



MOTOR DRIVE UNIT TYPE CMA7

Operation Instructions



HM 0.460.302

Shanghai Huaming Power Equipment Co., Ltd

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1. General

Type CMA7 motor drive unit acts as the drive and control mechanism for the tap change operation of Type CM on-load tap changer.

All necessary electrical and mechanical equipment for driving on-load tap changer all installed in the housing Type CMA7 motor drive unit, and control follows the step-by-step principle i.e for operating the tap changer from one service position to the next one, the motor drive is initiated by a single control signal and it will stop automatically after one operation has been completed.

The overrun of end position is prevented by dual limitation of electrical and mechanism, with further safely and monitoring device.

The motor drive unit adopts motor with different power and current so that each tap changer can be operated by motor drive unit.

In order to make motor drive unit adapt for various operating conditions, the whole motor drive unit is installed on the wall of oil tank of transformer, and it is coupled with tap changer with the help of horizontal drive shaft, intermediate bevel bear box and vertical drive shaft.

1.1 Scope of application

This product is used to drive the Type CM or CV on-load tap changer manufactured by our factory

1.2 Application condition: the application condition of Type CMA7 motor drive unit must meet the following condition.

- 1.2.1 The height above seal level can't exceed 2000m unless otherwise specified.
- 1.2.2 The ambient temperature can't be higher than +40°C, and not lower than -25°C.
- 1.2.3 The deviation of perpendicularity with horizontal can't exceed 5%.
- 1.2.4 There mustn't be any severe dust and explosive and corrosive gas.

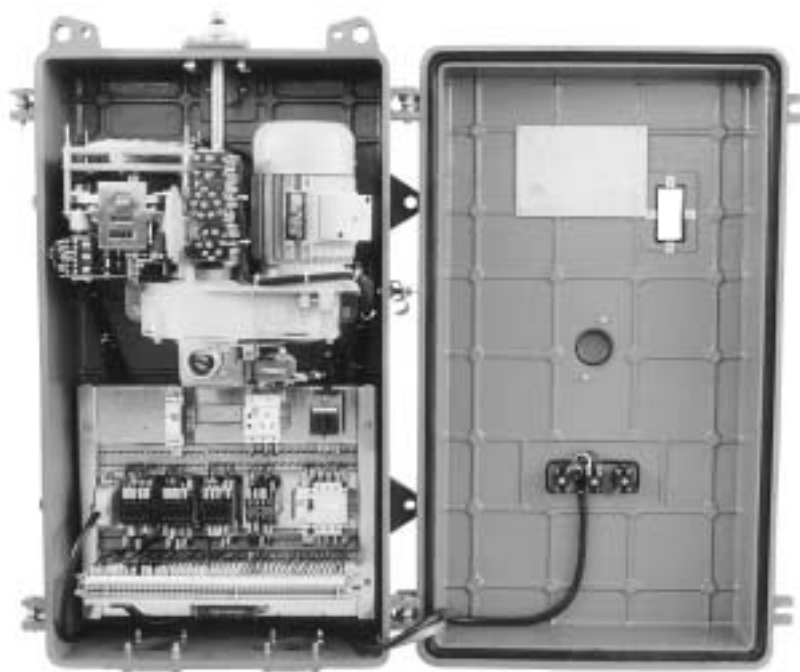


Fig. 1 Inside view of Type CMA7 motor drive Unit

2. Technical data

2.1 The technical data of motor drive unit, see appendix 1.

2.2 The mechanical life of motor drive unit is over 80 0,000 times.

3. Structure

Type CMA7 motor drive unit consists of housing, drive unit, position indicating unit and electrical control, show in figure one.

3.1 Housing

The housing consist of two parts: tank cover and tank bottom, both manufactured from corrosion-proof aluminum alloy and the surface of tank is coated with finish paint. The tank bottom and tank cover are interlocked through hinge unit which can be interchanged to from a door open towards right or left. The swing-open direction has to be indicate in the order sheet. the surface between tank and tank cover is sealed by sectional rubber.

Two labyrinth vent-hole at the back of tank and all apertures for driving shaft, inspection glass, hand crank and push-buttons adopt the sealed structure which can make the housing meet the requirement of preventing rain dust and insects.

There are two cable entries hole under the bottom of tank.

Two cable holes is sealed temporarily by sealing when ex factory; When installing the motor drive unit, remove hole-less seals, and the cable can pass through directly the seals with hole.

3.2 Drive unit

The drive unit is shown in figure 2.

The Poly-V-driving belt is installed inside the cast aluminum alloy case, the belt shaft and transmission gear shaft adopts a structure of set shaft, and connected by a mechanical clutch which is used for the mechanical limit protection of motor drive unit, when the mechanical limit is initiating, the mechanical clutch will work, the motor is running, but the transmission shaft stop running.

3.3 Position indicating and controlling mechanism

Position indicating and controlling mechanism comprises cam disc for cam travel switch indicating wheel of tap changing and unit position indication and remote position signal sender. Position indicating and controlling mechanism is fixed on one side of belt drive unit.

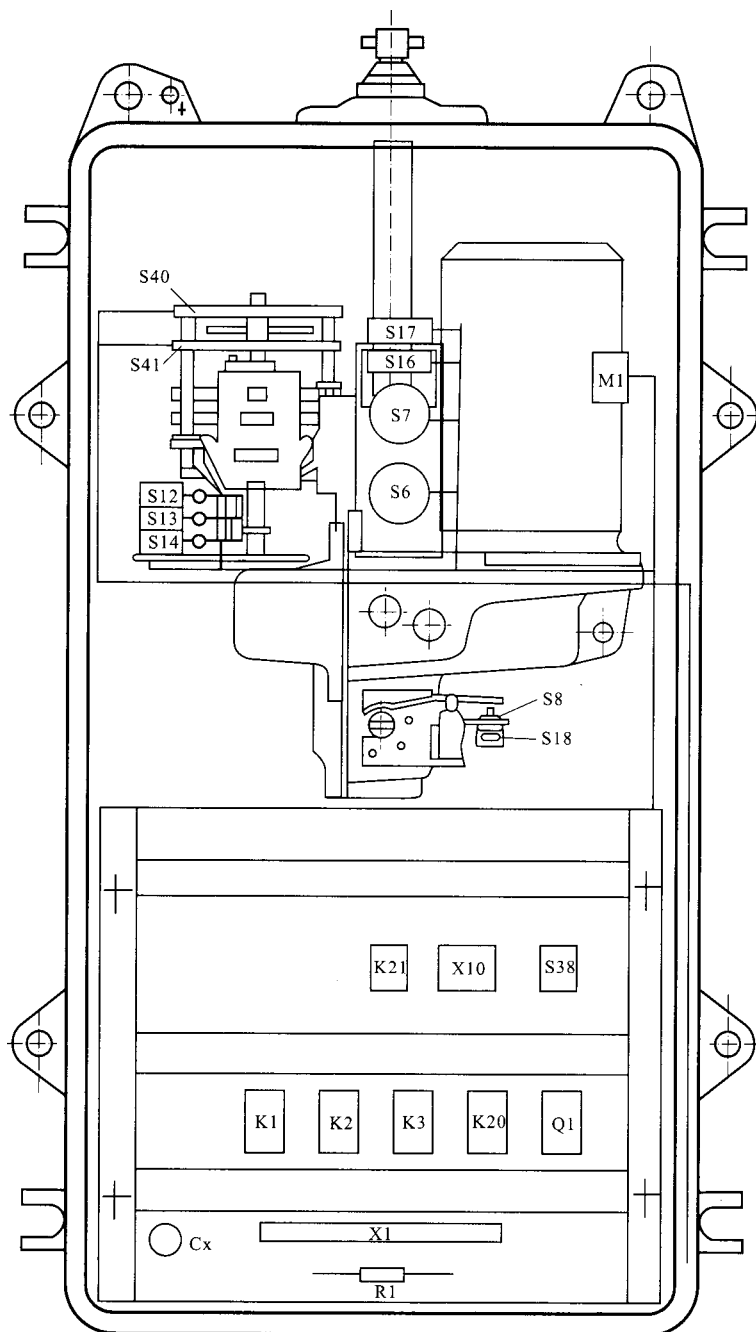
Both tap changing and cam wheel disc will revolve one revolution for each operation of tap changing. The tap changing indicator wheel is divided into 33 sections, the green field indicates the stop position of cam wheel travel switch.

The counter indicates the accumulated tap changing times of tap changer.

It's not necessary to open the tank cover when visualize, the grade indication of mechanism position indicator and the operation times of counter, the remote position signal transmitter and position indicated shall be in use at the same time, the structure of position indicating mechanism, see diagram 2.



