



CXT/160

Tower Crane Intelligent Monitoring System

Installation and Use Instructions

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Content

Product Overview

System Composition

Hardware Installation

Function and Setting

Operation Order Access Module Specification

Analysis of System Malfunction Codes

Technical Support and Maintenance Service

System Overview

1.1 Product Features

CXT/160 tower crane intelligent monitoring system combines tower crane load moment indicator, video monitoring, anti-collision&zone protection, frequency converter parameter reading, and remote online monitoring function.It indicates real time working states of tower crane and tower crane group in operator's cabin and online computer.In the meantime it combines functions including black box, anti-collision & zone protection.The system is applicable to various types of level-jib and luffing tower cranes. It adopted the most advanced embedded intelligent system, popular Android technology,high precision digital azimuth sensor, weighing sensor, angle sensor,high-imaging automatic hook-following focusing camera,and etc.In addition, CXT/160 adopts 10.6-inch or 15.6-inch full touch Android screen, and the system is equipped with four 1080P digital cameras, three fixed focus cameras and one zoom camera. The zoom camera is 22~30 times optional, and the clear visual field can reach more than 300 meters.Display in Chinese/English/Russian language,information is intuitive and easy to read, and it is easy to install and use.The system provides the most comprehensive working state information and sufficient protection for the operators and supervisors during the use of the tower crane.

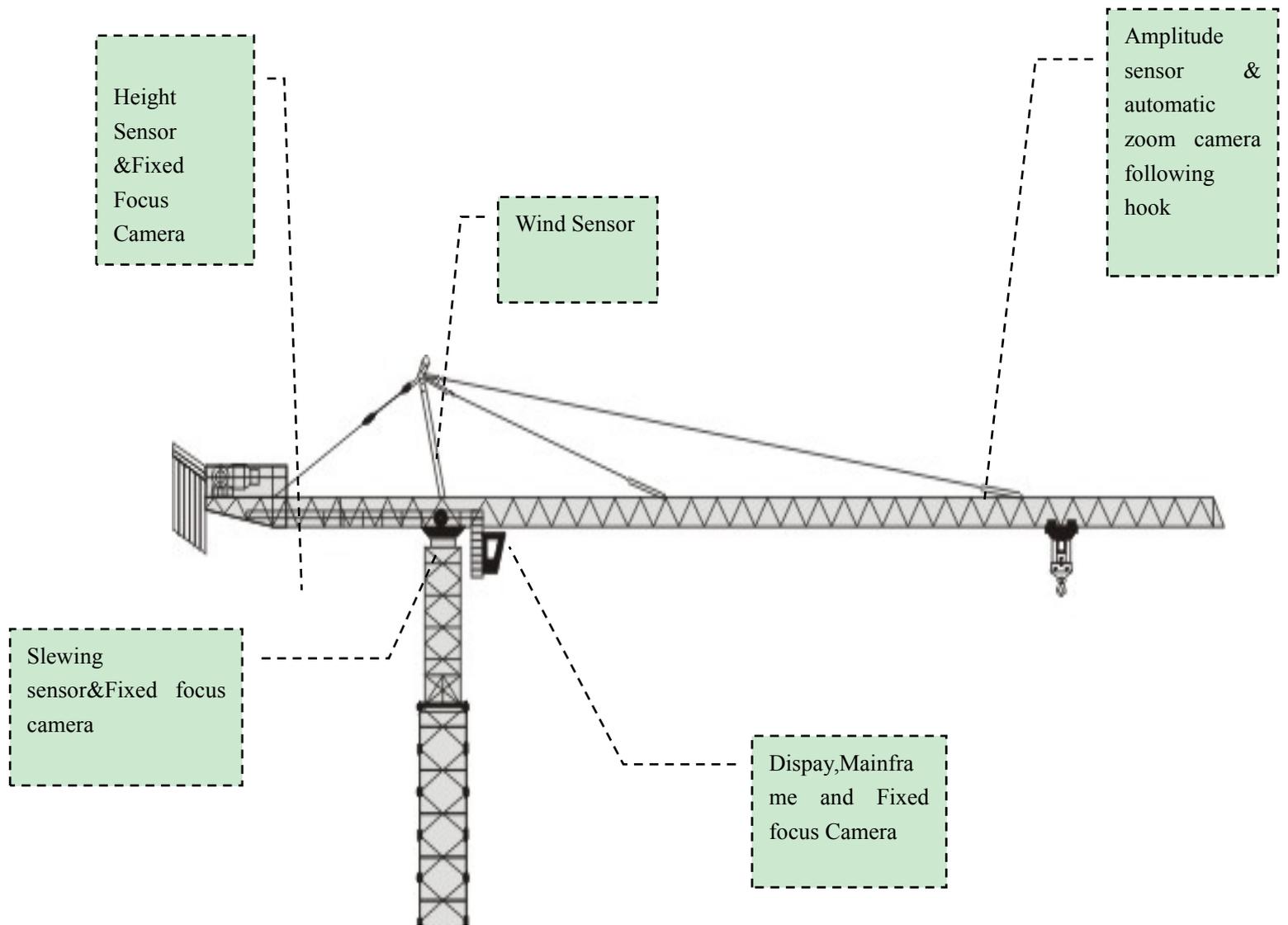
Note:Users can choose part or all of the system's functions according to their needs.We will prepare different spare parts based on the order.The function and the supplied spare parts are subject to the contract.

