Supply this manual to the user.

INSTRUCTION MANUAL

CABLE REEL

CRL - 2000 SERIES
CRL - 3000 SERIES

⚠ WARNING

- Read this manual before use.
- Keep this manual available.

ENDO KOGYO CO., LTD

ENDO

RM-10548b

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SAFETY ALERT SYMBOL AND ALERT SIGNS

Please read this manual carefully and follow its instructions.

The SAFETY ALERT SYMBOL (⚠), WARNING, CAUTION, and NOTE carry special messages.

⚠ This SAFETY ALERT SYMBOL is used to call your attention to items or operations that could be dangerous to you or other persons using this equipment.

Please read these messages and follow these instructions carefully.

⚠ **WARNING** : WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION** : CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury, damage or destruction of the equipment and others.

NOTE : NOTE indicates a special instruction in operation or maintenance.

Contents

1. ⚠ Safety instructions

Regarding name plates, warning labels and labels:

⚠ WARNING
・Never remove or deface any name plates, warning labels or labels which are attached to the body. The operator should always observe them.

Regarding installation (page 8):

⚠ WARNING
・Never use in ignitable or explosive atmospheres. ・Take sufficient care not to knock or drop the reel when handling. Never use the arm of the guide roller (special accessories) to lift the reel.

Regarding ground connection work (page 9):

⚠ WARNING
・Electric shock hazard. Do the ground connection work. ・Never connect the earth line to the following: Gas pipes, etc. : Danger of ignition or an explosion. Phone lines / lightning rods : Danger of being struck by lightning. Along plastic water pipes : Does not act as an earth.

Regarding cable connection (page 10):

⚠ WARNING
・Electric shock hazard. Turn off the power before carrying out any work.

⚠ CAUTION
・Do not install cable to drum more than 2-3 times round. (2-3 times means winding length & initial spring turns) Make free space in drum, otherwise cable could spill out from drum cover. If cable spilled, it causes accidents as a cable cutting. ・When used for vertical lift or horizontal stretch applications, in order to prevent severing of the cable and then a fall in case of a spring breakage, protect the cable by wrapping rubber or the like around the cable portion which contacts with the oblong hole in the drum cover. ・Check the wire connections are sound and there are no wiring errors. ・Never allow the cable (leads) connected to the terminal plate to protrude over 15mm from the terminal plate upper surface. ・Leave sufficient room for connecting the cable (leads) to the brushes so as not to apply excessive force to the brushes. ・Securely tighten the cross recessed head screws to attach the dust proof cover and the connector nut to prevent rain penetration. Take sufficient care not to damage the seal ring during any work.

Regarding initial tension setting (page 14):

⚠ WARNING

- Never let go of the drum during any work.
  When released, the drum suddenly rotates, possibly causing personal injury.
- After setting the initial tension, wire connection requires more than 2 people to secure the drum and connect the cable.

Safety instructions on use (page 15):

⚠ WARNING

- Never approach the moving parts during operation.
  There is a danger of being caught up.
- Turn off the power immediately in case of any trouble to avoid the problem escalating.
- Never use the reel when damaged or abnormal sound/vibration occurs.
- Never alter the reel or its accessories.
- Never let go of or unfasten the cable from the fixed points when the cable is pulled out.
  The cable will rewind suddenly, possibly causing personal injury.

⚠ CAUTION

- Use within the rated values of the operating voltage and current.
  Refer to the name plate attached to the body.
- Never pull out the cable past the winding length. Always leave 2 - 3 dead turns on the drum. (To the sign of red tape)
  Put sign (red tape) on the 2 – 3 dead turns when installing or replacing the cable.

Regarding periodic inspections (page 17):

⚠ WARNING

- Periodically inspect the reel and replace any worn or damaged parts.
  Carefully check the cable has no damage.
- If a malfunction is found during a periodic inspection, never reuse the reel but repair immediately.
- Allow the cable to fully wind onto the drum to give the minimum winding tension before carrying out inspections.
- Electric shock hazard.
  Turn off the power before removing the dust proof cover.
- Verify safety using some kind of electrical test sensor before carrying out inspections.