Fig (2) Drive mechanism



3.4 Electrical elements (See figure 3)

- H1: Signal lamp with lamp holder for the tripping of motor protective switch Q1.
 K1/K2: Motor contactor for control direction.
 K3: Brake contactor
 K20: Auxiliary contactor for step-by-step control.
 M1: Motor
 Q1: Motor protective switch with magnetic tripping.
 R1: Heater resistance, 1.5k
 X10: Socket
 S38: Remote/Local control shift switch.
 S1/S2: Push-button for control direction.
 S5: Emergency stop button, with lamp holder (for H1 signal lamp).
 S16/S17: Limit switch for position N and position 1 Open/Close control circuit.
 S8: Manual protective switch.
 S12/S14: Step-by-step control cam switch.
 S12: $n \rightarrow 1$
 S14: $1 \rightarrow n$
 S13: Step-by-step control cam switch.
 X1/X3: terminal block for external wiring.
 S18: Manual protective switch.
 K21: Time relay for continuous action protection.
 S6/S7: Limit switch for position n or 1 Open/Close main circuit
 CX: Terminal socket for HMC-3C

Fig.3 Layout of electrical elements

4. Operating principle

4.1 Mechanical operation principle (see fig.4)

The normal operating mode of motor drive unit shall be motor drive, when repmotor protectiveing or maintenance, it shall be in manual mode.

When the motor 1 is initiated, the big drive wheel 3 will revolve followed by small drive wheel 2, the drive force of big drive wheel 3 will be transmitted to drive shaft 4, thus making the tap changer perform the operation of tap changing.

The control gear on position indicator will be transmitted to 101 gear through the shaft gear on drive shaft 4, making tap changer switching indicating wheel 104 and planet gear revolve, thus followed it, the mechanism position indicating wheel 108 will revolve accordingly and indicate the operation position of motor drive unit. The remote signal position sender 121 will send the signal of tap changing operation position according to different position, the opearation counter 116 will be controlled by tap changing indicating wheel and it will operate once against each operation of tap changing to indicate the accumulated operation times of tap changer, when 4 blocks green field appear on tap changing indicator wheel, the mechanism controlled cam switch is in the position of release, the motor will be short braked via AC contactor to complete an operation of tap changing.

When the motor drive unit is operating to the end limit position 1 or N, the mechanism position indicating wheel will continue to revolve and drive the limit position block in wheel trough, moving end position lever mechanism 115, and disconnect the corresponding N position electrical limit switch 110, thus preventing motor drive unit from revolving towards the direction exceeding 1 or n position. If the limit switch failure, the motor drive unit will continue to revolve towards direction exceeding position 1 or N. In this case, end position lever mechanism will move the lock of gear mechanical clutch making mechanism clutch closed, and the drive shaft 8 will stop revolving, thus the dual protection is formed. The limit position protective unit shall follow the following sequence of motion.

A : The electrical limit switch controlling circuit operates.

B: The electrical limit switch for motor main circuit operates.

C: The mechanical clutch release.

4.2 Electrical operating principle

The electrical operating principle of Type CMA7 motor drive unit , see appendix 5, it includes motor circuit (main circuit), control circuit, protective circuit and indicating circuit.

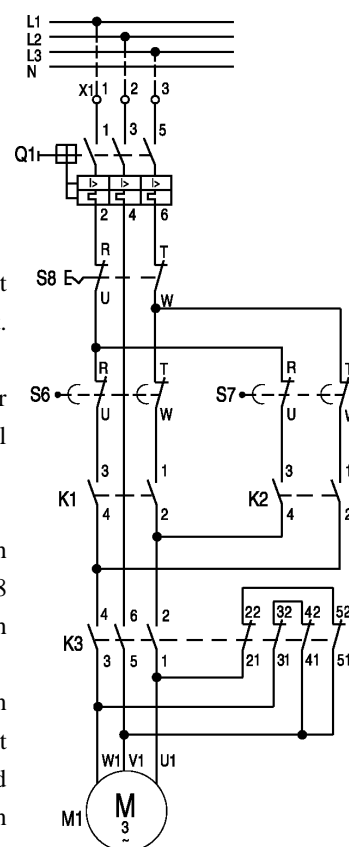
4.2.1 Motor circuit

The motor terminals U, V and W are connected to the terminals X1/1,2,3 of power supply L1, L2, L3 respectively via contactor K3, K1/K2 limit switch S6/S7, manual protective switch S8 and motor protective switch Q1 for motor protection.

4.2.2 Control circuit

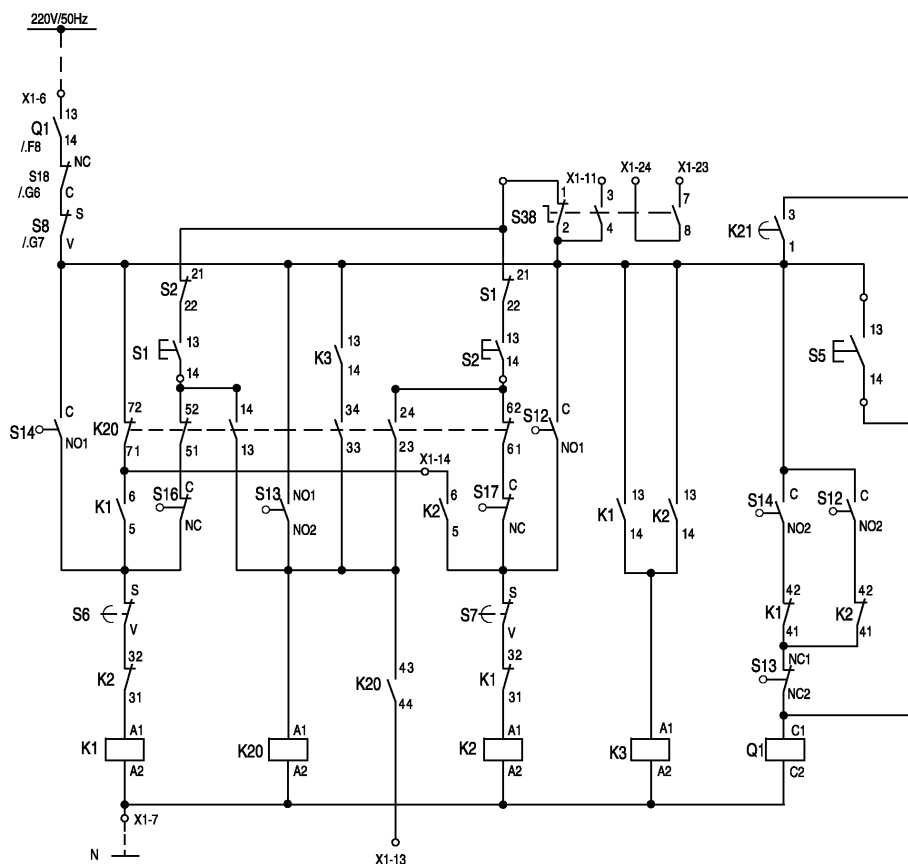
The control circuit is connected to L1 and N via X1/6,7, and motor protective switch Q1 and manual protective switch S8, S18 are connected in the middle, thus Q1 or S8, S18 operate and the control voltage interrupt, the tripping circuit of motor protective switch Q1 is interlocked with control circuit.

The motor protective switch Q1 is equipped with open-circuit tripping coil, which can be energized by push-button S5 (on the door of motor drive unit cabinet), safety circuit and continuous motion circuit. The safety circuit consists of cam switch S12, S13 and S14, the auxiliary contact points of motor contactor K1, K2. The continuous motion protection is an permanent open contact point of time relay K21.



4.2.1 Motor circuit



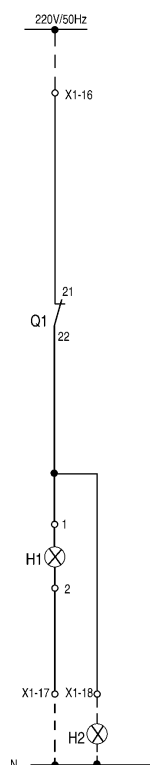
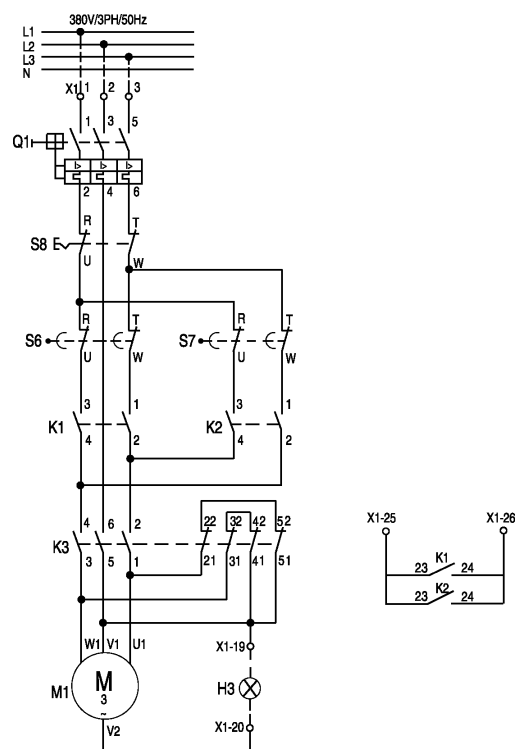


4.2.2 Control circuit

4.2.3 Tripping indication circuit for motor protective switch Q1

This circuit is connected to Q1/22 and N via terminals X1/18 and 17; the signal lamp is installed in the emergency tripping push-button S5 of motor drive unit. The auxiliary contact Q1(43,44) are connected to X1/27, 28 and captive contact point of “Q1” “close” status.

