

INSTRUCTION MANUAL

DATE :2007. 12.14

FILE No. :CA78162M1

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CABLE REEL TCR - MC TYPE



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1. INTRODUCTION AND FEATURES

1.1 INTRODUCTION

This cable reel is equipped with permanent magnet couplings which can be selected to accommodate for any reeling situation, therefor, ensuring a long life for the cable.

No extra devices are required for electric power adjustment or power transmission which makes the cable reel compact and light.

1.2 FEATURES

- 1) Because of the compact structure of the cable reel, the area required for installation is minimal, By combined operation with multi-couplings, the tension applied to the cable can be adjusted. Therefore, applying the cable reel to long distance winding or hoisting, the life of the cable becomes longer and the,operation is smoother.
- 2) The magnetic coupling is a non-contact type by applying the strong attractive force of permanent magnets. There is no physical contact or mechanical abrasion and therefore torque adjustment after extensive use is not required.
- 3) The use of squirrel cage motors makes maintenance easy as there is no requirement for power adjustment or power transmission devices which could malfunction. Therefore, maintenance is considerably reduced.
- 4) The transmission torque of the coupling can be adjusted easily, and with the use of planetary gears, the torque is large and the operation is smooth.

『 Warning 』

If a one way clutch is used instead of a brake motor, the direction of the motor rotation must be maintained to prevent damage to the motor and the clutch. An arrow indicating direction of motor rotation is on the fan cover of all motors.

2. INSTALLATION OF CABLE REEL

When delivering the magnetic coupling type cable reel, the reducer assembled with reel drum and slip ring case is separately packed and delivered.

After unpacking, set up the cable reel according to following procedures.

1-st : Checking the winding direction

Check the coincidence of winding direction between the winding direction marked on Cable Reel Drum and the winding direction at site.

2-nd : Checking of rotating direction of magnetic coupling motor.

Because the one way clutch is assembled at Magnetic Coupling, the rotating direction should not changed at wiring of motor. Check the R,S,T Phase and wire on motor wiring. After input of power check the coincidence of the rotating direction between actual direction and marked direction on the motor sticker.

2.1 INSTALLATION OF REDUCER(INCLUDING SLIP RING BOX)

Move the reducer to the installation place by using the rope.

- 2) After setting on mounting base plate, fastening and fixing the reducer at anchor bolt holes with bolt, nut and spring washer.
- 3) Unfasten the bolt(or lock nut) at the front of reducer, and remove the anti-rusting agent on the drum and reel shaft.

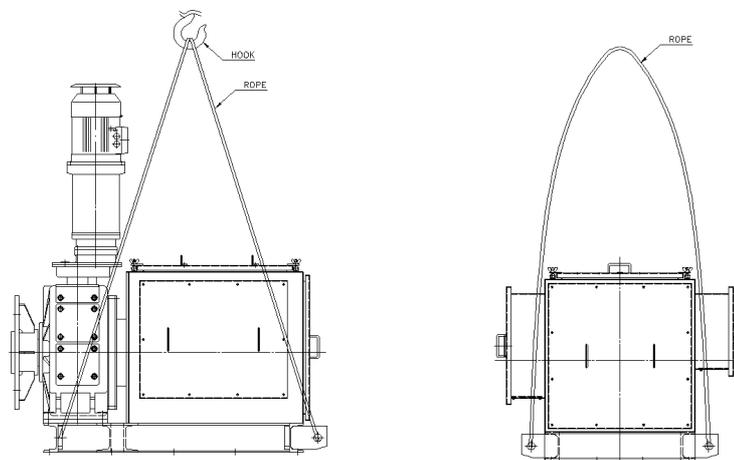


Figure 1. Installation of Reducer

2. 2 INSTALLATION OF REEL DRUM

- 1) The reel drum where the assembly is completed use the lops in drum and lug by the crane reel drum and to assemble in shaft flange of the reducer whole surface transport
- 2) The flange the breakdown power use bolt which at assembly hour flange bolting hole is combined, the nut and spring washer reel to combine drum and the flang.