⚠ CAUTION

- Always put up an instruction sign ("Equipment being inspected", "Do not turn on the power", etc.) before carrying out periodic inspections or repair.
- Take care as the slip ring assembly can still be very hot even if the power is cut.
- Always use genuine parts for replacement.
- Test the insulation after the reel has been stored for a long time.

Regarding brush and slip ring replacement (page 20):

⚠ WARNING

- Electric shock hazard.
  Turn off the power and verify safety using some kind of electrical test sensor before carrying out replacement.
- Allow the cable to fully wind onto the drum to give the minimum winding tension before carrying out replacement.

⚠ CAUTION

- Always put up an instruction sign ("Equipment being inspected", "Do not turn on the power", etc.) before carrying out periodic inspections or repair.
- Take care as the slip ring assembly can still be very hot even if the power is cut.
- After part replacement, test the insulation before connecting the cable.
- Check the conduction of each cable core after cable connection.

Regarding spring replacement (page 22):

⚠ WARNING

- Electric shock hazard.
  Turn off the power and verify safety using some kind of electrical test sensor before carrying out replacement.
- When disconnecting the mating equipment side wiring on the cable winding side, the drum may suddenly rotate.
  Allow the cable to fully wind onto the drum to give the minimum winding tension, then dismantle the mating equipment side wiring with more than 2 people to secure the drum and dismantle the wiring.
  Allow the dismantled cable to wind around the drum, slowly turning the drum until the winding tension in the drum is released.
- Never disassemble until the reel's winding tension is released.
  The spring will burst out and cause personal injury.
- Never disassemble using any other disassembly procedure.
  If disassembled incorrectly, the spring will burst out and cause personal injury.
- Never remove the spring from the spring case.
  If removed, the spring will expand explosively and cause personal injury.
- Treat and dispose of the spring according to the instructions.