The phase voltage of motor M1 is connected with terminals X1/19,20. As a captive signal of motor operation. Operation signal lamp, H3 (in control cabinet) is connected with X1/25,26 via contact point signal. Combined by K1(23,24), K2 (23,24).

4.2.3 Tripping indication circuit
for motor protective switch Q14.2.4 Motor operation indication
circuit



4.2.5 Remote position indicating circuit

Digital remote position signal transmitter adopts code dialing slide contact set. The stator contact connected to terminals on socket according to decimal point code, and the motion contact will move by means of close after open from one position to another position coordinating with indicator to display position number.

4.2.6 Heater circuit

Heater circuit is connected to power supply L1 and N. via terminal X1/4 and 5 heater resistance is connected to the power supply permanently.

4.3 Operation

4.3.1 Control

The control of motor drive unit adopts step-by-step principle i.e. After the motion of switching has been initiated. One operation will be completed automatically and irrevocably (emergency stop exclusive) whether the push-button from S1 to S4 has been pressed or not. Another operation of switching can be made unit control system has been in step position once again. The stop position of the indicated by green field on step-by-step position indicating oils. The center of green field will be marked by red line.

The prerequisite of operation:

The motor protective switch Q must be closed.

The voltage of L1, L2 and L3: AC 380V, 3 phase

The voltage of L1, N: AC 220V, 50Hz

Note: When operating S1, S2, S3, S8 must be in local position.

When operating S3, S4, S8 must be in remote position.

Operation: (Control of the switching towards N position)

4.3.1.1 Start-up

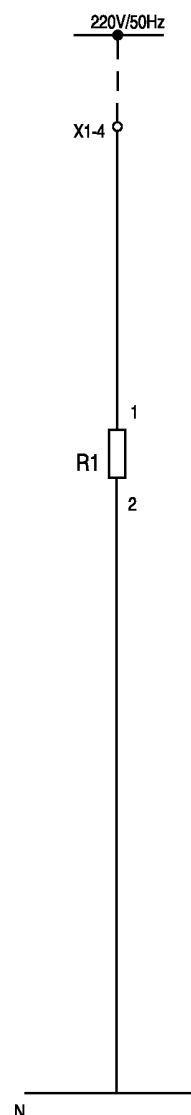
Press down push-button S1, 13-14 of S1 will be closed (meanwhile, 21-22 disconnected). In this case, current pass through Q1(13,14), S8(S,V), S38(2,1), S2(21,22) S1(13,14), K20(52,51), S16(C, NC), S6(S,V), K2(32,31), via X1/6, K1 is energized and contactor K1 closed, which make auxiliary contact point K1(5,6) closed to keep K1 coil live via K20(72,71), thus self-locking is performed.

When the K1 is closed, its contact points K1 (13,14) will be closed, to make K3 coil energized. K1 and K3 close, the motor M1 operate, meanwhile. K21 (A1, A2) is energized, and the delay is initiated.

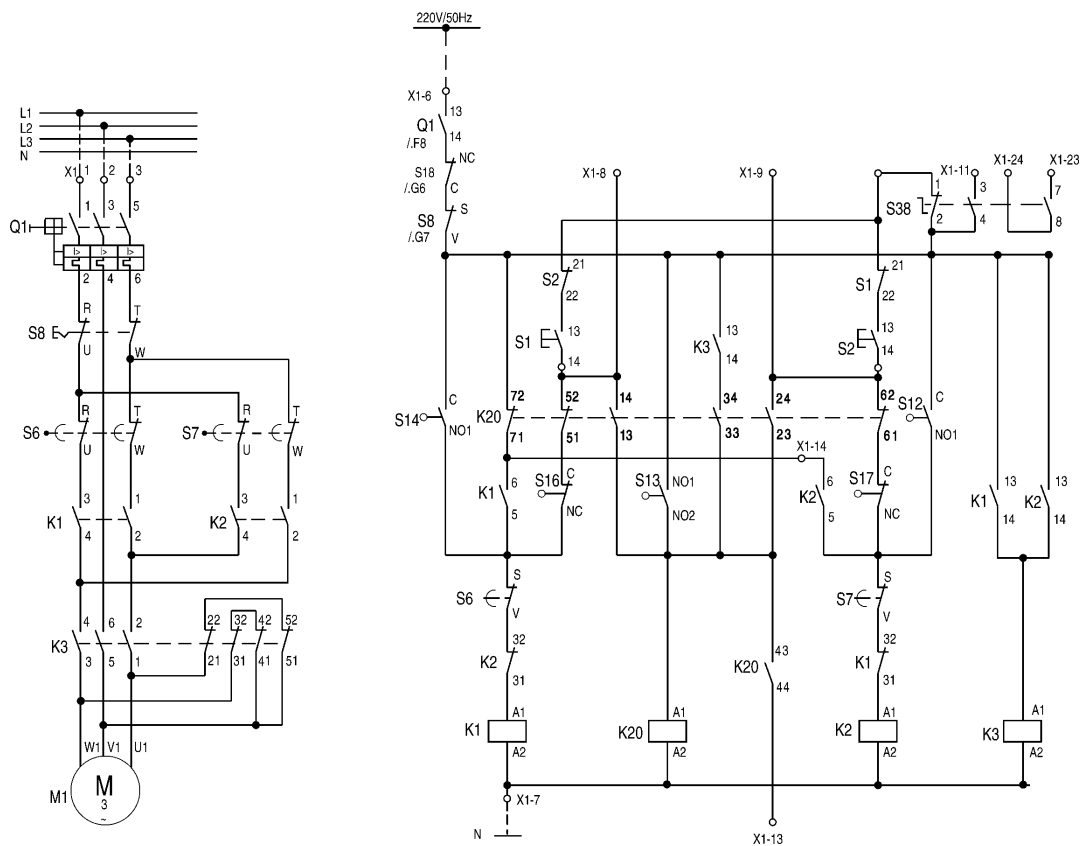
4.3.1.2 Step-by-step control

After the motor has been operated, step-by-step position indicating disc will go beyond the green field. Cam travel switch S14(C, NO1) close. In this case, contactor K1(A1,A2) can be energized via S14(C, NO1).

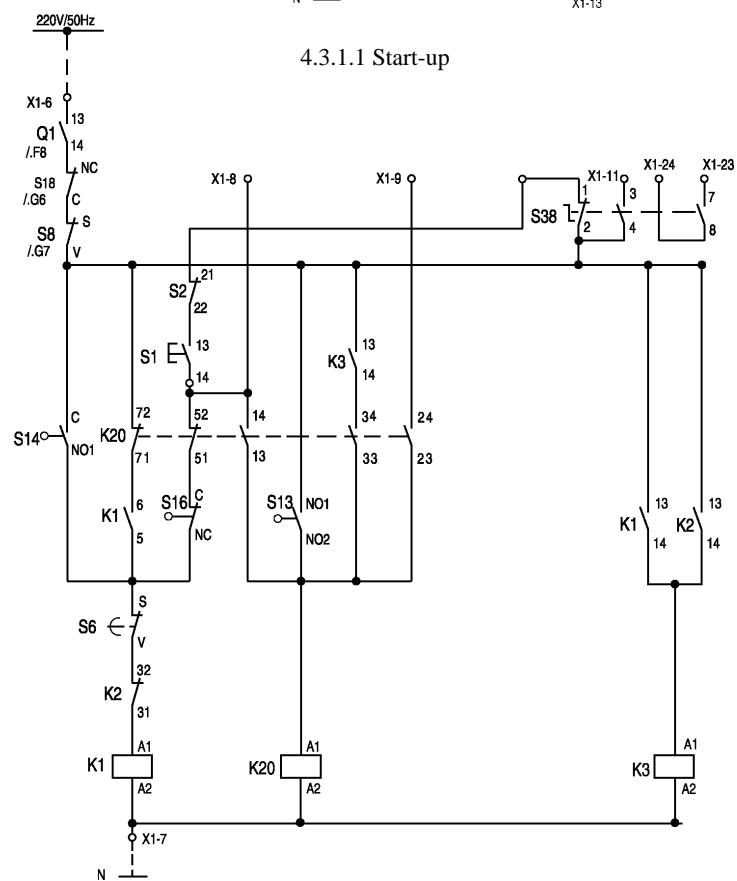
When motor drive unit step-by-step position indicating disc revolve another small pane, the cam switch S13 starts, the close of S13 (NO1, NO2) make intermediate relay K20 coil energized and closed, K20(52, 51), K20(72,71) open, and K20(14, 13), K20(34, 33) close, meanwhile, K20 open via S13(NO1, NO2), and K20 will be energized and kept close via K3(13,14), K20(34,33).



