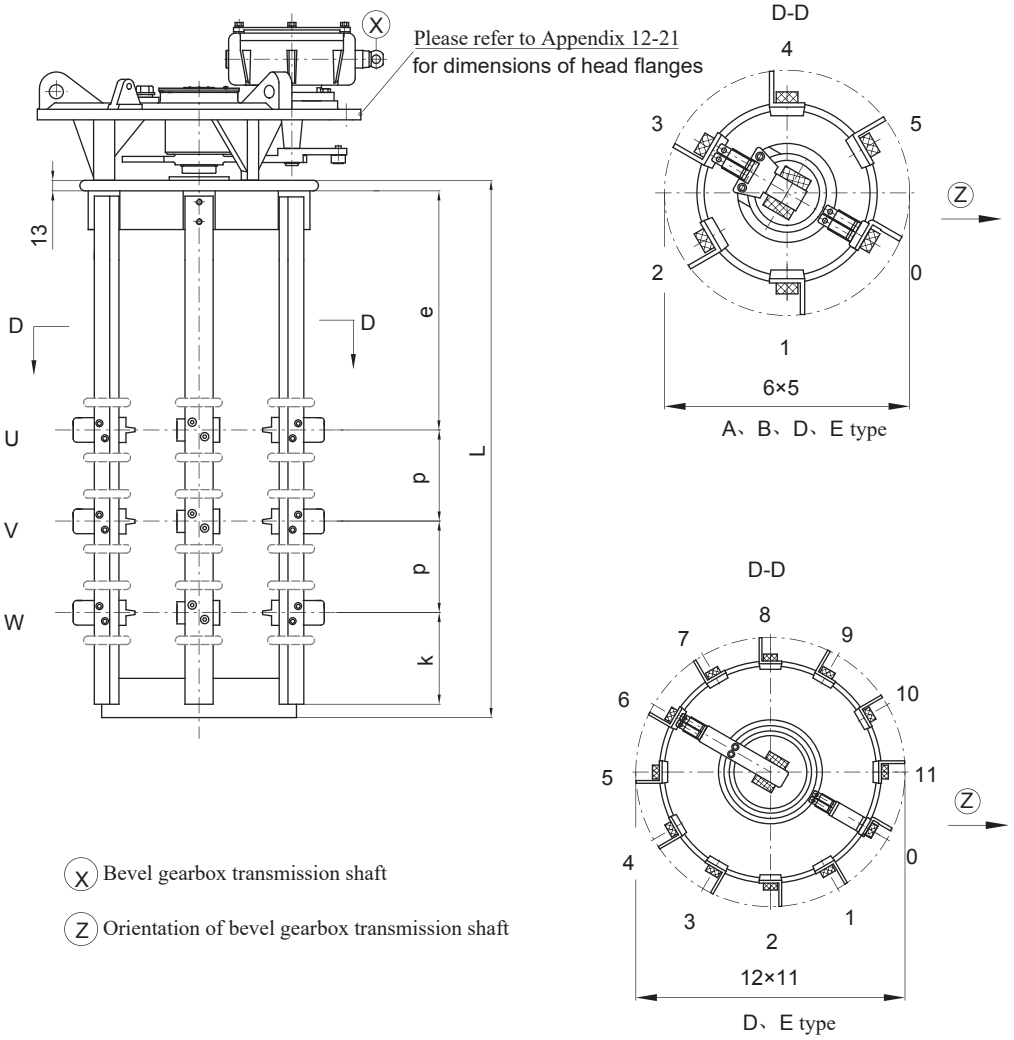
8. Accessories

Bevel gearbox is applicable for connection of horizontal shaft of tap changer and vertical shaft of the motor drive unit, by which transferring the driving torque from motor drive unit to tap changer, its overall dimensions is shown in appendix 28.

9. Appendix

Appendix 1 600-1000A Linear regulation, overall dimension
Appendix 2 600-1000A 252kV Linear regulation, overall dimension
Appendix 3 600-1000A Single-bridging regulation, overall dimension
Appendix 4 600-1000A Y-D regulation, overall dimension
Appendix 5 600-1000A Double-bridging regulation, overall dimension
Appendix 6 600-1000A Series-parallel regulation, overall dimension
Appendix 7 600-1000A Reversing regulation, overall dimension
Appendix 8 600-1000A 252kV reversing regulation, overall dimension
Appendix 9 1000-2000A Reversing regulation, overall dimension
Appendix 10 Installation flange for standard tank type cover, overall dimension
Appendix 11 Installation flange for bell type tank cover, overall dimension
Appendix 12 Ground motor drive (manual), Type A for standard tank, head flange dimensions Appendix 13 Ground motor drive (manual), type B, D, E for standard tank, head flange dimensions Appendix 14 Top cover hand wheel type A for standard tank, head flange dimension
Appendix 15 Top cover hand wheel type B, D, E for standard tank, head flange dimension Appendix 16 Ground motor drive (manual), Type A for bell type tank, head flange dimensions Appendix 17 Ground motor drive (manual), type B, D for bell type tank, head flange dimensions Appendix 18 Ground motor drive (manual), type E for bell type tank, head flange dimensions Appendix 19 Top cover hand wheel type A for bell type tank, head flange dimension
Appendix 20 Top cover hand wheel type B, D for bell type tank, head flange dimension
Appendix 21 Top cover hand wheel type E for bell type tank, head flange dimension
Appendix 22 Type A bell type supporting flange, installation drawing
Appendix 23 Type B, D bell type supporting flange, installation drawing
Appendix 24 Type E bell type supporting flange, installation drawing
Appendix 25 Tap changer terminal overall dimension
Appendix 26 Ground motor drive, Tap changer installation drawing
Appendix 27 Ground manual drive, Tap changer installation drawing
Appendix 28 Bevel gear, over dimensions
Appendix 29 Side-manual operation, overall dimension
Appendix 30 SHM-D Motor drive unit, overall dimension
Appendix 31 SHM-K Remote controller, overall dimension

Appendix 1 600-1000A Linear regulation, overall dimension



X Bevel gearbox transmission shaft

Z Orientation of bevel gearbox transmission shaft

Note: 1 Generally type A is applicable to the current of less than 800A

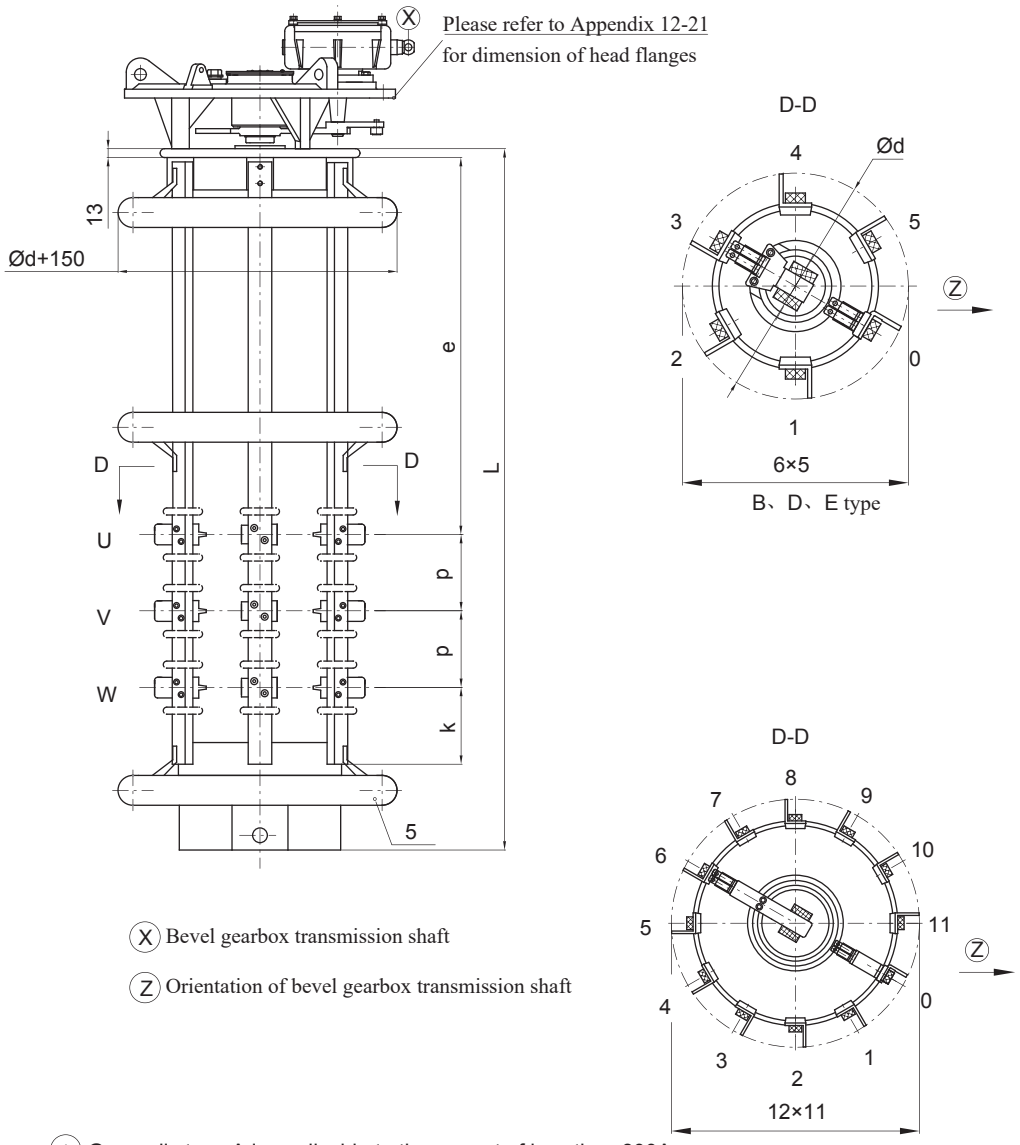
2 Connect dimension. Please refer to Appendix 20

3 A、B、D and E type cage outer diameters: Φ350mm、Φ500mm、Φ600mm和Φ750mm

Conection	Y				D			
Highest Voltage for equipment	e	p	k	L	e	p	k	L
12kV	200	130	135	630	200	130	135	630
72.5kV	340	130	145	780	340	280	145	1080
126kV	470	170	155	1000	470	410	155	1480

Unit：mm

Appendix 2 600-1000A 252kV Linear regulation, overall dimension



Ⓧ Bevel gearbox transmission shaft

Ⓩ Orientation of bevel gearbox transmission shaft

NOTE：

① Generally type A is applicable to the current of less than 800A

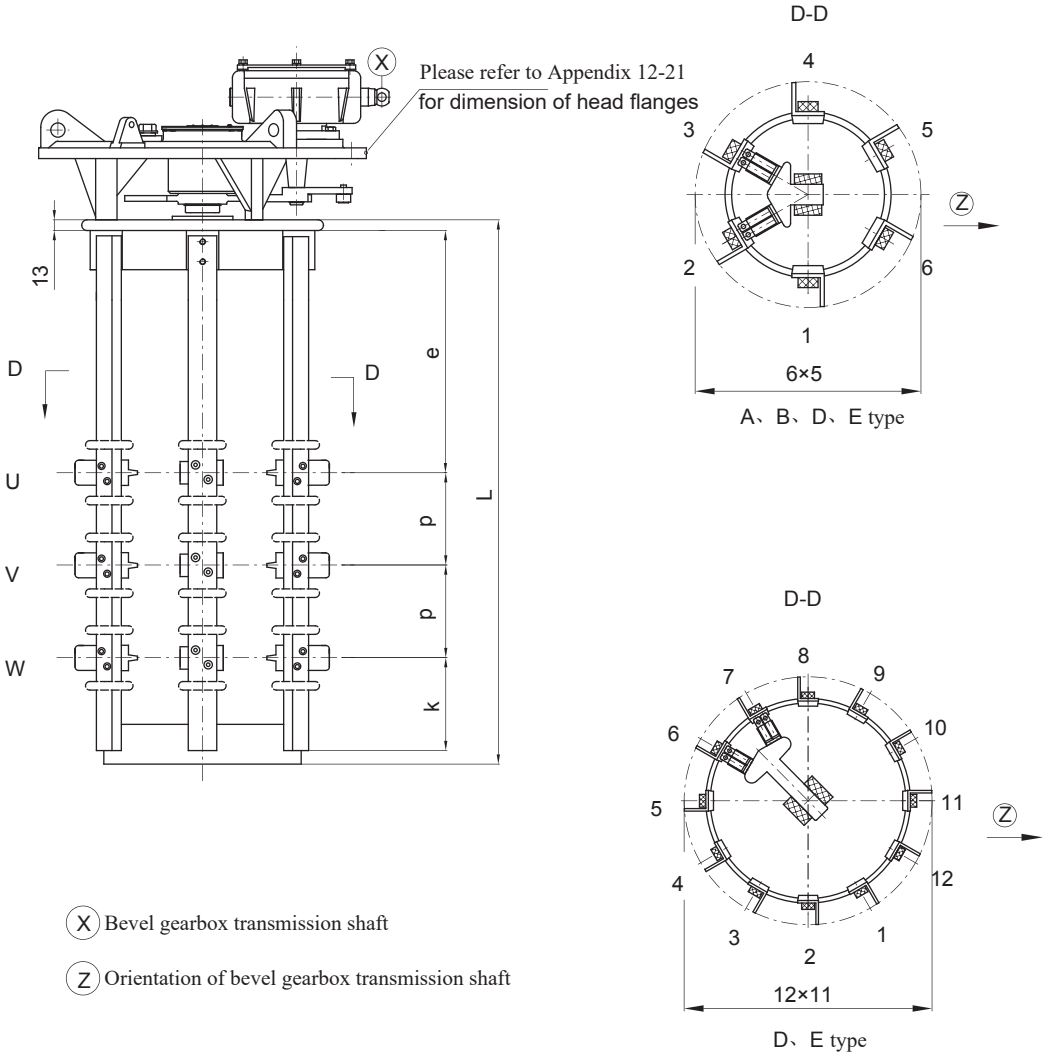
② Connect dimension. Please refer to Appendix 20

③ A、B、D and E type cage outer diameters: Φ350mm、Φ500mm、Φ600mm和Φ750mm

Conection	Y			
Highest Voltage for equipment	e	p	k	L
252kV	980	170	155	1690

Unit：mm

Appendix 3 600-1000A Single-bridging regulation, overall dimension



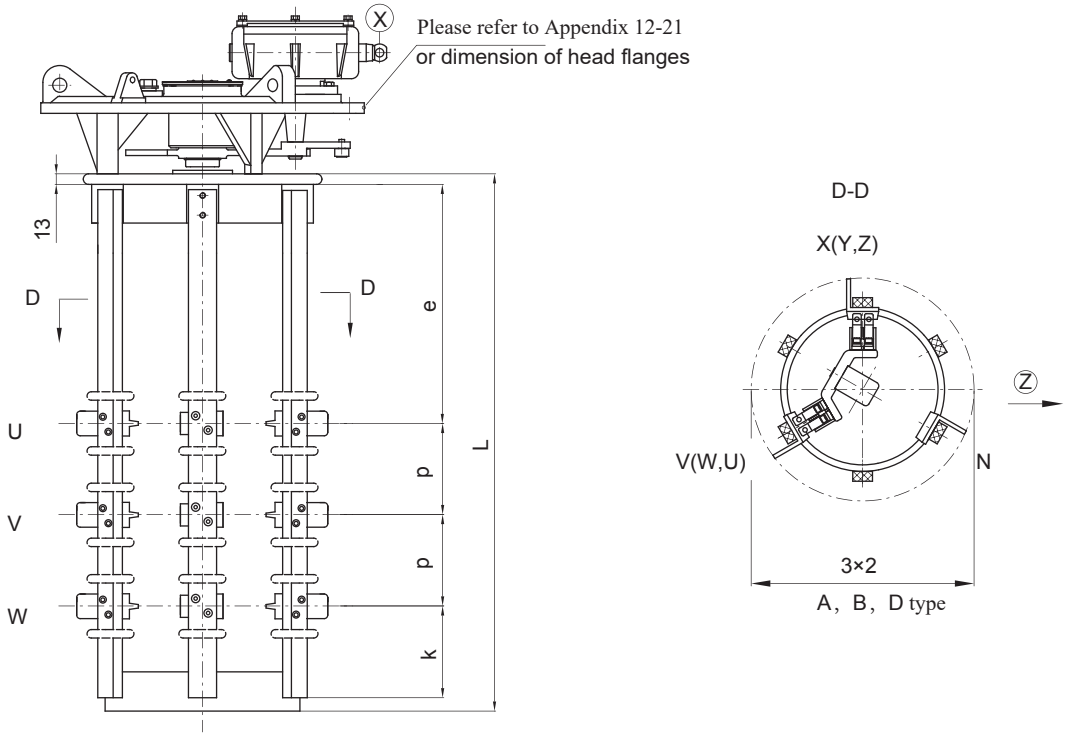
Note：

1. Generally type A is applicable to the current of less than 800A
2. Connect dimension. Please refer to Appendix 20
3. A、B、D and E type cage outer diameters: Φ350mm、Φ500mm、Φ600mm and Φ750mm

