

Welcome to use On Load Tap Changer of Guizhou Changzheng!

Please read the operating instructions of this product before you put the on load tap changer into service. Please pay special attention to the following items:

1. Check and accept the products according to the packing list when receiving products. Keep the evidence if there are any damages during transportation in order to claim compensation from the responsible party and protect your rights.
2. The product only can be used with the transformer which specified in the order. You need to consult with our company in advance if you want to change the purpose of this product.
3. The installation, put into operation, maintenance and repair of the product should be complied with the operating instructions and relevant provisions of security.

All data in this manual may be different in details from the tap-changer that we delivered. We reserve the right to change without notice.

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1. General

1.1 Safety instructions

All personnel involved in installation, commissioning, operation, maintenance or repair of the device must:

- ❖ be suitably qualified
- ❖ strictly observe these operating instructions

Improper operation or misuse can lead to

- ❖ serious personal injury
- ❖ damage this device and user's equipment
- ❖ reduce the efficiency of this device

These operating instructions emphasize some important information of safety instructions in four forms



Give the word of “Warning” when ignoring a certain requirement will cause the life damage of operator. This is a warning of danger to life and health, disregarding this warning can lead to the serious or fatal injury.



Give the word of “caution” when ignoring a certain requirement will lead to the damage to the equipment. This information indicates particular danger to this device or other equipment of the user, but the serious or fatal injury can't be excluded.



In order to emphasize at any time, the word of “Note” will be used, remind it should be careful when operating according to the requirements of “Warning” .

Prompt:

It is the important instructions for a certain item.

1.2 Illegal operation

We shall not be liable for any loss caused by unauthorized alteration or incorrect modification of the product.



Failure to modify the product without the permission of the manufacturer will result in personal injury, property damage and equipment failure.

1.3 Purpose

ZD motor drive mechanism is used for the driving and control on load tap changer and off circuit tap changer. It connects to the auto voltage regulator or computer and can achieve the auto control of on load voltage regulation system.

The technological performance of motor drive mechanism meet to the requirement of GB/T10230.1<Tap Changer Section 1: Performance Requirement and Test Method> and IEC60214-1<Tap Changer Section 1: Performance Requirement and Test Method>.



This mechanism is only used for driving the tap changer with the same factory number.
The installation, electrical connection and commissioning should be performed by the qualified and skilled person according to these instructions.
This mechanism whether to be used for the specified purpose depends on the user himself.

1.4 Function and interface

- 1.4.1 Manual & motor operating;
- 1.4.2 Remote & local operating;
- 1.4.3 Local tap position indicator;
- 1.4.4 Local tap changing indicator;
- 1.4.5 Local number of operations recorded;
- 1.4.6 Transfer to remote/stop/local operating;
- 1.4.7 Local block & power failure alarm indication;
- 1.4.8 With over current lockout protects passive input contacts;
- 1.4.9 With remote 1→N, N→1, STOP passive input contacts;
- 1.4.10 With tap position corresponds to a passive signal output;
- 1.4.11 With tap position BCD code passive output signal;
- 1.4.12 With a set of independent motor operation signals output and the signal can also be used for passive signal output terminal of oil filter;
- 1.4.13 With passive signal output: Remote/local conversion, motor running, switch unfinished, mechanical faults;
- 1.4.14 With RS485 and fiber optic communication interface(Special configuration), choose one of them, fallow MODBUS protocol;

1.5 Product feature

- 1.5.1 Following the step-by-step control principle, that is, when the tap changer switches from a tap position to an adjacent tap position, it only receives one operation command; if a tap changer is required, the setting motor can automatically override the position;
- 1.5.2 With position memory function. Motor driver mechanism can remember the position, if the power supply is interrupted during operation; Motor driver mechanism can continue to complete tap change operating in this position, when the power to restore power;

- 1.5.3 With the protection of the phase sequence disorder protection circuit, when the power supply into the line phase sequence error, the control circuit automatically detects and alarms;
- 1.5.4 With prevent running gear, prevent tap changer linked;
- 1.5.5 With machine and electric position limitation protection, to prevent tap changer to the extreme outer direction;
- 1.5.6 The box and lid are made of stainless steel materials, sealing property is superior and beautiful. More conform to the requirements for outdoor use. Protection grade IP66;
- 1.5.7 Electrical control functions use microelectronic components, programmable program and information technology instead of traditional relays and their logical circuits;
- 1.5.8 Signal transmission with BCD code, remote control and all kinds of hard contact status signal transmission, at the same time, increased the RS485 communication transmission, reliable performance, increase when special needs without being limited by the signal attenuation and transmission distance, strong anti interference ability of the optical fiber transmission to replace traditional control cables;
- 1.5.9 Break the traditional manual operation mode, hand-operated equipment and hand tools to be one.

1.6 Environment condition of using

- 1.6.1 The using ambient temperature is $-25^{\circ}\text{C} \sim +40^{\circ}\text{C}$;
- 1.6.2 The incline degree of installation: not exceeding 5° ;
- 1.6.3 There is no serious dust and other explosive and corrosive gas in the using site.



If ambient temperature over the range in 1.6.1, user may request when ordering, we will meet the demand by special designed.

2. Motor parameters

See table 1

No.	Specification	Technical Parameter
1	Rated power	0.75kW
	Rated voltage	220V/380V, 3 phase
	Rated current	3.48A/2.01A
	Rated frequency	50 Hz
	Rated revolutions	1400 r/min
2	Rated torque of drive shaft	18 N.m

3	Revolutions of hand crank per step tap change	33
4	Revolutions of drive shaft per step tap change	33
5	Time of per step tap change	Approx 6 s
6	Number of max. tap positions	35
7	Voltage of control and heating circuit	AC 220V
8	Consumed power of the heater	50W
9	To the ground insulation test (Power frequency)	2kV • 1min
10	Protect level	IP66
11	Machine life	Over 1000000 times
12	Weight	Approx 78 kg
13	Apply controller(*1)	CY50 or YK-6

Note: (*1) The controller is fittings selection. Other data is standard design. Different order conditions different data. This data sheet are subject to change without prior notice.

3. Structure

ZD Motor drive mechanism consists of cabinet, gear drive mechanism and control mechanism, position indication device and etc., the layout diagram of inner electrical components is showing in figure 1.