1.2 Parameter

1	Working environment temperature	-20℃ ~60℃
2	Working environment humidity	≤95% (45℃)
3	Power Supply voltage	~48V~220V ~380V(customizable)
4	Mode of operation	continuous
5	System Combined error	≤±3%
6	Repeatability error of weighing sensor	≤±0.5%
7	Linearity error of weighing sensor	≤±0.5%
8	Zoom Camera	20-30x optical zoom with maximum resolution of 1080P
9	Fixed focus camera	resolution 1080P
10	Storage	500G storage hard disk

二. System Composition

The composition of CXT/160 tower crane intelligent monitoring system is shown in the following figure, including display, power supply mainframe, amplitude sensor, height sensor, weighing sensor, anemometer, signal access module, high-definition camera, and etc. (according to the manufacturer's requirements)



Display



Mainframe



Zoom ,Fixed Focus Camera



Load Cell



Height,Amplitude&Angle Sensor



Control Cable



Slewing Sensor(Optional)



Wind Speed Sensor(Optional)



This is the photo of basic configuration of the system. Spare parts can be selected by customers according to their required functions.

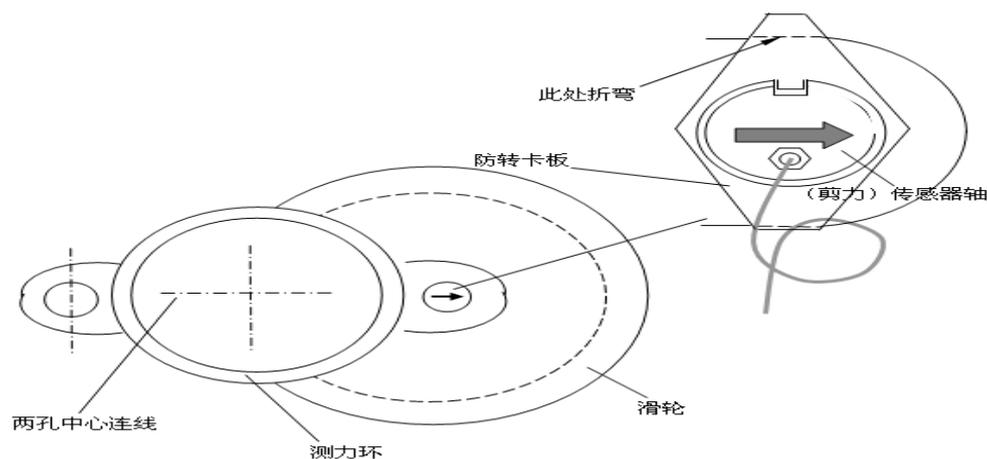
Hardware Installation

3.1 Installation of Driver Cabin's Control Box and Monitor

It is recommended that the control box be installed at an appropriate position on the left side of the cab (the specific installation method should be handled by the user)

3.2 Installation of Load Cell

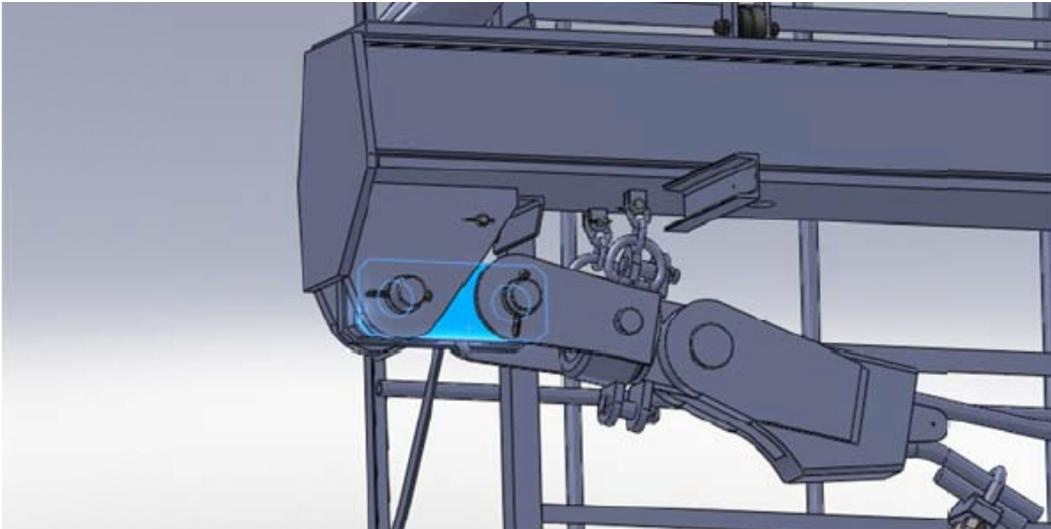
First way of installation: Take the original load cell down; replace it with the **shear force weighing sensor** shaft according to the original assembling structure. Try to avoid strong force striking. It's better to use a wooden hammer. During assembling, attention shall be paid to prevent the lead-out cable or cable joint at the ends of the shear shaft from impacting or punchy bending in case of damage. After installation of shear force weighing sensor shaft, lay the signal cable and connect it to the controller the 4 cored port and tighten the screws.



