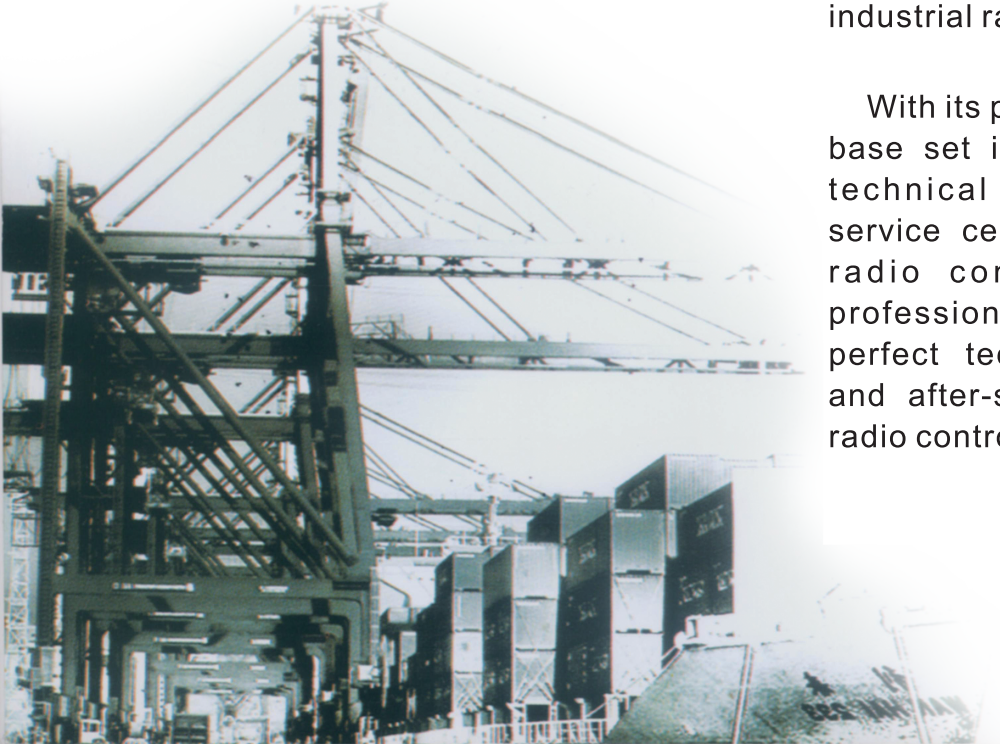
Operating Manual

TCS-B

ND FUSION SKILL CO.,LTD.

OHM 欧姆 German Technology, First Class Quality

As a professional industrial radio control and parts manufacturer, OHM radio control has always been pursuing technological progress and innovation; We listen to the demands, share experience and provide a full range of industrial radio control solution.



Corporate Profile:

Keeping safety promise is the first principle of OHM. With rigorous design concept, professional technical team and sophisticated processing equipment, OHM is able to provide you with safe, reliable and economical industrial radio control products.

With its production and manufacturing base set in Chongqing and its sales, technical support and after-sales service centre set in Shanghai, OHM radio control provides you with professional, thoughtful, timely and perfect technical consulting, support and after-sales services on industrial radio control.

Quality Assurance

ND FUSION SKILL CO., LTD. (hereinafter referred to as OHM) warrants that the product completely conforms to various technical parameters listed in the instructions at delivery and that it can be able to normally function as along as it is correctly installed and operated as required.

Warranty Commitment

This product has one year of warranty period since the date of delivery. The company promises to make repair when any damage or fault that is not caused by human factors occurs during the warranty period. The product needing repair must be sent to maintenance station designated by the company.

The foregoing warranty scope does not include consumable parts like relays, fuses, batteries and so on, or system damages caused by installation error, as well as does not contain faults that are caused by improper use or unauthorized changes by the customer.

Remark

This manual describes basic principle, operation and application, installation and system maintenance of TCS-B series. Before installation and using, carefully read this manual and properly keep it for future reference. This manual may be updated at any time as needed. If needed, contact the dealer or manufacturer to obtain the latest version.

Table of Contents

1、Safety instructions

- Read through these operating instructions carefully before working with the radio control system.
- As an integral part of the radio control system, the operating instructions shall be always kept by specially-assigned personnel.
- The term “machine” used in the operating instructions refers to various equipment controlled by the radio control system in general;

1.1 Purpose

- The radio control system is used to control machines and for data transfer. Observe the job safety and accident prevention regulations applicable to each application.
- The use also includes reading the operating instructions and adhering to all safety information contained therein.
- The radio control system must not be used in areas where there is a risk of explosion, nor for the control of machines used to convey persons, unless it is explicitly approved by the manufacturer for these uses.
- Modifications to the radio control system must only be carried out by specialist personnel who have been trained and authorized by OHM. All modifications must be documented at the factory in the form of documents.
- The safety devices of radio control system must not be modified, removed or bypassed. It is absolutely forbidden to make modifications to any part of complete emergency stop link of the radio control system.

1.2 Safety instructions for installation and operation

- Power connection for the receiver can only made by professional electricians. Power line shall be connected as per bundled output wire diagram.
- The receiver can only be opened by trained personnel. Some parts inside the system may have life-threatening voltage. Make sure to cut off the power supply to the machine before opening.
- Note that the presence of persons in the danger zone. In particular beneath the load of

cranes is prohibited in every instance.