Highest Voltage for equipment	e	p	k	L
12kV	200	130	135	630
72.5kV	340	280	145	1080
126kV	470	410	155	1480

Unite：mm

Appendix 4 600-1000A Y-D regulation, overall dimension



(X) Bevel gearbox transmission shaft

(Z) Orientation of bevel gearbox transmission shaft

Note： (1) Generally type A is applicable to the current of less than 800A

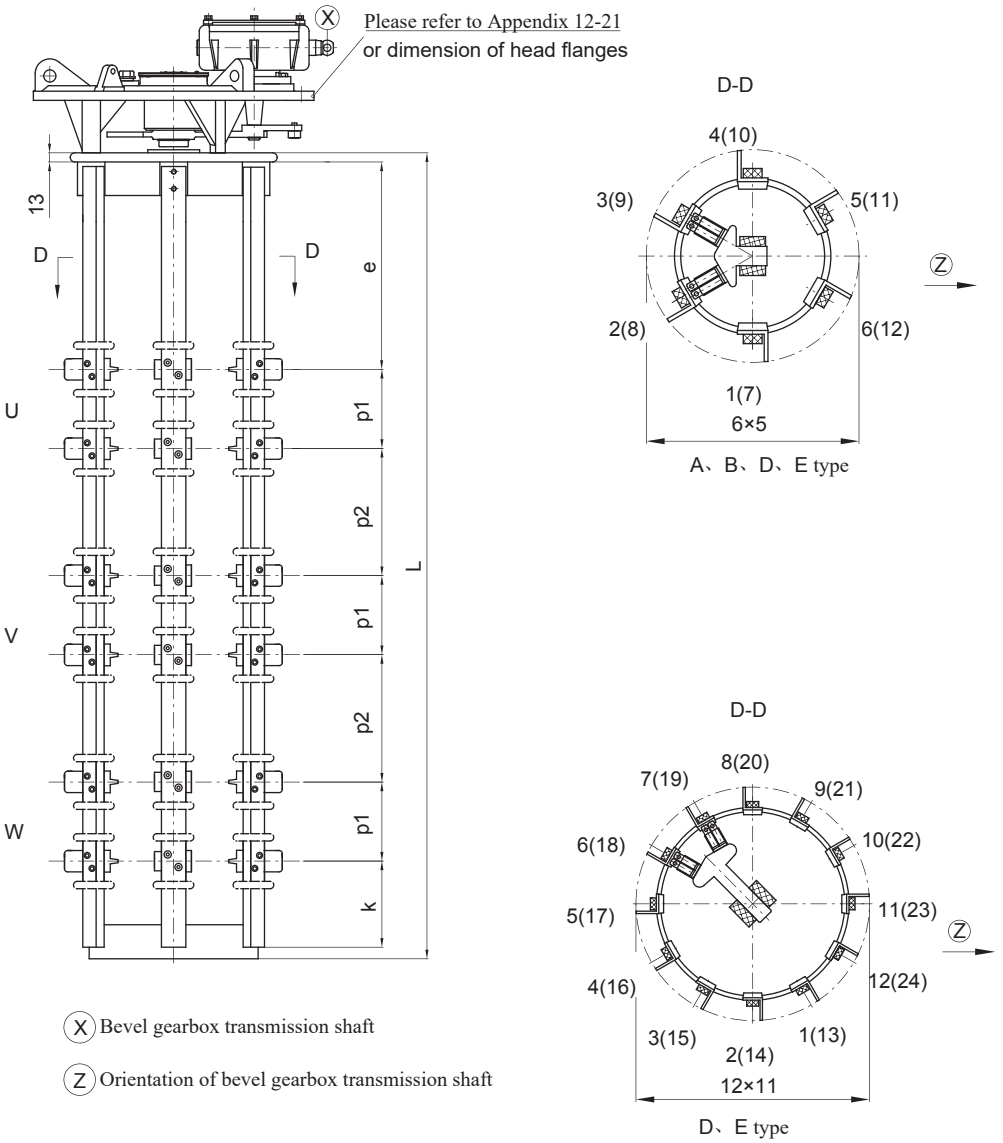
(2) Connect dimension. Please refer to Appendix 20

(3) A、B、D and E type cage outer diameters: Φ350mm、Φ500mm、Φ600mm and Φ750mm

Highest Voltage for equipment	e	p	k	L
12kV	200	130	135	630
72.5kV	340	280	145	1080
126kV	470	410	155	1480

Unit：mm

Appendix 5 600-1000A Double-bridging regulation, overall dimension



Ⓧ Bevel gearbox transmission shaft

Ⓩ Orientation of bevel gearbox transmission shaft

注：

① Generally type A is applicable to the current of less than 800A

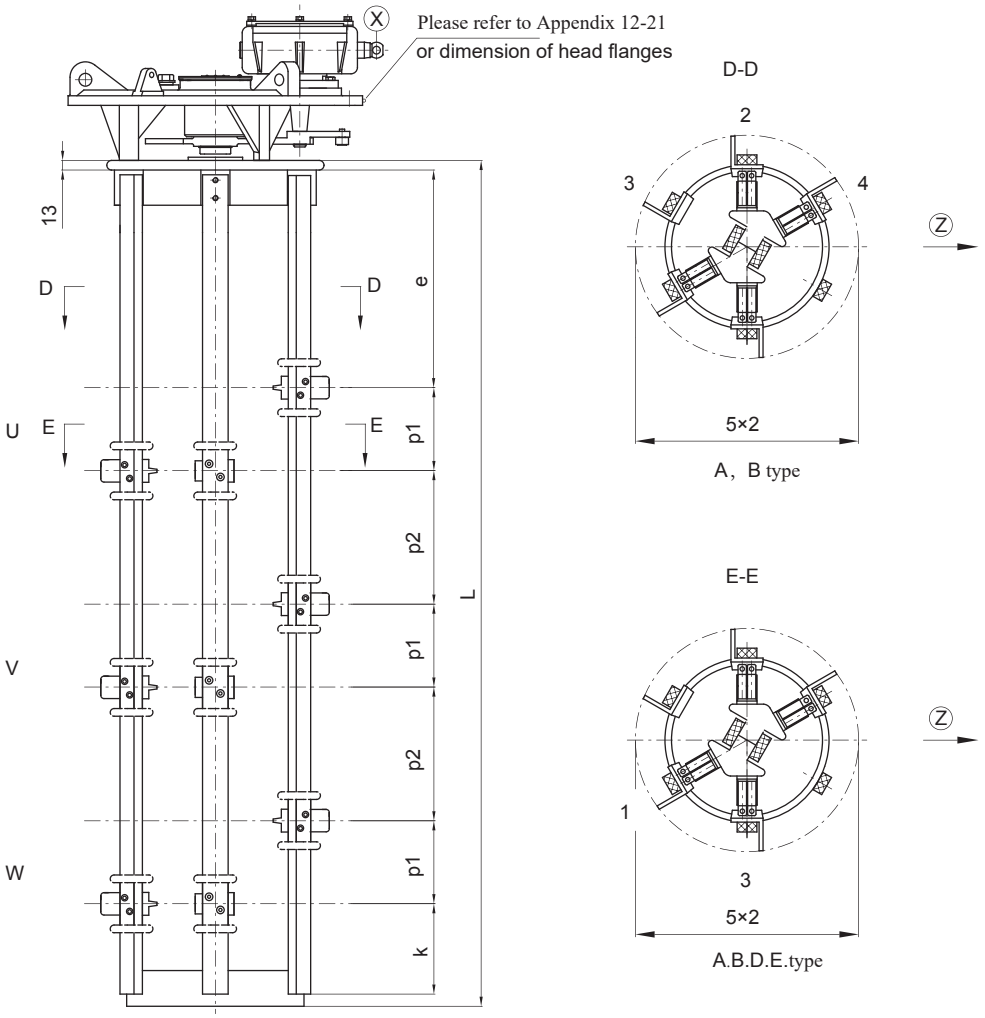
② Connect dimension. Please refer to Appendix 20

③ A、B、D and E type cage outer diameters:Φ350mm、Φ500mm、Φ600mm and Φ750mm

Highest Voltage for equipment	e	p1	p2	k	L
12 kV	200	120	150	125	1020
72.5 kV	340	160	280	145	1560
126 kV	470	170	410	155	1990

Unit：mm

Appendix 6 600-1000A Series-parallel regulation, overall dimension



(X) Bevel gearbox transmission shaft

(Z) Orientation of bevel gearbox transmission shaft

Note：

(1) Generally type A is applicable to the current of less than 800A

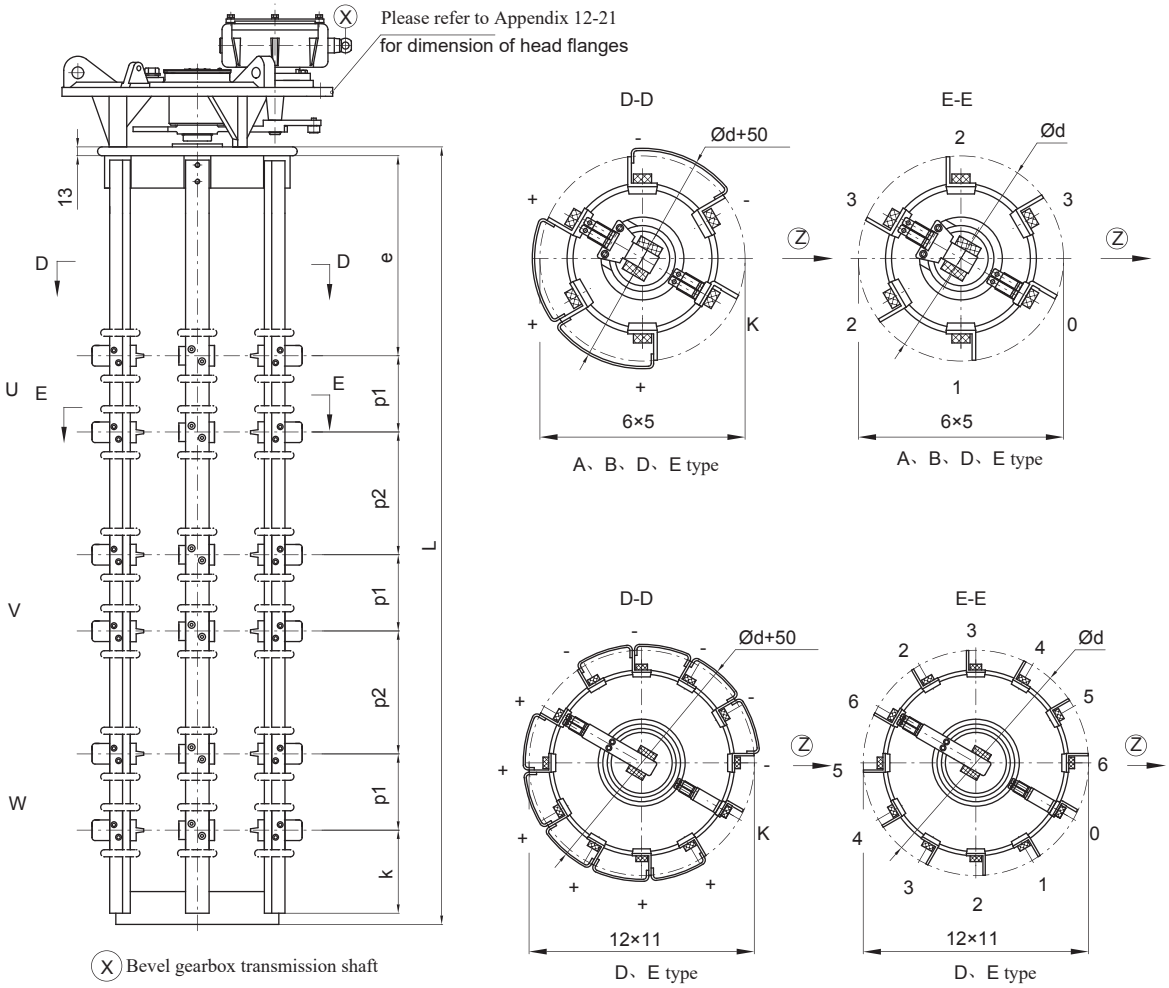
(2) Connect dimension. Please refer to Appendix 20

(3) A、B、D and E type cage outer diameters:Φ350mm、Φ500mm、Φ600mm and Φ750mm

Highest Voltage for equipment	e	p1	p2	k	L
12 kV	200	120	150	125	1020
72.5 kV	340	160	280	145	1560
126 kV	470	170	410	155	1990