Note: If the tower crane doesn't have dynamometer and the way of the installation is different from the above, please contact the manufacture. What's more, please ensure the arrow mark of the load cell points to the direction of steel wire ropes' resultant force.

Second way of installation: Tension sensor: The blue part on the below picture is the installation position of tension sensor. Pay attention to the wiring during the

installation.



3.3 Installation of Trolley Travel Limiter (DXZ-W with Potentiometer)

3.3.1 Installation of Height Travel Limiter

Take down the original height travel limiter without potentiometer and replace it with the one with potentiometer and larger drive ratio (for example, replacing 1:78 with 1: 96). After fixing the limiter cable well, connect it to the controller the 3 cored signal cable port and tighten the screws

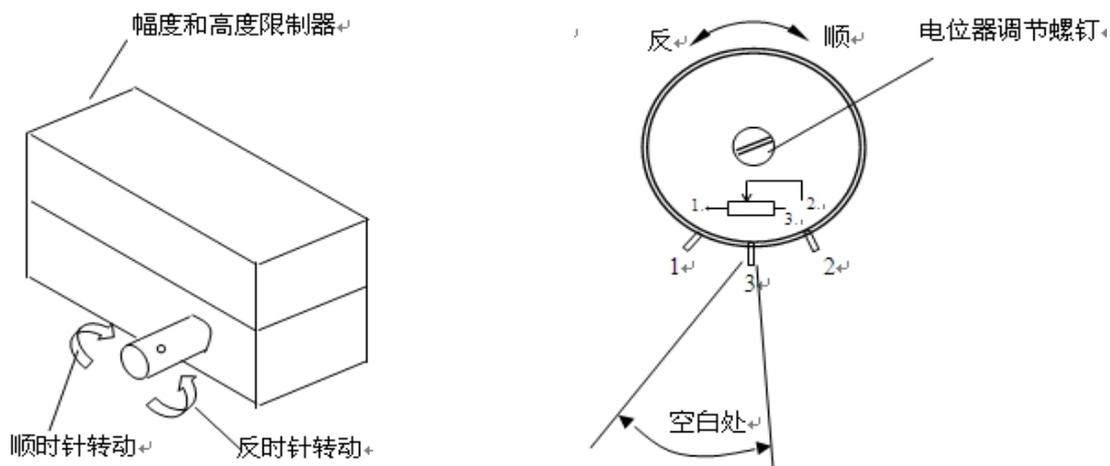
3.3.2 Installation of Amplitude Travel Limiter

Take down the original amplitude travel limiter without potentiometer and replace it with the one with potentiometer and larger drive ratio (for example, replacing 1:78 with 1: 96). After laying the limiter cable, connect it to the controller the 5 cored signal cable port and tighten the screws

3.3.3 Adjustment of Travel Limiter

Note: The height travel limiter and amplitude travel limiter need to be adjusted after installation. The way of adjustment of both devices is the same.

Find out the rotary direction of the limiter shaft when the hook is rising or traveling outwards. See the Figure below. You can find out the rotary direction of POT (same as limiter shaft).

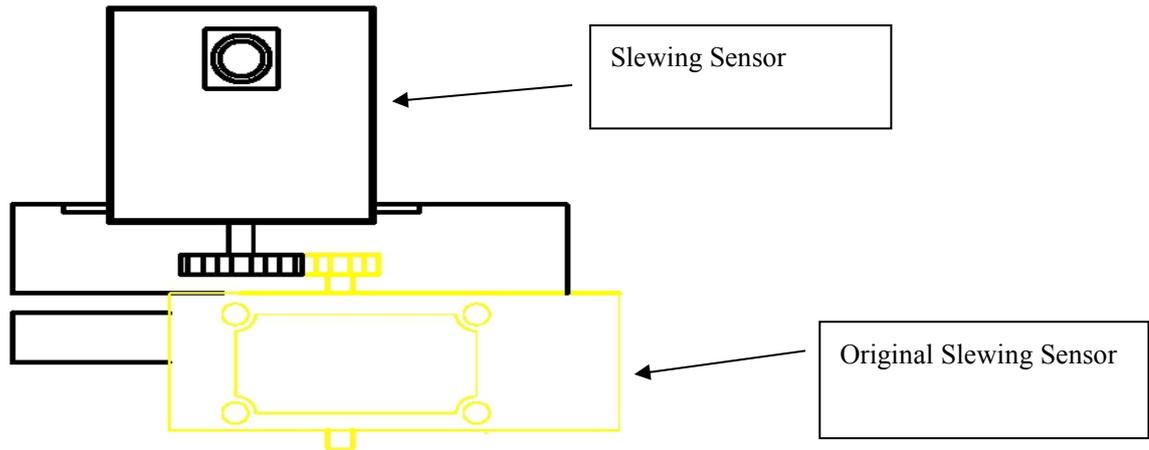


Note: Take down POT cover to observe the sliding contact point of POT, and then find out the traveling range of POT according to the rotary direction of hook when it is rising or of trolley when traveling outwards. Moving the sliding contact point to the place where the POT begins to work and voltage is 0.2V or 0.5V when the hook height is zero or the trolley moves to min amplitude.