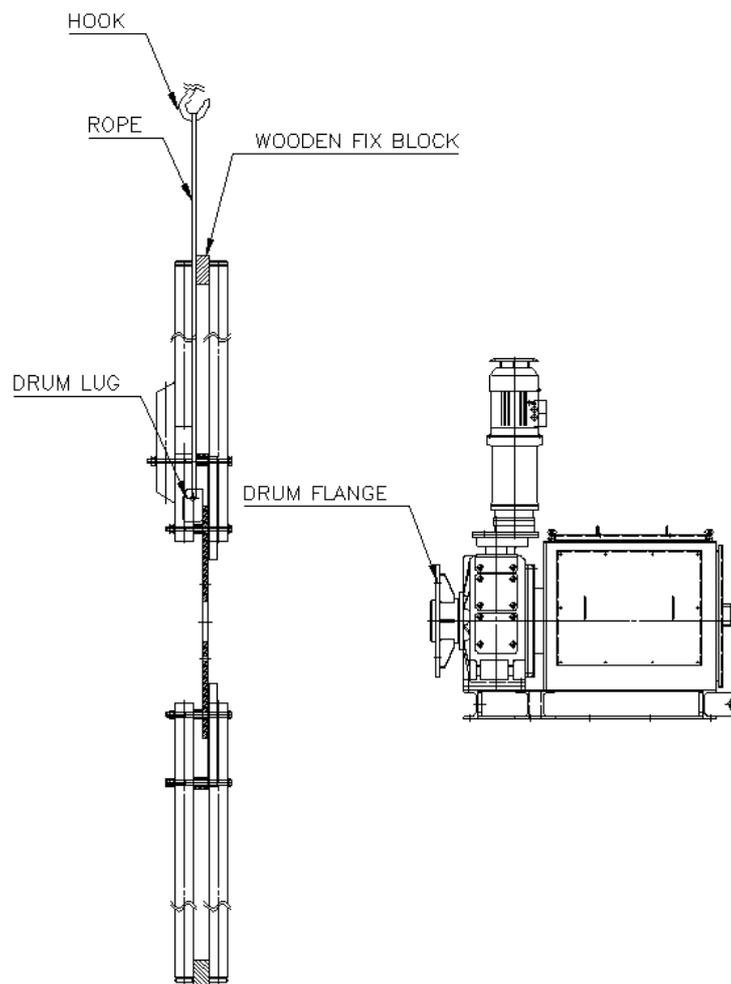


Figure 2. Installation of Reel Drum

2. 3 INSTALLATION OF GUIDE ROLLER

The guide roller is installed to align the center of inside and outside diameter for the reel drum and the center of the reel drum width, and also to be located the direction of winding cable.

2. 4 WIRING OF ELECTRIC MOTORS**2. 4. 1 Motors Equipped With Brake**

- 1) Check motor's name plate for voltage, phase and frequency against the supplied voltage.
- 2) Remove motor terminal cover.
- 3) Fit the correct size cable gland to terminal box. Fit protective tube over the Cable, and insert cable through cable gland. Wiring shall be done according to the sequence diagram. Tighten the cable gland and replace terminal box cover.
- 4) Switch on the power and check that the motors are rotating in the same direction and that the reel is rotating in accordance with the direction of the equipment or hook. If the reel is rotating in the wrong direction, switch off power, change any two phases with each other, and re-check the rotation direction again.
- 5) Also check whether the operation sequence is in accordance with the reeling drum rotation.
- 6) If the rotating direction is correct, remove the wooden block from between the spokes.

2. 4. 2 Motors Equipped with Back Stop Clutch

This back stop clutch prevents slack cable when this equipment stops or when unwinding against the magnetic coupling.

- 1) During the assembly of the cable reel, the back stop clutch is positioned correctly for the motor rotation and cable drum winding direction.
- 2) If the motor is wired incorrectly and rotates in the opposite direction, the one way clutch or the motor may be damaged. So, please use the following method for wiring the motors.
 - a. Take out the cap screws where the housing connects to the planetary gear box and remove motor and housing.
 - b. Remove coupling retaining screw and washer and remove coupling.
 - c. Remove motor fixing screws and remove motor.
 - d. Connect power source to motor terminal and check rotation of motor shaft with the motor rotation arrow marked on the motor fan cover.
 - e. Re-assemble in reverse order. If the motor direction has to be changed due to an error in the specification, the one way clutch has to be reversed.
(Refer to section "5.3 Changing the rotating Direction of The One Way Clutch")

2.5 CONNECTING AND WIRING OF REELING CABLE

Before connecting the cable, carry out 2.7 Checking the Position of Limit Switch Cam. And before connecting the reeling cable to the reel drum, take into account the cable specification (Square x Core, out-diameter, weight), wiring length of drum inside, dead turn of reel , the length for setting height, winding length, the length based on the center position device and the length for connection to junction box. In addition make sure comments in approved drawing and prepare the required cable. If the excessive cable is wound on the drum, the torque is increased and it brings on the damage of the related facilities and the impossibility of winding. So please make a note this. And if the starting time of crane is very quick, the cable tension is momentarily increased in large. This is the reason of shearing of cable. Please start in low speed.