Unit：mm

Appendix 7 600-1000A Reversing regulation, overall dimension



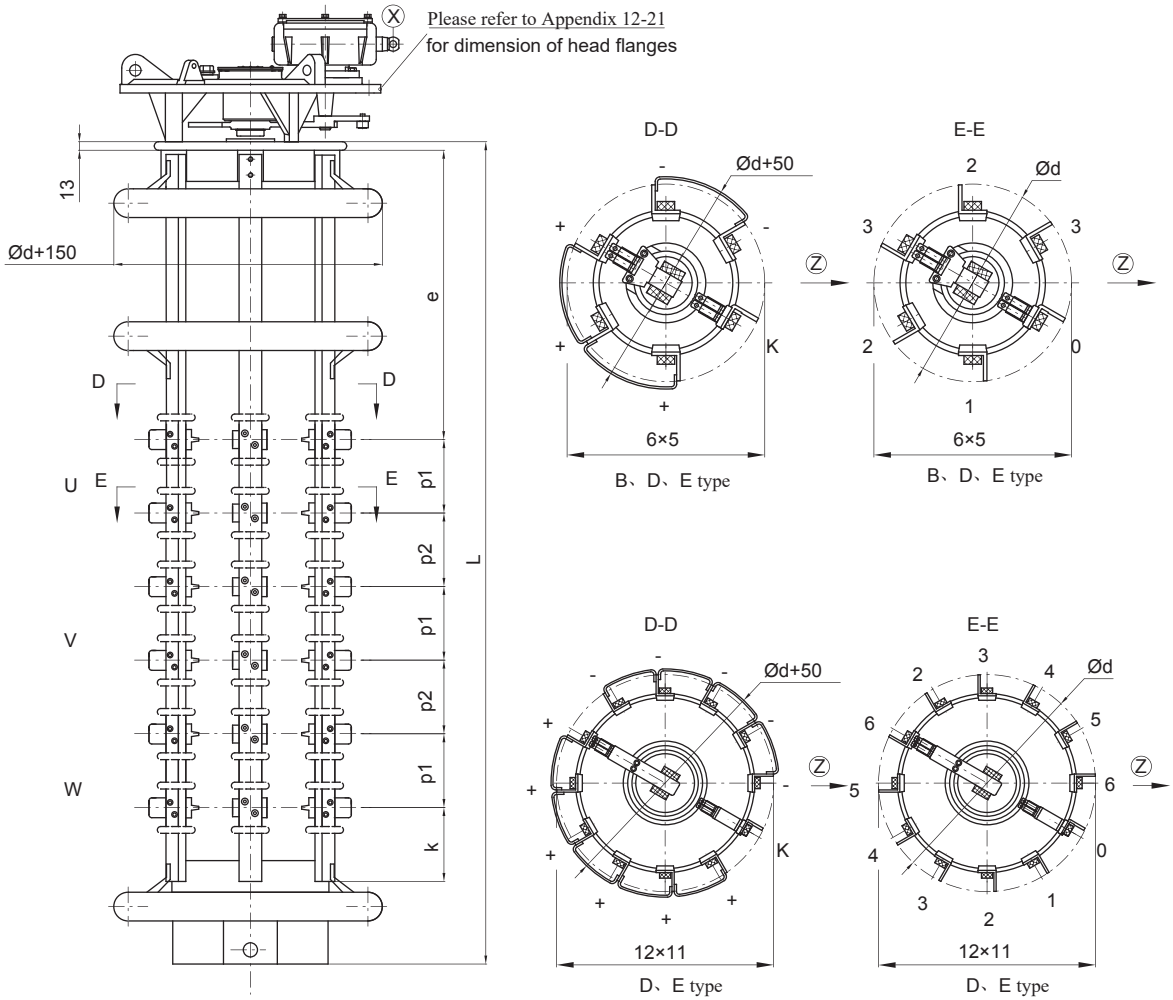
注：

1. Generally type A is applicable to the current of less than 800A
2. Connect dimension. Please refer to Appendix 20
3. Regularlly Huaming connection "+" and "+"、"−" and "−", as shown "D-D", Others connection by customers
4. A、B、D and E type cage outer diameters:Φ350mm、Φ500mm、Φ600mm and Φ750mm

Connection	Y					D				
Highest Voltage for equipment	e	p1	p2	k	L	e	p1	p2	k	L
12kV	170	120	120	125	930	200	120	150	125	1020
72.5kV	340	135	160	150	1250	340	160	280	145	1560
126kV	470	170	170	155	1510	470	170	410	155	1990

Unit：mm

Appendix 8 600-1000A 252kV Reversing regulation, overall dimension



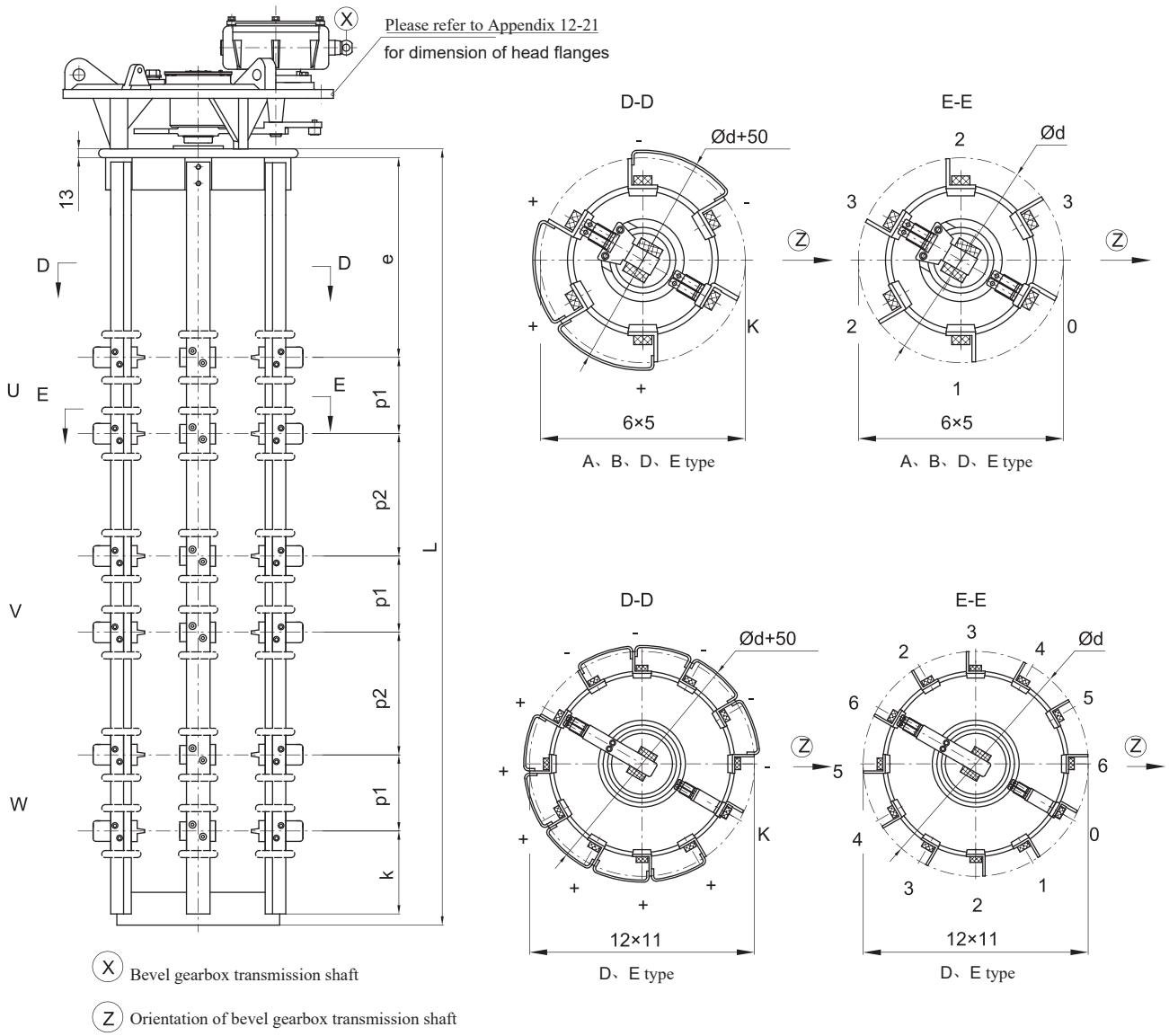
Note:

1. Generally type A is applicable to the current of less than 800A
2. Connect dimension. Please refer to Appendix 20
3. Regularlly Huaming connection "+" and "+"、"-" and "-", as shown "D-D", Others connection by customers
4. A、B、D and E type cage outer diameters:Φ350mm、Φ500mm、Φ600mm and Φ750mm

Connection	Y				
Highest Voltage for equipment	e	p1	p2	k	L
252 kV	980	170	170	155	2200

Unit：mm

Appendix 9 1000-2000A Reversing regulation, overall dimension



(X) Bevel gearbox transmission shaft

(Z) Orientation of bevel gearbox transmission shaft

Note:

(1) Generally type A is applicable to the current of less than 800A

(2) Connect dimension. Please refer to Appendix 20

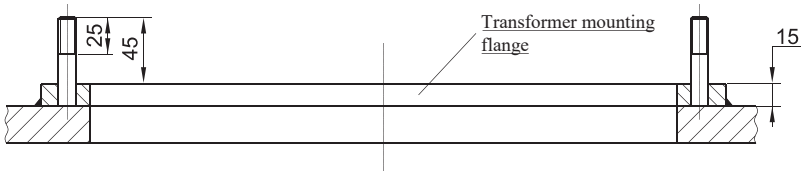
(3) Regularlly Huaming connection "+" and "+"、"-" and "-", as shown "D-D", Others connection by customers

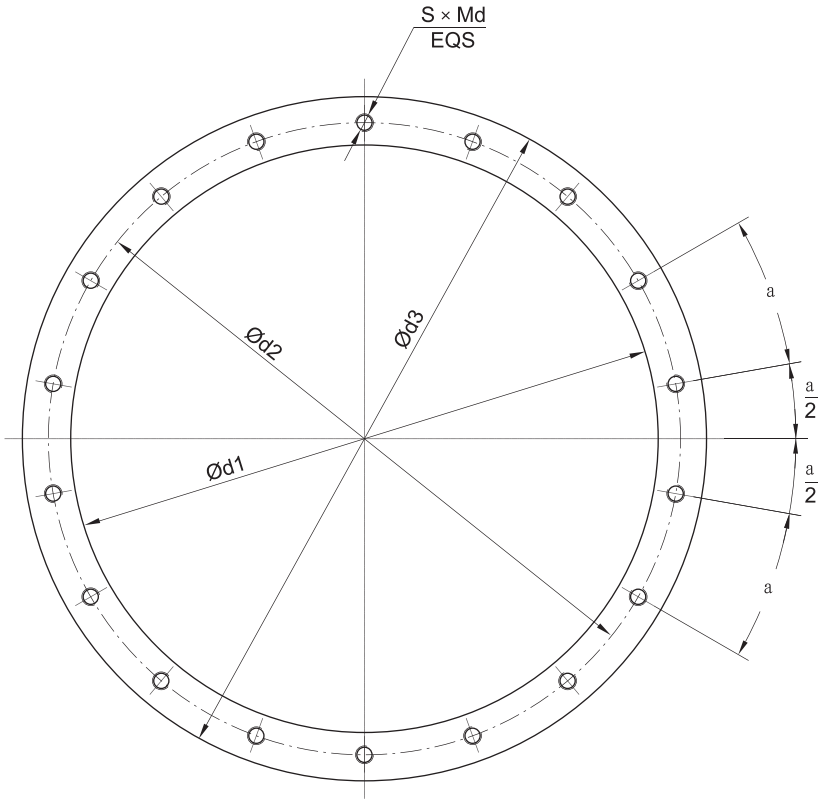
(4) A、B、D and E type cage outer diameters:Φ350mm、Φ500mm、Φ600mm and Φ750mm

Connection	Y					D				
Highest Voltage for equipment	e	p1	p2	k	L	e	p1	p2	k	L
12 kV	170	120	120	125	930	200	120	150	125	1020
72.5 kV	340	135	160	150	1250	340	160	280	145	1560
126 kV	470	170	170	155	1510	470	170	410	155	1990

Unit :mm

Appendix 10 Installation flange for standard tank cover, overall dimension

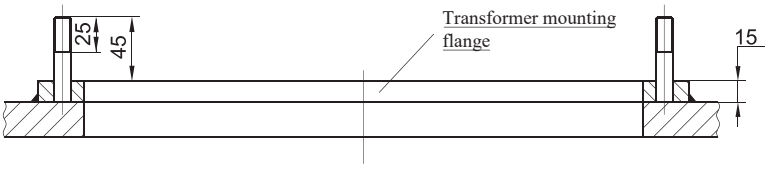


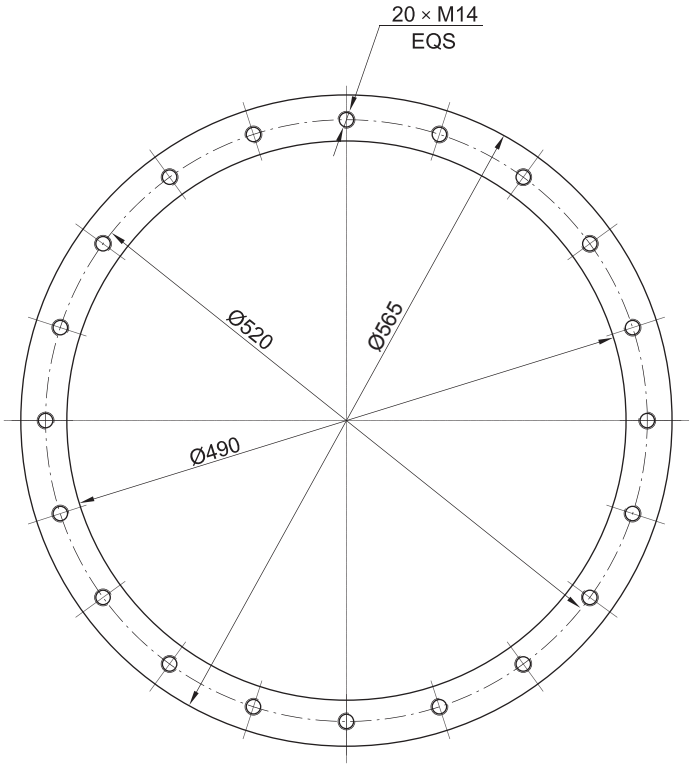


	Diameter d1	Diameter d2	Diameter d3	Bolt S×Md	Angle a
A type	Φ395	Φ425	Φ460	18×M12	20°
B type	Φ520	Φ550	Φ590	20×M12	18°
D type	Φ620	Φ650	Φ690	20×M12	18°
E type	Φ770	Φ800	Φ840	20×M12	18°

Unit：mm

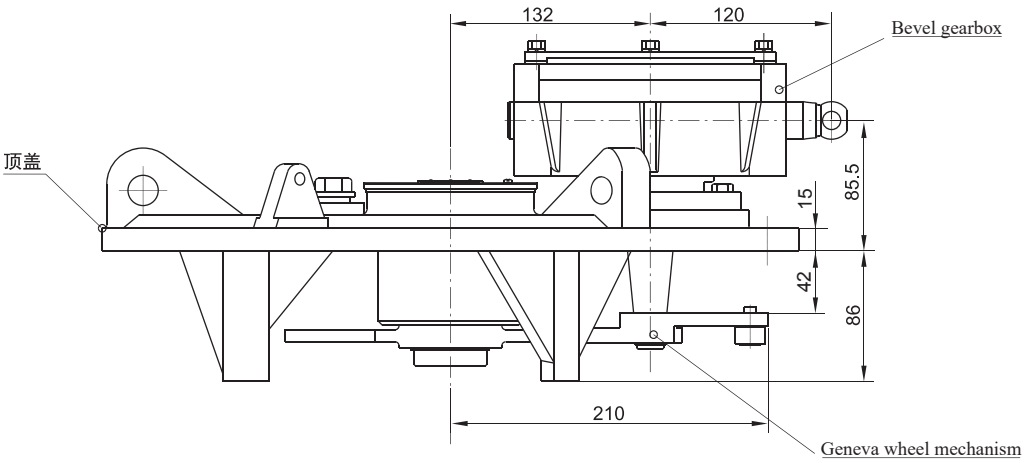
Appendix 11 Installation flange for bell type tank cover, overall dimension

