SHM Intelligent Motor Drive Unit
Operation Instruction

Shanghai Huaming Power Equipment Co.,Ltd.

Content

1. General

SHM Intelligent motor drive Unit is an intelligent and universal on-load tap changer drive unit designed by Huaming. Its outstanding features is to use information technology, microelectronic element and computer technology to substitute the existing conventional electrical element with contacts and whose function has to be completed by means of mechanical motion. The on-load tap changer motor drive unit on the domestic or fortian market used to adopt mechanical element switch contacts,as well as a very complicated drive control system comprising of switch contactor, relay, cam switch, travel switch, cam lever, lever and spring. This complicated actuation system affects the life and quality of the motor drive. And SHM is controlled by electronic signal, So the electric pave and mechanical part can be seperated. Therefore, the life and reliability is greatly improved. Two versions are available, SHM-I and SHM-II.SHM-II is designed for retrofit purpose.

Fig.1 SHM-I front view

2. Introduction of function and working condition

2.1 Introduction of features

Manual operation and automatic operation

Remote control operation and local operation

Step-by-step operation as well as overrunning continuously

Local position indicating, remote position indicating

Local operation push button

Record of operating times

Reliable overload protection

Standard aviation socket terminal, easy to connection.

BCD code position signal output contact

Over-current lockout protection input terminal

One to one position signal output contact (terminal block)

2.2 Working condition

2.2.1 Altitude must not exceed 2500 meters

2.2.2 Ambient temperature: -25℃～ 40℃

2.2.3 Vertical mounting gradient can't exceed 5%

2.2.4 Free of serious dust or explosive, corrosive gas.

3. Technical data

Item		Value	Value
Motor	Rated power (W)	750	1100
	Rated voltage (V)	AC 220 single phase	AC 220 single phase
	Rated current (A)	5.12	7.2
	Frequency (Hz)	50/60	50/60
	Revolution speed (r/min)	1400	1400
Revolution torque on output shaft (N. m)		45	66
Revolutions of drive shaft each step		16.5(1,2)	16.5
Revolutions of hand crank each step		33	33
Automatic operation time of each step (s)		About 4	About 4
Maximum number of operating position		35	35
Insulation grade power frequency kV (50Hz, 1min)		2	2
Weight (kg)		73	73
Protection grade		IP66	IP66
Controller	Model	HMK7	HMK7
	Rated voltage (V)	220	220
	Frequency(Hz)	50/60	50/60

Note: 1. The above listed data only applies to standard design, modification can be made according to different requirement, we will reserve the right to make modification.

2. ( )Represents the revolutions of shaft at each step is one or two turns .

4. Design

SHM type motor drive unit adopts modular and standardization design principles. computer program encoder and photoelectric conversion technology to substitute the previous mechanical elements with contacts. The connection/disconnection of electrical signal can be realized without contact and mechanical control. SHM motor drive realizes the separation of mechanical and electrical. The mechanical part and electrical part are installed in separate housing thus the electrical element influence caused by environment will be reduced to a minimum.

4.1 Appearance of control cabinet

4.1.1 Housing

The housing consists of two parts, the housing and the cover ,which both are cast at low pressure. by corrosion -resistant aluminum alloy. Protective paints coated on the surface, The whole housing and the cover are fully-sealed , its protection grade is IP66.

4.1.2 There are 2 aviation sockets as inlet passage on the bottom of the housing.

4.2 Internal structure

4.2.1 Drive section

Drive unit is a low noise and pulley drive system, For one tap change, SHM-I output shaft will turn 16.5 revolutions, SHM-II output shaft will turn one or two revolutions.