3.1 Box body, box cover

The box and box cover are made of corrosion-resistant stainless steel, the sealing performance is superior, the appearance is beautiful, more accord with outdoor use requirement.

The box and box cover are connected by hinges, the standard product box is open in the direction of the left, and the opening angle is 180

The box and box cover are seal by sponge rubber, all open holes required for operation are completely sealed (transmission shaft, observation window, etc.). This ensures the protection against dust and splashing water. (Level of protection IP66)

The left and right sides of the box each have a labyrinth with a metal mesh, to make air circulation in the box, and to prevent the invasion of insects.

The lower side of the box is provided with two cable entry holes and a communication cable entry hole, as the inlet and outlet channels

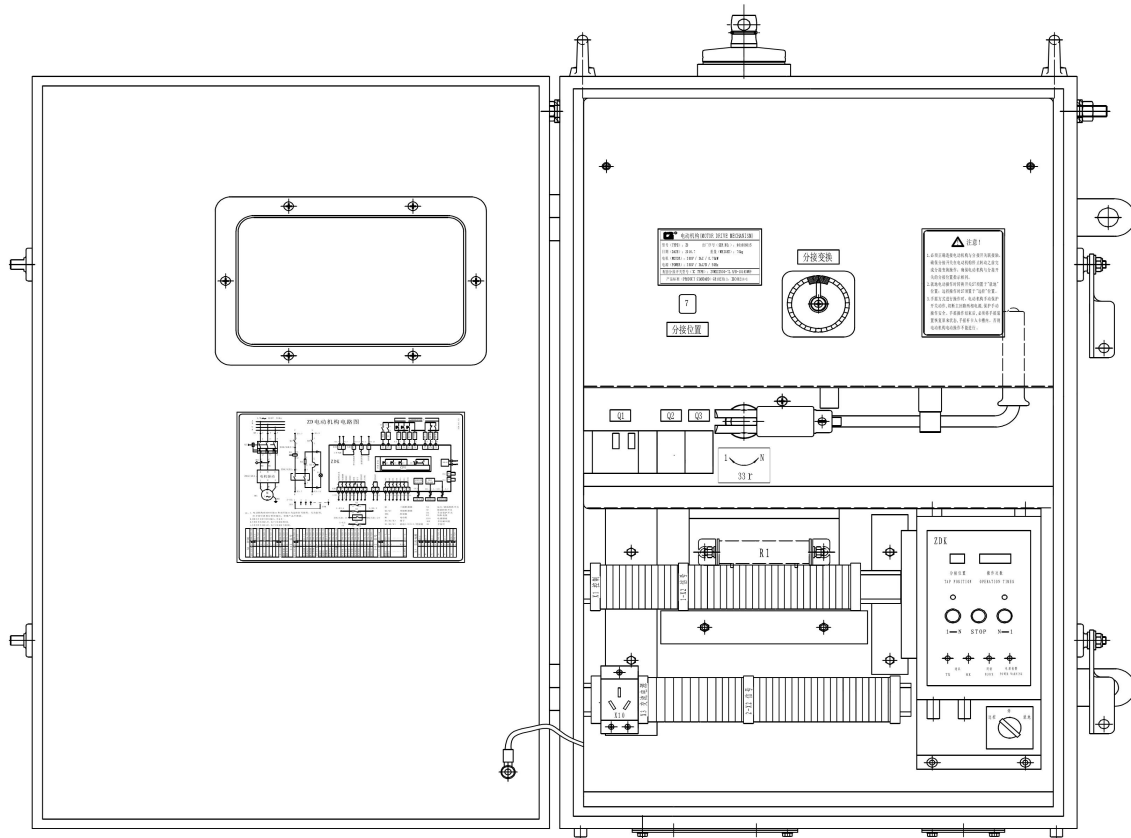


Figure 1

3.2 Transmission part

The transmission part is located in the upper body.

3.2.1 Transmission mechanism

The transmission mechanism in the up half of the box. In the front of a protective plate, to prevent accidentally hit. Transmission mechanism motor through wear resistance wedge belt reduction drive, low noise. Per level tap change operation can output turns 33 times. (=hand crank turns 33 times.)



The belt of transmission should not contact grease.

3.2.2 Mechanical instructions

The mechanical instructions of the motor driver mechanism is composed of the tap position indication and the tap change indication, which the tap position is indicated by the indicator wheel; the tap change is indicated by the pointer disk, and the green area on the pointer disk is indicated the initial position of the tap change operation by the center line. When the motor driver mechanism finished a tapping position, the tap change pointer rotates 360° and the tap position indicator turns 10°. The recording tap changer's tap position and the tap change state can be observed in the window of the cover.

Prompt:

The centerline mark of the green area of tap change pointer disk is used as reference position when the tap changer is connected to the motor driver mechanism. After the end of a tap change, the pointer in the centerline mark of the green area stop position should be correct, the pointer is a small offset is allowed.



The tap change pointer is prohibited from self-adjustment after leaving the factory. Otherwise, it will cause the motor stop position to be incorrect.

3.2.3 Tap position transmission device

Tap position transmission device adopts the printing plate coding method.

In standard products, there are two sets of signals for the output of tap position transmission device: One group is used as electrical control part of the signal collection, and the other group is directly output to the user..

The signal output is first closed and then broken

In order to facilitate user connection, the electrical wiring of the tap position transmission device is connected to the terminal of the lower part of the box body.

Prompt:

The signal output on the terminal is: The passive output position and BCD code passive output position are corresponding, to be used when the user to connected the position signal. If the decimal code signal or resistance position signal is to be output, and other tap position signals are required, The user can request the request when ordering, we can meet the corresponding usage request through special design.

3.2.4 Hand crank device

There are hand crank device and hand cranking operation tools are combined in motor driver mechanism, it also has the interlock protection of manual and motor operation, ensure manual operation is safe.



1. When the motor driver mechanism is operated manually, please strictly follow the attention mark of the motor driver mechanism pay, or it will affect motor operation or not motor operation.

2. After the safety switch of hand crank, cut off the main circuit two phase power supply, do not cut off the control circuit power supply.

3.2.5 Protective plate

The protective plate is a plate of the mechanical transmission part of an motor driver mechanism, to prevent arbitrary adjustment or accidentally touched.



Protective plate only in the maintenance of electric only need to open, open the shield must be a professional maintenance staff.