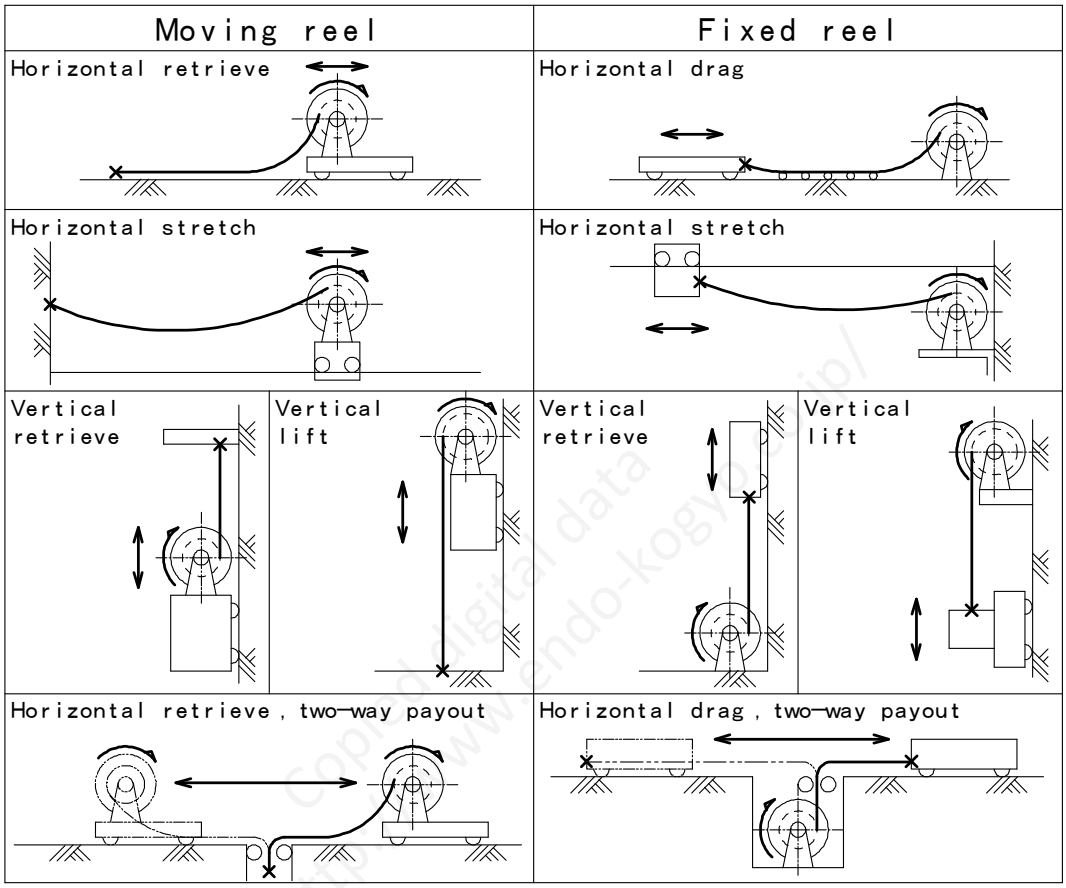
⚠ CAUTION

- Always put up an instruction sign ("Equipment being inspected", "Do not turn on the power", etc.) before carrying out periodic inspections or repair.

2. Terminology definitions

The terminology used in this manual will be explained here.
If there is any terminology which is unclear or not included in this section, please contact our company.

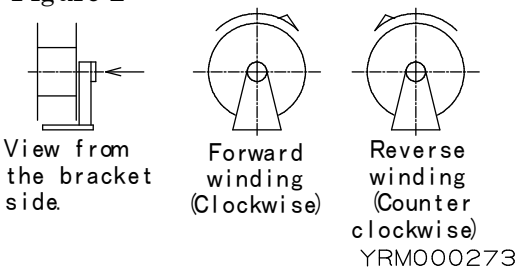
Winding methods: Figure 1



Forward winding : The winding direction when viewed from the bracket side is right (clockwise).

Reverse winding : The winding direction when viewed from the bracket side is left (counterclockwise).

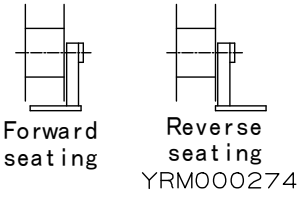
Figure 2



Forward seating : The installation plate (base plate) is located under the drum.

Reverse seating : The installation plate (base plate) is located on the opposite side of the drum.

Figure 3



C-class ground, connection work: applied to non-charging parts of electric equipment or cable metal jackets, the ground resistance of which should be 10 ohms or less.

Dead turns : The 2-3 turns of cable wrapped around the drum other than the used winding length.

Initial spring turns : The applied initial tension to the spring. The initial tension is required for winding the cable on the drum.

3. Product Description

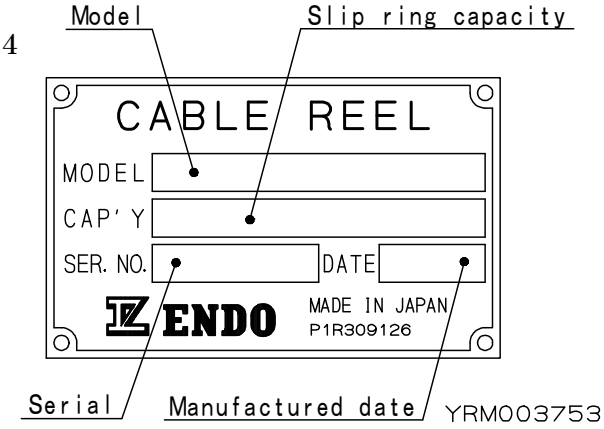
3-1. Models and specifications

(1) Models

Please observe the name plate attached to the main body.

Refer to Figure 5 (page 7) for the attached location.

Figure 4



MODEL: The product model is shown.
Please check if this manual matches with the product.
Refer to Table 1.

CAP'Y: The slip ring capacity is shown.