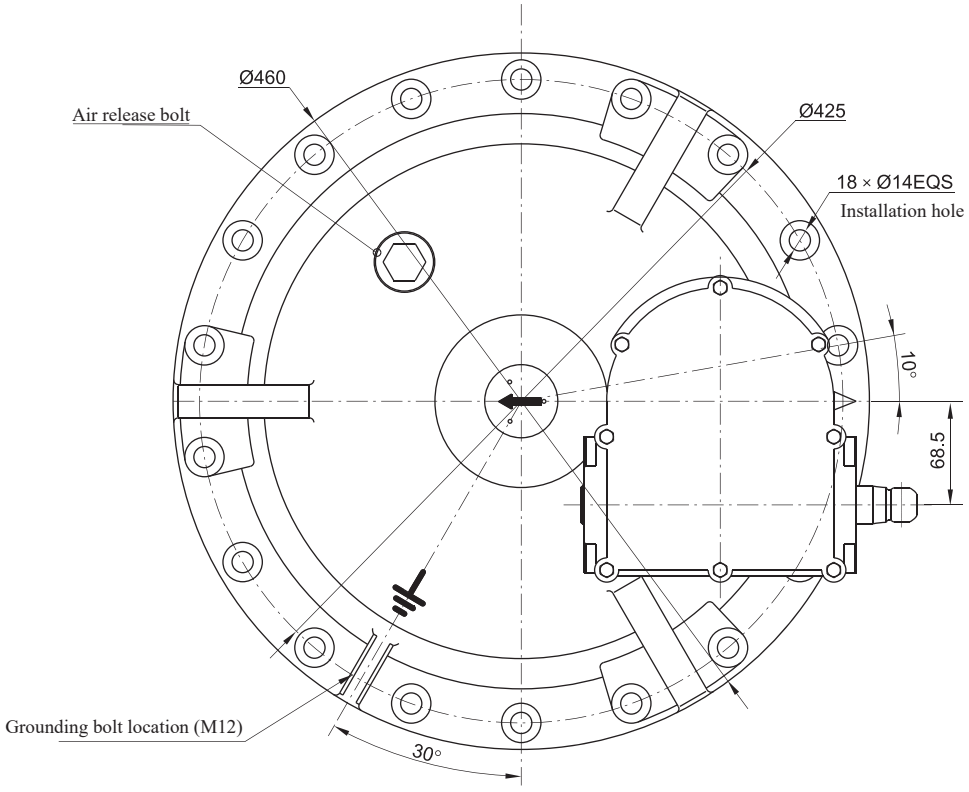




Unit：mm

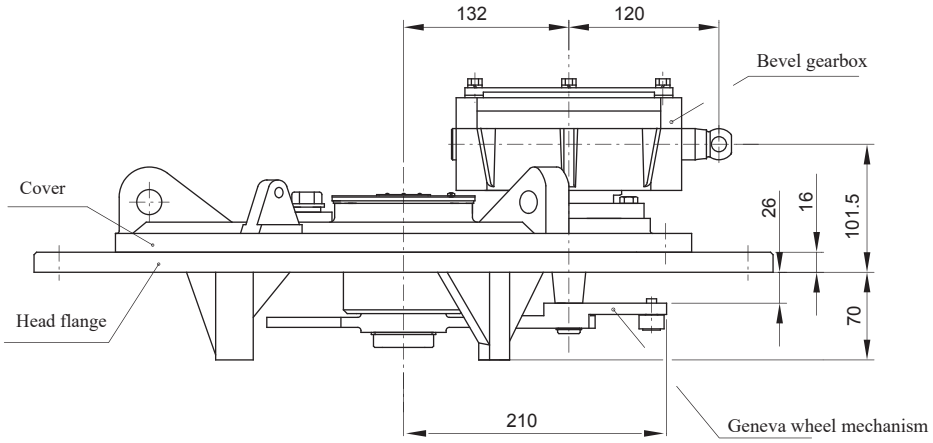
Appendix 12 Ground motor drive (manual), Type A for standard tank, head flange dimensions

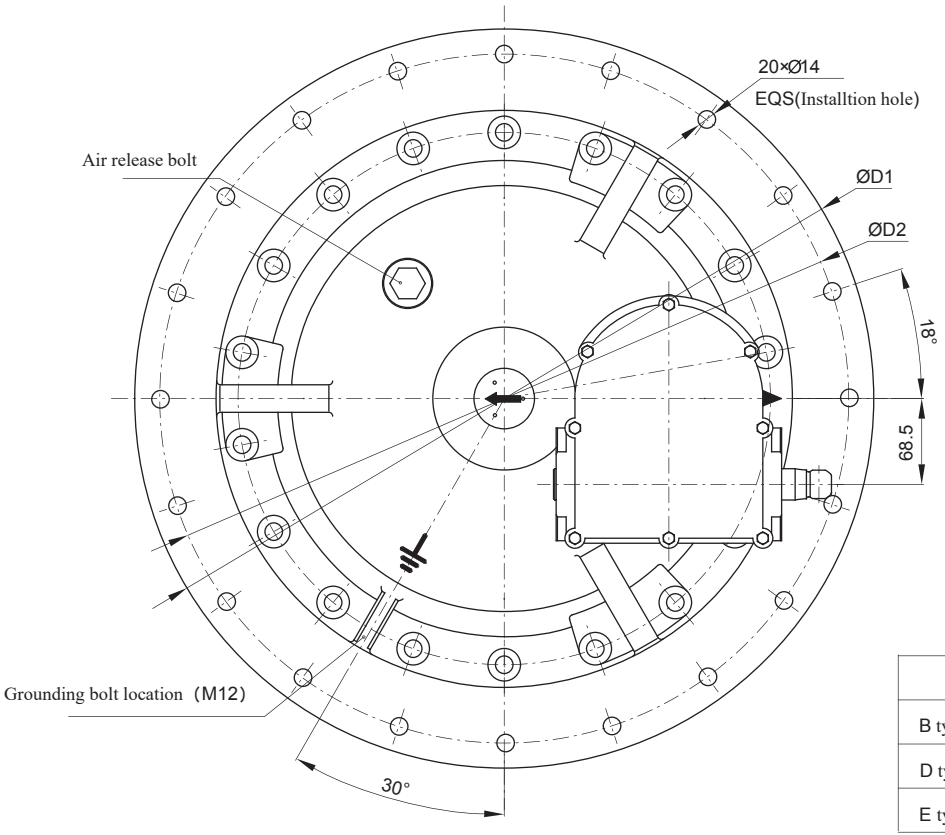




Unit：mm

Appendix 13 Ground motor drive (manual), type B, D, E for standard tank, head flange dimensions

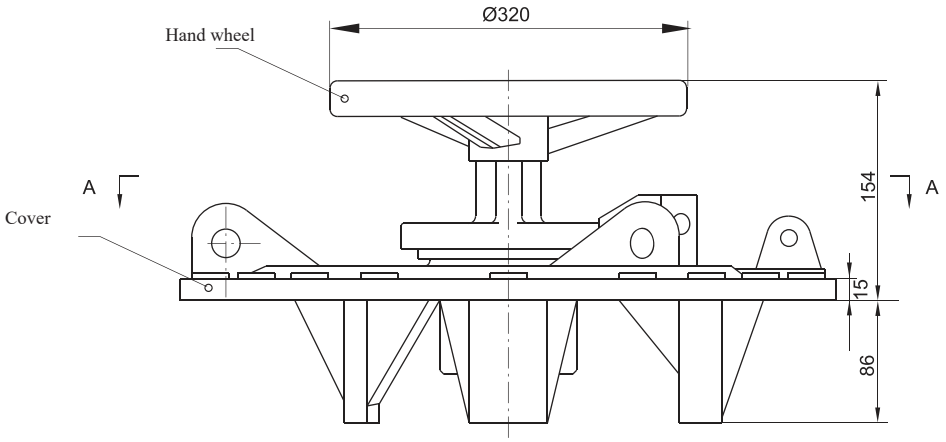


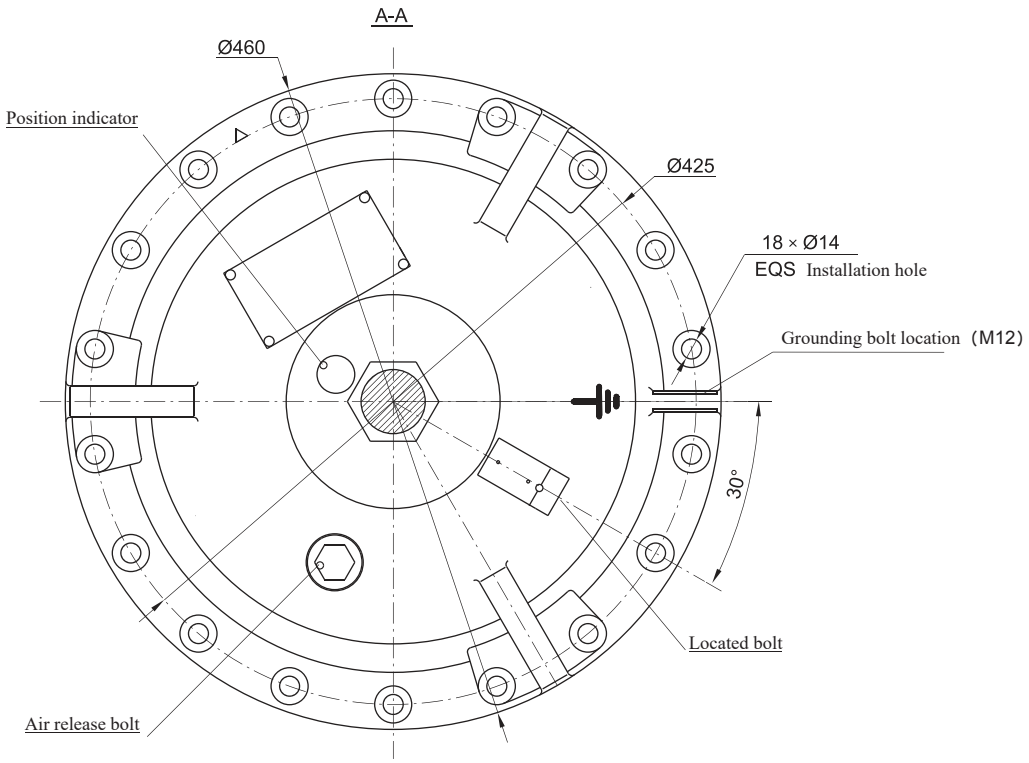


	ØD1	ØD2
B type	590	550
D type	690	650
E type	840	800

Unit：mm

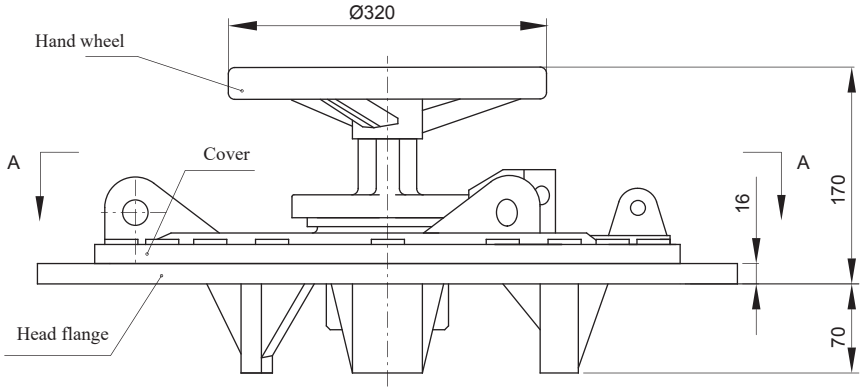
Appendix 14 Top cover hand wheel type A for standard tank, head flange dimension



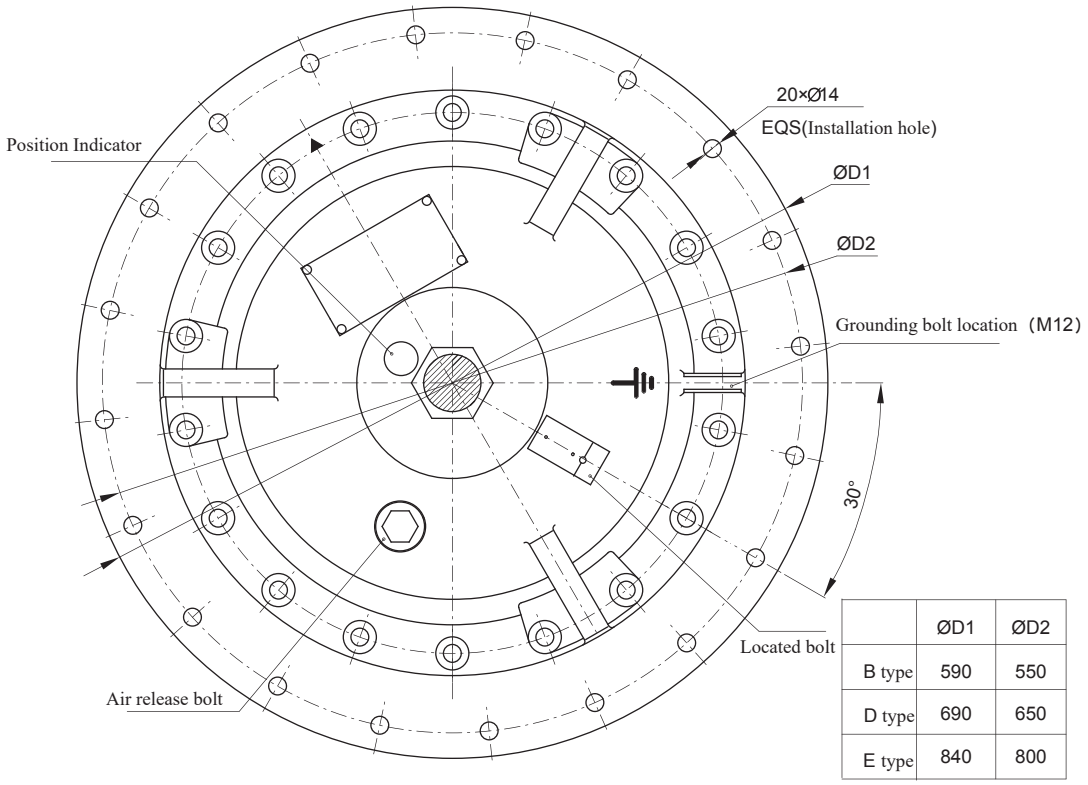


Unit：mm

Appendix 15 Top cover hand wheel type B, D, E for standard tank, head flange dimension