Note: Rising by rotating anti-clockwise, move the contact point to the right starting point (voltage 0.2 V or 0.5V). Rising by rotating clockwise, move the contact point to the left starting point (voltage 0.2 V or 0.5V); pay attention to the blank space of POT when adjusting.

3.4 Slewing Sensor Installation (Optional)

Take down the two screws of original slewing travel limiter and mount the azimuth (slewing angle) sensor between the tower crane and slewing travel limiter, and then fasten the bigger and smaller gear to slewing travel limiter and slewing angle sensor separately, make sure the two gears are properly joined. Lay and lead the signal cable of slewing angle sensor into the cabin, then connect the 7-cored plug to the controller the slewing angle signal socket marked and then screw it.



Note: The slewing angle sensor utilizes the transmission function of slewing travel limiter .It does not change the connection of slewing travel limiter.

3.5 Installation of Wind Sensor and Other Equipment

Fasten wind sensor on the top of tower crane, lead the signal cable to operator cabin and connect it to the wind sensor port of the controller. After all the other devices have been installed, connect the signal cable to driver's cabin. All the interfaces are unique so there will not by any wrong connection.

3.6 Installation of Camera



The zoom camera is installed under the trolley or at the root of the main jib on the level-jib tower crane to monitor the lifting state of the hook.



The fixed-focus camera is installed at the required position such as behind the counter jib in the driver's cab to monitor the rope arrangement of the hoisting drum and the driver's operation.

3.7 Connection of Power Line

Requirements on power connection: Don't connect to the same phase line as power supply of tower crane control circuit; try to minimize power interference (it is better to connect power directly from tower crane power control cabinet). Requirements on grounding: Choose the appropriate ground point for reliable grounding, ground resistance should not more than 4Ω , so as to ensure that the system work properly.

Control Port

It has two types of control port: 15 port control and 24 port control

15 control port

Load moment indicator		Tower Crane Anti-collision	
1	park when trolley runs outwards (or maximum angle)	1	inverse ejecting Liebherr when left slewing is restricted Liebherr
L	park when trolley runs inwards (or minimum angle)	2	inverse ejecting Liebherr when right slewing is restricted Liebherr
3	moment limitation point 1	3	slewing braking
4	moment limitation point 2	4	park when trolley runs outwards (or maximum angle)
5	moment limitation point 3	5	park when trolley runs inwards (or minimum angle)
6	weight limitation point 1	6	moment limitation point 1
7	weight limitation point 2	7	moment limitation point 2
8	weight limitation point 3	8	high speed limitation of trolley running outwards(or maximum angle)
9	weight limitation point 4	9	high speed limitation of trolley running inwards(or minimum angle)
10	Installation mode Bypass	10	high speed limitation of left slewing
11	Left slewing limitation	11	high speed limitation of right slewing
12	right slewing limitation	12	Installation mode output Bypass
13	maximum height limitation	13	left slewing stop

14	minimum height limitation	14	Right slewing stop
15	moment limitation point 4	15	Moment limitation 4

24 control port

1	park when trolley runs outwards (or maximum angle)	13	high speed limitation of right slewing
2	park when trolley runs inwards (or minimum angle)	14	high speed limitation of left slewing
3	moment limitation point 1	15	high speed lifting
4	moment limitation point 2	16	lifting limit
5	moment limitation point 3	17	high speed lifting down
6	weight limitation point 1	18	lifting down limit
7	weight limitation point 2	19	high speed limitation of trolley running outwards(or maximum angle)
8	weight limitation point 3	20	high speed limitation of trolley running inwards(or minimum angle)
9	weight limitation point 3	21	moment limitation point 4
10	Installation mode bypass	22	Slewing braking
11	left slewing stop	23	Wind speed early warning output
12	right slewing stop	24	Wind speed early warning output

The relay is closed(ON)when the power in on. The relay is off(OFF) when it is on the state of alarm.The above contacts can be used as normally closed contacts.

Function and Setting(Load Moment Indicator&Camera&frequency converter)

The basic functions of CXT/160 tower crane intelligent monitoring system mainly include tower crane load moment indicator, work record display and video

monitoring. On this basis, the anti-collision&zone protection system of tower crane group and remote online computer monitoring and management functions can be upgraded.