4.2.6 Heater circuit



4.3.1.1 Start-up



4.3.1.2 Step-by-step control

4.3.1.3 Stop

When the operation grade one come to an end, cam switch S14 open at contact(C,NO1). K1 drops the contact 13-14 of K1 will open, K3 drops, open main circuit, connect motor short braking contact 21-22, 31-32, 41-42, 51-52, self-actuated energy braking motor M1 stop.

At the same time, K3 open at contact 13-14, to make K20 de-energized, but if the push-button S1 (or S2) has been pressed, K20 will be self-locked via contact 13-14 (or 23-24), thus prevent K1 (or K2) from being energized via 51-52 (or 61-62) of K20. If the push-button S1(or S2) has not been pressed, K20 will drop.

Control the switching towards position 1.

Press push-button S2.

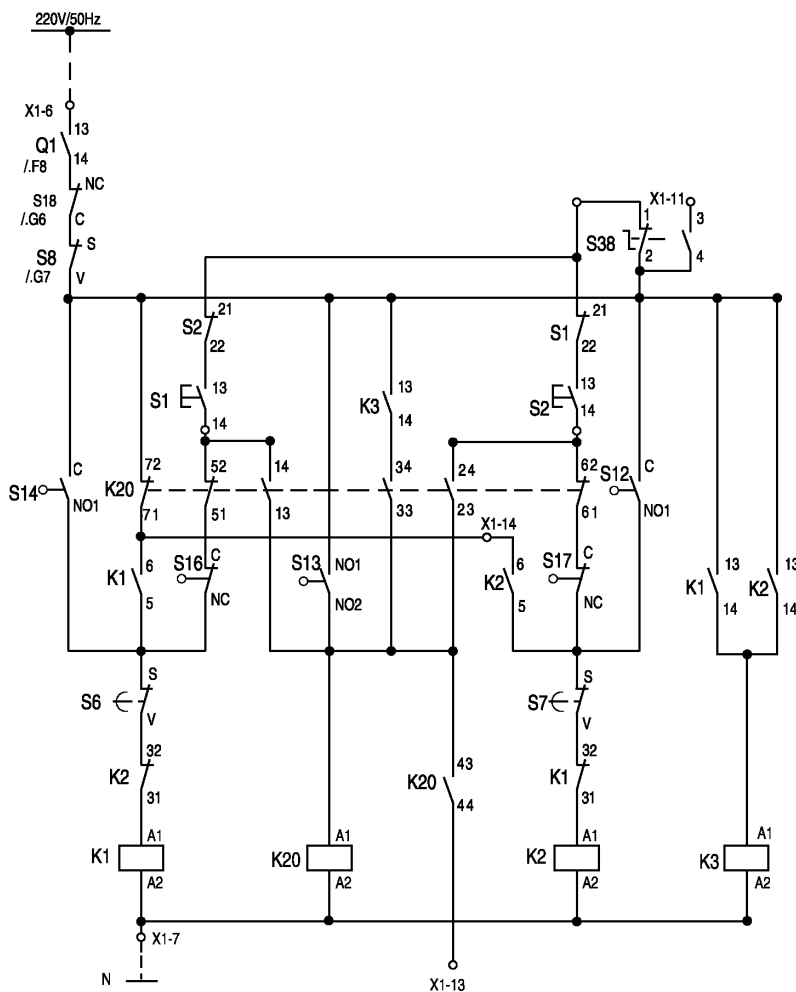
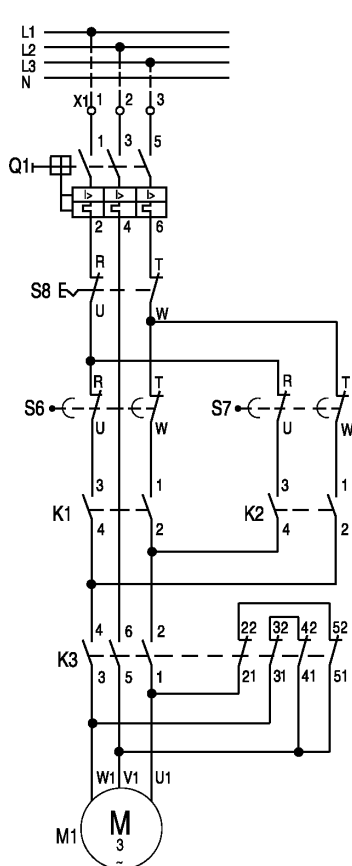
Contactor K2 is energized and closed.

Braking contactor K3 is energized and closed.

Motor M1 revolve counter-clockwise.

The direction-memory cam switch S12 starts.

The subsequent control is similar to that of position n switching.



4.3.1.3 Stop

In the switch motion sequence changing from one tap switching to next tap switching, (=33 panes on step-by-step position indicating disc), the operation status of each control element are as follows.

The sequence of closing: S1 (S2), K1 (K2), K3

S14 (S12), S13, K20

4.3.2 The override performance of intermediate position.

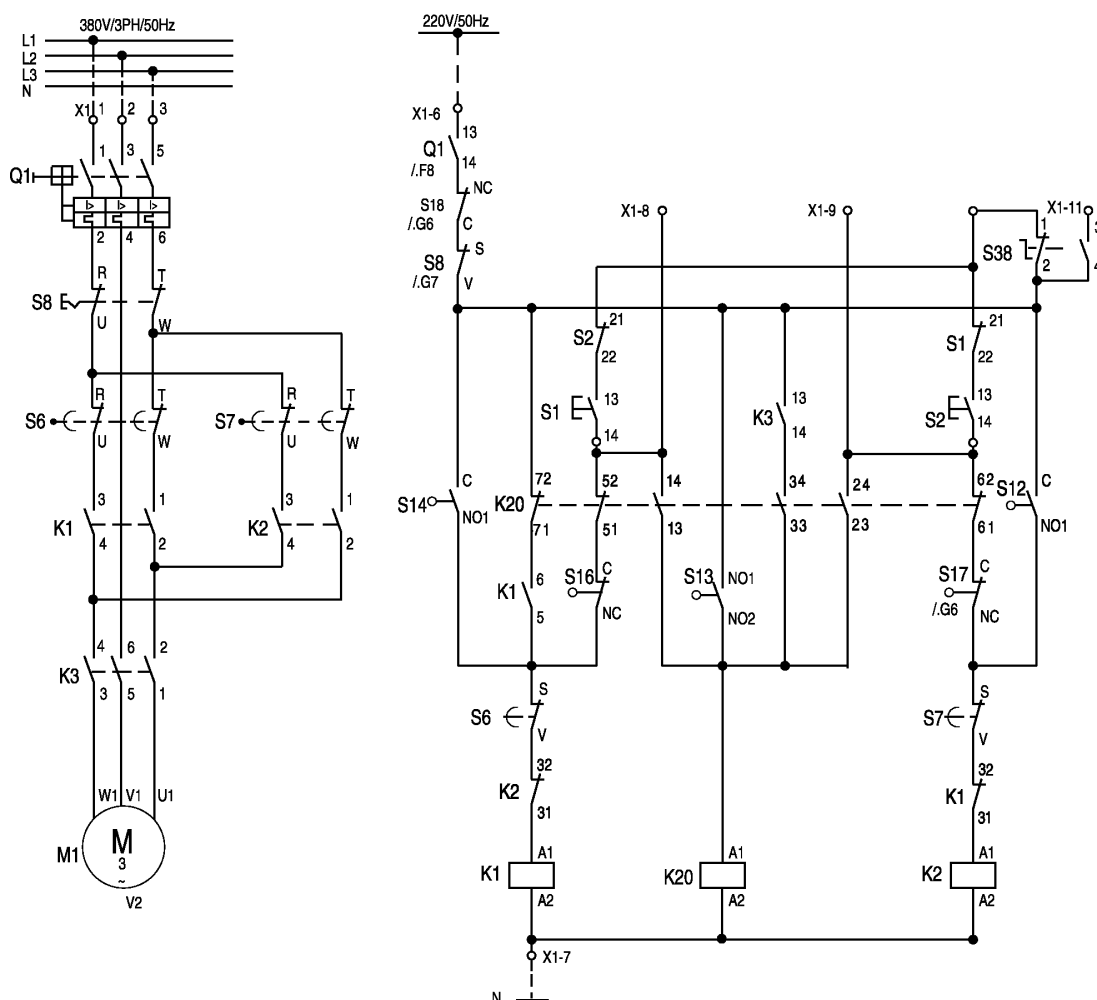
From the appendix 2, we can know that motor drive unit will be in continuous. Operation after S37-1, S27-2 have been connected, thus for the motor drive unit required for override continuous operation, it can be realized by means of connecting intermediate override contact S37, which is realized by means of using the increased contact on remote position signal sender.