■ Model description

CRL	-	2A	2	05	W	-	1	R
Series name		Drum size and width	Drum cover size	Spring type	Spring combination		Installation plate	Winding direction

Drum size and width

Code	2	2A	3	3A	3B
Size	200	200	230	230	240
Width	75	110	75	110	127

Drum cover size

Code	2	3	4	5
Size	292	350	440	510

Spring type

Spring code	05	10	09	16	32
Number of springs	05×1	05×2	09×1	16×1	16×2
Total spring torque N・m {kgf・m}	4.9 {0.5}	9.8 {1.0}	8.8 {0.9}	15.6 {1.6}	31.4 {3.2}

Spring combination

Code	None	W	T
Number of sets	1	2	3

Installation plate

None	1
Forward seating	Reverse seating

Winding direction

None	R
Forward winding	Reverse winding

(2) Specifications

Table 1

Model	Maximum spring torque N・m { kgf・m }	Calculated maximum spring tension N { kgf }	Total number of spring turns	Spring structure	Reference mass kg
CRL-2205 CRL-2205-R	4.9 { 0.5 }	49 { 5.0 }	20	A	10
CRL-2305 CRL-2305-R	4.9 { 0.5 }	49 { 5.0 }	20	A	11
CRL-2A210 CRL-2A210-R	9.8 { 1.0 }	98 {10.0 }	20	D	13
CRL-2A205W CRL-2A205W-R	4.9 { 0.5 }	49 { 5.0 }	39	C	13
CRL-2A305W CRL-2A305W-R	4.9 { 0.5 }	49 { 5.0 }	39	C	14
CRL-3316 CRL-3316-R	15.6 { 1.6 }	132 {13.5 }	13	A	13
CRL-3A316W CRL-3A316W-R	15.6 { 1.6 }	132 {13.5 }	26	C	16
CRL-3A309W CRL-3A309W-R	8.8 { 0.9 }	73 { 7.5 }	38	C	16
CRL-3416 CRL-3416-R	15.6 { 1.6 }	132 {13.5 }	13	A	14
CRL-3409 CRL-3409-R	8.8 { 0.9 }	73 { 7.5 }	19	A	14
CRL-3A416W CRL-3A416W-R	15.6 { 1.6 }	132 {13.5 }	26	C	18
CRL-3A409W CRL-3A409W-R	8.8 { 0.9 }	73 { 7.5 }	38	C	18

NOTICE : The reference mass shown in the table is for a slip ring capacity of 30A×3P, and does not include accessories such as the guide rollers, turn table and ratchet mechanism.

※ The method for spring replacement is different depending on the spring structure. Refer to chapter 13. (page 22) "Spring replacement".