『Connection of Cable』

- 1) Attach the cable guide roller to planed position and take off the shield of cable from cable in order to wire the cable to the slip ring in the slip ring box.
- 2) Pull out cable between rollers of guide roller and insert the cable into the spoke1-1 of the reel drum. Then take off the cable from the inner rim.
- 3) Pull out the cable which came out from the reel drum into slip ring box through quill shaft of reducer shaft.
- 4) The cable inlet should be sealed with sealing compound through the quill shaft of the reducer shaft.
- 5) The cable between spoke1-1 cable inlet to the inlet of the quill shaft of reducer shaft should be fixed with cable tie after wind around the cable with rubber pud 2~3 times.
- 6) Detach the cable clamp bar on the inner rim and fix the cable clam bar arain after winding around the cable with rubber pud (thickeness 2~3mm) where cable becomes clamp as explained above

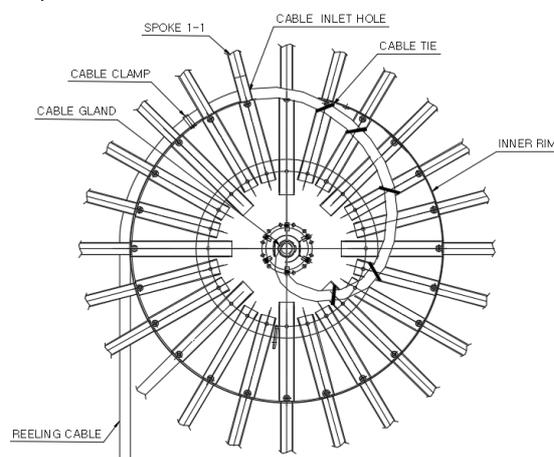


Figure 3. Connection of Reeling Cable

『Wiring of Slip Ring』

- 1) The reducer hollow shaft of the shaft lead and the cable withdrawl the slip ring box internal furnace terminal lug and to elect use in slip ring buss bar
- 2) The reel with cable final election from earth slip inter ring the order broad way to elect together.

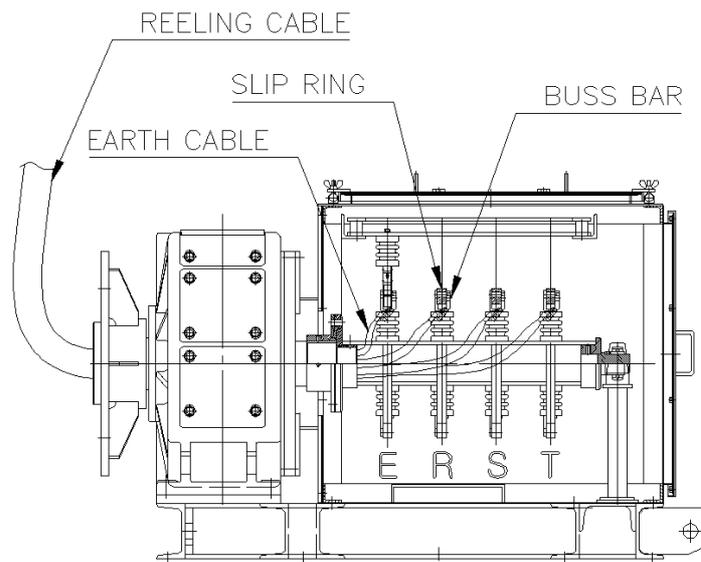


Figure 4. Wiring of Reeling Cable

2. 6 WIRING OF SLIP RING SIDE

- 3) Unfasten the fixing bolts of terminal box cover in rear of reducer, detach terminal box cover.
- 2) Throw the cable into the case through the cable connector of bottom cover. Considering the disassembling of box or space and interference at assembling, the suitable length of cable should be decided.
- 3) The connector of tube for cable protection should be used for water proof of box on cabling.
- 4) Wiring the cable to the terminal block of the terminal box in coincidence with cable number.

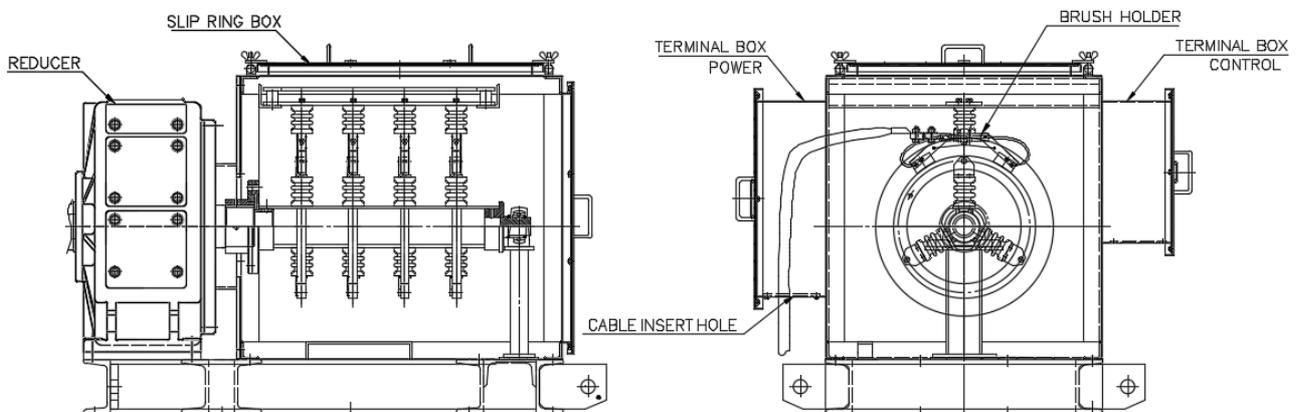


Figure 5. Wiring of Slip Ring

2.7 POSITION OF LIMIT SWITCH CAM

The Limit Switch for checking the Over Travel and the unwinding length of cable is installed in reducer.