4.3.3 Safety performance.

4.3.3.1 Protection of limit position

When the motor drive unit has reached the limit position, the limit switch S16 (in position N) or S17 (in position 1) will open at the permanent closed contact C-NC, thus contactor K1 or K2 can't be energized any more.

When it exceed the end position, the limit switch S6 (or S7) will open at main circuit contact R-U, T-W, making motor run, and motor contactor K1(or K2) circuit open at contact S-V.



4.3.3.1 Protection of limit position

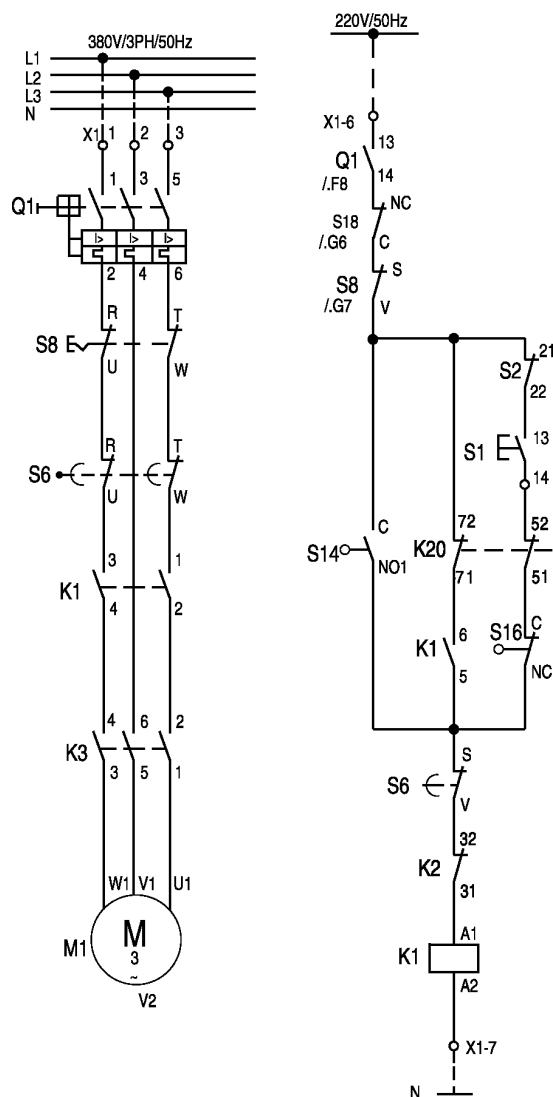
4.3.3.2 Manual operation protection

Insert hand crank on the shaft, manual protection switch starts before hand crank clogged, and withdraw the hand crank from the shaft after cutting off the motor power supply and control power supply, and manual operation has been completed, the manual protection switch S8 will be closed once again. Note: To avoid the restart of motor drive unit automatically, the motor drive unit must be swung into the central red line on step-by-step position indicating disc after manual operation has been completed, which is the standstill position for mechanically-driven cam switch.

4.3.3.3 Phase sequence protection

To ensure the motor run according to preset direction, there are some requirement for the phase sequence of motor 3 phase power supply. If the phase sequence of L1, L2 and L3 is wrong, the motor protective switch Q1 trip by means of phase sequence protection circuit, see fig.5. When the phase sequence is wrong, press S1 to make K1 closed, K1(41,42) open, but the motor will revolve counter-clockwise, the motor mechanism will operate toward the reverse direction accordingly, making S12(C, NO2) close, and Q1 tripping coil live via S12(C,NO2), K2(41,42), S13(NC1,NC2), the motor protective switch trip to disconnect main circuit and control circuit, the motor will stop running. In this case, the phase sequence should be adjusted (any two phase interchange), manual operation to the central red line on the step-by-step position indicating disc green field, and close the motor protective switch, thus the operation can start.

Additionally, during the start of tap changing, if motor drive unit is initiated by direction memory cam control S14/S12 not by push-button S1/S2 (Non-automatic pass working position). The motor protective switch Q1 also trip via S14(C, NO2), K1(41,42), S13(NC1,NC2) or S12(C,NO2).



4.3.3.2 manual operation protection

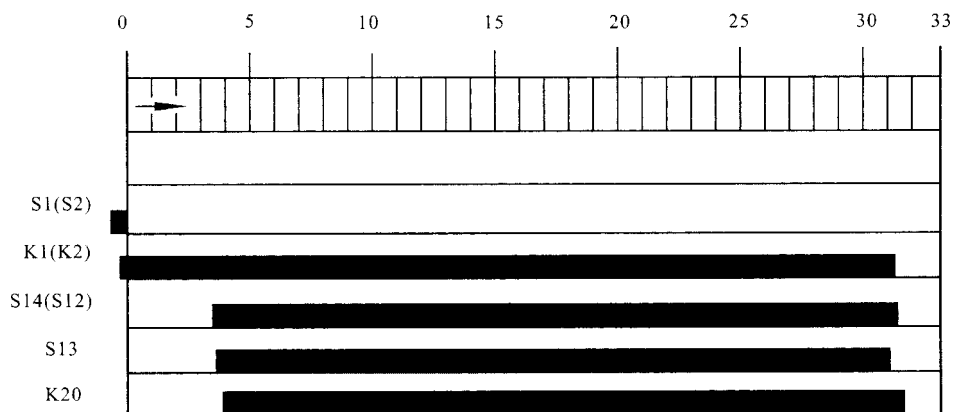


Fig.5 Status diagram of tap switching operation

4.3.3.4 Automatic restart protection after control voltage temporarily de-voltage.

If the control voltage restore after being disappeared during the operational time of motor drive unit, the motor drive unit restart automatically according to the previous controlled direction, once starting, the motion of tap changing will be completed by the closed direction memory cam switch S14(or S12). In this case, the safety circuit is dead, because the cam switch S13 (NC1,NC2) has been opened.

4.3.3.5 Emergency cut-off power protection (Emergency stop).

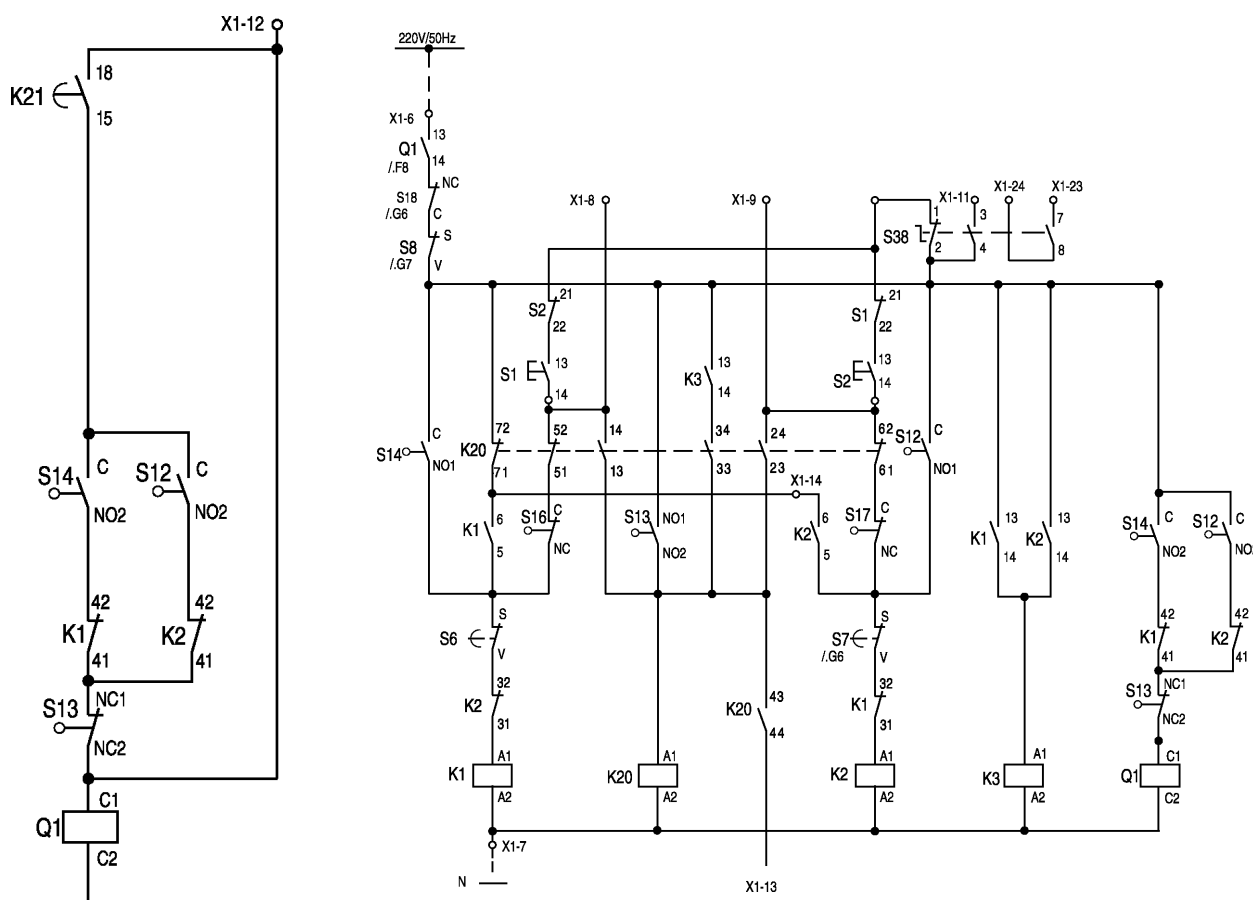
Press motor drive unit emergency trip push-button S5 or emergency trip push-button S9 in control cabinet, the motor protective switch Q will trip, both push-button are parallel connected. After motor protective switch has tripped, operation can't be made until the door of motor drive unit has been opened and motor protective switch has been closed.