Preparation: Confirm the tower crane type and manufacturer (e.g. Yongmao STL293-18T), dimension of weighing sensor, ratio of amplitude and height limiter,load chart

Facial Recognition

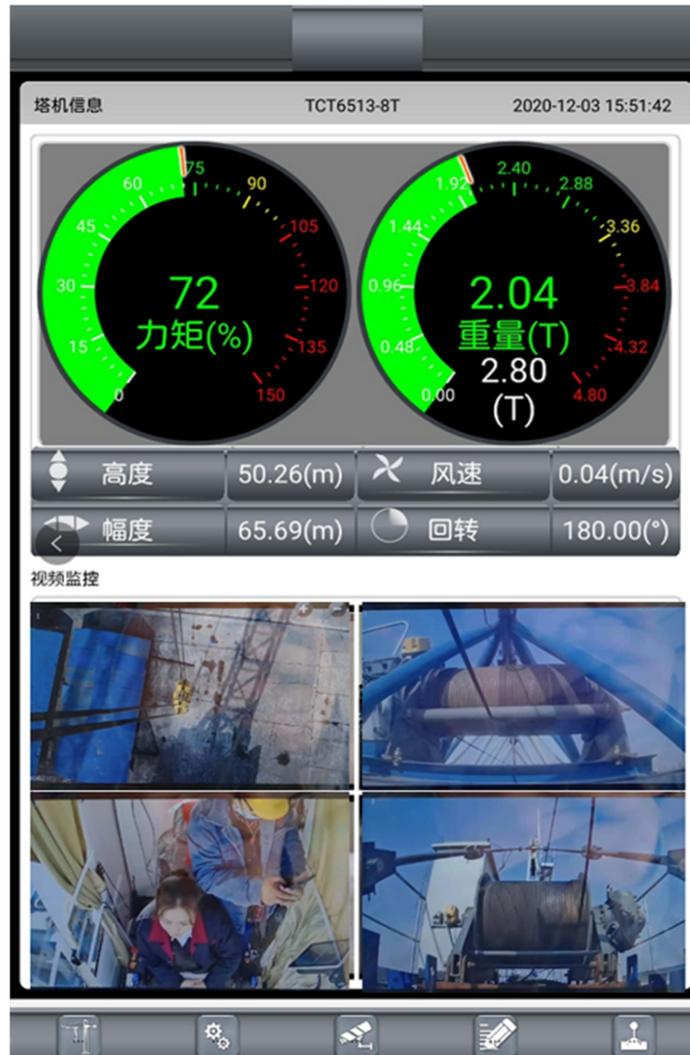
After the equipment is powered on, it will enter the face acquisition interface automatically. After the face recognition passes, the system will enter the acquisition main interface.

Face registration

If the operator's face information needs to be registered after the equipment is powered on (need to be registered once only, no need to do it again in the future). Enter the administrator password in the face collection interface to skip the face collection interface and directly enter the system main interface. Enter the "System Settings" interface at the bottom of the main interface, and perform face registration under the "System Settings". Enter the operator's "name", "ID card", "ID" and other information when registering. After the registration is completed, it can be directly identified and passed in the future.



Enter the main interface through face recognition after starting system



Tower crane setting	system setup	Video settings	Work record	frequency converter parameters
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Setting procedure: tower crane setting → site setting → general parameters → load chart → parameter calibration → system setting → video setting

4.1 Tower Crane Setting

塔机设置		关闭
参数标定	塔机编号	1
	设备名称	100005
	大臂长度	50.20
负荷表	塔机高度	200.00
	短臂长度	5.00
通用参数	X1	10.00
	Y1	-10.00
工地设置	X2	-1.00
	Y2	-1.00
塔吊设置	最小幅度	30.00
	最大仰角	90.00
	最小仰角	0.00
	臂根绞点距离	3.00

See the site drawing, as shown in the figure, the coordinates of tower crane site are 1#()2#()3# ().

Assign and record the one-to-one correspondence between the tower crane number and the host serial number, and complete the data input one by one.

Tower crane number: the number of tower crane anti-collision

Equipment name: the serial number of this system (100003) is unique for each one, and has been set at the factory. You need to match the equipment name to the tower crane number. For example, Now I have three systems, namely 100003, 100004 and numbering sequence can be random

X1 coordinate and y1 coordinate: the position of the tower crane installed in this system. If you need to input the coordinate positions of X2 and Y2 for the traveling

type tower crane, it is generally at the track end position (all networked tower cranes must be in one coordinate system).

Tower crane's height: often refer to as height of counter jib

Main jib length, counter jib length, minimum distance, means the group of jib length, length of counter-jib and minimum amplitude.

Note: If luffing tower crane, maximum elevation of jib, minimum elevation of jib, structural parameter (distance between the root of jib and the slewing center)

A total of 30 tower cranes can be selected. Need to edit the number of tower crane.

Click to enter to edit it and store it automatically. The above parameters can also be edited and uploaded wirelessly using the ground PC software.

4.2 Site Setting

Section	Parameter	Value
回转坐标	A点 X	110.00
	A点 Y	100.00
	B点 X	90.00
	B点 Y	100.00
通用参数 - 距离设置	回转报警距离	8.00
	回转预警距离	12.00
	小车报警距离	1.00
	小车预警距离	1.50
塔吊设置	反顶时间	0.00
	制动距离	0.00
	惯性角度	0.00
	限制速度	-1.00

Slewing coordinate Point A and B need to be calibrated according to the site drawing.