- Select a safe operation location for the radio control system, from which you have a good and complete view of the working movements of the machine, the load movements and the surrounding working conditions.
- It is not permissible to put a radio transmitter unattended to one side. Always switch the radio transmitter off when it is not required. This applies in particular if you change location, when working without radio control, during breaks and at the end of work. Always safeguard the radio transmitter against use by unauthorized persons, for example by locking it away.
- In the event of an emergency or a fault of the crane or machine, make sure to immediately press emergency stop switch on the transmitter.
- Only operate the radio system when it is in perfect working order. Faults and defects that could influence safety must be rectified before the system is put back into operation, by specialists who have been trained and authorized by OHM company.
- Note that the operational directions of the machine may appear inverted depending on operating location and viewing angle to the machine. This will apply in particular to rotary cranes, if your location changes from inside to outside the radius of the crane. The operator must make himself familiar with directional markings on the machine before the start of work.
- Repairs to the radio control system may only be carried out by specialist personnel who have been trained and authorized by OHM. Use OEM replacement parts and accessories; otherwise safety of the radio control system can no longer be guaranteed and our extended warranty will be avoided.
- Remain vigilant when working with the radio system and familiarize yourself with its functions. This applies in particular if you are working with it for the first time or if you work with it only occasionally.
- Check the function of the Emergency Stop switch before starting work each time. If you start the transmitter with the emergency stop switch pressed, the status indicator lamp will go out. If the status indicator lamp does not go out, you have to disable the radio control system immediately by removing the battery from the transmitter and contact the radio control system service engineer.

1.3 Precautions

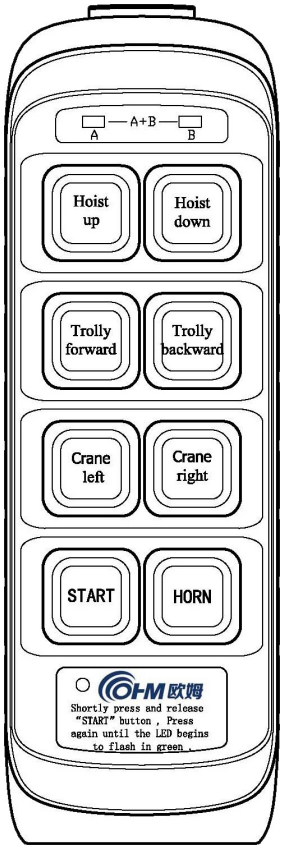
- Always check housing and push-buttons of the transmitter. In case of damage found, immediately replace it.
- Always pay attention to and check voltage of the transmitter; in case of no power or insufficient voltage, immediately replace the battery.
- In case of any abnormal condition, immediately press the emergency stop switch.
- In case of tempory disuse or end of operation, press the emergency stop switch.
- Do not use 2 (or more) transmitters to operate the same equipment in the same time.
- Do not use the same frequency within the same one factory area (or 300m scope) to avoid mutual interference.

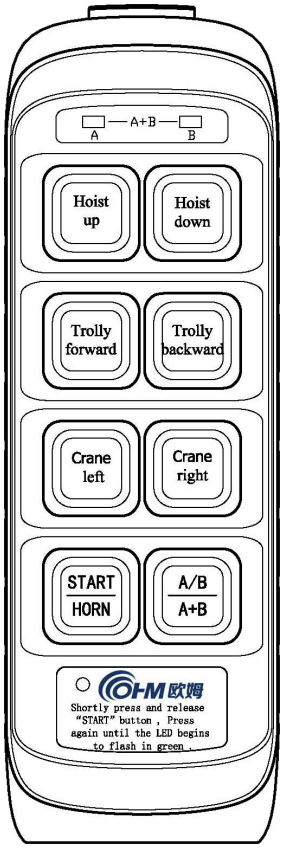
2、Introduction

TCS-B series are Push-buttons radio controls, including TCS-B08; TCS-B12; TCS-B16; TCS-B20; TCS-B16FK; TCS-B08FIX. Among which, TCS-B08FIX system is a kind of fixed radio control adopting TCS-B series platform design.

2.1 Function introduction

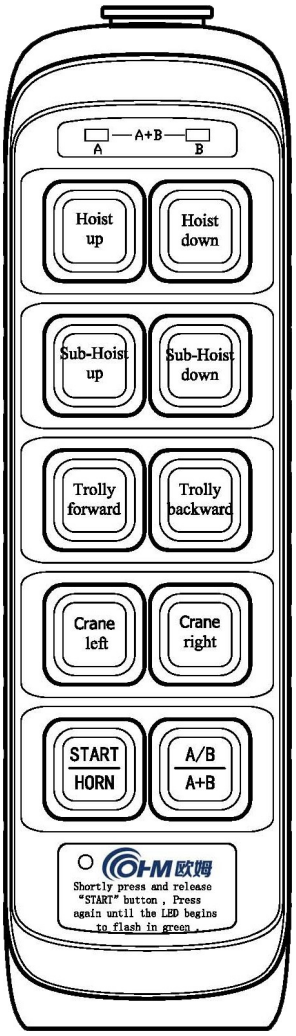
2.1.1 Basic function



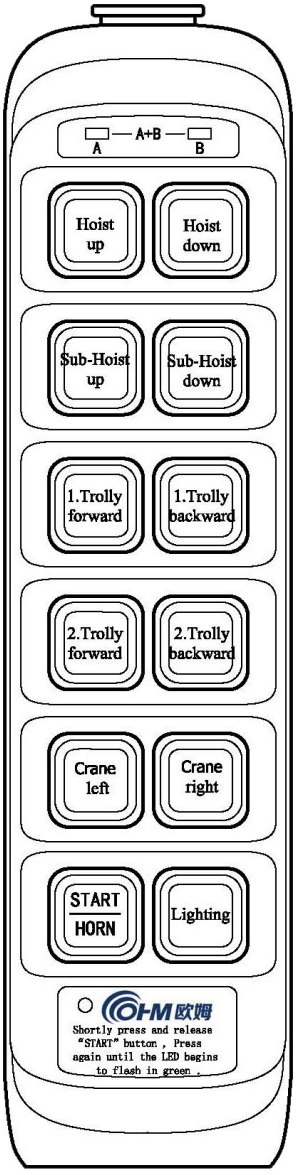


TCS-B08
TCT-B08: 8 one-step push buttons +E-stop. TCR-B08: up to 8 relays output. Standard system functions are shown in the figure above.