4.3.3.6 Linkage protection tripping

The delay time of time relay is set at set-point, if mechanism has continuous tap changing without central signal, the energized time of K21 will exceed the set-point, the contact 15,18 is connected and the protective switch trip.

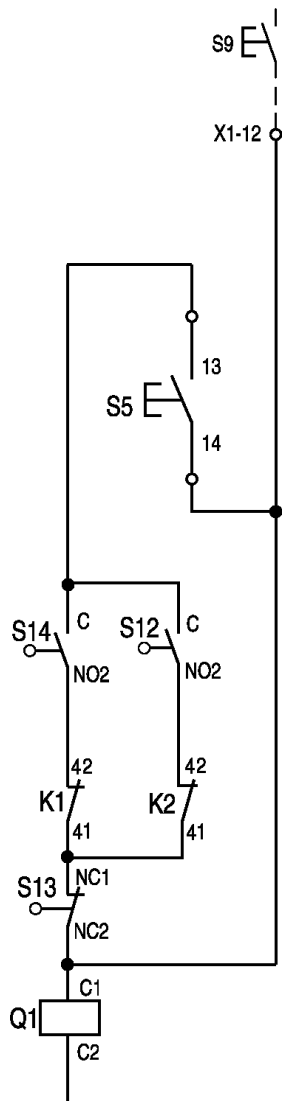
4.4 External connection

There are special terminal X1 in motor mechanism cabinet, the terminal for power supply inlet and remote control, signal indication, can perform remote control of up, down, emergency trip and long-distance of operation status signal. (X1-1, X1-2, X1-3, X1-5 as power supply inlet terminal).

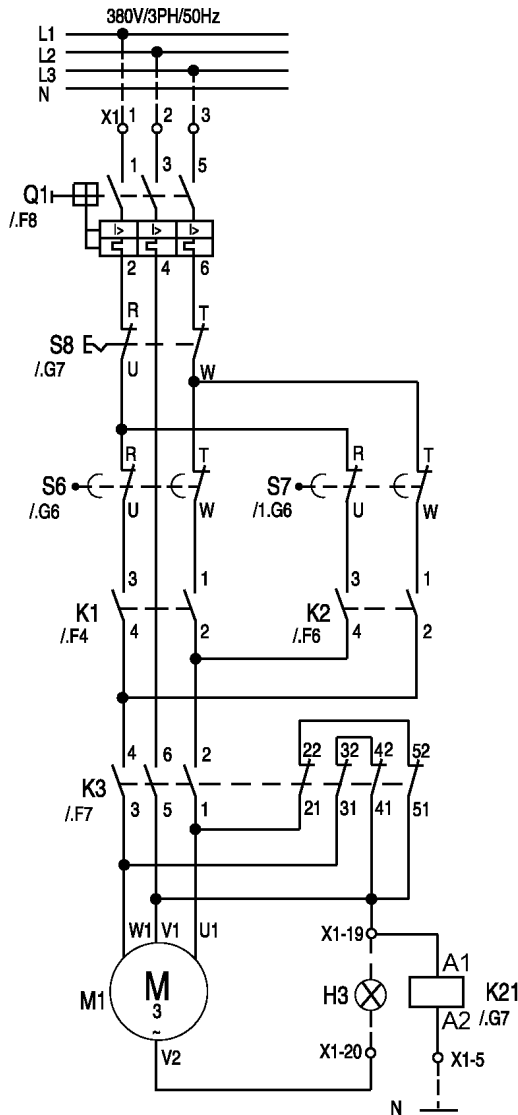


4.3.3.3 Phase sequence protection

4.3.3.4 Automatic restart protection after



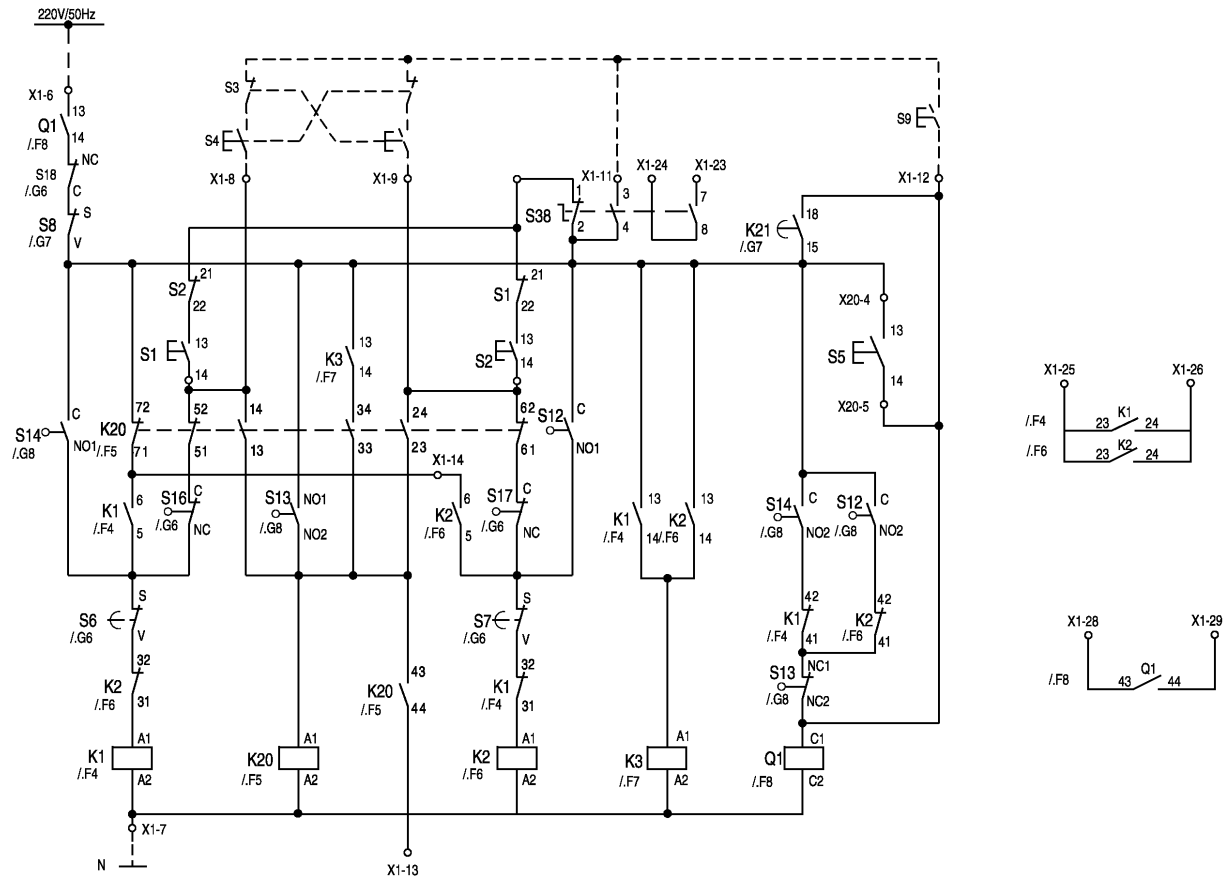
4.3.3.5 Emergency stop



4.3.3.6 Interlink protection

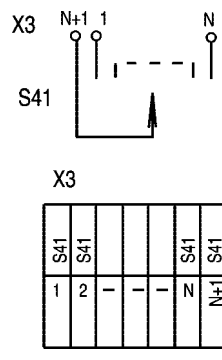
4.5 Grade signal captive terminal (so-called dual signal)

At the remote position indicating circuit, add a group of slide contact set, which stator contact corresponds to the stator contact position of position circuit, and connected to terminal block X3 by the sequence of 1 → N, the common conduct terminal associating with motion contact leaded to X3, the motion contact starts from one position to next position in form of close after open. Two groups contact should keep sync correspondence mechanically, and independent electrically, thus the terminals can provide a group of closed and captive signal contact in operation position.