Before opening the plate, be sure to disconnect the motor's protective switch to prevent accidental start-up of the motor-drive mechanism.

3.3 Control part

3.3.1 ZDK Controller (Figure 2)

The electric control part of the ZD motor driver mechanism is completed by a separate control module ZDK controller.

ZDK controller main feature:

- Display operation status and tap position;
- Record and display the number of operations;
- Set the local operation button and local/stop/remote switch.
- Check power supply and lock and light alarm;
- Check the temperature and humidity in the box and output control signal;
- Output a variety of status signals and control signals;
- With RS485 communication interface and optical fiber communication interface (special configuration).

State of the communication lamp on ZDK controller:

RX - Flash when it is received;

TX - Flash When RX receives the correct data and sends the data.

The RS485 communication interface or optical fiber communication interface follows MODBUS protocol, and the protocol is detailed in the appendix.

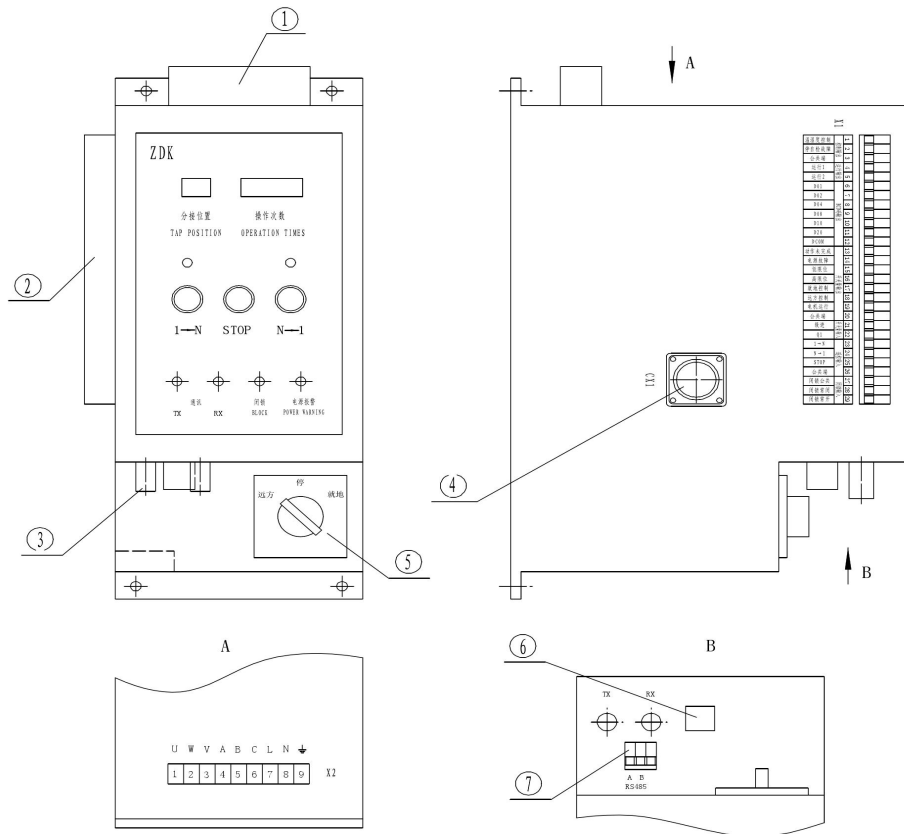


Figure 2

- ① ZDK/X2 terminal ② ZDK/X1 terminal ③ ZDK/Filter terminal
- ④ ZDK/CX1 terminal ⑤ ZDK/S4 changeover switch ⑥ ZDK/standby extension interface
- ⑦ ZDK/RS485

3.3.2 Heating equipment

There is a 50W heating resistor R1 in motor driver mechanism, which is used to heat to prevent cold condensation due to temperature changes. That will emit signal to control heating resistance when ZDK controller to detect the temperature in the cabinet below 5°C and humidity $\geq 88\%RH \pm 5\%RH$.

3.3.3 Electric wiring

Internal wire of motor driver mechanism: Black flexible wire (1.5mm²) to be wire of main control circuit of motor driver mechanism, black flexible wire (1mm²) to be wire of electric control part, multi core cable and black flexible wire (1mm²) to be wire of tap position transmission mechanism .

RS485 transmission interface wire: RS485 communications special cable.

Optical fiber transmission interface wiring(special requirement): Special cable for optical fiber signal.

Prompt:

Max.diameter of wire is 4mm² flexible wire for external terminal in motor driver mechanism.

3.4 Driving motor

ZD motor driver mechanism use a three-phase asynchronous motor, the standard product voltage is 3 phase 380V, frequency is 50Hz. The motor is mounted on the below of the transmission mechanism.

3.5 Remote controller

Remote controller can be configured for ZD motor driver unit according to user demand. The supporting models are: CY50 tap position monitor or YK-6 on load voltage regulating controller.

CY50 tap position monitor transmission cable is RS485 communication cable.

The transmission cable of YK-6 On-load voltage regulator controller is RS485 communication cable or fiber optic cable (special configuration), choose one of them.

The remote controller is installed in the control room.

Prompt:

1. When the remote controller needs to with the CY50 or YK-6, the user must request when ordering.
2. CY50 and YK-6 details, please refer to the instruction manual. YK-6 can auto voltage regulating, parallel operation.

4 Installation

Outline and installing dimension as Figure 3.

4.1 Installation of motor driver mechanism

Motor driver mechanism is installed on the side of the transformer tank, by 4 M16 ×60 bolt and nut and pring washer and washer.

In the case of larger vibration, damping measures are recommended for installation;

The box grounding position is on both sides of the upper and left of the box body, and the ground stud is M12, as Figure 3.