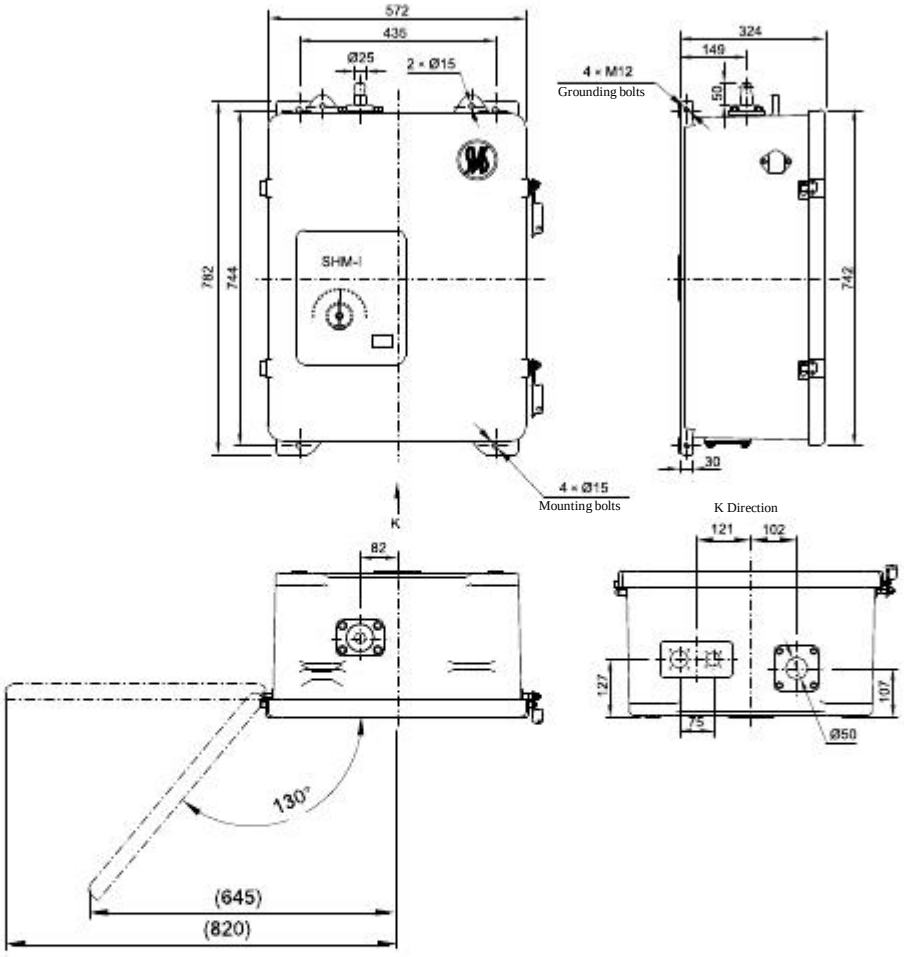
Note: Pulley system must not contact lubrication oil.

4.2.2 Position indicating section

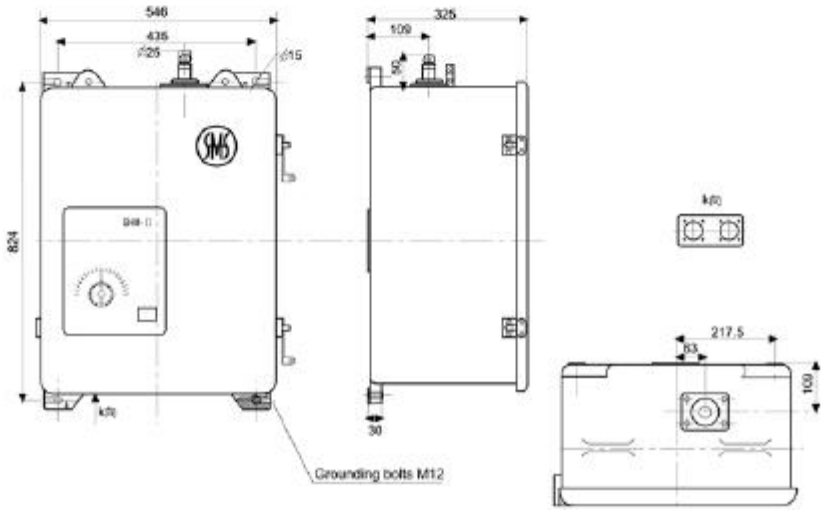
The indication dial shows clearly the position of motor drive unit and on-load tap changer.

The electromagnetic counter records the actual operations of motor drive unit. This section is not necessary to make maintenance as the mechanical drive of whole position indicating and photoelectric conversion section are installed in a sealed cabinet.