- 1) Through the bevel gear and bevel pinion, the RPM of Reel drum shaft is transmitted to Limit Switch. And The cam angle of limit switch changed by worm & worm wheel of limit switch.
- 2) Open the upper cover of Limit Switch and check the position of cam is coincided with unwinding length of cable. (Right End, Left End)
- 3) In case that the position is not coincidence, correct the cam position with turning the cam connected to limit switch shaft.
- 4) Assembled the limit switch cover and install the slip ring box.

3. Operation

- 1) Input the power and make a run with operation switch.
- 2) At first, check that the moving direction of equipment (or direction of hoisting) coincide with the rotational direction of reel drum with jog operation.
- 3) If the rotational direction is right, checking the slackening and over-tension of cable make a operation all over the traveling length.
- 4) In case that the cable may be damaged by the slackening and over-tension of cable caused during operation stop the operation and adjust the torque of coupling.
- 5) In case that the slackening of cable happen according to the difference of inertia force when the equipment stop abruptly during winding, the motor should be run for some times for the compensation.

During the test operation, please check the following items.

3.1 CHECK TENSION OF THE GUIDE ROLLER

- 1) Attached to the guide roller frame are the following limit switches.

NO	SIGNAL	REMARKS
1	LS1	Left Position
2	LS2	Right Position
3	HL	Cable Over Tension Detector (Left)
4	HR	Cable Over Tension Detector (Right)
5	HS	Cable Slack

- 2) When winding or un-winding so that over tension does not occur, please adjust the spring force accordingly and check the position of the limit switches and the limit switch actuators.
- 3) Generally at the time of starting, high tension is applied momentarily.
- 4) For adjustment of the guide roller tension spring, see section " 5. 1 Adjustment Tension of Guide Roller.

3. 2 CHECKING OVER TENSION OR SLACK OF CABLE

- 1) If over tension or slack occurs in the cable, first check that the limit switch cam is in the correct position with regards to the equipment position along its travel length.
- 2) If the cam is out of position, please adjust according to page 16 of 19 - 5. 2 limit switch cam position adjustment. After adjusting a test run over the complete length of travel should be done.
- 3) If the cam is in its correct position, the torque can be adjusted by the gap adjustment of the magnetic coupling.
- 4) First, select the coupling unit that needs to be adjusted by referring to the electric circuit diagram and the coupling test sheet. Please adjust the torque according to section " 5. 4 magnetic coupling transmission torque adjustment".

4. STRUCTRE AND FUNCTION**4. 1 MAGNET COUPLING UNIT**

- 1) Torque is transmitted by means of strong magnetic forces re-acting with a disc which is directly connected to the motor shaft.
- 2) The transmission torque is adjust by varying the air gap between the disc and the permanent magnet segments. For adjustment of the transmission torque see page 18 of 19 - 5. 4 magnetic coupling transmission torque adjustment.
- 3) The heat that is generated during operation is dissipated by means of cooling fins on the coupling housing and top cover.
- 4) The motor speed is reduced and the torque is multiplied by the gear box which consists of a planetary reducer and a bevel gear main drive. The planetary gear box was designed with three sets of gears to transmit a high torque and the teeth were heat treated and ground for long life.
- 5) A bevel gear is fitted to the output shaft of the planetary reducer and transmits the torque to the driving shaft of the cable reel drum.