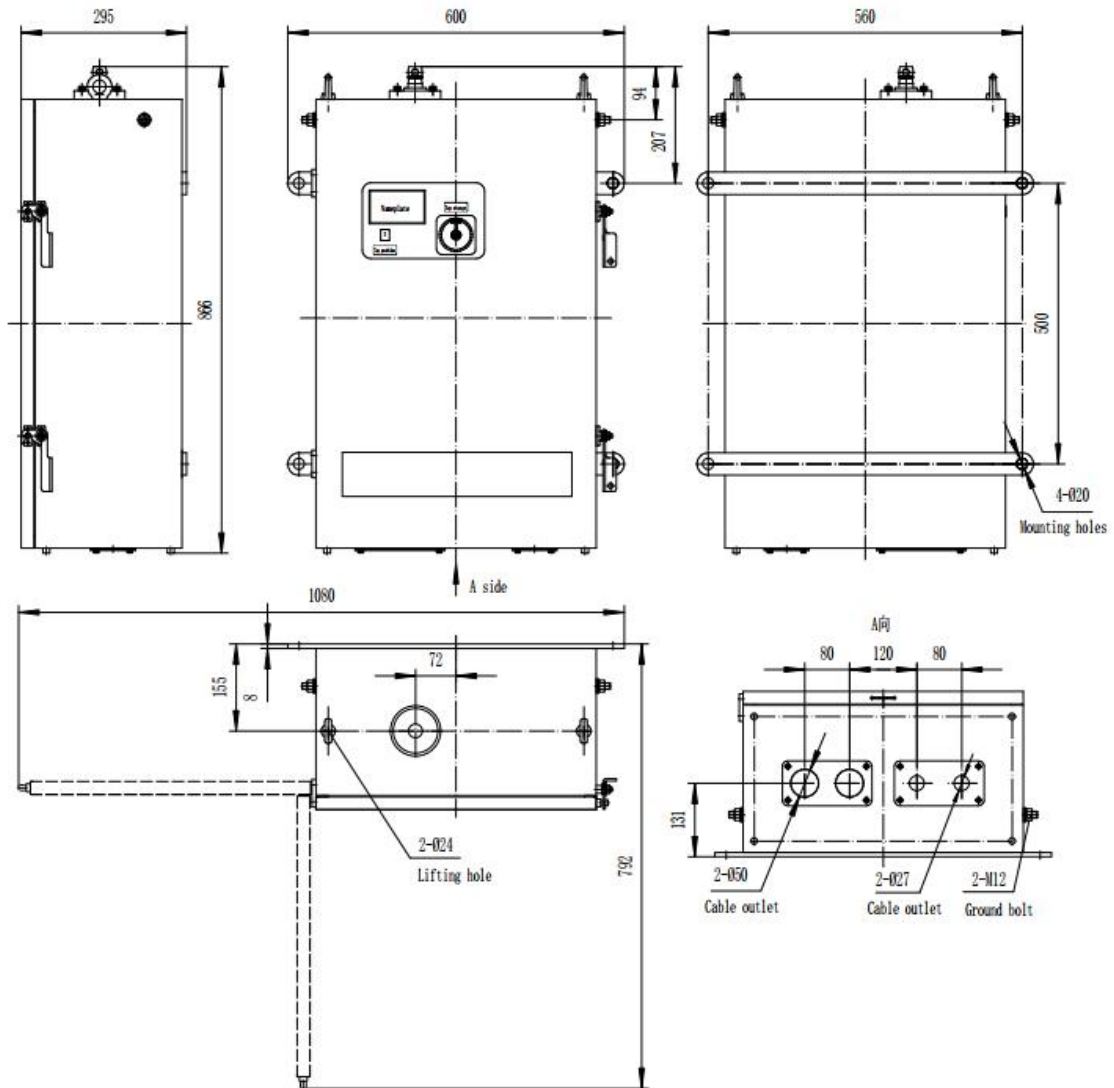


Figure 3



1. Serial Number of the motor driver mechanism must correspond with the tap changer.
2. Motor driver mechanism and the tap changer must be in the same setting position. This position is indicated in the tap changer wiring diagram provided with the tap changer.
3. Motor driver mechanism is installed vertically on the side of the transformer tank and shall not be skewed. The drive shaft and the drive shaft of cone gear box is adjusted to a straight line to avoid damage to the motor mechanism, the on-load tap-changer and the transformer.

4.2 Installation of cone gear box and drive shaft

Installation of cone gear box and transmission shaft, see On load tap changer operation instruction.

4.3 Check the connection between tap changer & motor driver mechanism

Check the connection between the tap changer and the motor driver mechanism, see On load tap changer operation instruction.

4.4 Electrical wiring of the motor-drive mechanism



Before the motor driver mechanism is connected to power, you must comply with the relevant safety regulations to prevent serious or fatal injuries.

Motor driver mechanism wiring is carried out according to the circuit diagram of the box cover. (Figure 4).

4.4.1 Figure 4 Terminal board

X1 control: Include remote instruction input and block signal input;

2-X2 signal: For correspondence tap position signal output; (N is Max.number of tap position, N+1 is tap position signal COM)

X3 AC power: Include Motor driver mechanism working power and auxiliary power input.

Prompt:

When the power line are default phase, anti phase and low power supply voltage, the ZDK controller "power alarm" indicator light is lit, while the motor operation is closed.



1. The blocking signal is Passive normally open or Passive normally close, user can choose one to use.
2. When the current blocking signal is not normally closed, the terminal is short connected; When the current protection device is equipped, the short wiring must be removed and correct connecting to over current normally closed contact.

Prompt:

Figure 4: 1-X2:12&13 to be a set of independent motor running signal output in X1 terminal, this signal also can use for passive signal output of oil filter.

4.4.2 Communication interface connection

The communication interface is set on the lower side of the electrical control module ZDK controller, mainly used for connected with remote controller (CY50 or

YK-6) by RS485 communication cable or fiber optic cable (special configuration) . To achieve the remote controller and the local electric machine operating status information transmission.

RS485 communication interface have connected to ZD/1-X2 signal terminal 23, 24, 25, and 1-X2: 25 is communication cable shield layer contact.

When ZD Motor driver unit connected to CY50, the transmission information of RS485 communication interface is: tap position, operation instruction.

When ZD Motor driver unit connected to YK-6, the transmission information of RS485 communication interface or optical fiber communication interface is: tap position, operation instruction, state signal, operation number, etc. Choose one of 2 kind of communications..



The minimum bending radius of the optical fiber at the time of use or arrangement is R30mm

Prompt:

There are communication cable inlet on low side of motor driver mechanism, bore diameter \varnothing 20.5.