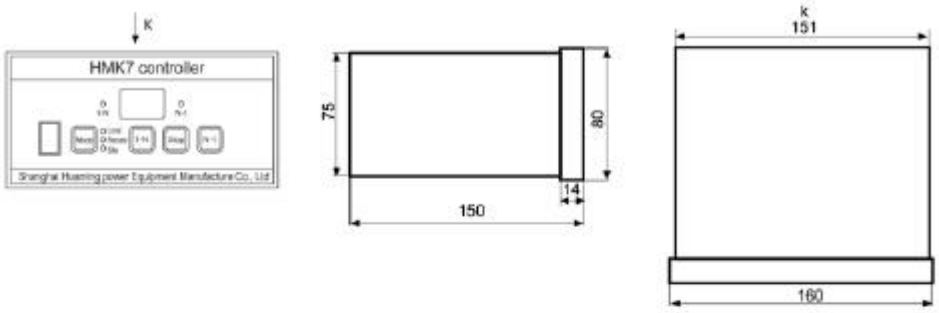
5. Overall and mounting dimension diagram of SHM-I



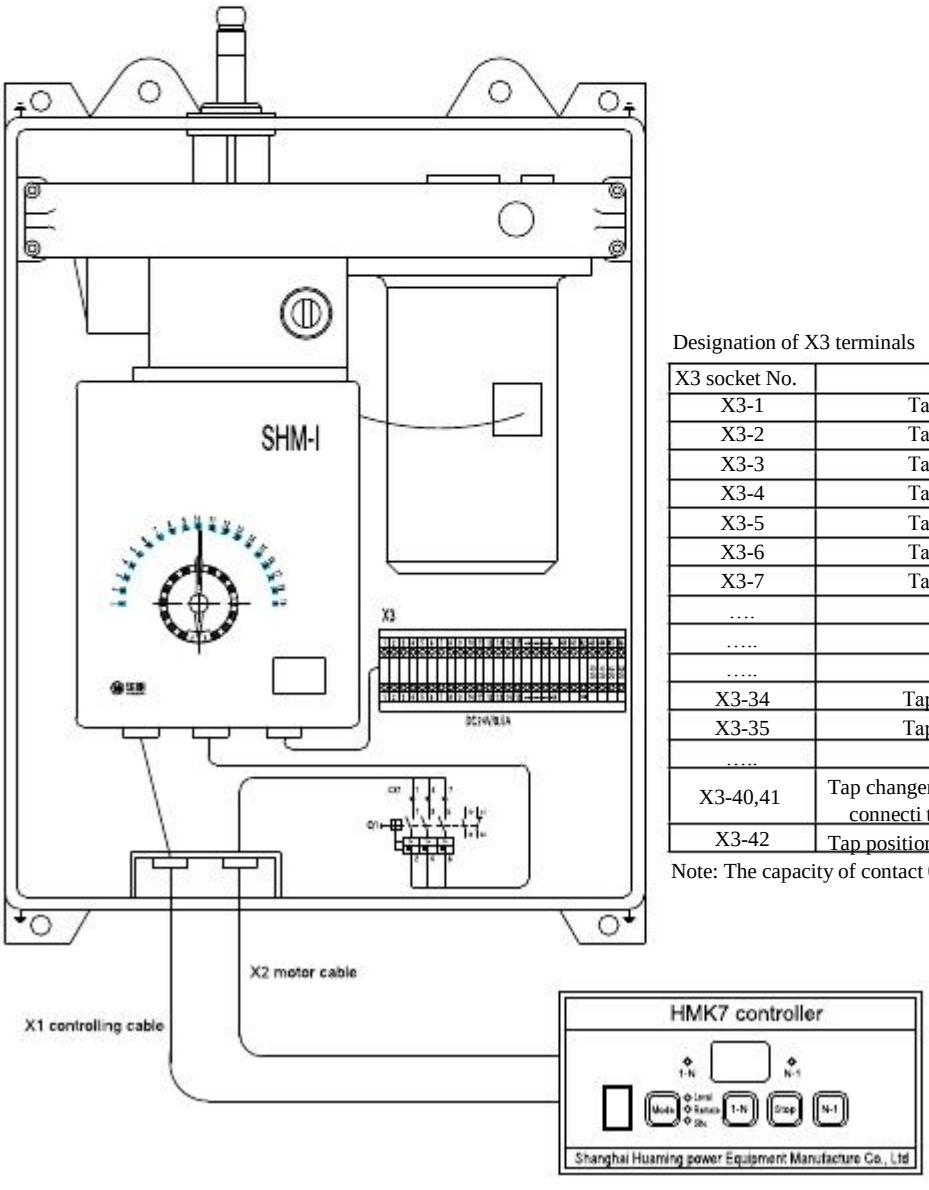
6. Overall and mounting dimension diagram of SHM-II