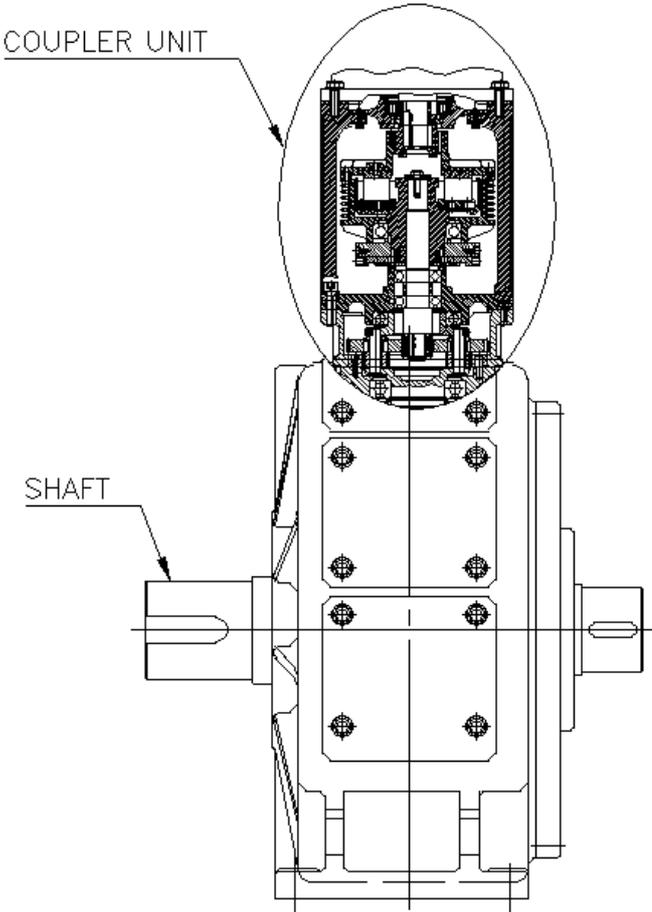


Figure 5. Magnetic Coupling Unit Structure

4.2 CONSTRUCTION AND FUCTION OF REDUCER

- 1) According to the required torque for cable winding, total 4 numbers of magnetic coupling can be attached on the main frame of reducer.
- 2) If the bevel gear attached on the shaft rotates, the cable is wound with the rotation of reel drum in front of shaft. At unwinding of cable, the power of motor is interrupted and the cable is unwound by the slip of magnetic coupler.
- 3) By the one way clutch bearing at lower part of motor, the motor shaft rotates on only one direction.
- 4) On the standstill state of the equipment, the slackening of cable can be protected by one way clutch.
- 5) In case that the more of 2 magnetic coupling unit are used, the units are designed to be operated according to the allowable tension of cable and the required torque. So all of units may not be operated at winding of cable

4.3 CONSTRUCTION OF SLIP RING BOX

- 1) The slip ring, brush holder, terminal box and limit switch for detecting the position attached in rear side of reducer.
- 2) The cable connected through reel drum is joined at slip ring by way of hollow shaft of reducer and supporting shaft(hollow shaft) of slip ring.
- 3) The brush is contacted on the out-diameter of slip ring and the cable is connected between brush holder and terminal block.
- 4) So, the power of terminal block of reel drum is connected to the outside by way of the slip ring and brush at the rotation of reel drum.

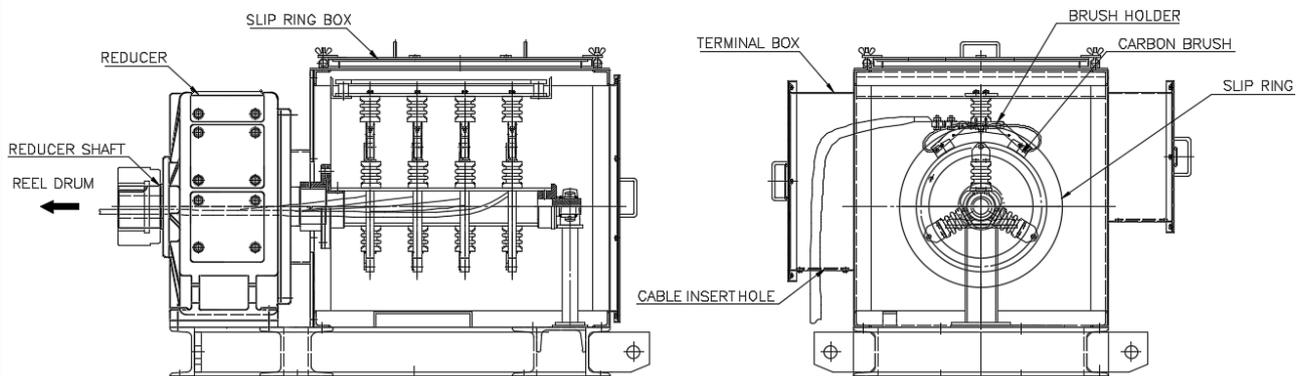


Figure 6. Construction of Slip Ring Box

5. ADJUSTMENT

5.1 ADJUSTMENT TENSION OF GUIDE ROLLER

1) In guide roller, the spring at both bottom side and the limit switch are installed as follows