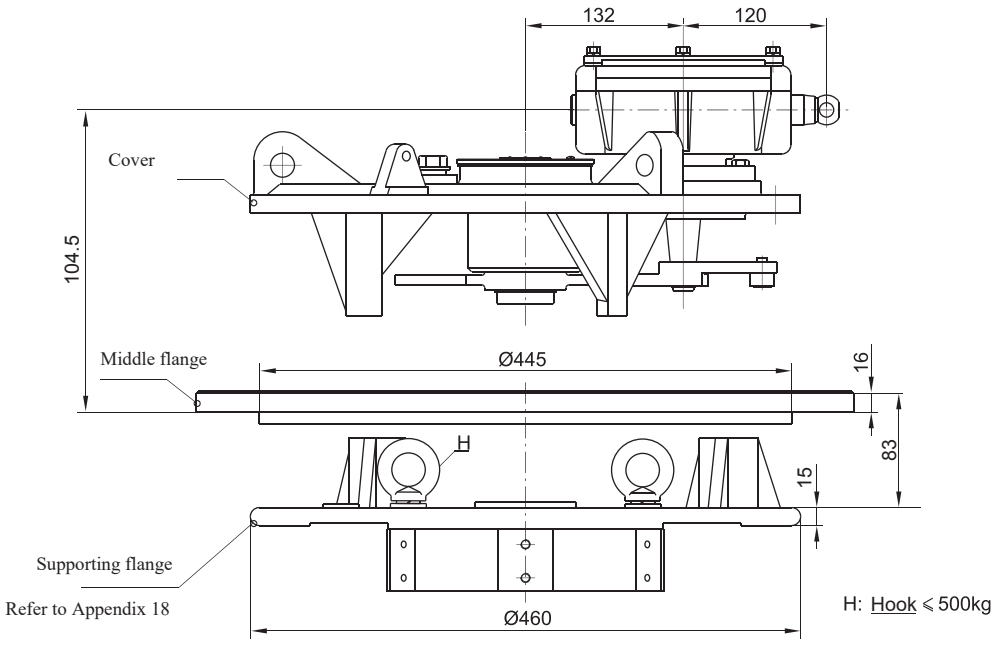
A-A

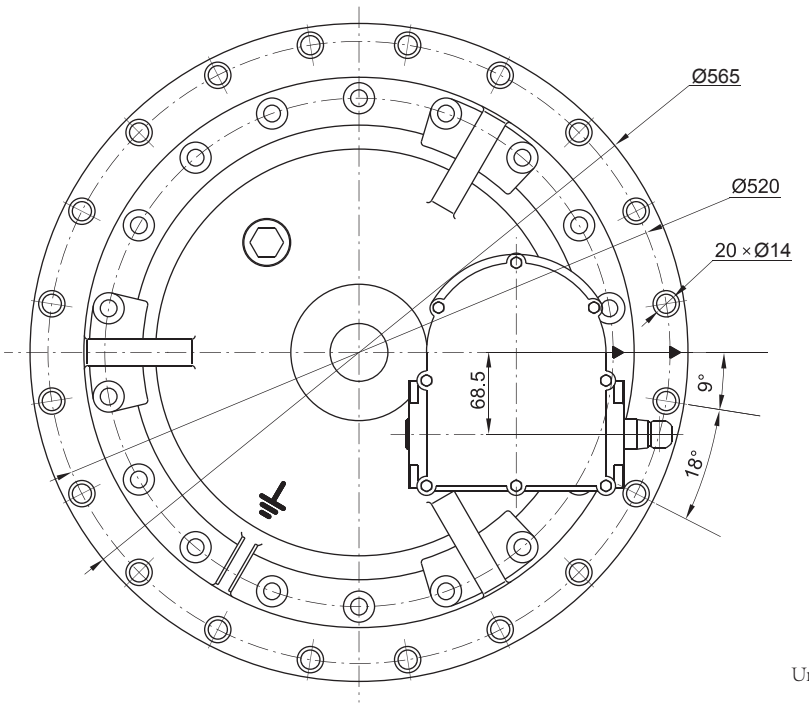


	ØD1	ØD2
B type	590	550
D type	690	650
E type	840	800

Unit：mm

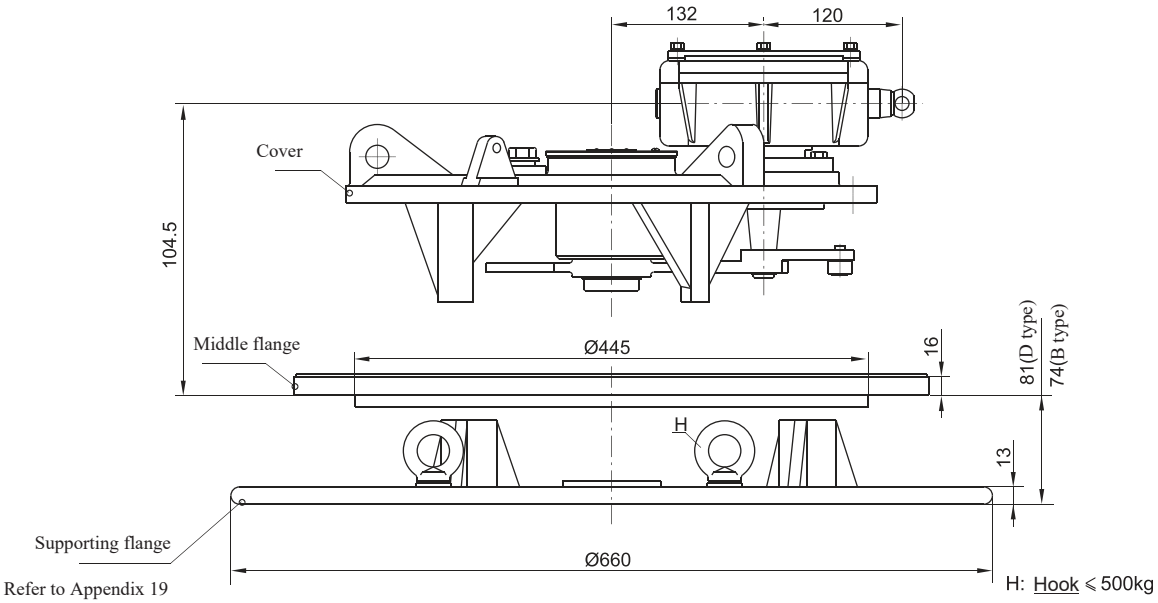
Appendix 16 Ground motor drive (manual), Type A for bell type tank, head flange dimensions

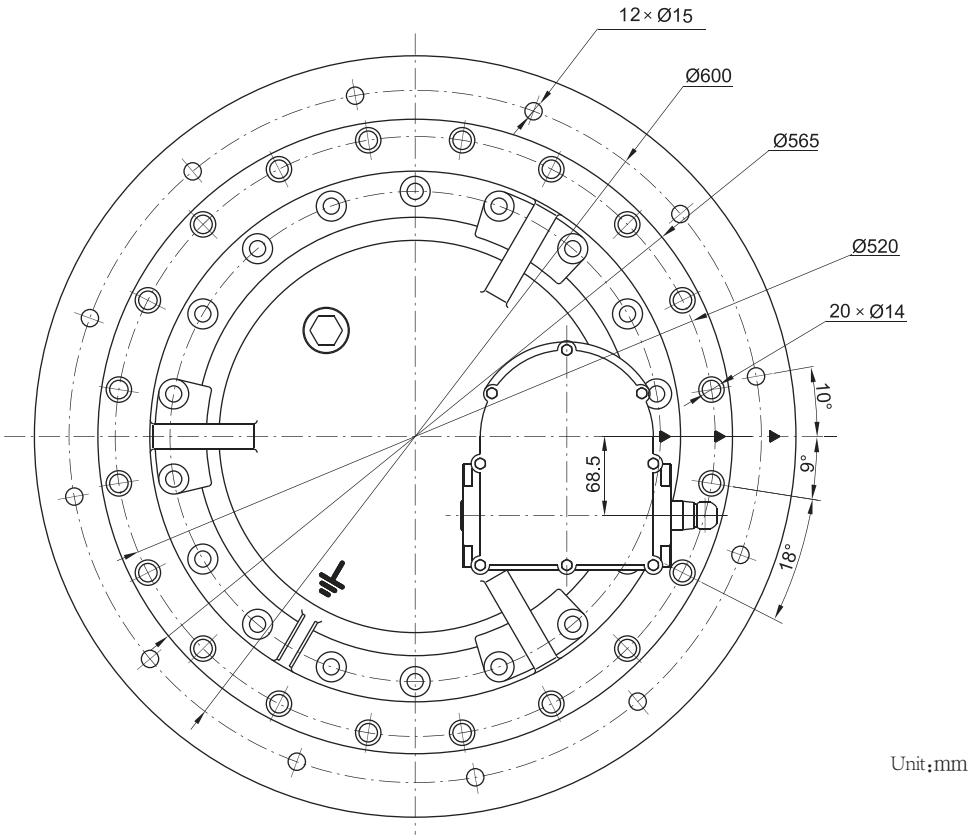




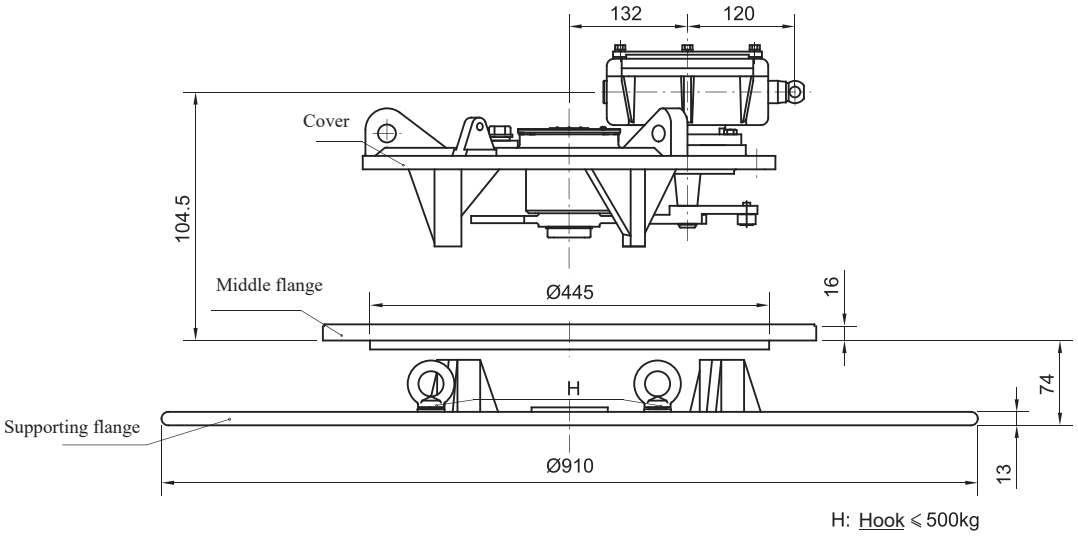
Unit：mm

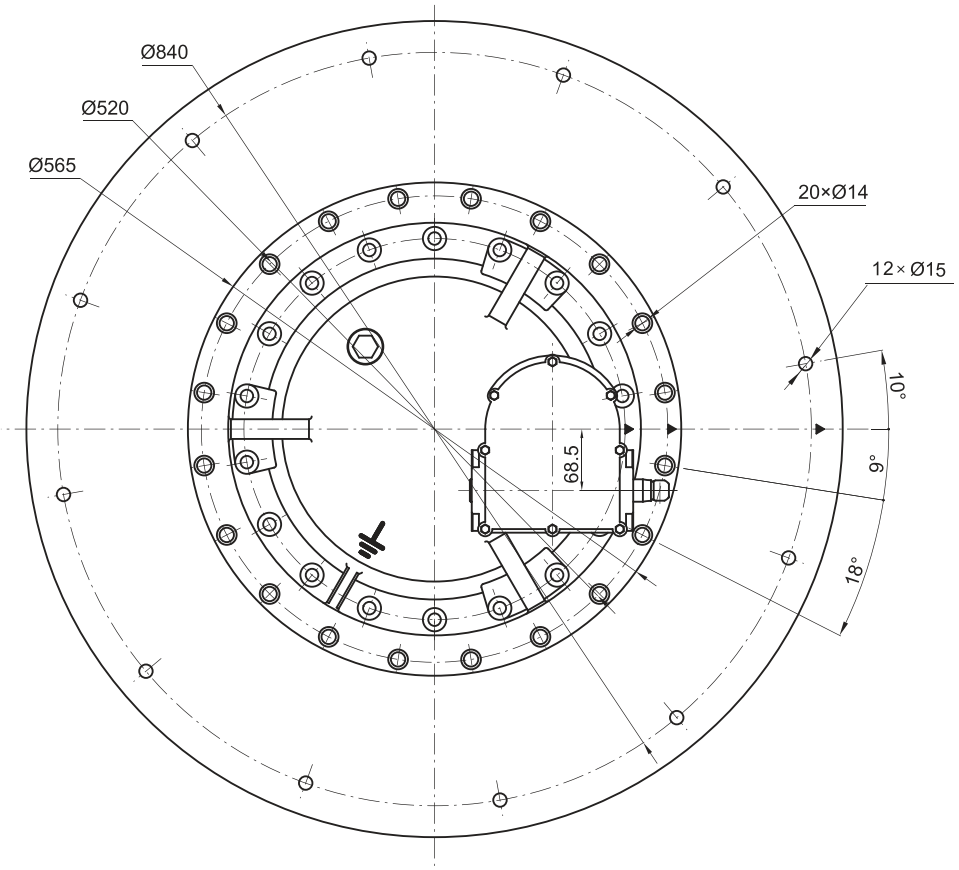
Appendix17 Ground motor drive (manual), type B, D for bell type tank, head flange dimensions





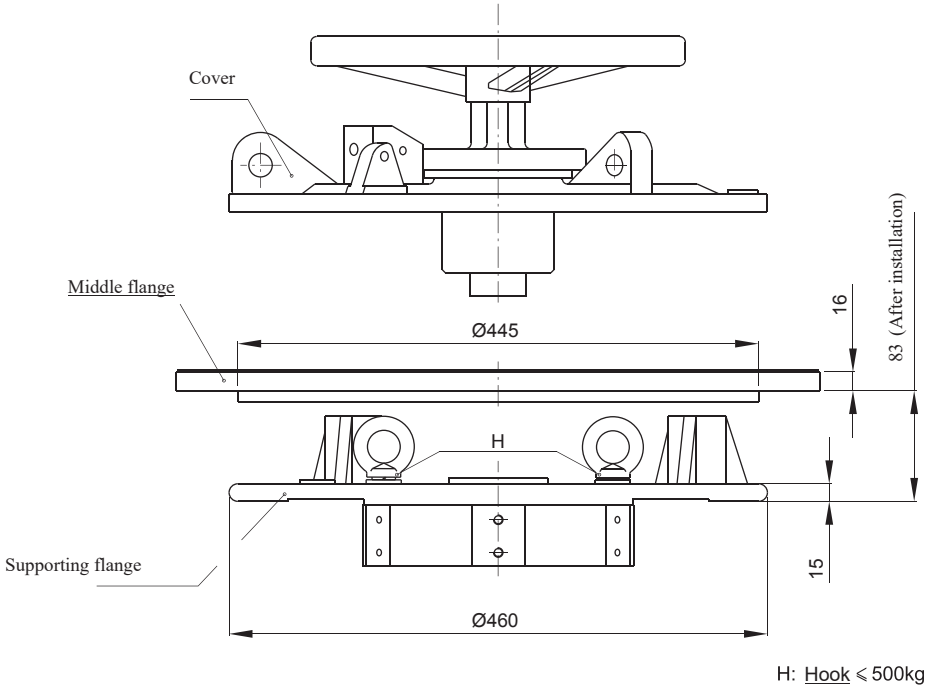
Appendix18 Ground motor drive (manual), type E for bell type tank, head flange dimensions