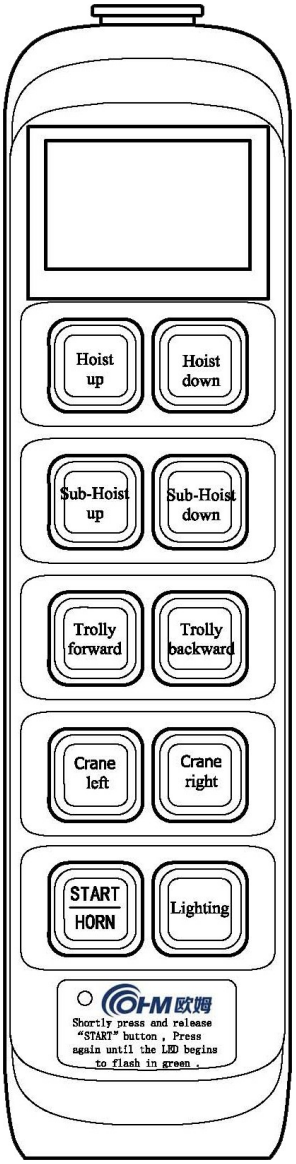
TCS-B12
TCT-B12: 8 two-step push buttons +E-stop. TCR-B12: up to 13 relays output. Standard system functions are shown in the figure above.



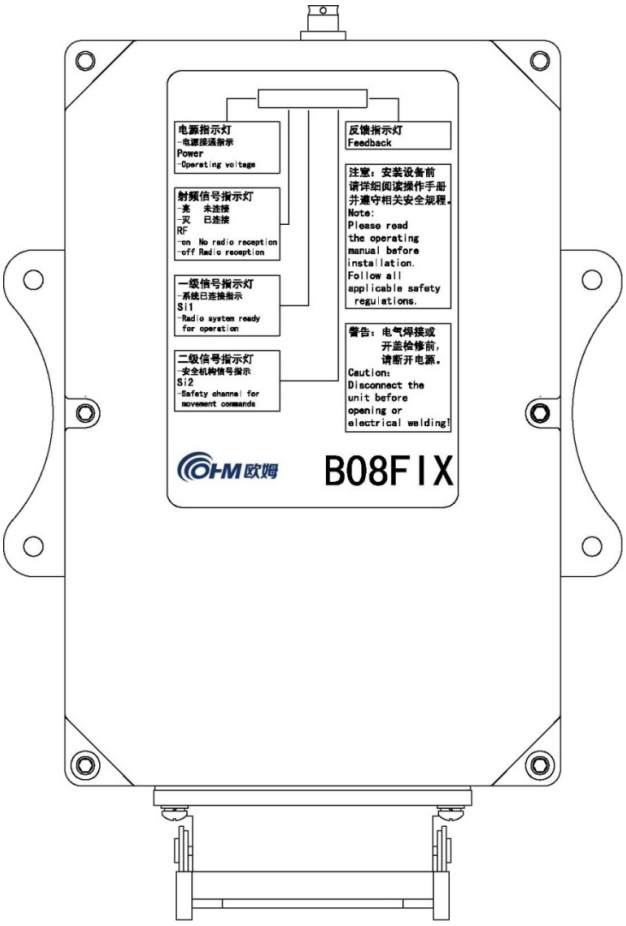
TCS-B16
TCT-B16: 10 two-step push buttons +E-stop. TCR-B16: up to 16 relays output. Standard system functions are shown in the figure above.



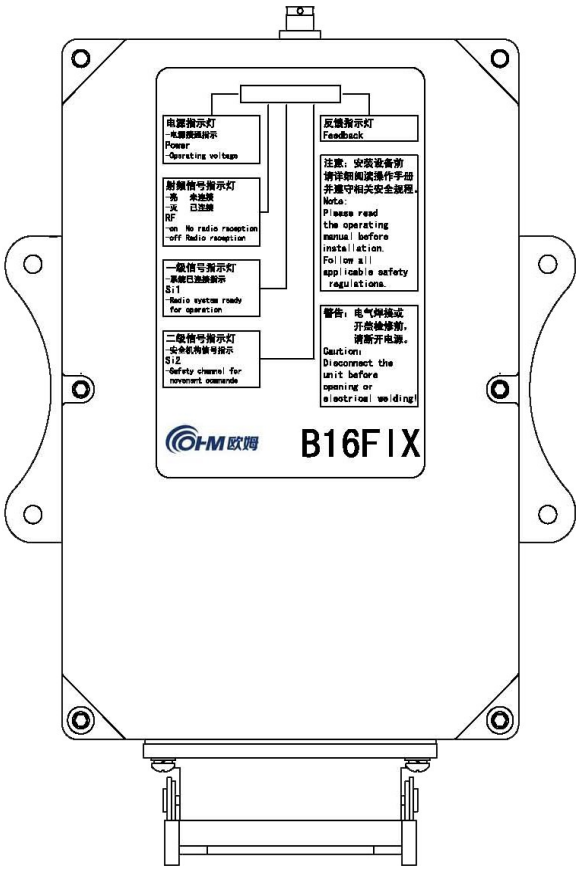
TCS-B20
TCT-B20: 12 two-step push buttons +E-stop. TCR-B20: up to 20 relays output. Standard system functions are shown in the figure above.



TCS-B16FK
TCT-B16FK:10 two-step push buttons + E-Stop + display screen. TCR-B16FK: up to 10 relays output, up to 4 I/O input, up to 2 analog input . Standard system functions are shown in the figure above.



TCS-B08FIX
TCT-B08FIX: up to 8 I/O input, up to 2 analog input. TCR-B08FIX: up to 8 relays output, up to 2 analog output . TCS-B08FIX is a fixed system. The housing of the transmitter and receiver are all medium-sized receiver housing, as shown in the figure above.



TCS-B16FIX
TCT-B16FIX: up to 16 I/O input, up to 2 analog input. TCR-B16FIX: up to 16 relays output, up to 2 analog output . TCS-B16FIX is a fixed system. Housing of the transmitter and receiver are all medium-sized receiver housing, as shown in the figure above.