7. Overall diagram of HMK7 controller



8. External connection diagram of SHM motor drive unit and HMK7 c



Designation of X3 terminals

X3 socket No.	Designation
X3-1	Tap position signal No. “1”
X3-2	Tap position signal No. “2”
X3-3	Tap position signal No. “3”
X3-4	Tap position signal No. “4”
X3-5	Tap position signal No. “5”
X3-6	Tap position signal No. “6”
X3-7	Tap position signal No. “7”
….	….
…..	….
…..	….
X3-34	Tap position signal No. “34”
X3-35	Tap position signal No. “35”
…..	….
X3-40,41	Tap changer running signal output terminal connecti to CX3-1,2 terminal in oil filter
X3-42	Tap position grade signal common terminal

Note: The capacity of contact 0.5A/24V DC

9. Installation

9.1 Install motor drive unit to the transformer tank

9.1.1 The motor drive unit is mounted by four studs at the transformer tank. The bracket to install motor drive unit must be flat, otherwise, the motor drive unit will be deformed, which may prevent the door from being closed, even affect the function of it. The mounting holes are at upper/lower end of motor drive unit .Take care that the motor drive unit has to be installed vertically and convenient to operate, the output shaft is in correct alignment with the shaft of bevel gear. If transformer causes extremely heavy mechanical vibration, the use of vibration dampening connectors is recommended.

9.1.2 Connect HMK-7 controller and motor drive unit properly, users mustn't change the length of cable or cable or weld the connector by non-professionals, otherwise, it may affect the normal operation of motor drive unit.

9.2 The installation of drive shaft gear box (see Fig.1)

9.3 The switching of tap changer must be completed before stopping the motor drive unit

There is an interval between the end of motor drive unit action and the action of switching,(1.5~2 positions before the red center mark on the tap change indication wheel), it can be ensured by adjusting the time of selector or diverter switch. This red center mark is used as a reference when adjustment.

One tap change operation corresponds to one rotation of the tap changer indication wheel. The tap change indication wheel is divided into 33 positions with one position corresponding to one rotation of hand crank. The number of positions counted from the beginning of tap change opertion until the red center mark of the indication wheel faces the mark on the inspection window should be equal in both rotation senses.

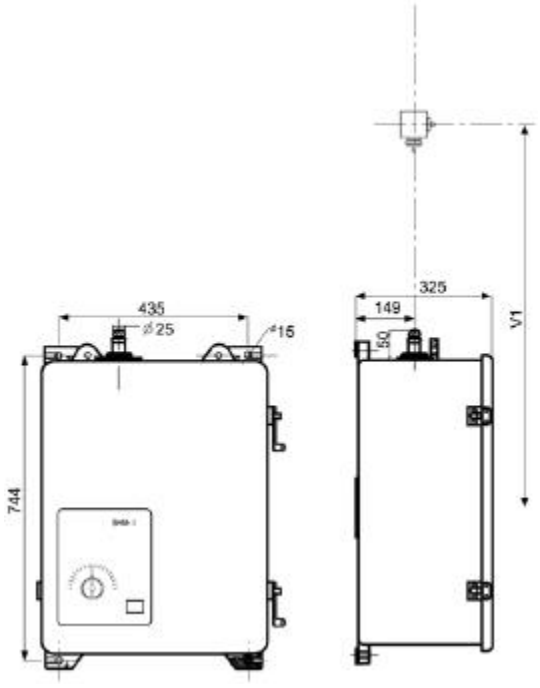
Minor asymmetry is admissible

Symmetrical connection 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 and tap changer are equal.

c) Tap changer and motor drive have to be in the adjustment position.



d) Connect tap changer and motor drive unit.

e) Turn crank in one direction until selector or diverter switch action occurs.

f) Repeat this procedure in the opposite direction.

g) If there is a difference between the numbers of positions counted in both directions, the motor drive must be readjusted in relation to the tap changer by half this difference of numbers.