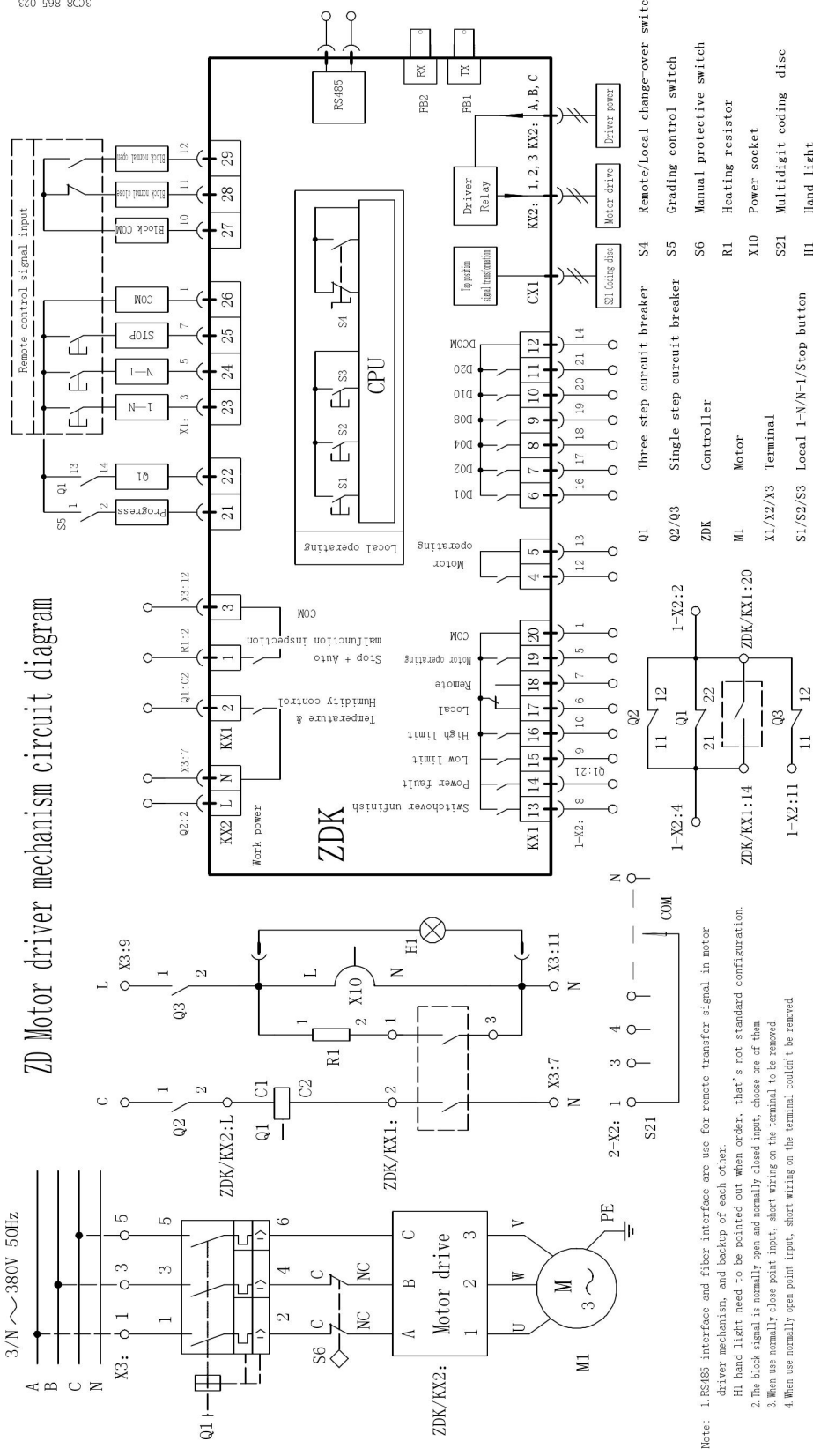
Prompt:

When the ZDK local controller and the remote YK-6 on load voltage regulating controller communication is normal, the TX and RX communication indicator flashes on ZDK controller mean connected correctly, or mean the connection failure. Please switch the connection of the A, B terminal of RS485 interface or connect the two fibre-optic connecting plug.

Prompt:

In the case of transformer or tap changer debugging, test, and no remote control, the motor driver mechanism can operate separately, don't need the remote controller. After the power is connected as Figure 4 or Figure 5, the "local" controller mode is selected on the motor driver mechanism to operate.