Point A and B are the reference points of slewing coordinates which are set by the

operator. Check the setting of site drawing Point A and B Then set alarm distance and pre-alarm distance. Inertia angle indicates the angle when system stays alarm.

Brake and inverse ejecting are used exclusively for LIBHERR

The calibration of coordinate of anti-collision has been done.

4.3 General Parameter (Protected by password)

Set by the tower crane manufacturer and leasing company according to the characteristics of the tower crane. Can't be changed after setting it up.

塔机设置			关闭
参数标定	力矩设置点	80 %	90 %
		105 %	110 %
负荷表	重量设置点	80 %	90 %
		100 %	110 %
通用参数	高度限制	最大值	200.00
		最小值	10.00
工地设置	风速	预警值	12.00
		报警值	20.00
塔吊设置	回转速度限制	0.00	
	钢丝绳重量	0.00	Kg/m
	最大起重量	最小重量	80
		最大重量	90

4.load chart(Protected by password ,not available to the terminal customer)

塔机设置 关闭

塔机型号: F0/23-10T

参数标定	NO.	1	2	3	4	5	6	7	8	9	10
	Radi...	0.00	26.90	30.00	35.00						
	Wei...	5.00	5.00	4.40	2.00						
—	NO.	11	12	13	14	15	16	17	18	19	20
	Radi...										
	Wei...										
负荷表	NO.	21	22	23	24	25	26	27	28	29	30
	Radi...										
	Wei...										
—	NO.	31	32	33	34	35	36	37	38	39	40
	Radi...										
	Wei...										
通用参数	NO.	41	42	43	44	45	46	47	48	49	50
	Radi...										
	Wei...										
—	NO.	51	52	53	54	55	56	57	58	59	60
	Radi...										
	Wei...										
—	NO.	61	62	63	64	65	66	67	68	69	70
	Radi...										
	Wei...										

导入

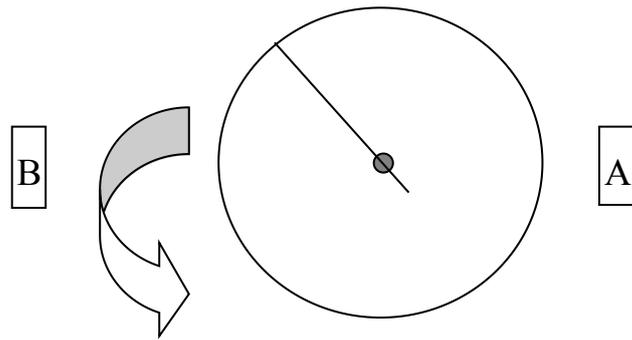
Input the load chart of tower crane by PC software and set up the file. Upload the file by USB disk to change the type of tower crane.

It has been set by tower crane manufacturer and leasing company according to the features of tower crane and can not be changed.

4.5 Parameter Setting (real time working parameter of tower cranes, e.g. amplitude, height, weight, slewing,traveling)



1.Slewing Calibration: Point A and B need to be set up properly.(see construction site settings for details)Move the tower crane main jib to point A ,click “point A” and ‘Yes’, Then move the tower crane jib anticlockwise to point B and click “point B” and “Yes”. The system will calculate the slewing angle automatically.



E.g: If the tower crane coordinate is (100、 100), point A is(110、 100), point B is (90、 100). Move the main jib to point A and click point A, and move the main jib in anticlockwise direction to point B. If the tower crane coordinate became(150 、 100), then point A should be (160、 100) ,point B should be (140、 100).

2. Amplitude Calibration

Move the trolley to the minimum amplitude (normally 2M), click “minimum amplitude” and input the data. Move the trolley to the maximum amplitude and stop it, click “maximum amplitude” and input the data.

3. Weight Calibration

First press the weight reset button when the hook is empty;

If the weight is calibrated only once, lift a heavy object with known weight and calibrate it according to weight 1.

If it is necessary to calibrate the weight twice, first lift a weight of known weight and calibrate it according to weight 1, then lift a weight heavier than the first weight and calibrate it according to weight 2.

If it is necessary to calibrate the weight three times, first lift a weight with known

weight and calibrate it according to weight 1, then lift a weight heavier than the first weight and calibrate it according to weight 2, and then lift an object heavier than the second weight and calibrate it according to weight 3.

A total of three weights can be calibrated, which makes the weight display more accurate.

Note: The calibration weight should be in the middle of the mainjib. Heavy objects weigh more than 2T.

4. Height Calibration

Move the hook to the ground (normally 0M), click “minimum height”. Move the hook to the maximum height, click “maximum height” and input the data(eg.100M)

Note: The height of luffing tower crane should be calibrated when the angle of main jib is 15°

5. Jib length combination and falls selection (multiple falls can be selected)

The jib length and the falls should be in line with the current working states of tower cranes. Otherwise the load chart of load indicator can't protect the tower crane.