9.4 Example of connection

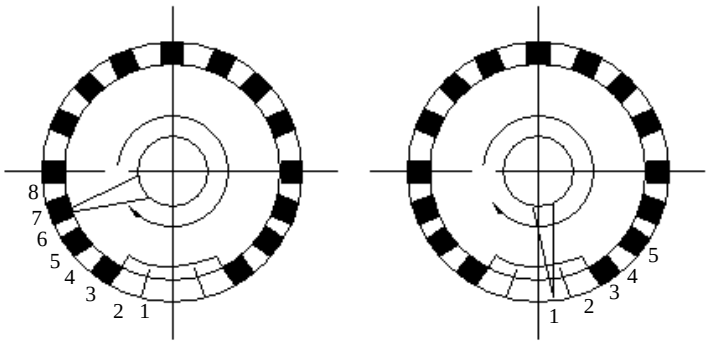


Fig. A Fig. B

a) Tap changer is in operating position 10. Turn crank turn towards 11 until the diverter switch action occurs.

Count the number of TIW position.

Result: error of 7 positions

b) Tap changer is in operation position 11. Turn hand crank towards 10 until diverter switch action occurs. Count the number of 1.5 positions.

Result: error of 1.5 positions

Correction value: 1/2(7sections -1.5sections)=2.75positions

Method of correction:

1) Loosen vertical drive shaft;

2) Turn crank 3 positions towards operating position11;

3) Connect vertical drive shaft again;

4) Turn crank towards operating position 10, count the number of TIW positions indication.

Result: error of 4.5 positions

5) Check the direction of operating position 11;

Result: error of 4 positions

10. Operation

10.1 Electrical operation

10.1.1 Select correct command on HMK7 controller or on motor driver unit SHM-I.

10.1.2 The electrical operation mode is used to press the pushbuttons on motor drive unit directly to complete the operation of raise, lower and stop.

10.1.3 The remote operation mode is used to press the remote pushbutton to complete the operation of raise, lower and stop.

10.1.4 The local operating mode is used to complete the operation of raise, lower and stop of motor drive unit by means of controller.

10.1.5 Select correct command, press N → 1 or 1 → N push-button, the motor drive unit will complete tap changing automatically (the small pointer on the dial will turn 33 sections) and will stop in the specified field.

10.2 Manual operation

Insert hand crank on shaft, manual protection switch S8 will start before the hand crank mates and cut off the power supply of motor. Turn manually 33 rotations, motor driver unit will complete one operation.

11. Put into operation

11. 1 Operation test

Before applying the supply voltage for motor circuit, control and auxiliary circuit, check whether voltage, current and output of the supply meet with the required value; and the position indication of tap changer is in compliance with the motor drive unit and controller.

11. 2 Operation test of intermittent gear (mechanical end position limit)

The tap changer can be always change to any position within the tap range, till it has reached the end position. Continue to make further revolution and hand crank has turned about 3~5 rotations, the action of mechanical limit will occur, then turn hand crank in opposite direction, making mechanical limit release and restore, if hand crank hasn't turned 3~5 rotations or mechanical limit can't be released and restores, adjust mechanical limit screw to make another 3~5 rotations after mechanical limit has been restored. The motor drive unit return to last operating position of tap change, the pointer of tap change indication wheel return to the original position. The same procedure is applied when the other end position is tested.

11. 3 Put into operation at the operating site

The transformer can be put into operation after being tested according to section 9.1.