ZD Motor driver mechanism circuit diagram



X1 Control		X2 Signal												X3 AC Power																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Remote COM	ZDK/KX1:26	Signal COM	ZDK/KX1:20	Q1:22	Q2:11	Mechanism faults	ZDK/KX1:19	Local control	ZDK/KX1:17	Remote control	ZDK/KX1:18	Switchover unfinished	ZDK/KX1:13	High Limit	ZDK/KX1:15	High Limit	ZDK/KX1:16	Q3 Trip	Q3:11	Motor operation	ZDK/KX1:4	Motor operation	ZDK/KX1:5	BCD COM	ZDK/KX1:12	BCD-D01	ZDK/KX1:6	BCD-D02	ZDK/KX1:7	BCD-D04	ZDK/KX1:8	BCD-D08	ZDK/KX1:9	BCD-D10	ZDK/KX1:10	BCD-D20	ZDK/KX1:11	RS485-A	ZDK/KX3:1	RS485-B	ZDK/KX3:2	RS485-G	ZDK/KX3:3	Step COM	S21:COM	Step 1	S21:1	Step 2	S21:2	S21:N	Max. step																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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COM	Q1:1	Q1:2	Q1:3	Q1:5	Q1:8	Q1:9	Q1:10	Q1:11	Q1:12	Q1:13	Q1:14	Q1:15	Q1:16	Q1:17	Q1:18	Q1:19	Q1:20	Q1:21	Q1:22	Q1:23	Q1:24	Q1:25	Q1:26	Q1:27	Q1:28	Q1:29	Q1:30	Q1:31	Q1:32	Q1:33	Q1:34	Q1:35	Q1:36	Q1:37	Q1:38	Q1:39	Q1:40	Q1:41	Q1:42	Q1:43	Q1:44	Q1:45	Q1:46	Q1:47	Q1:48	Q1:49	Q1:50	Q1:51	Q1:52	Q1:53	Q1:54	Q1:55	Q1:56	Q1:57	Q1:58	Q1:59	Q1:60	Q1:61	Q1:62	Q1:63	Q1:64	Q1:65	Q1:66	Q1:67	Q1:68	Q1:69	Q1:70	Q1:71	Q1:72	Q1:73	Q1:74	Q1:75	Q1:76	Q1:77	Q1:78	Q1:79	Q1:80	Q1:81	Q1:82	Q1:83	Q1:84	Q1:85	Q1:86	Q1:87	Q1:88	Q1:89	Q1:90	Q1:91	Q1:92	Q1:93	Q1:94	Q1:95	Q1:96	Q1:97	Q1:98	Q1:99	Q1:100	Q1:101	Q1:102	Q1:103	Q1:104	Q1:105	Q1:106	Q1:107	Q1:108	Q1:109	Q1:110	Q1:111	Q1:112	Q1:113	Q1:114	Q1:115	Q1:116	Q1:117	Q1:118	Q1:119	Q1:120	Q1:121	Q1:122	Q1:123	Q1:124	Q1:125	Q1:126	Q1:127	Q1:128	Q1:129	Q1:130	Q1:131	Q1:132	Q1:133	Q1:134	Q1:135	Q1:136	Q1:137	Q1:138	Q1:139	Q1:140	Q1:141	Q1:142	Q1:143	Q1:144	Q1:145	Q1:146	Q1:147	Q1:148	Q1:149	Q1:150	Q1:151	Q1:152	Q1:153	Q1:154	Q1:155	Q1:156	Q1:157	Q1:158	Q1:159	Q1:160	Q1:161	Q1:162	Q1:163	Q1:164	Q1:165	Q1:166	Q1:167	Q1:168	Q1:169	Q1:170	Q1:171	Q1:172	Q1:173	Q1:174	Q1:175	Q1:176	Q1:177	Q1:178	Q1:179	Q1:180	Q1:181	Q1:182	Q1:183	Q1:184	Q1:185	Q1:186	Q1:187	Q1:188	Q1:189	Q1:190	Q1:191	Q1:192	Q1:193	Q1:194	Q1:195	Q1:196	Q1:197	Q1:198	Q1:199	Q1:200	Q1:201	Q1:202	Q1:203	Q1:204	Q1:205	Q1:206	Q1:207	Q1:208	Q1:209	Q1:210	Q1:211	Q1:212	Q1:213	Q1:214	Q1:215	Q1:216	Q1:217	Q1:218	Q1:219	Q1:220	Q1:221	Q1:222	Q1:223	Q1:224	Q1:225	Q1:226	Q1:227	Q1:228	Q1:229	Q1:230	Q1:231	Q1:232	Q1:233	Q1:234	Q1:235	Q1:236	Q1:237	Q1:238	Q1:239	Q1:240	Q1:241	Q1:242	Q1:243	Q1:244	Q1:245	Q1:246	Q1:247	Q1:248	Q1:249	Q1:250	Q1:251	Q1:252	Q1:253	Q1:254	Q1:255	Q1:256	Q1:257	Q1:258	Q1:259	Q1:260	Q1:261	Q1:262	Q1:263	Q1:264	Q1:265	Q1:266	Q1:267	Q1:268	Q1:269	Q1:270	Q1:271	Q1:272	Q1:273	Q1:274	Q1:275	Q1:276	Q1:277	Q1:278	Q1:279	Q1:280	Q1:281	Q1:282	Q1:283	Q1:284	Q1:285	Q1:286	Q1:287	Q1:288	Q1:289	Q1:290	Q1:291	Q1:292	Q1:293	Q1:294	Q1:295	Q1:296	Q1:297	Q1:298	Q1:299	Q1:300	Q1:301	Q1:302	Q1:303	Q1:304	Q1:305	Q1:306	Q1:307	Q1:308	Q1:309	Q1:310	Q1:311	Q1:312	Q1:313	Q1:314	Q1:315	Q1:316	Q1:317	Q1:318	Q1:319	Q1:320	Q1:321	Q1:322	Q1:323	Q1:324	Q1:325	Q1:326	Q1:327	Q1:328	Q1:329	Q1:330	Q1:331	Q1:332	Q1:333	Q1:334	Q1:335	Q1:336	Q1:337	Q1:338	Q1:339	Q1:340	Q1:341	Q1:342	Q1:343	Q1:344	Q1:345	Q1:346	Q1:347	Q1:348	Q1:349	Q1:350	Q1:351	Q1:352	Q1:353	Q1:354	Q1:355	Q1:356	Q1:357	Q1:358	Q1:359	Q1:360	Q1:361	Q1:362	Q1:363	Q1:364	Q1:365	Q1:366	Q1:367	Q1:368	Q1:369	Q1:370	Q1:371	Q1:372	Q1:373	Q1:374	Q1:375	Q1:376	Q1:377	Q1:378	Q1:379	Q1:380	Q1:381	Q1:382	Q1:383	Q1:384	Q1:385	Q1:386	Q1:387	Q1:388	Q1:389	Q1:390	Q1:391	Q1:392	Q1:393	Q1:394	Q1:395	Q1:396	Q1:397	Q1:398	Q1:399	Q1:400	Q1:401	Q1:402	Q1:403	Q1:404	Q1:405	Q1:406	Q1:407	Q1:408	Q1:409	Q1:410	Q1:411	Q1:412	Q1:413	Q1:414	Q1:415	Q1:416	Q1:417	Q1:418	Q1:419	Q1:420	Q1:421	Q1:422	Q1:423	Q1:424	Q1:425	Q1:426	Q1:427	Q1:428	Q1:429	Q1:430	Q1:431	Q1:432	Q1:433	Q1:434	Q1:435	Q1:436	Q1:437	Q1:438	Q1:439	Q1:440	Q1:441	Q1:442	Q1:443	Q1:444	Q1:445	Q1:446	Q1:447	Q1:448	Q1:449	Q1:450	Q1:451	Q1:452	Q1:453	Q1:454	Q1:455	Q1:456	Q1:457	Q1:458	Q1:459	Q1:460	Q1:461	Q1:462	Q1:463	Q1:464	Q1:465	Q1:466	Q1:467	Q1:468	Q1:469	Q1:470	Q1:471	Q1:472	Q1:473	Q1:474	Q1:475	Q1:476	Q1:477	Q1:478	Q1:479	Q1:480	Q1:481	Q1:482	Q1:483	Q1:484	Q1:485	Q1:486	Q1:487	Q1:488	Q1:489	Q1:490	Q1:491	Q1:492	Q1:493	Q1:494	Q1:495	Q1:496	Q1:497	Q1:498	Q1:499	Q1:500	Q1:501	Q1:502	Q1:503	Q1:504	Q1:505	Q1:506	Q1:507	Q1:508	Q1:509	Q1:510	Q1:511	Q1:512	Q1:513	Q1:514	Q1:515	Q1:516	Q1:517	Q1:518	Q1:519	Q1:520	Q1:521	Q1:522	Q1:523	Q1:524	Q1:525	Q1:526	Q1:527	Q1:528	Q1:529	Q1:530	Q1:531	Q1:532	Q1:533	Q1:534	Q1:535	Q1:536	Q1:537	Q1:538	Q1:539	Q1:540	Q1:541	Q1:542	Q1:543	Q1:544	Q1:545	Q1:546	Q1:547	Q1:548	Q1:549	Q1:550	Q1:551	Q1:552	Q1:553	Q1:554	Q1:555	Q1:556	Q1:557	Q1:558	Q1:559	Q1:560	Q1:561	Q1:562	Q1:563	Q1:564	Q1:565	Q1:566	Q1:567	Q1:568	Q1:569	Q1:570	Q1:571	Q1:572	Q1:573	Q1:574	Q1:575	Q1:576	Q1:577	Q1:578	Q1:579	Q1:580	Q1:581	Q1:582	Q1:583	Q1:584	Q1:585	Q1:586	Q1:587	Q1:588	Q1:589	Q1:590	Q1:591	Q1:592	Q1:593	Q1:594	Q1:595	Q1:596	Q1:597	Q1:598	Q1:599	Q1:600	Q1:601	Q1:602	Q1:603	Q1:604	Q1:605	Q1:606	Q1:607	Q1:608	Q1:609	Q1:610	Q1:611	Q1:612	Q1:613	Q1:614	Q1:615	Q1:616	Q1:617	Q1:618	Q1:619	Q1:620	Q1:621	Q1:622	Q1:623	Q1:624	Q1:625	Q1:626	Q1:627	Q1:628	Q1:629	Q1:630	Q1:631	Q1:632	Q1:633	Q1:634	Q1:635	Q1:636	Q1:637	Q1:638	Q1:639	Q1:640	Q1:641	Q1:642	Q1:643	Q1:644	Q1:645	Q1:646	Q1:647	Q1:648	Q1:649	Q1:650	Q1:651	Q1:652	Q1:653	Q1:654	Q1:655	Q1:656	Q1:657	Q1:658	Q1:659	Q1:660	Q1:661	Q1:662	Q1:663	Q1:664	Q1:665	Q1:666	Q1:667	Q1:668	Q1:669	Q1:670	Q1:671	Q1:672	Q1:673	Q1:674	Q1:675	Q1:676	Q1:677	Q1:678	Q1:679	Q1:680	Q1:681	Q1:682	Q1:683	Q1:684	Q1:685	Q1:686	Q1:687	Q1:688	Q1:689	Q1:690	Q1:691	Q1:692	Q1:693	Q1:694	Q1:695	Q1:696	Q1:697	Q1:698	Q1:699	Q1:700	Q1:701	Q1:702	Q1:703	Q1:704	Q1:705	Q1:706	Q1:707	Q1:708	Q1:709	Q1:710	Q1:711	Q1:712	Q1:713	Q1:714	Q1:715	Q1:716	Q1:717	Q1:718	Q1:719	Q1:720	Q1:721	Q1:722	Q1:723	Q1:724	Q1:725	Q1:726	Q1:727	Q1:728	Q1:729	Q1:730	Q1:731	Q1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5 Place in service