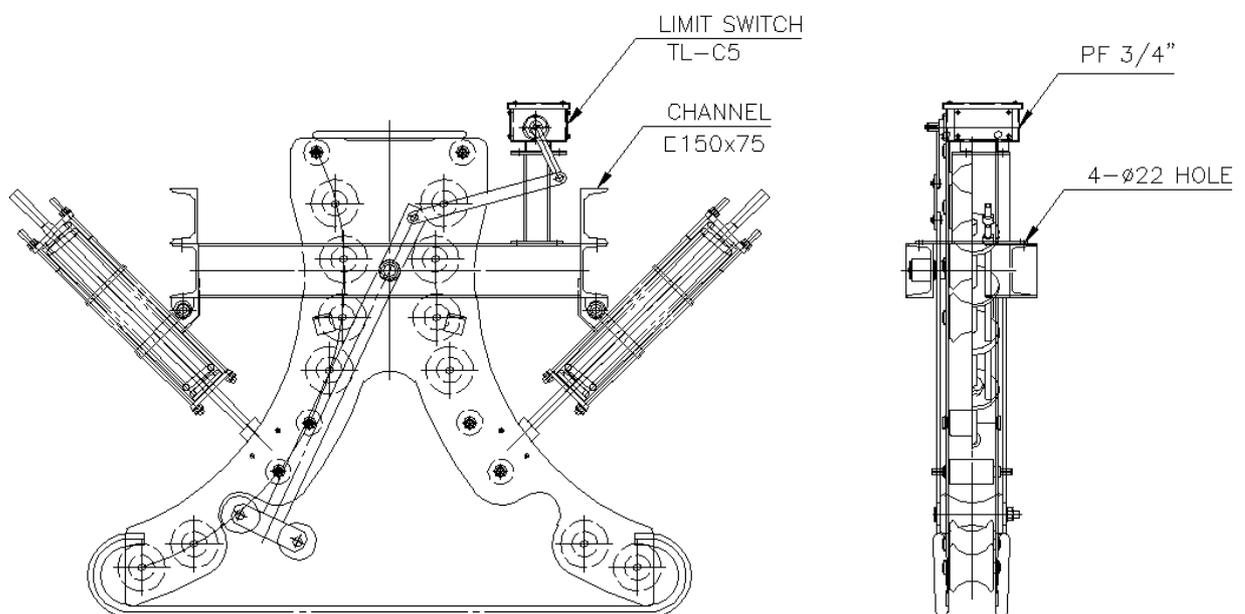


Figure 7. Adjustment Tension of Guide Roller

- 2) On reeling or unreeling, the cable reel should be normally run, but if the over tension is occurred at guide roller, the tension will be adjusted by tightening the spring of both bottom side of guide roller.
- 3) In guide roller, the limit switch to detect the left/right position, and the limit switches for cable slack and left/right over tension are installed. If the fault is occurred during normal operation, please check the situation of limit switch connection.

5. 2 POSITION ADJUSTMENT OF LIMIT SWITCH CAM

- 1) The limit switch installed at the cable reel reducer and signal detected is as follows.
 - 2) Cam switch is used for detecting the right end, left end and mid point of the cable reel and detecting the torque convert point if needed.
 - 3) The setting method of cam position is as follows. Open the cover and slightly loss the fixed Nut which fasten the cam to the position required shift the cam and fasten the Nut tightly.
 - 4) When adjusting the cam position consider shift direction of the cable reel and check the codes connected to panel.
 - 5) In the method of center feeding when the distance covered in right ang left of the cable reel is different, if the cam positioned shorter side on the traveling distance previously works, crane interlock way occur.
- See the circuit diagram sent when approval.