4.6 System Settings



System settings interface:

1. restore the factory settings (with password protection), which is mainly used for the factory settings of testers
2. Number of this machine (protected by password), the customer numbers the equipment according to his actual needs, which is convenient for management.
3. Slewing source selection (protected by password), the customer selects the type of slewing acquisition sensor (limiter or encoder) according to his actual needs
4. Whether to turn on the relevant sensors (with password protection). Users can choose the sensors to be installed based on their needs.
5. Language selection: the customer chooses the language. The system display in Chinese/English/Russian
6. IP selection: the customer adjusts the imaging position of the main interface video

according to his needs.

4.7 Video Setting



The video setting interface mainly adjusts the accuracy of the automatic hook-following zoom camera. The accuracy of following hook can be improved by adjusting the minimum angle change, height offset and setting the maximum zoom magnification parameter. You can also choose to turn on or off the automatic hook-following function as required (auto hook-following zoom by factory default).

Customers can download and copy videos by choosing their own video time slot through USB interface.

4.8 Frequency converter information acquisition

变幅变频器	
名称	值
运行/停止	停止
运行方向	正转
运行频率(HZ)	0.00
输出电压(滤波)(V)	0.00
直流电压(V)	562.40
电流有效值(滤波)(A)	0.00
转子转速(r/min)	0.00
温度(°)	22.00
警告	0.00

Navigation buttons: 上一页, 下一页, 退出

The frequency converter interface mainly reads and displays the working parameters of the frequency converter which controls the lifting mechanism, the slewing mechanism and the amplitude mechanism in the electric control cabinet of the tower crane. Because the inverter models used by different manufacturers are different, the following main parameters are mainly collected: bus voltage, current, working state, working frequency, inverter temperature and fault code. For remote management, the

above parameters will be uploaded to the remote platform.

4.9 Record query

实时记录 第 1 页 共14318 页 共114538 条												
实时记录	编号	时间	T	A	力矩	幅度	重量	高度	风速	回转	型号	ID
	1	2020-10-12 10:34:05			60%	29.28	2.74	58.49	0.00	436.50	F0/23-10T	100000
工作记录	2	2020-10-12 10:34:04			60%	29.28	2.74	58.49	0.00	436.50	F0/23-10T	100000
	3	2020-10-12 10:34:03			60%	29.28	2.74	58.49	0.00	436.50	F0/23-10T	100000
风速记录	4	2020-10-12 10:34:02			60%	29.28	2.74	58.49	0.00	436.41	F0/23-10T	100000
	5	2020-10-12 10:34:01			60%	29.28	2.74	58.49	0.00	436.41	F0/23-10T	100000
操作记录	6	2020-10-12 10:34:00			60%	29.28	2.74	58.49	0.00	436.32	F0/23-10T	100000
	7	2020-10-12 10:34:00			60%	29.28	2.74	58.49	0.00	436.41	F0/23-10T	100000
工作报警统计	8	2020-10-12 10:33:58			60%	29.28	2.74	58.49	0.00	436.41	F0/23-10T	100000
风速报警统计												

开始时间 结束时间

Record include

- 1.Real-time record: Record working states in every 2 seconds after starting the system.(same as work records)
- 2.Working record: record every lift weight
- 3.Wind speed record: When the speed of the wind exceeds the pre-set data, it will keep record of real time wind speed.

4.Operation record: Keep record of every calibration of amplitude, height, weight or slewing. In case of any careless calibration.

5.Work alarm record: record all parameters of tower crane during over-torque alarm in work.

4. 10 USB disk download

Records can be downloaded based on actual needs: See below figure

It can also be downloaded by USB disk. The document is in excel format. See the snap shot of screen.

The screenshot shows an Excel spreadsheet titled 'LOGRTIME.CSV - Microsoft Excel'. The data is organized in a table with the following columns: A (编号), B (时间), C (类型), D (倍率), E (力矩), F (幅度), G (重量), H (高度), I (风速), J (回转), K (仰角), L (型号), M (ID), N, O, P. The data rows show a sequence of operations with varying parameters.

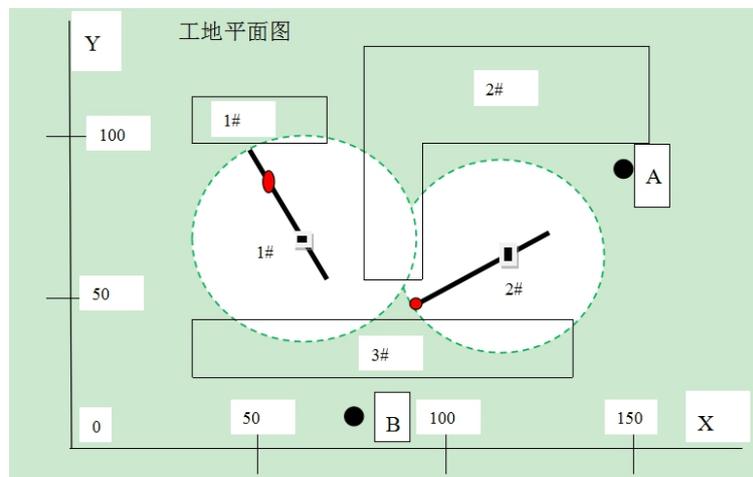
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
编号	时间	类型	倍率	力矩	幅度	重量	高度	风速	回转	仰角	型号	ID													
1	2015-7-17 14:43	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													
2					0		0		0																
3					0		0		0																
4					0		0		0																
5					0		0		0																
6	2015-7-17 14:43	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													
7					0		0		0																
8					0		0		0																
9					0		0		0																
10	2015-7-17 14:43	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													
11					0		0		0																
12					0		0		0																
13					0		0		0																
14	2015-7-17 14:43	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													
15					0		0		0																
16					0		0		0																
17					0		0		0																
18	2015-7-17 14:43	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													
19					0		0		0																
20					0		0		0																
21					0		0		0																
22	2015-7-17 14:43	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													
23					0		0		0																
24					0		0		0																
25					0		0		0																
26	2015-7-17 14:42	!	4	0%	-1	0	-1.5	0	-955	0	TC7035B-161	100003													