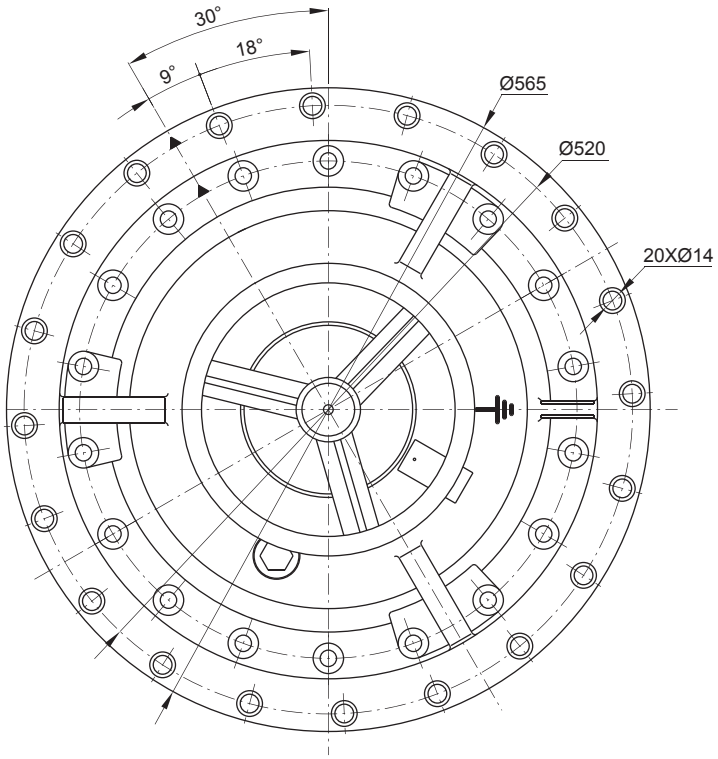


Unit：mm

Appendix19 Top cover hand wheel type A for bell type tank, head flange dimension

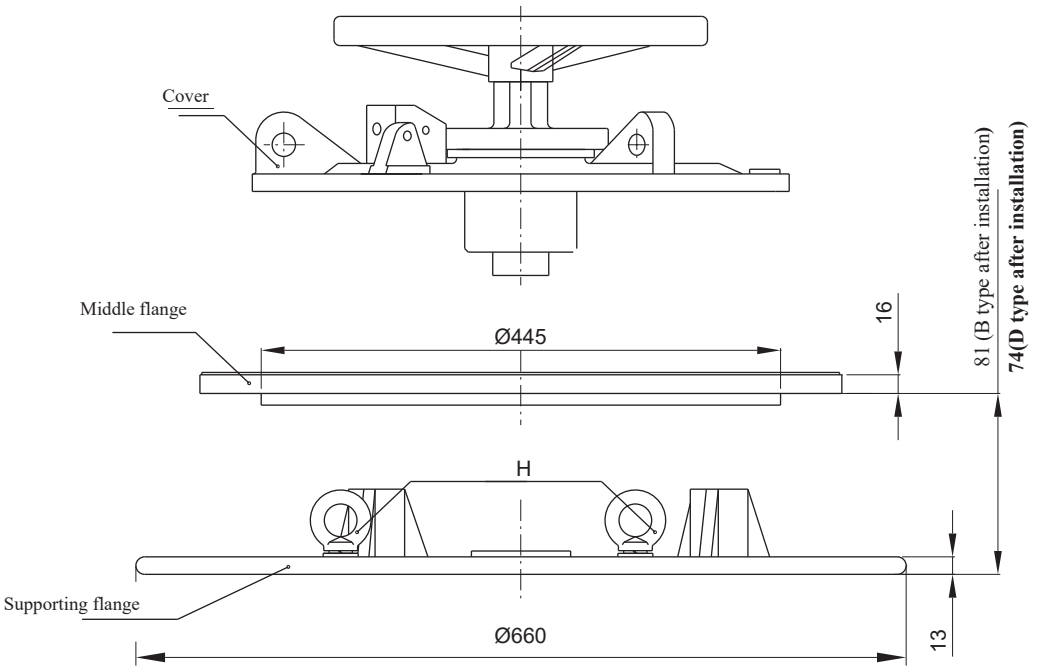


H: Hook ⩽ 500kg

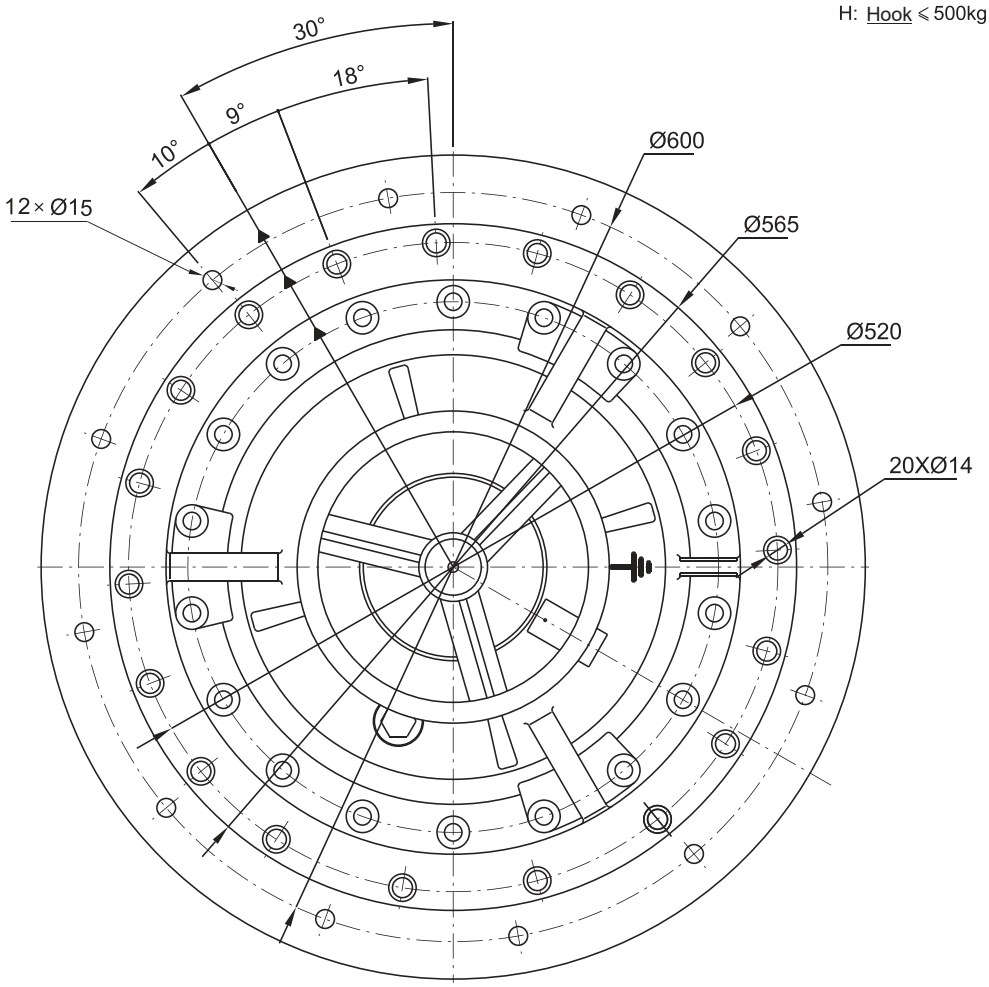


Unit:mm

Appendix 20 Top cover hand wheel type B, D for bell type tank, head flange dimension

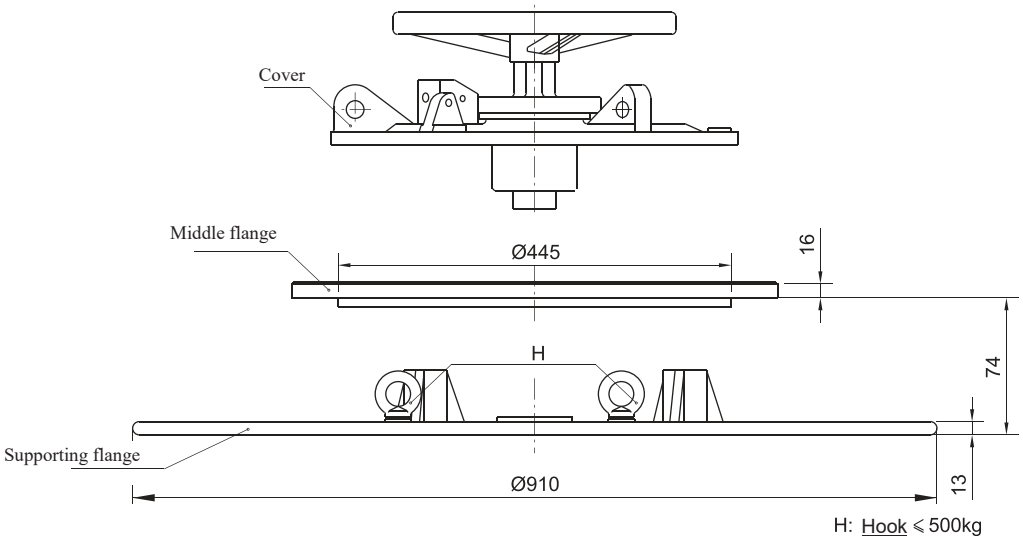


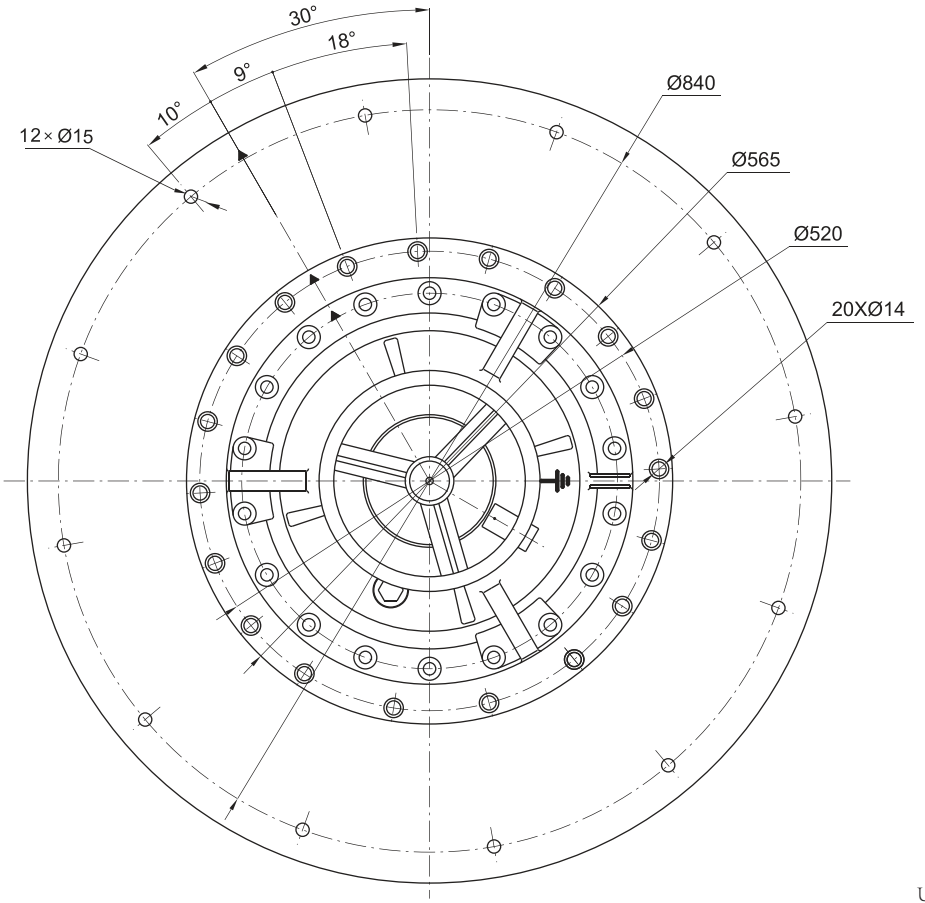
H: Hook ⩽ 500kg



Unit :mm

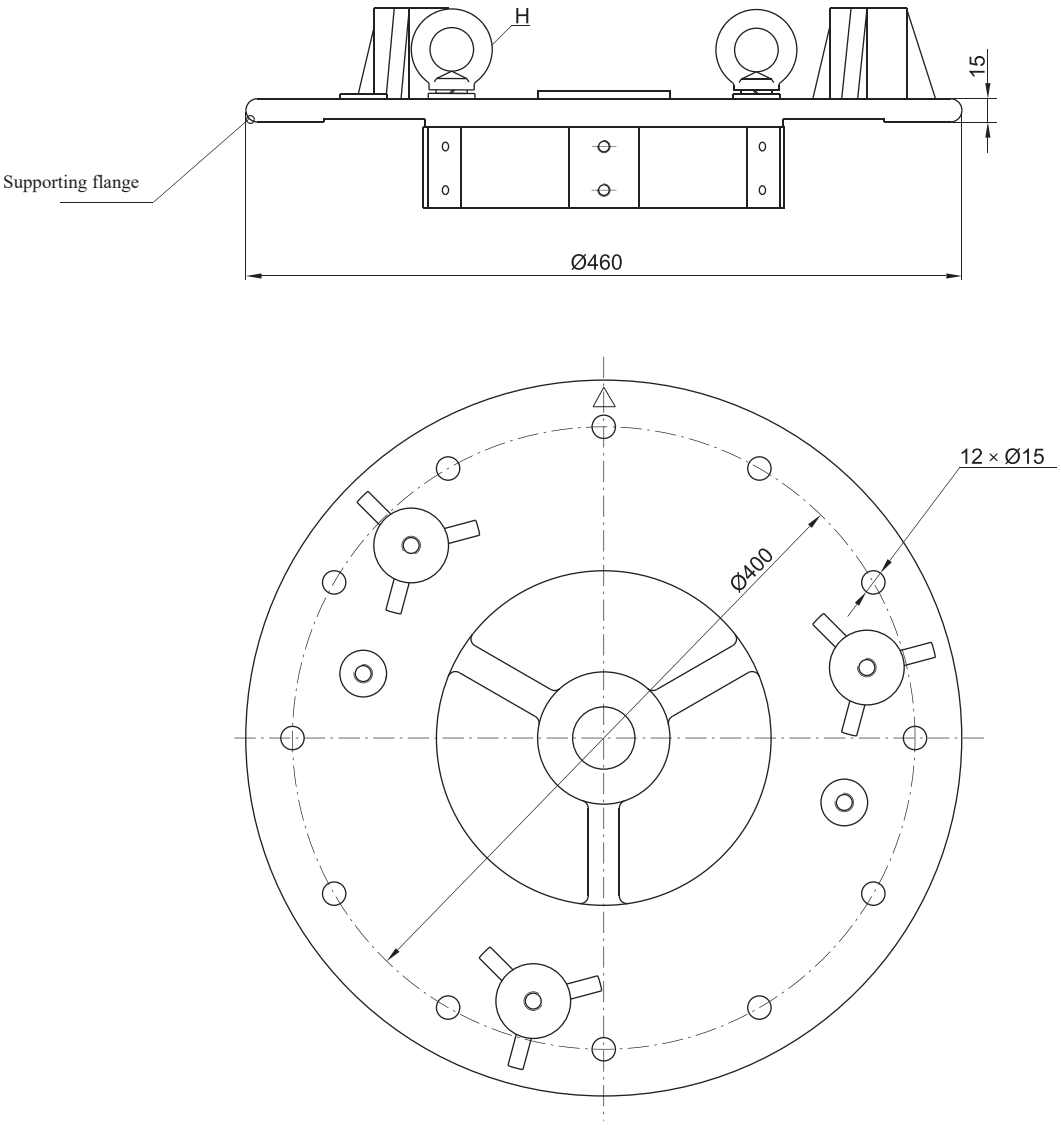
Appendix 21 Top cover hand wheel type E for bell type tank, head flange dimension