Note:

- Dual-speed push buttons: 2-speed can only be effective after 1-speed is pressed.
  Emergency stop switch: When an emergency occurs, press this switch to immediately stop the controlled equipment.

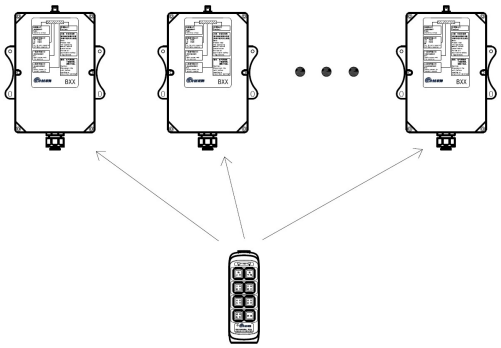
2.1.2 Special function

Standby transmitter

- It has the same functions as the original transmitter and does not have the Smart Card.
- When the original transmitter fails, remove its Smart Card and insert it into the standby transmitter; then the standby transmitter can replace the original one and immediately work.

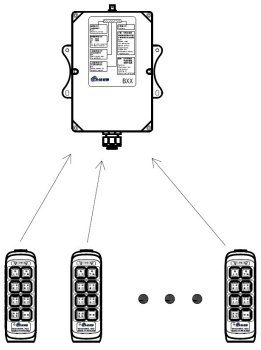
One-to-many function (as shown in the figure)

- One transmitter can control several receivers.
- Through selection function on the transmitter, select one receiver for control or several receivers for synchronous control.



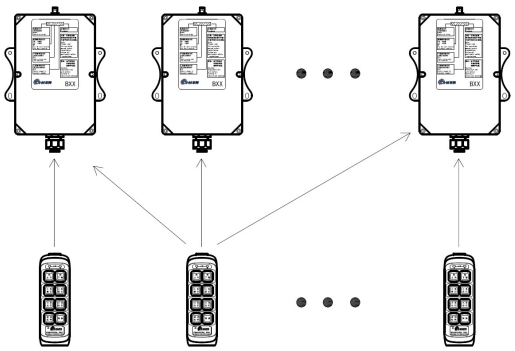
Many-to-one function (as shown in the figure)

- Several transmitters can control the same one receiver.
- Through “take over/release” function, select control or decontrol on the receiver.
- The receiver can only be taken over by the transmitter under “release” status.



Many-to-many function (as shown in the figure)

- Several transmitters can control several receivers.
- Through “take over/release” function on the transmitter, select control or decontrol on the receiver.
- The receiver can only be taken over by the transmitter under “release” status.



2.1.3 Function customization

Please view our website www.ndfusion.co.th or call us 0 2550 7471 for an service or sales.

2.2 Transmitter introduction

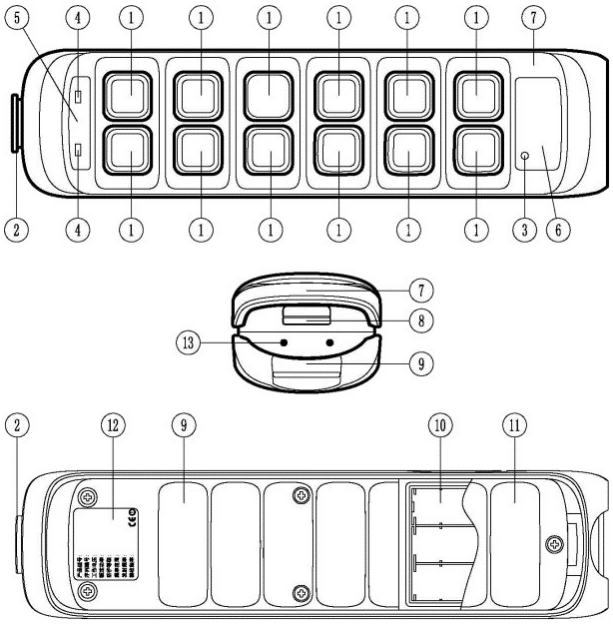
2.2.1 Transmitter size

- TCS-B08 (L x W x H): 193mm x 62mm x 50mm
- TCS-B12 (L x W x H: 193mm x 62mm x 50mm
- TCS-B16 (L x W x H): 226mm x 62mm x 50mm
- TCS-B20 (L x W x H): 255mm x 62mm x 50mm
- TCS-B16FK (L x W x H): 255mm x 62mm x 50mm
- TCS-B08FIX (L x W x H): 298mm x 206mm x 75mm
- TCS-B16FIX (L x W x H): 298mm x 206mm x 75mm

2.2.2 External view of transmitter

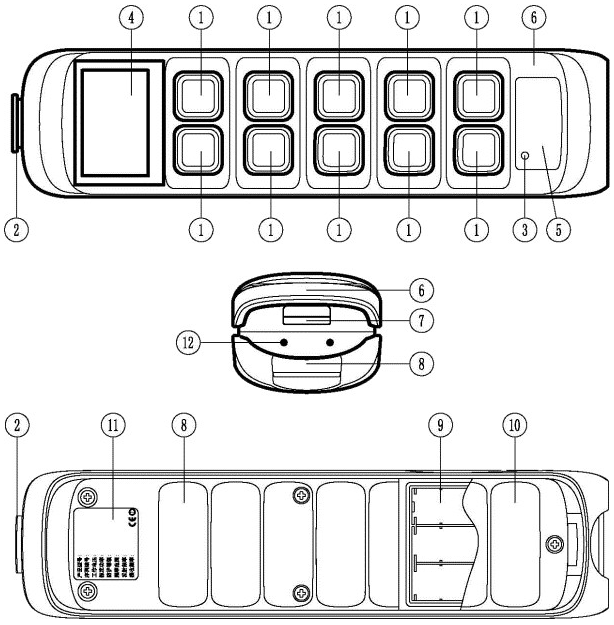
- **Model: TCS-B08, TCS-B12, TCS-B16, TCS-B20**