5.1 Function test

5.1.1 Preparation



The function test must be carried out after the power supply voltage is connected. The coupling of the motor driver mechanism and the tap changer must be correct, to make sure the switching operation of the tap changer before the motor driver mechanism stop operation. Also make sure the position indication of the tap changer and the motor driver mechanism are the same in each operation position. These measures can prevent damage to motor driver mechanism, tap changer and transformers.

Be sure to strictly observe relevant safety procedures to prevent serious or fatal injuries.



Main power must fully meet each requirement of wiring in motor driver mechanism.

Prompt:

S4 changeover switch must place in "local" position when operating local button 1→N, N→1, STOP.

S4 changeover switch must place in "remote" position when operating remote button 1→N, N→1, STOP.

5.1.2 Check power

When the power supply line are short of phase, opposite phase, low power supply voltage, circuit breaker Q1 is not closed. The ZDK controller "Power alarm" signal light is lit. At the same time, the electric power should be checked and the power supply should be checked until the "power alarm" indicator is out.

5.1.3 Protection and check for manual operation and electrical block.

When hand crank is operated, have to manual open the circuit breaker, and confirm ZDK power alarm light, than the hand crank can be operated, or it is may cause serious personal injury.

Remove the hand rocker from neck, rotate 90 ° downward and stand the hand rocker when operating the hand crank devices. At same time, cut off the motor main circuit power after manual safety switch operating. ZDK controller "power alarm" indicator light is on, the ZD motor driver mechanism can not carry out electric operation.

When manual operation, the axle sleeve is slide to the direction of the motor driver mechanism, so that the hand rocker is not skewed, and the manual operation can be carried out easily.

After manual operation, the hand-crank device must be returned to the original state, and the hand rocker is stuck in the slot, otherwise the manual protection switch cannot be reset, affecting the electric operation.

5.1.4 Step by step inspection

- Operation(Press for many time or hold on during operation)"1 → N" or "N → 1" button to start tap-change operation.
- Check whether the electric mechanism will stop automatically after the operation of the switching operation, and whether the pointer will stop at the center line of the green area.
- This test will be carried out in both directions.

5.1.5 Highest and minimum check

- When motor driver mechanism run to limit N, operating "1 → N" button, and motor driver mechanism can't start again. Check and confirm.
- In a similar way, when motor driver mechanism run to limit 1, operating "N → 1" button, and motor driver mechanism can't start again. Check and confirm.
- Check if the number of the split position indicates whether to stop in the small window, and whether the pointer of the tap is pointing to the center line of the green area of the dial.