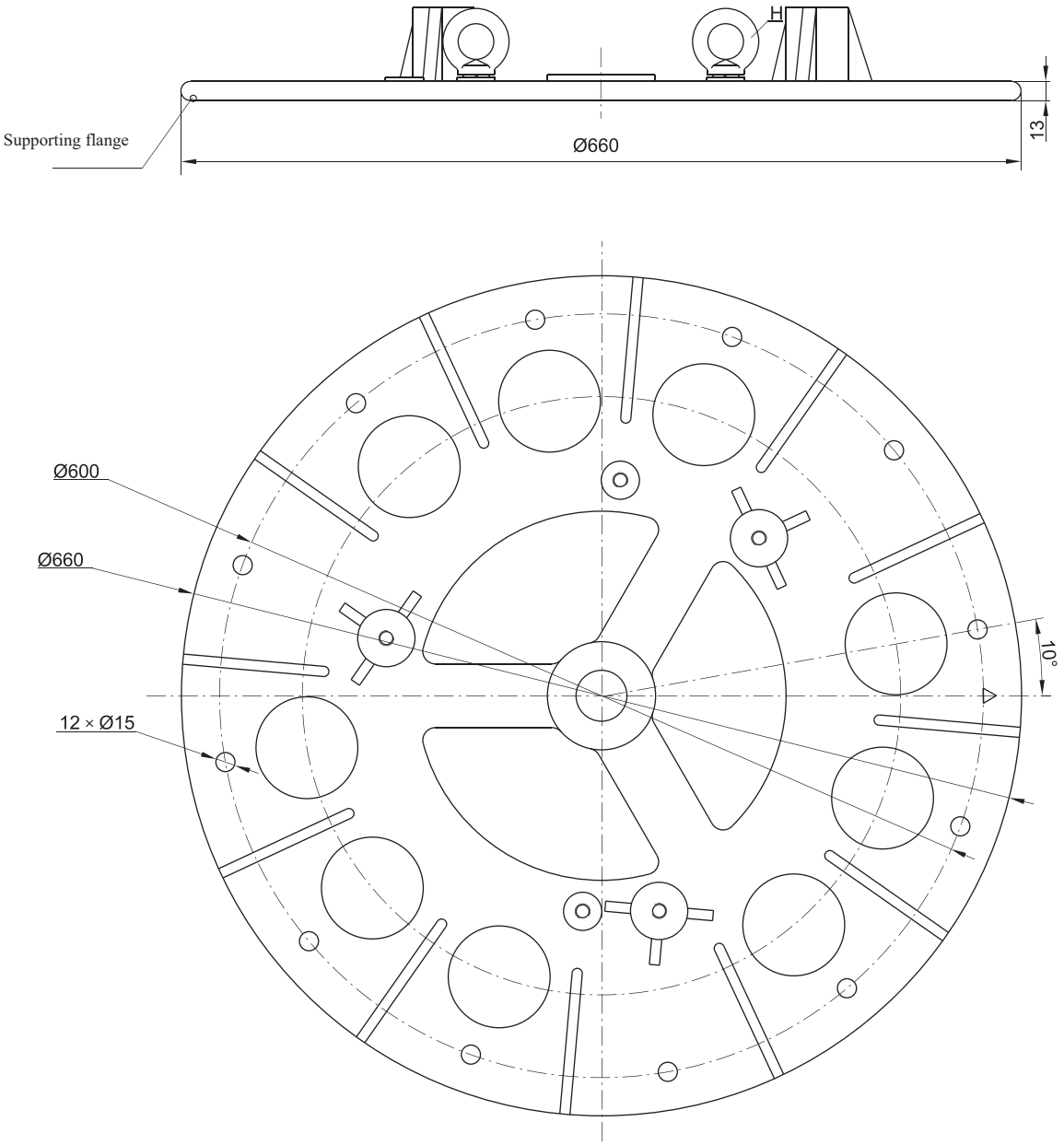
Unit：mm

Appendix 22 Type A bell type supporting flange, installation drawing



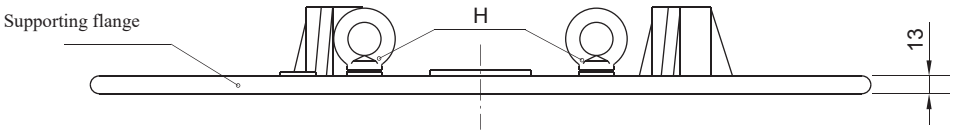
Unit：mm

Appendix 23 Type B, D bell type supporting flange, installation drawing

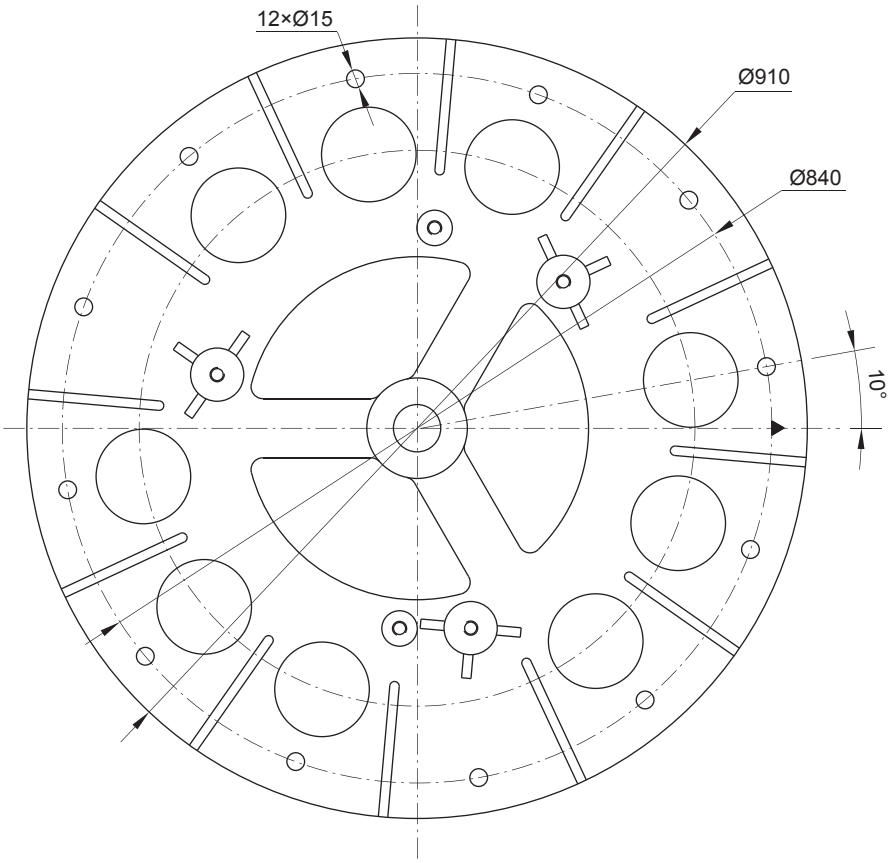


Unit：mm

Appendix 24 Type E bell type supporting flange, installation drawing

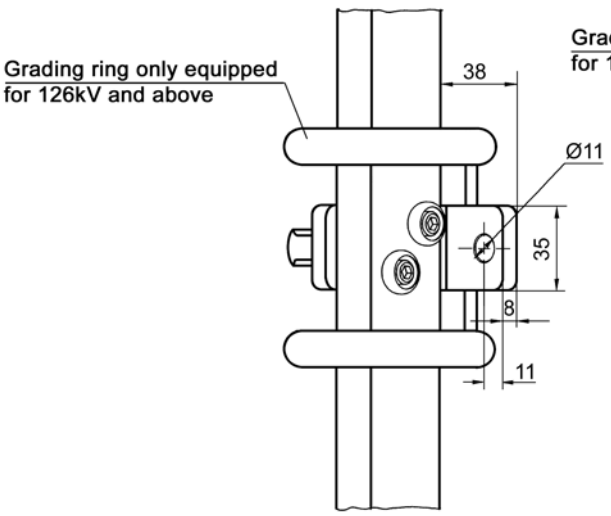


H: Hook ⩽ 500kg

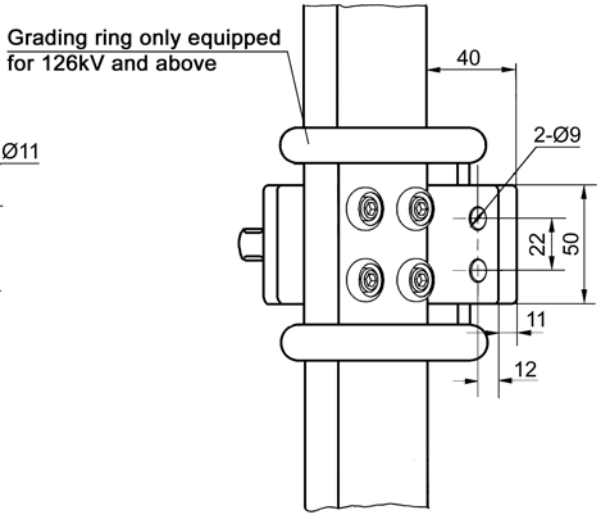


Unit：mm

Appendix 25 Tap changer terminal, overall dimension

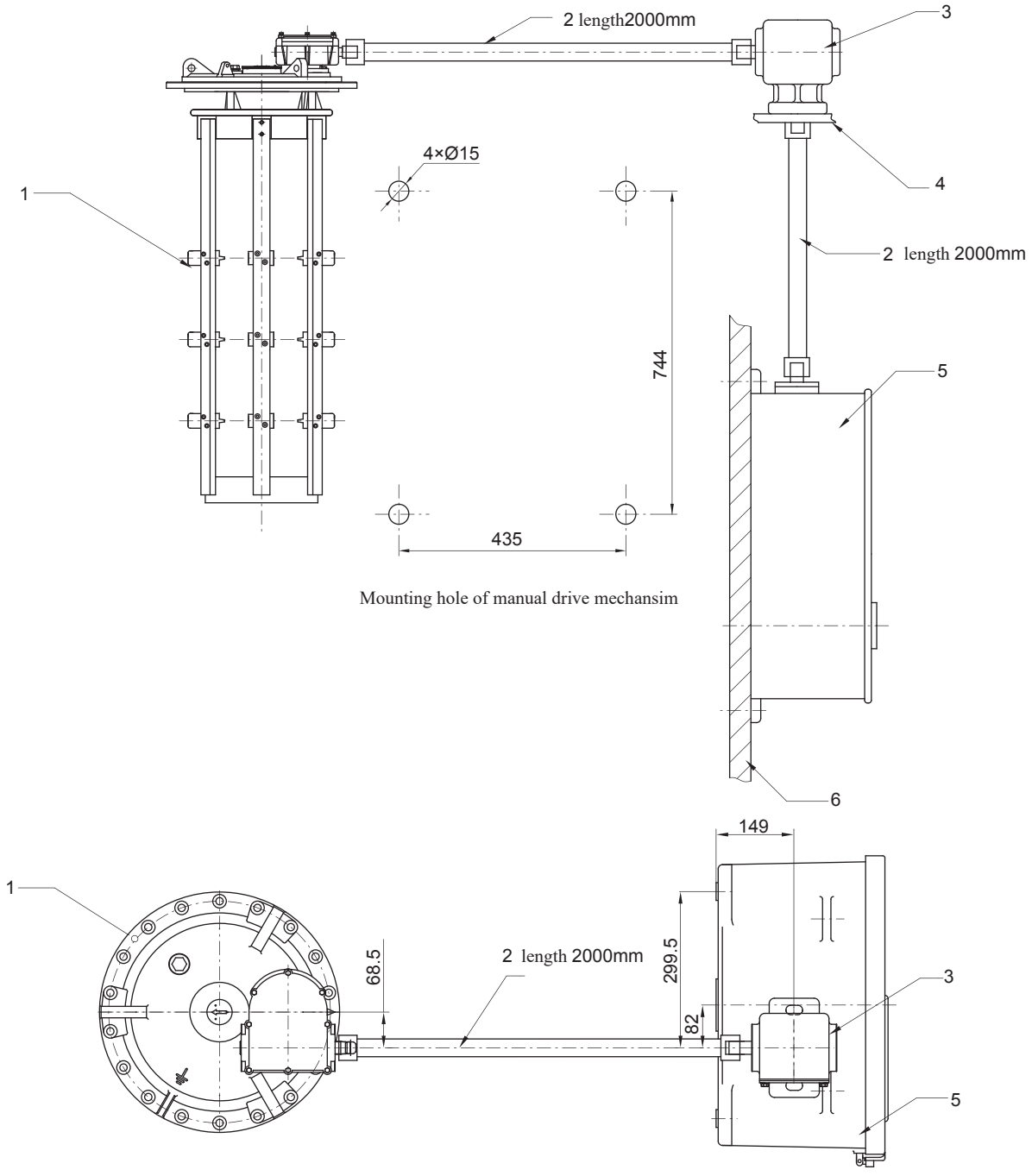


600A



800A/1000A

Appendix 26 Ground motor drive, Tap changer installation drawing

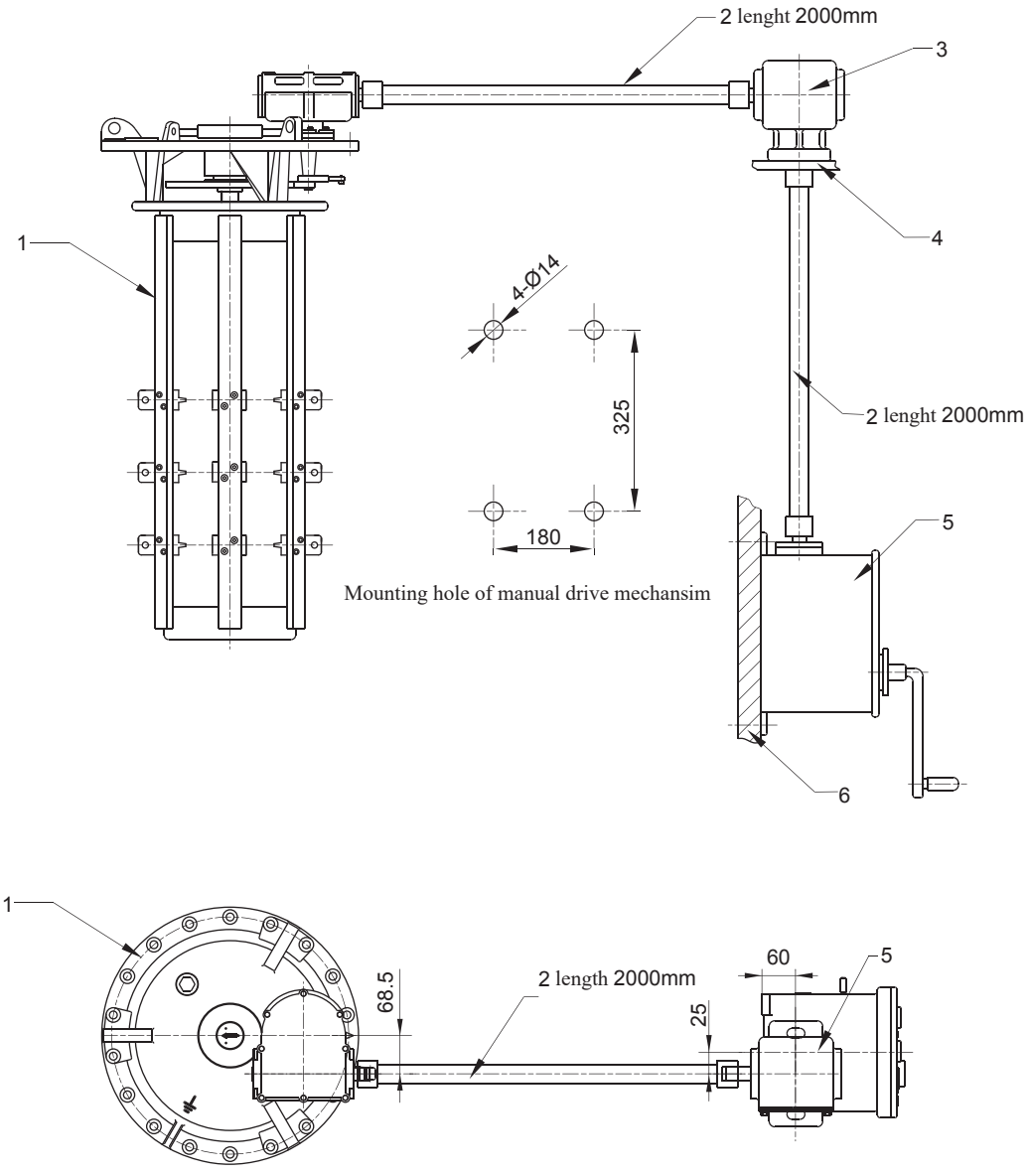


1.Tap changer body 2.Shaft 3.Bevel gearbox 4.Installation supporting plate（cusotmers）

5.SHM-D MDU（with SHM-K remote controller） 6.Installation supoorting plate（customers）