1. Push buttons
2. Emergency stop switch
3. Status indicator lamp
4. Indicator lamp
5. Panel
6. Panel
7. Upper part of transmitter
8. Smart Card
9. Lower part of transmitter
10. Battery compartment
11. Battery cover
12. Label
13. Charger contact (option)



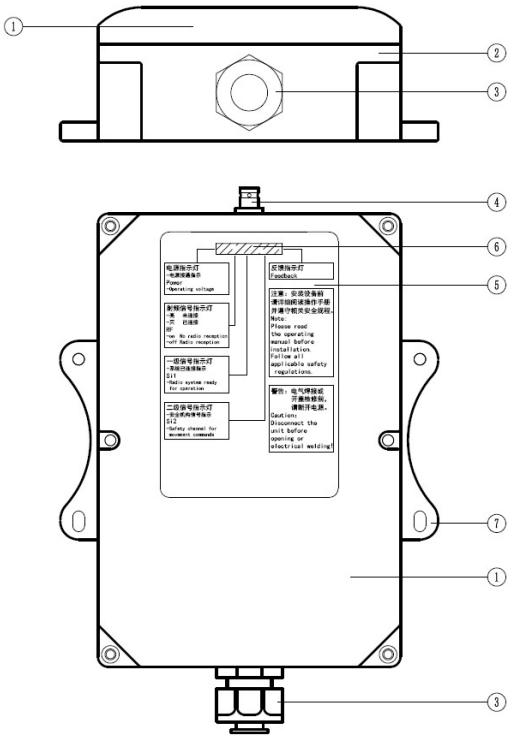
➢ **Model: TCS-B16FK**

1. Push buttons
2. Emergency stop switch
3. Status indicator lamp
4. Display screen
5. Panel
6. Upper part of transmitter
7. Smart Card
8. Lower part of transmitter
9. Battery compartment
10. Battery cover
11. Label
12. Charger contact (option)



➢ **Model: TCS-B08FIX, TCS-B16FIX**

1. Upper part of transmitter
2. Lower part of transmitter
3. Cable gland
4. Antenna socket(BNC)
5. Receiver status panel
6. Indicator lamp window
7. Shock mounts holes



2.3 Receiver introduction

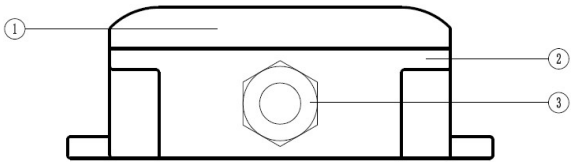
2.3.1 Receiver size

- Small-sized receiver housing (LxWxH): 248mm x 206mm x 75mm
- Medium-sized receiver housing (LxWxH): 298mm x 206mm x 75mm
  (excluding antenna connector, including cable gland)

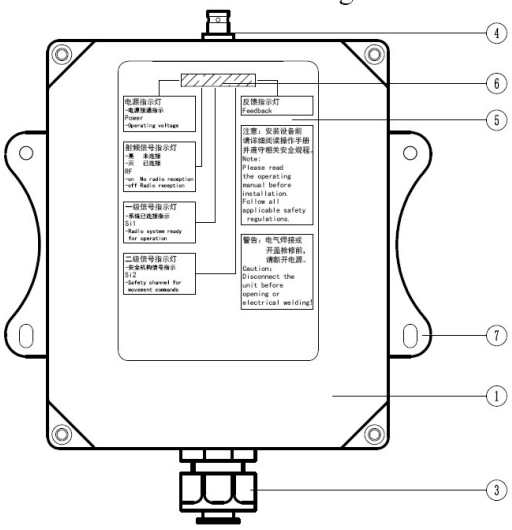
2.3.2 External view of receiver

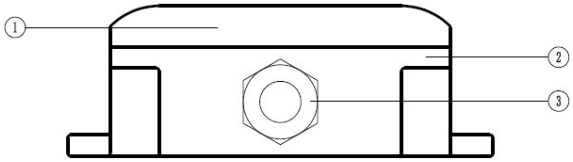
1. Upper part of receiver
2. Lower part of receiver
3. Cable gland
4. Antenna socket(BNC)
5. Receiver status panel
6. Indicator lamp window
7. Shock mounts hole

Receiver installation size

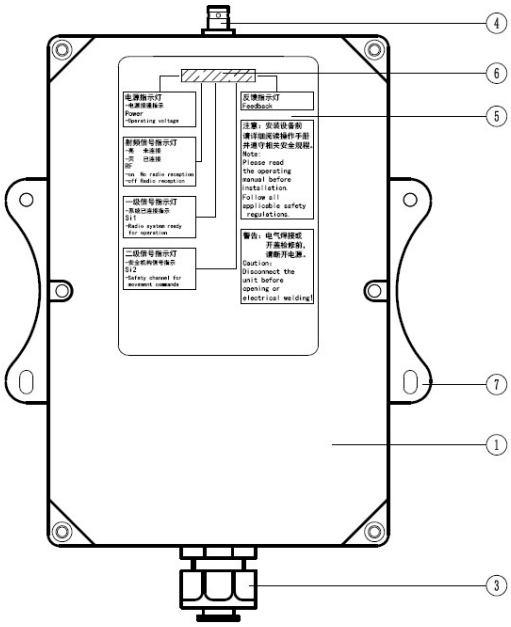


Small-sized receiver housing





Medium-sized receiver housing



Note:

- Small-sized receiver housing is applicable to TCS-B08
- Medium-sized receiver housing is applicable to TCS-B12, TCS-B16, TCS-B20, TCS-B16, TCS-B08FIX, TCS-B16FIX and TCS-B16FIX

2.4 Accessories

Neck belt

Shock mounts

Whip antenna

Charger (option)

Storage box (option)

Magnet antenna (option)

2.5 System wiring diagram

customized system; see output diagram in the receiver.