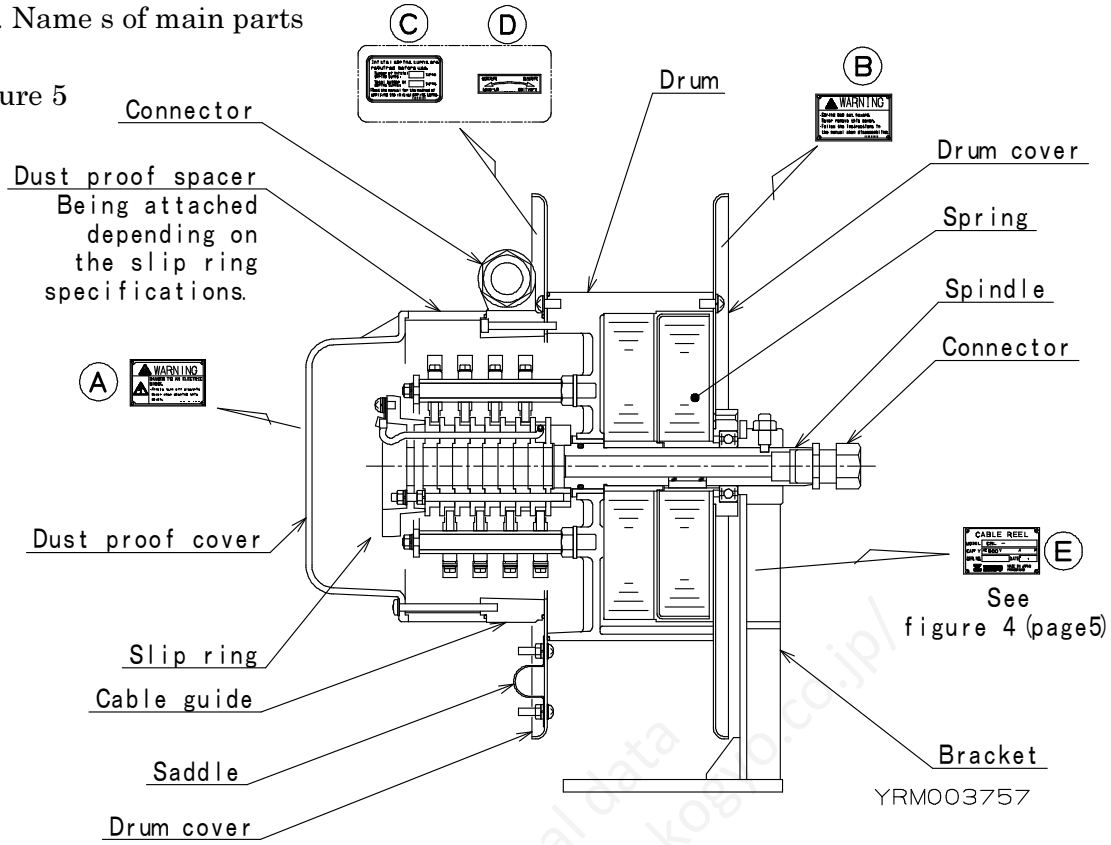
■ Working conditions

Application area : general outside conditions

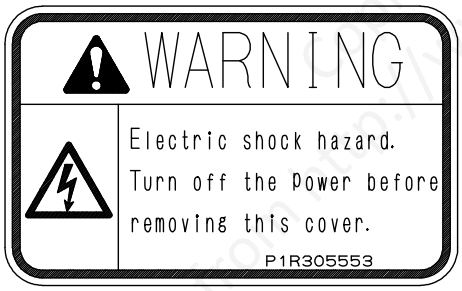
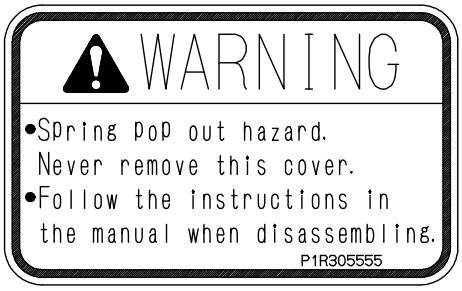
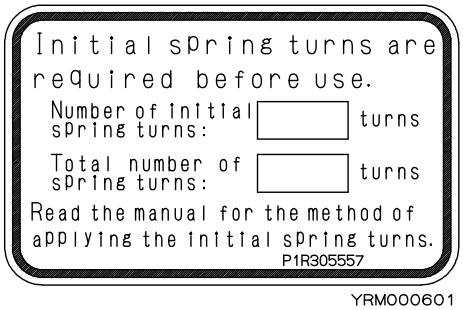
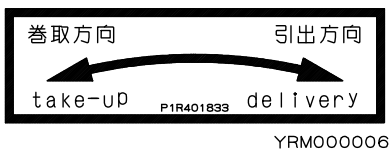
Surrounding temperature : - 10℃ to + 50℃

3-2. Name s of main parts

Figure 5



Regarding the accessories, refer to chapter 9. "Accessories" (page 16).

(A) Warning label	(B) Warning label
 YRM000600	 YRM000277
A warning is displayed regarding electric shock hazards.	A warning is displayed regarding spring ejection hazards.
(C) Label	(D) Label
 YRM000601	 YRM000006
The required number of initial spring turns is displayed.	The winding direction is displayed.