X1		K21-A2		Q1-C1		S37		K21-A1		K20-72		K3-13															
Q1-1	Q1-3	Q1-5	R1-1	R1-2	Q1-13	K1-A2	K20-52	K20-62		S38-3	X5-14	K20-44	K2-6	S37-1	Q1-21	H1-2	Q1-22	K3-51	M1-V2	S5-13	S13-NO1	S38-7	S38-8	K1-23	K1-24	Q1-43	Q1-44
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
L1	L2	L3	L1	N	L1	N									L1	N											

4.4 External connection



4.5 Grade signal captive terminals

5. ASSEMBLY

5.1 Mounting the motor drive unit to the transformer tank

(Overall and dimensions, see diagram 8).

The motor drive unit is mounted on the transformer tank by means of 4 studs. The plate to be used for the installation of motor drive unit must be flat and straight, otherwise, the motor drive unit will be deformed, which make the close of tank cover impossible, even affect the application. The care that the motor drive Unit is mounted vertical and that its drive shaft is in correct alignment with the shaft of the bevel gear,

If the transformer causes extremely heavy mechanical vibrations the use of vibration dampening connectors is recommended.

5.2 Mounting the drive shaft and the bevel gear (See fig.6)

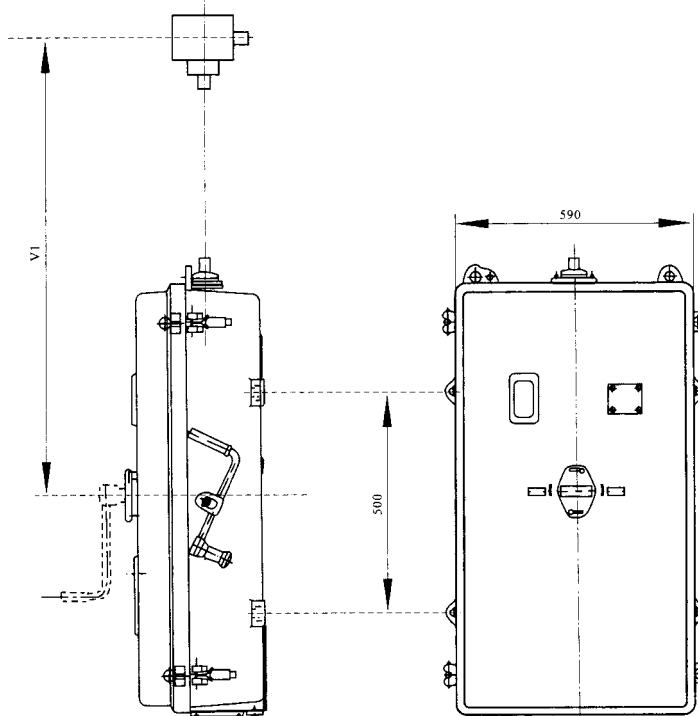


Fig. 6 Installation of CMA 7 Motor Drive Unit

5.3 Coupling of tap changer and motor drive unit.

It is absolutely necessary that the tap change operation is accomplished before the motor drive stops.

This is ensured by setting the time of the tap selector or diverter switch action (=on-load tap changing) at a distinct interval before the end of the motor drive unit action (1.5 ~ 2 sections before the red center mark on the tap change indication wheel.) This red center mark is used as a reference when adjusting.

One tap change operation corresponds to one rotation of the tap change indication wheel.

The tap change indication wheel divided into 33 sections with one section corresponding to one rotation of the crank.

The number of sections counted from the beginning of tap change operation until the red center mark of the indication wheel faces mark on the inspection window should be equal in both rotation senses. Minor asymmetry is admissible.

Symmetrical coupling is achieved as follows:

- a. Adjustment only with manual operation.
- b. On every adjustment take care that the position indication readings of both motor drive unit and tap changer are equal.
- c. Tap changer and motor drive unit have to be in the set position.
- d. Couple tap changer and motor drive unit.
- e. Turn crank in one direction until the operation of switching has been completed.
- f. Calculate the number of section, which the red center mark of the tap change indication wheel visible in the middle of the inspection window.
- g. Repeat this procedure in reverse order.
- h. If there exist difference in the counted numbers of sections in both directions, the motor drive unit must be readjusted in relation

to the tap changer by half this difference of numbers. Example: (See fig.7).

- a) Tap changer is in operation 10. Turn crank towards 11 until diverter switch action occurs. Count the number of sections until red center mark appears.

Result: 7 sections

- b) Tap changer is in operating position 11. Turn crank towards 10 until diverter switch action occurs. Count the number of sections until red center mark appears.

Result: 1.5 sections.

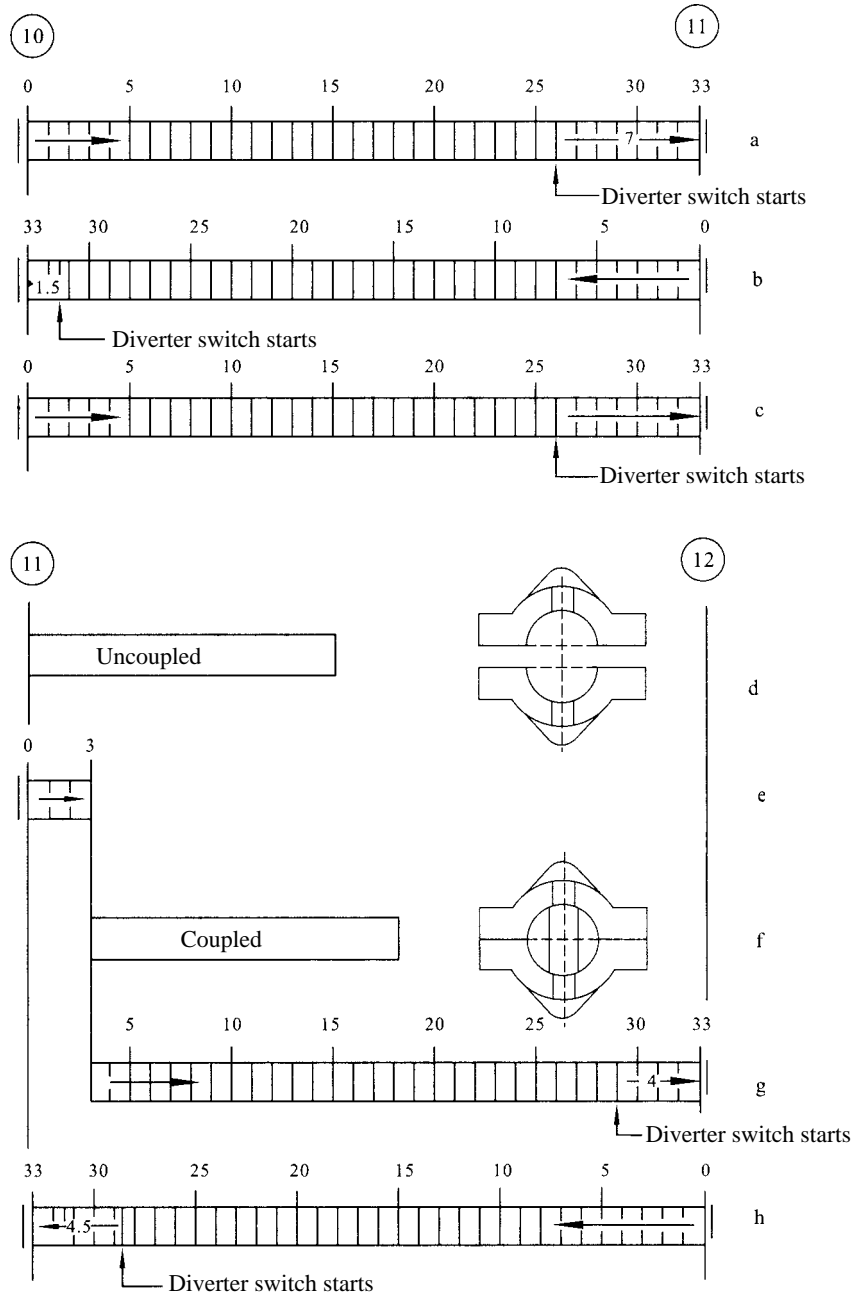
Correction value:

$1/2 (7 \text{ sections} - 1.5 \text{ sections}) = 2.75 \text{ sections}$, chosen 3 sections.

- c) Turn crank towards position 11 until red center mark appears.
- d) Uncouple vertical drive shaft.
- e) Turn on in the same direction (towards position 12) by 3 sections.
- f) Couple again.
- g) Turn on in the same direction until diverter switch action occurs. Count number of sections until red center mark appears.
Result: 4.5 sections.
- h) Check in the opposite direction.
Result: 4 sections.

Coupling of tap changer to the motor drive unit is sufficiently symmetrical.

Take out manual crank, change the mode of manual to automatic mode.



- a, b: Counting TIW sections after diverter switch action in both directions
- c: Cranking in the direction of the bigger number of TIW sections.
- d: Uncoupling
- e: Cranking on by correction value.
- f: Coupling
- g: Completing operation, checking number of sections
- h: Checking in the opposite direction

Fig. 7 Coupling between motor drive unit and tap changer

6. PUTTING INTO OPERATION

6.1 Operational tests

Before applying the supply voltage for motor circuit, control and auxiliary circuits check whether voltage, current, and output of the supply coincide with the required values.