Unit：mm

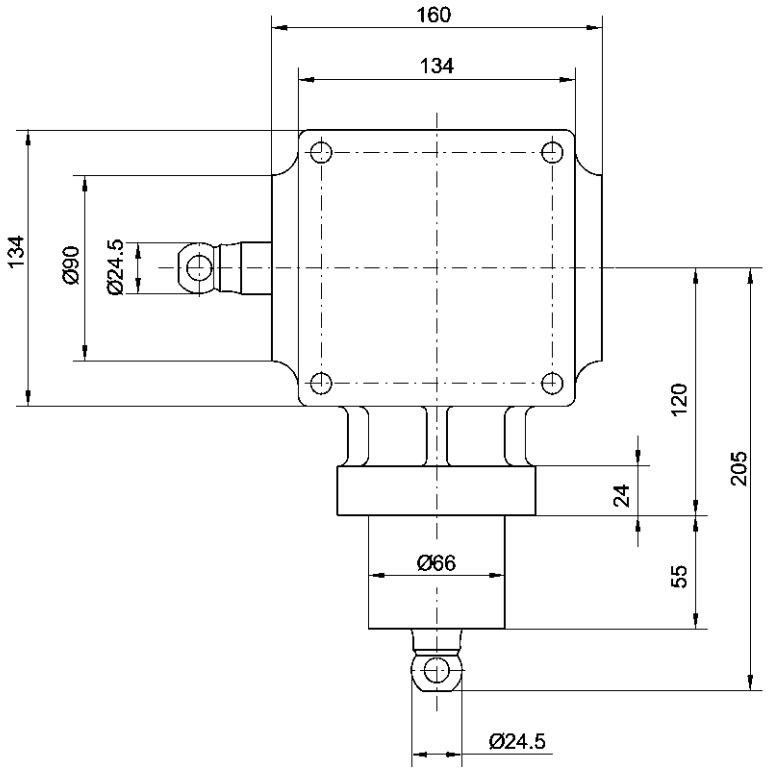
Appendix 27 Ground manual drive, Tap changer installion drawing

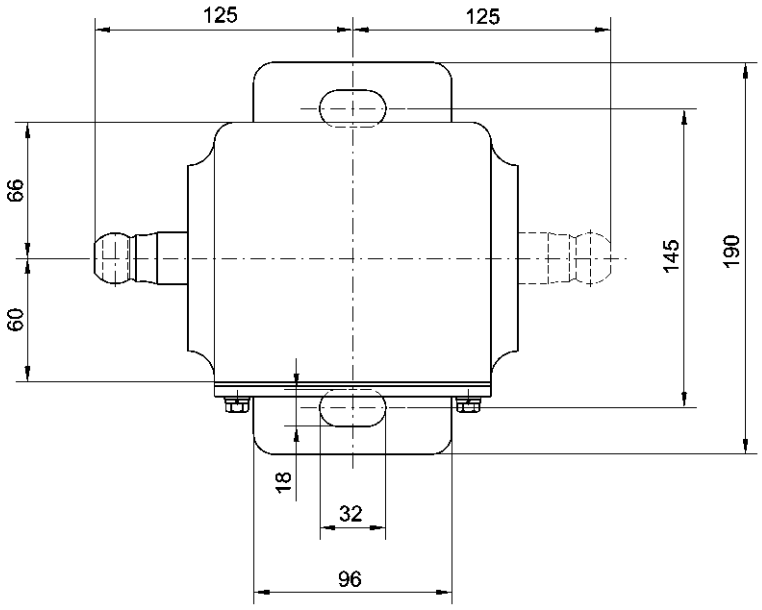


1. Tap changer body 2. Shaft 3. Bevel gearbox 4. Installation supporting plate（customers）
5. SL driving unit 6. Installation supoorting plate（customers）

Unit：mm

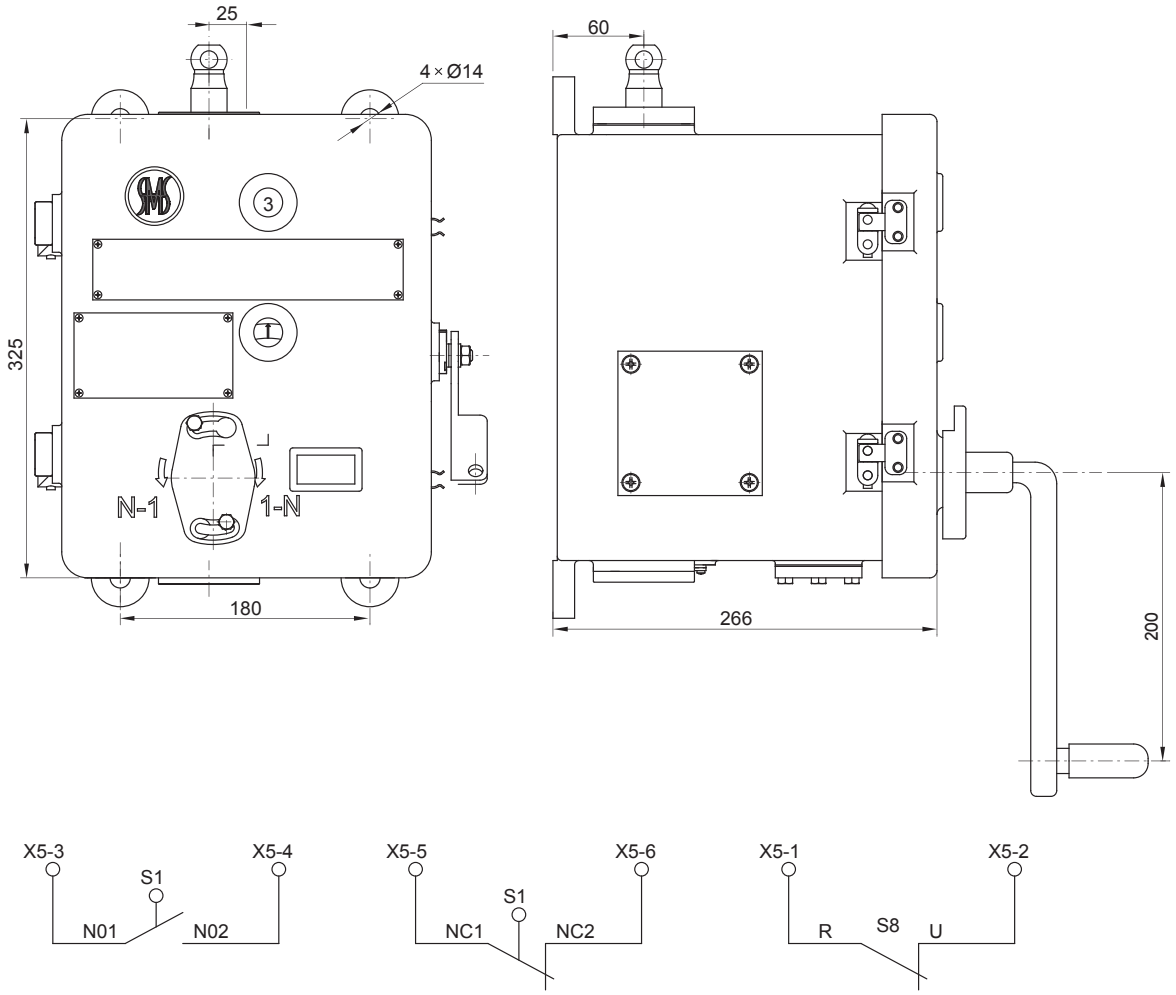
Appendix 28 Bevel gear, over dimensions





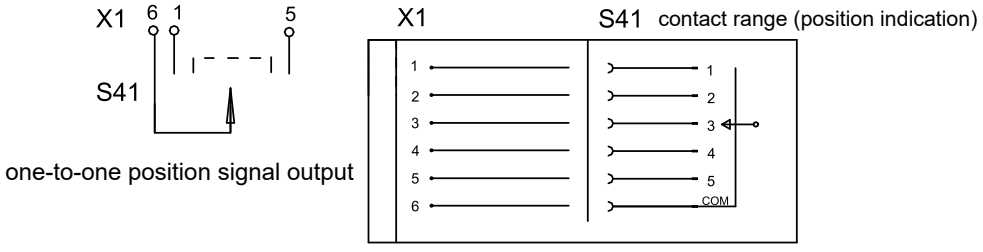
Unit: mm

Appendix 29 Side-manual operation, overall dimension

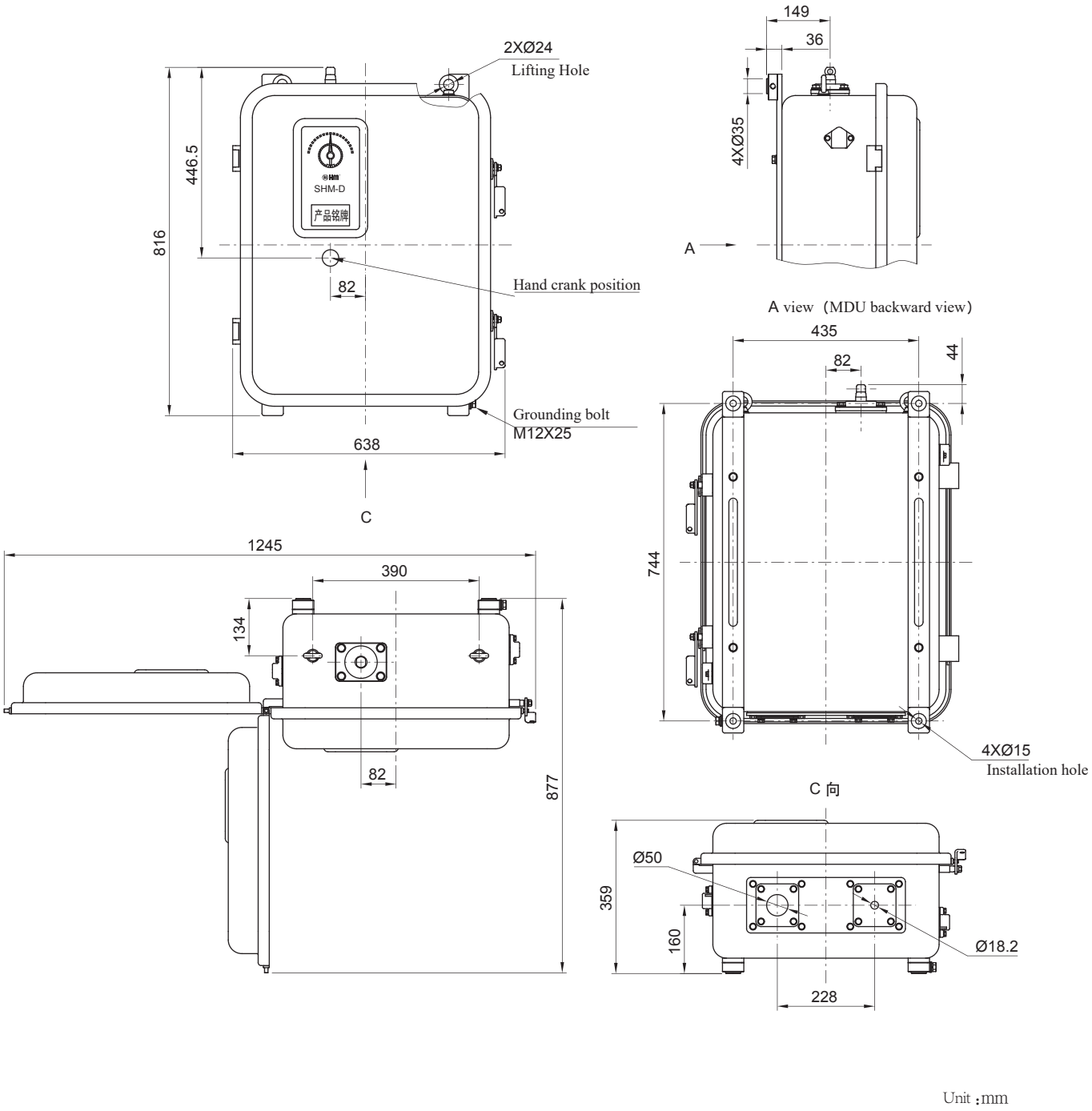


S1-NO1, S1-NO2 are the operation in progress signals. S1-NC1, S1-NC2 are the operation complete signals. S8-R,S8-U are drawn from the manual frive mechanism to terminal X5-1, X5-2. If hand crank is inserted for manual operation, then the X5-1, X5-2 are disconnected so that the contacts will open. If hand crank is removed, then the X5-1,X5-2 are connected. The signals are used for interlock between the tap changer and the transformer circuit breaker.

Unit:mm

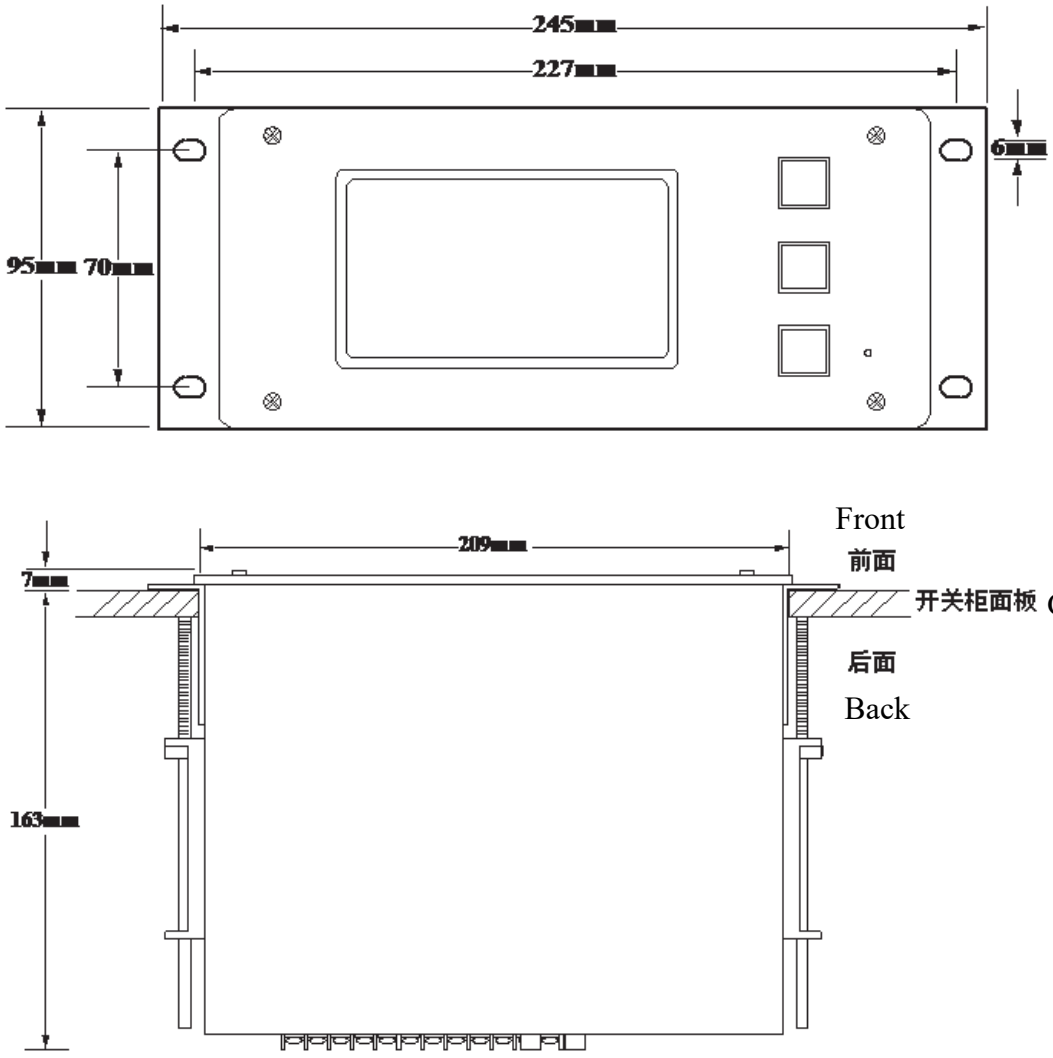


Appendix 30 SHM-D Overall Dimension



Unit：mm

Appendix 31 SHM-K Remote controller Installation



Note:
The installation method can be fixed and installed with the front screw, or it can be installed with the pin lock on both sides as shown in the figure above. Opening size: 210mm×96mm (length × width)

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