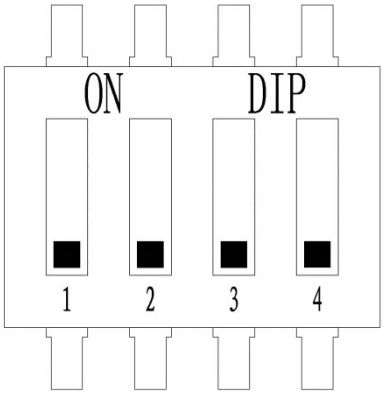
3、System settings

3.1 Setting of auto power off function

No. 4 position of DIP switch S13 at the back of transmitter Main board enable or disable the auto power off function.

OFF: Enable the auto power off function (default).

ON : Disable the auto power off function.



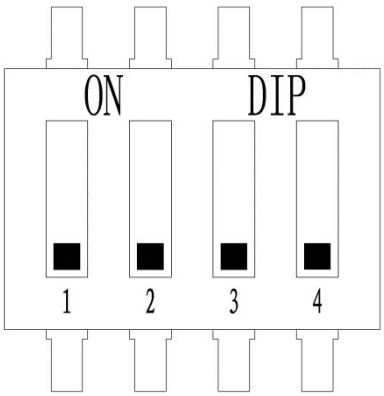
3.2 Setting of frequency band

Frequency band and address code are stored in system EPPROM chip and Smart Card.

There are 7 Frequency bands in one frequency group .it can be modified by adjusting No. 1-3 positions of DIP switch S13 on the back of transmitter mainboard.

See the table below for details:

Frequency group	S13-1	S13-2	S13-3
No. 1	0FF	0FF	0FF
No. 2	ON	0FF	0FF
No. 3	0FF	ON	0FF
No. 4	ON	ON	OFF
No. 5	OFF	0FF	ON
No. 6	ON	OFF	ON
No. 7	OFF	ON	ON



4、Transmitter operation

4.1 Transmitter installation

- Transmitter battery installation:
- Pay attention to the direction of the battery.
- When the transmitter is not used for a long time, open the battery cover and take out the battery.
- The transmitter shall be put at a safe and striking place to avoid damages caused by falling.

4.2 Transmitter startup

Push-buttons type:

- Correctly insert three AA alkaline batteries or rechargeable battery to the battery compartment, put the back cover and then tighten screws.
- Pull out the emergency stop switch of the transmitter.
- Short press “Start” to make the red light on and then immediately release it; then press “Start” until the green light flashes once per second; then the transmitter is ready to operate.
- Depending on the application, you must actuate the start button again before movement commands can be carried out.

Fixed type:

- According to the bundled transmitter wiring diagram, energize the transmitter.
- Connect the emergency stop switch.
- Click on “Start” switch to start the transmitter.

4.3 Transmitter shutdown

Push-buttons type:

- Press the emergency stop switch of the transmitter and the indicator lamp is off and then the transmitter is shut down.
- When battery voltage is lower than 3.3V, the transmitter automatically shuts down.

Fixed type:

- Disconnect the “Start” input and then the transmitter shuts down.
- Turn off the power to the transmitter when it is not used for a long time.

4.4 Table on transmitter indicator lamp status

4.4.1 Power indicator lamp

The green lamp flashes once per second	The transmitter works normally
The red lamp flashes once per second and is accompanied with sounds of the buzzer.	Low battery(3.3V-3.5V)
The green and red lamps flash alternately	The Smart Card initialization failed
The green and red lamps are always on	RF module Initialization failed

4.4.2 Status indicator lamp

According to system characteristics; for more information, see the drawing in receiver housing. i.e. TCS-B08 Transmitter Panel Diagram.

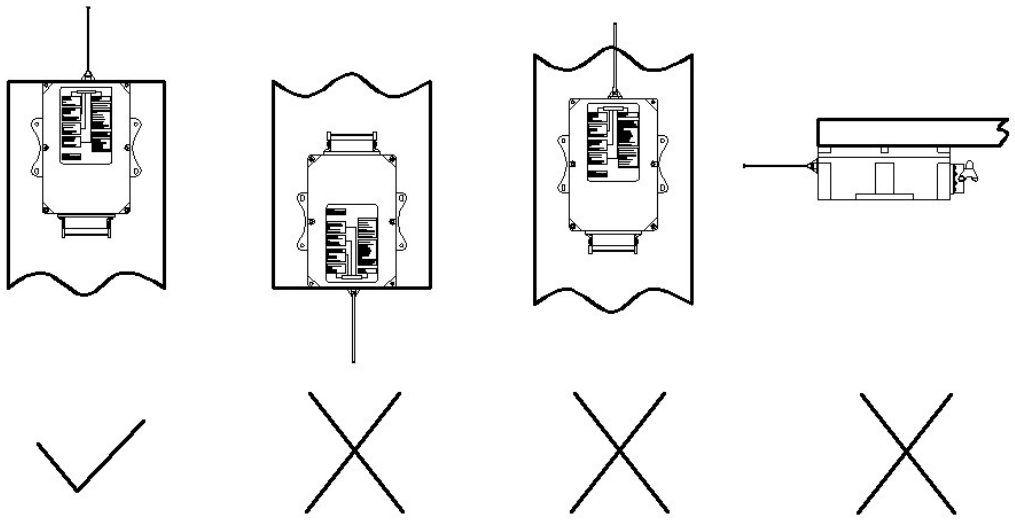
5、Receiver operation

5.1 Receiver installation

5.1.1 Precautions

- Determine that there is no radio controller with the same frequency within the range of 300m.
- Check whether the controlled equipment works normally.
- Determine whether voltage at the installation place is consistent with the receiver voltage; and then turn off the main power supply.