6.1.1 Checking the step-by-step operation

Press push-button S1(S2). Make sure that the driving motor is automatically switched off when the tap changer has performed one switching operation.

6.1.2 Functional test of intermission gear

(mechanical limit position of end position)

The tap changer can be adjusted to the last grade within the range of tap changing, but can't reach the limit position, the motor drive unit only can reach the limit position by manual operation. The mechanical limit position will act after the handle has been revolved 2~3 revolutions. Revolve the handle in the opposite direction to release the mechanical limit position unit. When it revolves back to red line, the motor drive unit will return to the last grade.

The same procedure is applied when the other end position is tested.

6.1.3 Operational test of the limit switch (electrical limitation of the end position)

The tap change range is run through up to one end position. Further control in the same direction may not result in any motor drive operation. Motor drive action is, however, possible in the opposite rotation sense.

For testing the other limit switch the corresponding procedure is applied.

6.2 Transporting the transformer.

It's necessary to dismount the motor drive unit if its dimension exceeding the transportation admissible size during transportation of the transformer from manufacturer to site. OLTC and motor drive must be set to adjustment position when the manufacturer make delivery.

Perform reinstallation of the motor drive according to section 5.

6.3 Putting into operation at the operating site

Before putting the transformer into operation operational tests according to section 6.1 have to be performed.

7. MAINTENANCE

As the transmission gear is a maintenance-free poly-v belt drive and the ball bearings of the driving motor are sufficiently supplied with grease, a regular maintenance is not necessary. We recommend, however, occasional inspection which should focus at:

- The housing still waterproof
- Function of electrical heater (check heater and thermostat)
- The appearance of the equipment in the motor drive unit

We recommend some tests switching operations during these inspections. Furthermore the functioning of the limit switch should be checked.

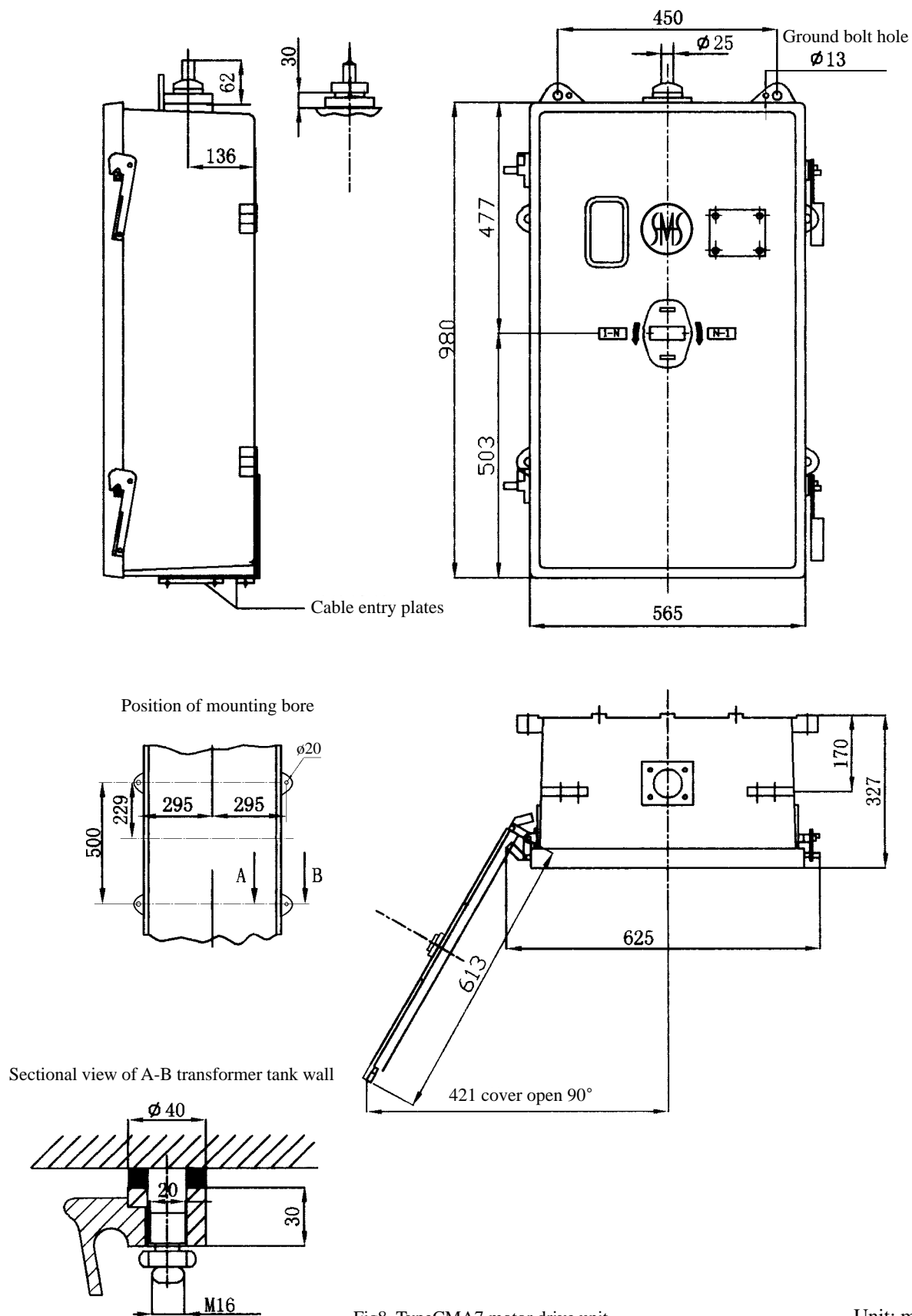


Fig8. TypeCMA7 motor drive unit

Unit: mm

Appendix 1 Technical data of Type CMA7 motor drive unit

Item \ Motor rated power (kW)		0.75	1.1	2.2
Rated voltage (V)	3 phase	380	380	380
	Single phase	220	220	220
Rated current (A)	3 phase	2.0	2.8	5.1
	Single phase	3.4	5	8.8
Rated frequency (Hz)		50, 60	50, 60	50, 60
Synchronous speed (rev/min)		1400	1400	1400
Rev. of drive shaft/per switching operation		33		
Running time per switching operation		About 5 sec		
Rated torque on drive shaft (N.m)		18	26	52
Max. number of operation positions		35		
Voltage for control and heater (V)		220		
Power consumption of control circuit (W)	When energized	52		
	During running time	24		
Heater power (W)		50		
Power frequency withstand voltage to ground/without motor		2.5kV/1min, 50Hz		
Weight (kg)		90		

Note : 1) The number of operating position should correspond to on-load tap changer.

2) The auxiliary contact of motor drive unit, motor protective switch in compression resistance test is exclusive.



Appendix 2

X1 Terminal Number	Description
1、2、3、5	Power supply entry terminal voltage of L1, L2, L3: 380V/50Hz. Voltage of N: 220V/50Hz
8	Remote control “1-N” motion command input terminal
9	Remote control “N-1” motion command input terminal
10、11	Remote control motion command common terminal
12	Remote control “stop” command input terminal
18	Emergency tripping signal output terminal (output 220V/50Hz power signal)
19、20	Motor operation signal output terminal (output 220V/50Hz power signal)
23、24	Remote control status signal output terminal for “remote/local” change-over switch contact captive signal
25、26	Motor operation signal output terminal (output without power signal)
27、28	Air switch “close” status signal output terminal (output without power signal)

Explanation of X3 terminals:

X3 can provide a group of one-to-one correspondence grade without power signal, among X3-N+1 is grade common terminals, X3-1to X3-N corresponds to 1 to N grade of tap changer.

Appendix 3

CX output decimal position signal, conventional product should be connected to HMC-3C indicator

CX socket signal	Description
CX-1	Tap changer posion signal digit “1”
CX-2	Tap changer posion signal digit “2”
CX-3	Tap changer posion signal digit “3”
CX-4	Tap changer posione signal digit “4”
CX-5	Tap changer posion signal digit “5”
CX-6	Tap changer posion signal digit “6”
CX-7	Tap changer posion signal digit “7”
CX-8	Tap changer posion signal digit “8”
CX-9	Tap changer posion signal digit “9”
CX-10	Tap changer posion signal digit “0”
CX-11	Tap changer posion decimal digit “0”
CX-12	Tap changer posion decimal digit “1”
CX-13	Tap changer posion decimal digit “2”
CX-14	Tap changer posion decimal digit “3”
CX-15	Tap changer posion signal digit “com”
CX-16	Tap changer posion signal digit common terminal
CX-17	“1-N” indication
CX-18	“N-1” indication
CX-19	“stop” indication

Appendix 4 Electrical principle diagram of Type CMA7 motor drive unit