5.2 The operation of the motor driver mechanism in the operation site

Repeat 5.1 function tests before the transformer is put into operation.

Connect the motor driver mechanism body with a transformer tank by a conductor, grounding bolt M12.



1. If the test is not pass for motor driver mechanism in 5.1 function tests, the transformer is absolutely not operational, or it will cause serious or fatal damage.
2. Tap position of motor driver mechanism is same with tap changer, or it will result in serious failure operation of the tap changer and motor driver mechanism.

6 maintenance and overhaul

ZD motor diver mechanism do not need to independent periodic maintenance, but they can also be used for routine maintenance according to the routine maintenance of transformer.



Relevant safety procedures must be strictly observed, or it can cause serious or fatal injuries.

ZD motor driver mechanism carries out the following routine inspection:

- Check whether the electric seal is good or not, Look inside for water inflow, whether there is dust or not, use a brush to clean the dust;
- Check whether the dehumidifying heater in motor driver mechanism is good or not;
- Check whether the electrical control module of ZDK controller and the attachment of the terminal are loose or not, if loose, should be fastened with a screwdriver (care for electric);
- Check whether the tap position of the ZDK controller is consistent with the mechanical indicator wheel or not;
- Check whether the action of the counter is normal or not;
- When connect of remote CY50 or YK-6 controller to check whether the communication lights on ZDK controller are flashing normally of not.

When maintenance for tap changer, should be tested for motor driver mechanism according 5.1.

Common failures and solutions see table 2:

No.	Common fault	Solution
1	ZDK controller blank screen, digital tube is not bright.	Check whether the external access power is correct; Check whether safety F1 is good or not; Contact manufacture to replace ZDK controller.
2	ZDK controller "power alarm" indicator light is lit → open air switch.	Replace the external access power phase sequence; Check whether is default phase in external access power or not; Contact manufacture to replace ZDK controller.
3	ZDK controller "tap position" display 0 → open air switch.	Check whether the cable head of ZDK controller is plugged in or not; check tap position disk output signal; Contact manufacture to replace ZDK controller.
4	Slip gears, tap position pointer is not in the green area when stop → open air switch.	Check whether the stage signal switch wear is serious; Contact manufacture to replace ZDK controller.

7. User notes

7.1 User must provide model of tap changer, step of voltage regulating, middle position, the required input and output function interface in order.

7.2 Remote control whether the supporting cable length can be supplied according to user orders.

7.3 Under the custody and usage rules, 12 months from installation, and from the manufacturer to deliver goods to the user does not exceed 18 months period, because of manufacturing quality products damaged or not working situation, factory can be free to replace or repair for the user.

8 Appendix: ZDK MODBUS protocol

ZDK controller use MODBUS RTU agreement.

The controller communication physical layer use optical fiber or RS485, baud rate 4800, data format are 1 bit to be starting bit, 8 bit to be data bits, no checksum, 1 bit to be stop bit.

The ZDK controller opens the function code of 03, 05 and 06, so as to facilitate the user to read the information of the controller, and the operation of the controller to promote, reduce, stop, and modify the address of the machine.

Read date (function code 03H)

The example of the following table is an instance of reading the current splitter position (register 03) from machine 01.

Data frames received from the machine (ZDK controller)

Slave address	Function code	Start address high	Start address low	Read data number of high	Read data number of low	CRC16 low	CRC16 high
01H	03H	00H	03H	00H	01H	74	0AH

Slave (ZDK controller) returns the data frame (current tap position is 06)

Slave address	Function code	Data length	Data segment (2 byte)	CRC16 low	CRC16 high
01H	03H	02H	00H, 06 H	38H	46H

ZDK controller data call address table:

Address	Parameters	type of data	Attributes	Remarks
0001H	Max tap position	Uint16	R	
0002H	Min tap position	Uint16	R	
0003H	Current tap position	Uint16	R	The upper 8 bits are 10,11,12, corresponding to a, b, c, low 8 bits for the stall (example: 22a, data is 0x0a16)
0004H	High number of actions	Uint16	R	
0005H	Low number of actions	Uint16	R	
0006H	Temperature value	Uint16	R	
0007H	Humidity value	Uint16	R	
0008H	State quantity	Uint16	R	
0009H	Link position 1	Uint16	R	Format with register 3
000AH	Link position 2	Uint16	R	
000BH	Link position 3	Uint16	R	
000CH	Link position 4	Uint16	R	

000DH	Link position 5	Uint16	R	
000EH	Link position 6	Uint16	R	

Status description

No.	Bit address	Description
1	Bit1 ~ bit2	Working mode: 00 - stop, 01 - local, 10 - remote
2	Bit3	Run status: 0 - switch to place, 1 - switching
3	Bit4	Lock Status: 0 - Unlock, 1 - Locked
4	Bit5	Fault state: 0-ready, 1- open air switch
5	Bit6	Fault state: 0 - ready, 1 - power failure
6	Bit7	Fault state: 0-ready, 1-self fault
7	Bit8	Minimum limit: 0 - normal, 1 - minimum limit
8	Bit9	Maximum limit: 0 - normal, 1 - maximum limit
9	Bit14	Action direction: 0 - no action, 1 - N → 1
10	Bit15	Action direction: 0 - no action, 1 - 1 → N

Remote control format description (function code 05H)

Remote rise

Slave address	Function code	Remote address high	Remote address low	Remote instruction high	Remote instruction low	CRC16 low	CRC16 high
01H	05H	00H	01H	FFH	00H	DDH	FAH

Remote drop

Slave address	Function code	Remote address high	Remote address low	Remote instruction high	Remote instruction low	CRC16 high	CRC16 low
01H	05H	00H	02H	FFH	00H	6cH	0aH

Remote stop

Slave address	Function code	Remote address high	Remote address low	Remote instruction high	Remote instruction low	CRC16 low	CRC16 high
01H	05H	00H	03H	FFH	00H	3DH	CAH

Remote address description

Address	Parameters	type of data	Attributes	Remarks
0001H	Remote rise	Uint16	S	
0002H	Remote drop	Uint16	S	
0003H	Remote stop	Uint16	S	

Change of address

Slave address	Function code	Data address high	Data address low	Data high	Data low	CRC16 low	CRC16 high
01H	06H	60H	01H	00H	02H	47H	CBH

Note: Only ZDK controller can be modified within 5 seconds to modify the address.