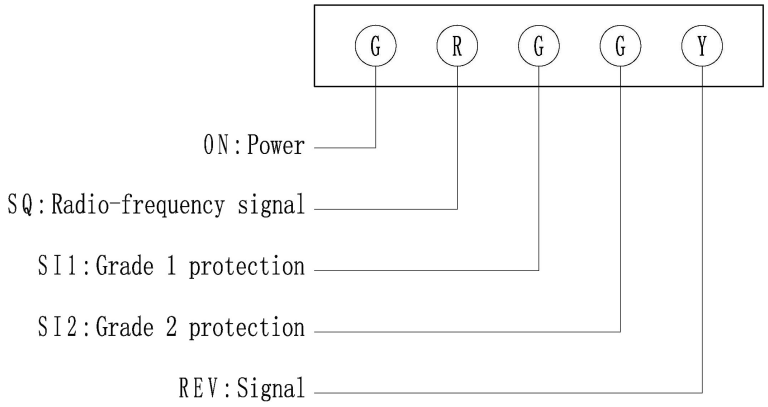
5.1.2 Installation



- The receiver should be mounted vertically with the cable connection downwards.
- Ensure that there are no metal parts within a radius of 1 m (3 feet) above the receiver.
- When the receiver has to be mounted into a control cabinet, an offset antenna must be installed.
- Receivers with external antenna must be installed in such a way that the antenna stands freely and does not touch walls or metal parts. Otherwise an offset antenna must be used, which can be supplied if necessary.
- Receivers with plastic housing should be protected against direct sunlight (UV radiation)

5.2 Status indicator lamps of receiver

You can observe working status of the receiver via the status indicator lamp window of the receiver.



The LEDs have the following significance:
ON (yellow) is illuminated as soon as operating voltage is present at the receiver, i.e. the connection to the electronic of the crane or machine is established and operating voltage (12 V) is present.
RF (red) is illuminated whenever the transmitter is switched off. It will be extinguished the very moment a signal is received by the receiver on its radio frequency.
Si1 (green) permanently illuminates after the transmitter is switched on, i.e. the receiver has identified its specific transmitter on the basis of the common message address (code). Safety circuit Si 1 is enabled.
Si2 (green) refers to the internal safety circuit Si2, responsible for a double switching off of the move commands whenever the control station is in the off (zero) position, i.e. "Si 2" will not be illuminated.
It is not until one or several drive commands (e.g. turn, trolley traveling, lifting gear or crane traveling) are input that the "Si2" LED may be illuminated!
REV (yellow) blinks, whenever the transmitter is sending a signal to the reveiver.

6、Use of charger

- Ensure correct voltage according to that indicated on the charger.
  - ✧ Vertically insert the rechargeable transmitter into the charger until it clicks into place.
  - ✧ When the charger indicator lamp changes from green to red, this indicates battery is charging.
  - ✧ When the charger indicator lamp changes from green ON to Red flashing, this indicates:
    - the battery is over-discharged and that the charger is in trickle charge status. After a short time of trickle charge, the indicator lamp becomes red ON and the charger goes into normal charging status.
    - the rechargeable battery defective and it is needed to replace.
- After completion of charging, the indicator lamp changes from red ON to green ON.

Note:

- Make sure don't charge the battery at high temperature(over 40°c).
- Make sure whether the transmitter totally insert into the charger.
- If the charging is still not completed after 4 hours, check whether the charger or the battery is in good conditions.

7、Simple troubleshooting

Problem	Possible cause	Measures
Transmitter does not react when switched on.	No power	① Carefully check the battery for damaged or contamination ②Insert a fully charged battery and then restart the transmitter
Indicator lamp of the transmitter becomes red and flashes once per second and is accompanied by sounds of the buzzer.	Low battery	① Replace with a fully charged battery.
Indicator lamp of the transmitter alternately flash red and green	Smart Card initialization failed	① Check whether the Smart Card is installed ② Check whether the SN of Smart Card is consistent with the SN of transmitter
Indicator lamp of the transmitter is always red and green	RF module initialization failed	① Check whether the RF module is tight

The transmitter is working, but machine does not react.	① Communication connection is not made for the system ② Connection cable between the receiver and the controlled equipment fails. ③ The controlled machine is not started.	① Check whether the receiver is energized. ② Check whether cable connectors are normally connected. ③ Check whether the controlled machine is started.
Some commands can not carry out.	①Receiver defective. ②Interruption in the connecting cable to the crane or machine.	① Check whether the receiver is energized. ② Check whether the cable and cable connectors are tight.

NOTE: If none of the measures mentioned resolve the problem, then please contact your service technician, dealer or OHM company

8、Maintenance

- Regularly check the function of emergency stop switch to ensure that the emergency stop switch is kept in normal working status.
- Keep the battery contacts clean.
- When a rechargeable battery is used, ensure the battery is fully charged for the first use; the battery not used for a long time shall be stored under normal temperature and shall be charged on a regular basis, to prevent battery damages caused by self-discharge (it is recommended that the battery is charged once per 6 months)
- If the radio control system is not used for a long time, take its battery out.
- Do no clean the transmitter with high pressure air gun and the like.
- Wipe the system with fine wool brush or soft dry cloth; do not wash it with water.
- Periodically check integrity and airtightness of system covers and rubber protection sleeve.
- Whenever welding the machine or the system fails:.
  - ✧ Switch off the radio system.
  - ✧ Switch off the controlled machine.
  - ✧ Disconnect all electrical connection to the receiver.
- Under harsh environment, exposed elements can be damaged; make sure to duly repair them.

Warning: Never operate a machine with a faulty or defective radio control system!