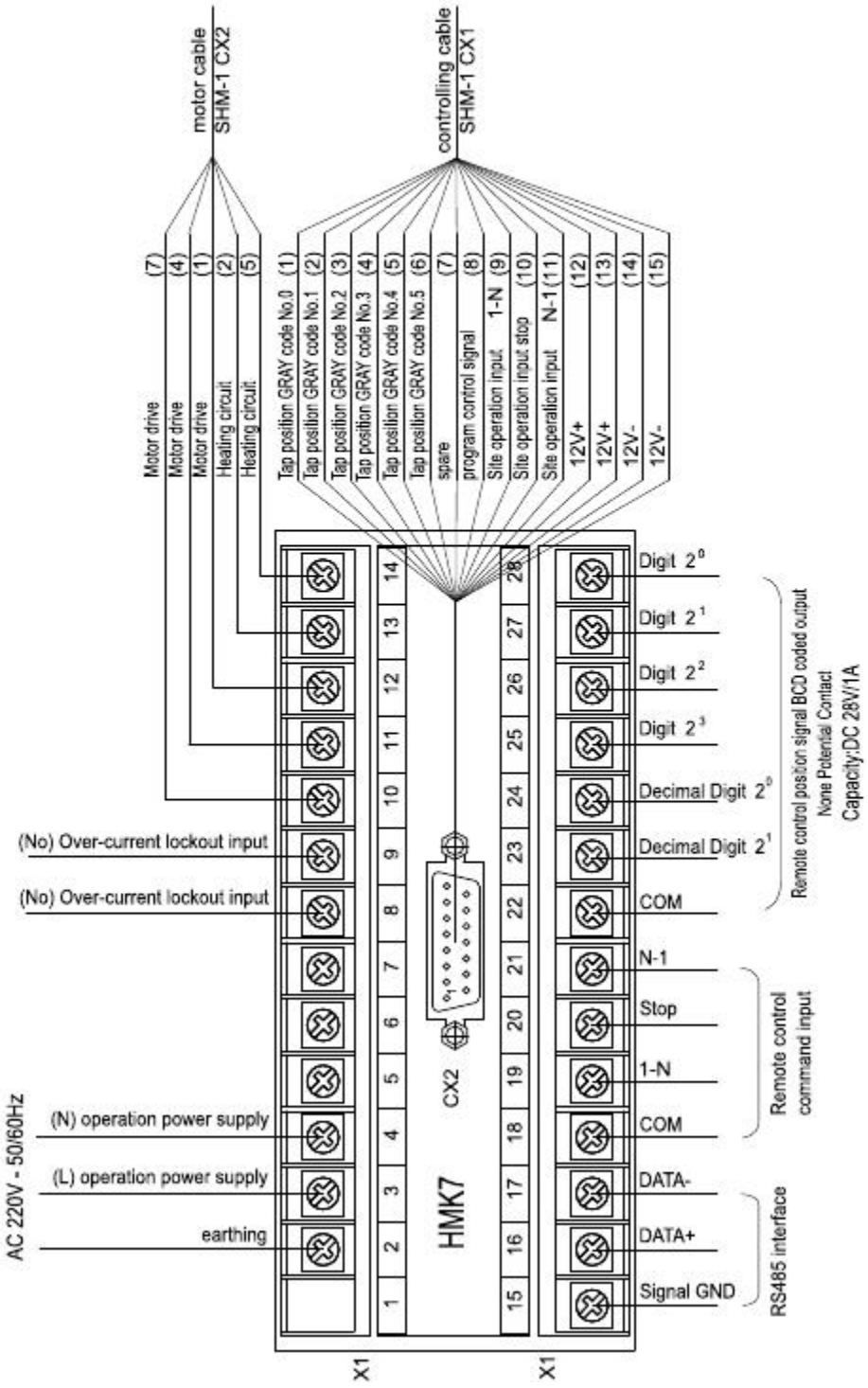
12. Maintenance

All maintenance work must be performed by qualified and skilled technician according to rules specified by Huaming company.

Maintenance or modification is prohibited without permission of Huaming.
SHM motor drive unit comprises of motor drive unit and control drive section, and connected by two M8 screws, easy to load, on-site maintenance-free, When replacing control drive section, its position must be in compliance with the indication position of control drive section to be replaced, then proceed to replace it. The transformer can be put into operation after operational test has been made according to section 9.1.

No.	Failure	Solution
1	No indication on HMK7 controller	(1) Is 220V power supply connected (2) Are all fuses good?
2	Wrong position indication	Is the signal cable connecting HMK7 is connected?
3	HMK7 not accept command	Whether the command selection is correct?
4	HMK7 with action indication but motor doesn't work	Is the connection of motor cable correct?
5	Don't stop when run tor red line	The signal cable form HMK7 to unit is connected properly?
6	The time exceed 6 seconds during on operation of tap changing	Check the transmisson belt is tight or loose?
7	Operation counter doesn't work	Check manual operation. The counter doesn't work without power?
8	Motor drive unit doesn't work	All plugs are connected?

Appendix: Connection diagram of HMK7 controller and SHM motor drive unit



Shanghai Huaming Power Equipment Co., Ltd.

Address: No 977 Tong Pu Road, Shanghai 200333, P.R.China
Tel: +86 21 5270 3965 (direct)
+86 21 5270 8966 Ext. 8688 / 8123 / 8698 / 8158 / 8110 / 8658
Fax: +86 21 5270 2715
Web: www.huaming.com E-mail: export@huaming.com

Printing: March 2010