4. 11 Note : Anti-collision and Zone Protection Setting(Optional)

The system can connect up to 30 sets within the same network

Preparation Each tower crane needs to be equipped with one mainframe

1. Confirm the corresponding distance between each tower crane, the distance between tower crane and structure according to the detailed drawing of construction site. In this way the corresponding coordinates can be calculated. See the drawing for details



1#Obstacle Coordinates: (30、95) (70、95) (70、115) (30、115) Height (H) : 50

2#Obstacle Coordinates: (80、58) (92、58) (92、95) (155、95) (155、125) (80、125) Height (H) : 30

3#Obstacle Coordinates: (30、22) (138、22) (138、44) (30、44) Height (H) : 80

1#Tower Crane(Level-jib)Coordinates: (70、65) main jib length: 50M counter jib length: 11M
H: 60M

2#Tower Crane(Luffing)Coordinates: (120、65) main jib length: 40M counter jib length: 8M
H: 80M

Point A coordinate (145、85) Point B coordinate (80、10)

2.After coordinate points confirmed, assign the serial number of each mainframe (e.g. 1# is 100021,2# is 100011,3# is 100035), connect each system online in advance on the ground, input the site coordinates and tower crane parameters into each mainframe, and check whether there are any

problems with the parameters. (There are three input modes: ① Manual input on the machine.② The configuration file is generated by the PC software provided by us, imported the file into the mainframe through the USB flash drive. (3) Upload it to the mainframe by wireless way through the PC software provided by us).

System fault analysis

No.	Fault Code	Solution
1	Face recognition failed	1、 1. Only half of the face was registered when registering, resulting in low recognition rate 2、 After power-on, the program did not start, and the software did not finish initialization
2	After starting system, the data shows error or no response.	Check the connection cable between the display screen and the mainframe computer, and restart system. Make sure to connect the cable before turning it on.
3	weight,amplitude, height and slewing are not displayed and alarm is given	the corresponding sensor fault. not completely connected or not connected. Please check the connecting cable, enter the parameter calibration interface, and check the parameters of each sensor. The weight varies from 0.5 to 4.8, the amplitude from 0.2 to 4.8, the height from 0.2 to 4.8, and the slewing from 0 to 16800.
4	The video image is	1. The camera is not connected well. Check the

	buffering	connection again 2.If the video is buffering, click the Refresh button to reconnect
5	There is no tower crane interface display for zone protection.	Check whether there is corresponding number of this monitor in the tower crane settings.
6	There is no display on the display screen	Check the power supply. No power supply or the internal power supply is damaged
7	The video didn't show accurate hook move	Are tower crane height parameters, zoom angle parameters and zoom offset set appropriately

Cautions

- ☆ Keep the system from the rain and direct sunlight
- Often check monitor fix holder. Keep it firm, stable and free of loose status.
- Regularly check whether the power supply cable is broken or the shell is damaged or not. Check if the connection is firm and stable on the grounding.
- Check if the lead-out cable, plugs and sockets are loose or not. Do not insert or pull o the cable improperly, or it may cause poor contact.
- Do not clean the panel with chemical solvent. Wipe it with semi-wet towel.
- Do not open the rear cover of case randomly.
- Regularly check whether the angle (arrow direction) of the load cell deflects.
- Height and amplitude limiters must be installed firmly.

Technical support and maintenance services

6.1 CXT/160 Installation and Commissioning

We will delegate personnel to provide our users with training and instructions during the installation and commissioning. To carry out installation and commissioning, the site should meet the following requirements.

- The tower crane works properly;
- Prepare standard weights or article with known weights for calibration to facilitate the calibration process.

Weight of article for calibration shall be close to 40%~50% of the maximum rated load capacity;

- Prepare an angle ruler to calibrate the length accurately.
- Assistance will be needed for on-site installation and commissioning from hoister, crane maintenance electrician, crane operator, and locksmith etc.

6.2 Maintenance Service

- Lifetime maintenance;
- 1 year Quality warranty period from date of purchase;
- Provide free Maintenance service within warranty period; beyond the warranty period, only cost will be charged.
- We exclude warranty for:
 - ① Damage from collision and extrusion;

② Damage from improper dismantle;

③ Damage from other abnormal operation.

Note: The system is a auxiliary safety system only. It cannot replace the original tower crane's safety device.