- If none of the measures mentioned resolve the problem, then please contact your service technician, dealer or ND FUSION SKILL company
- For maintenance by mailing, confirm the address by phone; making an appointment on the phone in advance for maintenance by mailing.
- Hotline for after-sales service: 0 2550 7471 , 06 2297 9654

9、Technical parameters of system

Type	TCS-B08	TCS-B12	TCS-B16	TCS-B20
Radio				
Digital-electronic	real-time control			
Frequency control	PLL(Phase lock loop)			
Address code	32 Bit			
Frequency range	433.100-434.750 MHz			
Transmitting rate	9600 Bit/s			
Transmitting power	≤10 mW			
Control distance	＞100m			
Frequency tolerance	＜4 ppm			
Modulation mode	GFSK (Gauss frequency Shift Keying)			
Channel spacing	25 KHz			
Sensitivity	-116 dBm			
Verification mode	CRC-16 (cyclic redundancy) + Hamming code (≥4)			
Response time	≤20 ms			
Dimension				
Transmitter weight (g)	320 (exclude battery)		360 (exclude battery)	380 (exclude battery)
Transmitter size (mm)	193 x 62 x 50 (L x W x H)		226 x 62 x 50 (L x W x H)	255 x 62 x 50 (L x W x H)
Transmitter housing material	High-strength engineering plastics			
Receiver weight (g)	1250	1400		
Receiver size (mm)	248 x 206 x 75 (L x W x H)	298 x 206 x 75 (L x W x H)		
Receiver installation size (mm)	186 x 88.5			
Receiver installation hole diameter (mm)	Φ6			
Receiver housing material	High-strength engineering plastics			
Operation temperature （℃）	-25 — 70			
Operation humidity	0 — 97%, anti-condensation			

Safety				
Safety standard	JB/T8437-2016			
	EN13849 grade D			
	Radio Transmitter Model Approval Certificate (State Radio Regulatory Commission of China)			
	Crane Radio Control Equipment Safety Certificate (Liaoning Bureau of Work Safety)			
Protection class	IP65			
Execution element				
Transmitter type	8 one-step push buttons	8 two-step push buttons	10 two-step push buttons	12 two-step push buttons
Transmitter power supply	3.6VDC or 4.5VDC (3 AA batteries)			
Working current of transmitter	≤40 mA (except special system)			
Transmitter undervoltage alarm	Sound-light alarm			
Transmitter fault alarm	Multiple combined sound-light alarms			
Power-saving protection	Auto shutdown (set to 0-30min)			
Transmitter antenna	Internal type			
Receiver power supply	42-250VAC 10-30VDC 220/380VAC (3 options)			
Rated power of receiver	≤6W			
Receiver fault display	LED working/failure status display			
Output mode	Fully airtight relay output Non-standard customized CANOPEN			
Relay capacity	4A/250VAC			
Connection	Cable gland(metric M25) Option:HAN16/HAN25			
Receiver antenna	External type			
Standard accessories				
Receiver antenna	1			
Receiver shock mounts	4			
Operating Instructions	1			

Technical parameters of system

Type	TCS-B08FIX	TCS-B16FIX	TCS-B16FK
Radio			
Digital-electronic	real-time control		
Frequency control	PLL(Phase lock loop)		
Address code	32 Bit		
Frequency range	433.100-434.750 MHz		
Transmitting rate	9600 Bit/s		
Transmitting power	≤20 mW		≤10 mW
Control distance	＞100 m		＞80 m
Frequency tolerance	＜4 ppm		
Modulation mode	GFSK (Gauss frequency Shift Keying)		
Channel spacing	25 KHz		
Sensitivity	-116 dBm		
Verification mode	CRC-16 (cyclic redundancy) + Hamming code (≥4)		
Response time	≤20 ms		
Dimension			
Transmitter weight (g)	2000		400 (Excluding battery)
Transmitter size (mm)	298 x 206 x 75 (L x W x H)		255 x 62 x 50 (L x W x H)
Transmitter housing material	High-strength engineering plastics		
Receiver weight (g)	2000		
Receiver size (mm)	298 x 206 x 75 (L x W x H)		
Receiver installation size (mm)	186 x 88.5		
Receiver installation hole diameter (mm)	Φ6		
Receiver housing material	High-strength engineering plastics		
Operation temperature （℃）	-25 — 70		
Operation humidity	0 — 97%, anti-condensation		

Safety			
Safety standard	JB/T8437-2016		
	EN13849 grade D		
	Radio Transmitter Model Approval Certificate (State Radio Regulatory Commission of China)		
	Crane Radio Control Equipment Safety Certificate (Liaoning Bureau of Work Safety)		
Protection class	IP65		
Execution element			
Transmitter type	Up to 8 I/O input +2 analog input	Up to 16 I/O input +2 analog input	10 two-step push buttons
Transmitter power supply	42-250VAC 10-30VDC 220/380VAC (3 options)		3.6VDC or 4.5VDC (3 AA batteries)
Current of transmitter	≤300mA@12VDC		≤30 mA (except special system)
Transmitter undervoltage alarm	None		Sound-light alarm
Transmitter fault alarm	None		Multiple combined sound-light alarms
Auto power off	None		Auto shutdown (set to 0-30min)
Transmitter antenna	External type		Internal type
Receiver power supply	42-250VAC 10-30VDC 220/380VAC (3 options)		
Rated power of receiver	≤6W		
Receiver fault display	LED working/failure status display		
Output mode	Multiple options		Fully airtight relay output Non-standard customized CANOPEN
Relay capacity	4A/250VAC		
Connection	Cable gland(metric M25) Option:HAN16/ HAN25		
Receiver antenna	External type		

Standard accessories		
Receiver antenna	2	1
Receiver shock mounts	8	4
Operating Instructions	2	1

10、Packing list (standard configuration)

Product name: Industrial radio control system

Product model: TCS-B _ _

Product No.:

No.	Name	Model	Qty	Checked by	Remark
1	Transmitter	TCT-B _ _	1		
2	Receiver	TCR-B _ _	1		
3	Receiver antenna	Whip antenna	1		
4	Receiver shock mounts	M6	4		
5	Transmitter lift belt		1		
6	Operating manual		1		English
7	Safety certificate		1		Copy
8	Certificate of conformity		1		
9	Output drawing		1		
Packed by:		**Packed by:**		**Date：**	