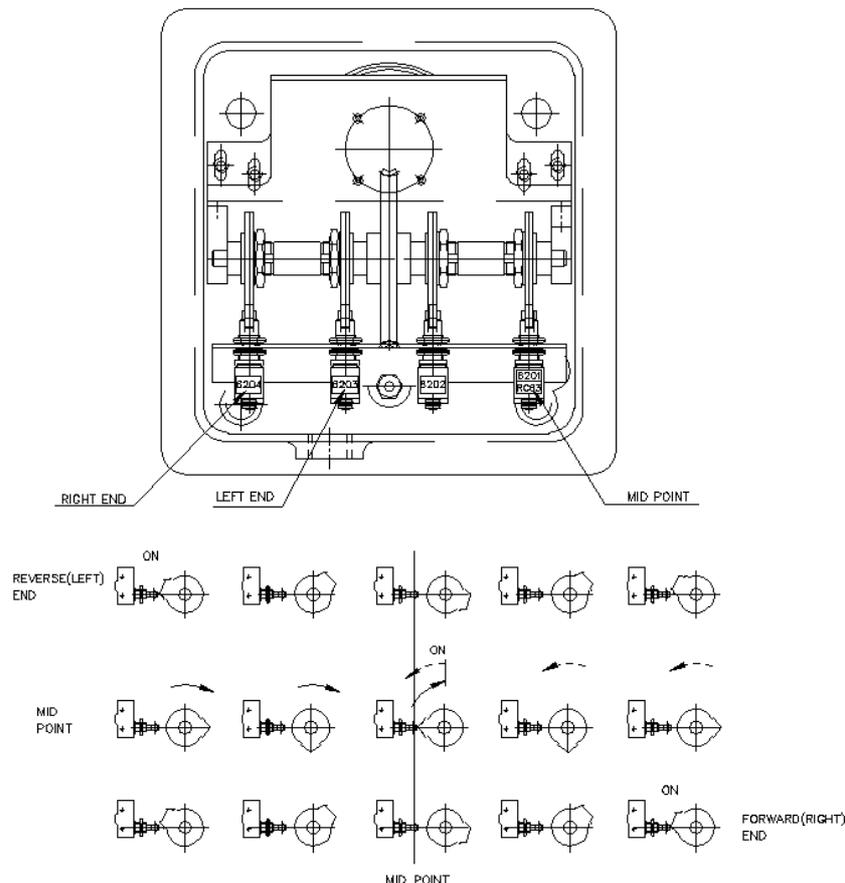


Figure 8. Position Adjustment of Limit Switch Cam

5.3 CHANGE OF ROTATE DIRECTION OF ONE WAY CLUTCH

- With seeing the section drawing of FiG. 9 Magnet Coupling, doing the work as following procedures.
 - 1) Detach the safety cover (1) of coupling.
 - 2) Unfasten the fixed bolt (2) and detach the motor and magnet bracket (3).
 - 3) Unfasten the bolt (4) on motor shaft and detach the end plate(5), and after unfastening the bolts (6) for motor fixing detach the motor.
 - 4) After disassembling the snap ring (11) in the clutch housing (7) and taking out the clutch, If the assembling is done to the contrary again, the rotational direction will be changed.
 - 5) The assembling is the contrary of disassembling.

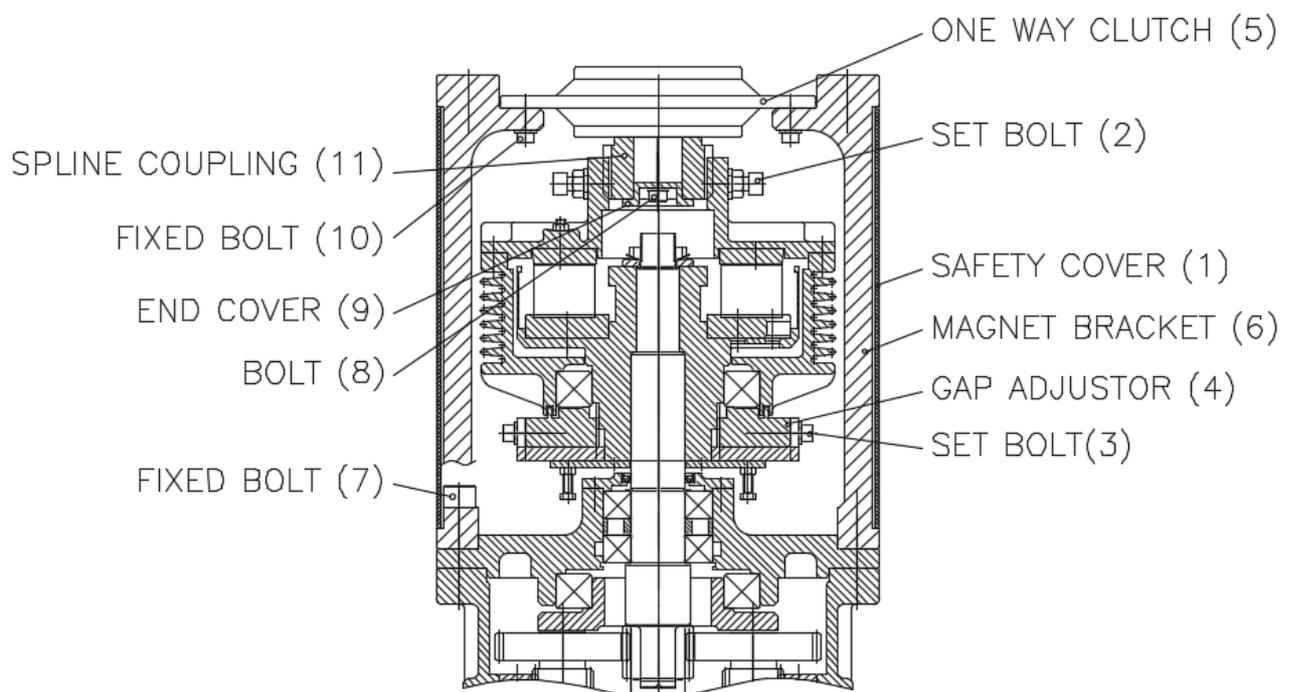


Figure 9. Change of Rotate Direction of One Way Clutch

5. 4 TORQUE ADJUSTMENT OF MAGNETIC COUPLING

- With seeing the section drawing of FiG. 3 Magnet Coupling, doing the work as follows
 - 1) Detach the safety cover (1) from magnet coupler.
 - 2) Unfasten the set bolt (2) of spline joint.
 - 3) Unfasten the set bolts (3) of adjusting nut (4).
 - 4) The air gap may be adjusted by 1/4 turn at a time by using of the opposite 2 holes of holes for gap adjusting nut (4) with adjusting tool.

And fix the adjusting washer should be fixed with a tool.

[Ref.] Magnet Gap is adjusted by 0.375mm at 1/4 turning on the basis of 1mm.
The adjustment range is min. 1.0mm to max. 3.625mm(Max. 2.5 turns)

- [Note]** 5) Turning to the clockwise the torque is reduced,
but to the counter-clockwise the torque is increased
- 6) Fasten the set bolt (3) after adjusting torque.
 - 7) Fasten the set bolt (2) of spline joint after adjusting the torque.
 - 8) Assemble the safety cover (1) of Magnet Bracket.

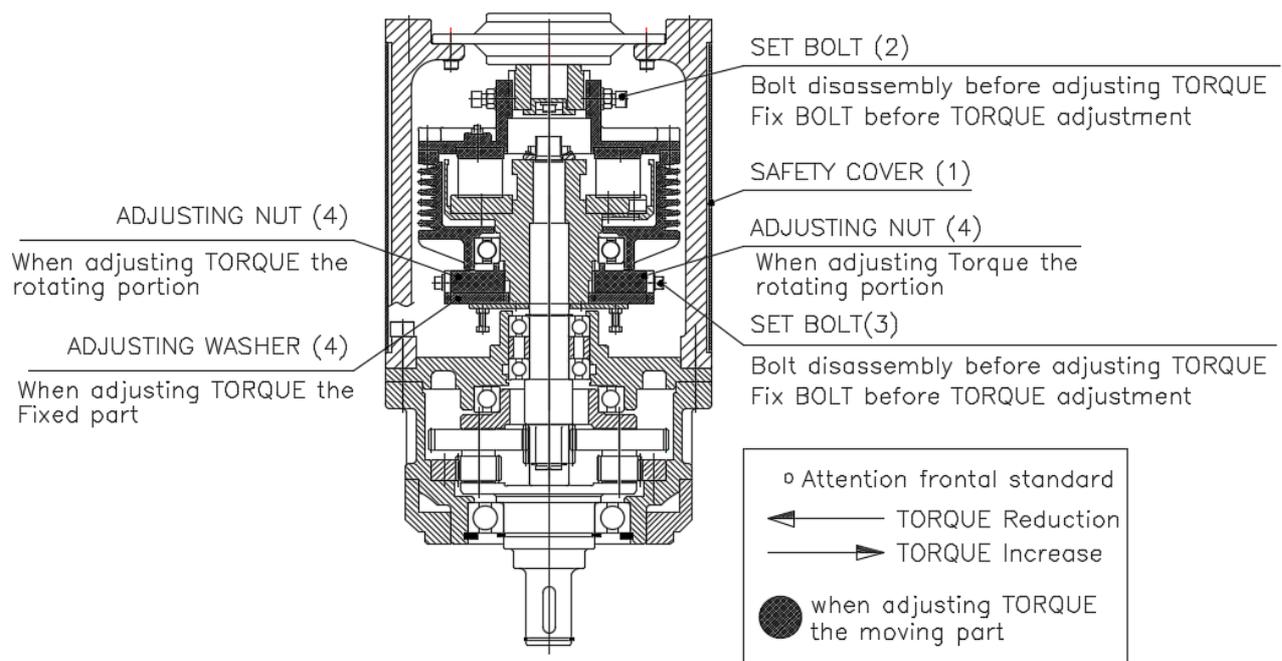


Figure 10. Torque Adjustment of Magnetic Coupling

. LUBRICATION & INSPECTION

6.1 LUBRICATION

- 1) The magnetic coupling unit is fitted with high temperature pre-greased sealed for life bearings.
- 2) The planetary gear box was filled with grease during assembly. Re-greasing is not necessary.
- 3) The bevel gear box requires replenishing of oil every 6-months. This is done through the plug hole at the rear of the reducer

NO	LUBRICANT	MANUFACTURER	REPLENISHING PERIOD	AMOUNT
1	Omala S2 G 220 or equivalent	Shell or equivalent	every 6 month	0.5ℓ

6.2 INSPECTION

No	Inspection point	Period	Countermeasure
1	Surface of slip ring	every month	Finish the scar with sand paper
2	Degree of brush abrasion	every month	Change at over abrasion
3	Brush holder spring tension	every month	Change at low tension
4	Deviation of brush	every month	Correction to original position
5	Invasion of moisture and dust to the slip ring box and Inside of reel drum	every month	Change Cover Packing or Checking fastening state of bolt. Check of cable connector .