4. Installation

4-1. Checks before installation

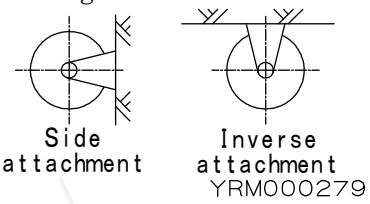
- Please check whether the items ordered were received.
  (Check the name plate.)
- Check there is no damage to the product caused during transportation.

4-2. Installation

⚠ WARNING

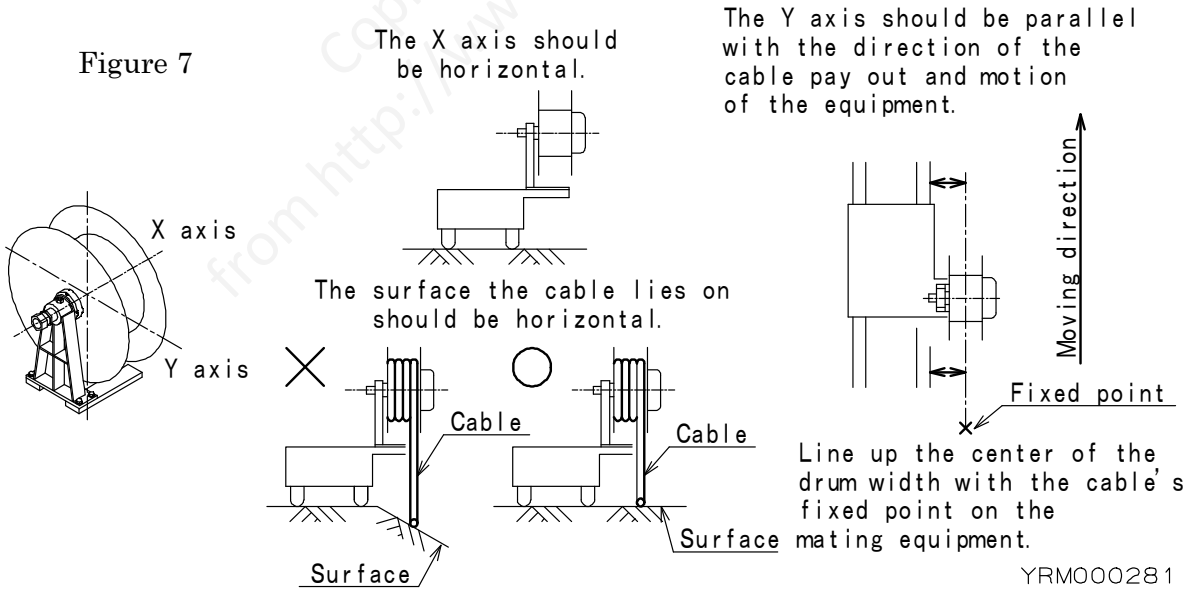
- **Never use in ignitable or explosive atmospheres.**
- **Take sufficient care not to knock or drop the reel when handling.**
  When lifting the reel, wrap the belt sling around the drum at least twice, and lift in stable conditions.
- **Never use the arm of the guide roller (special accessories) to lift the reel.**
- **For side attachment or inverse attachment, use bolts with a strength classification above 10.9.**

Figure 6



- Place the main body in the fixing location and anchor the bracket securely with 4 bolts.
  NOTE: In order to correctly wind the cable, adjust the reel position as shown in figure 7.
  Try to adjust so the center of the drum width lines up with the cables fixed point on the mating equipment.
  The surface the cable lies on should be horizontal.

Figure 7



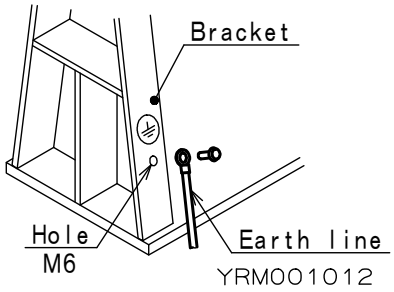
4-3. Ground connection work

⚠ WARNING

- **Electric shock hazard.**
  Do the ground connection work.
- **Never connect the earth line to the following:**
  Gas pipes, etc. : Danger of ignition or an explosion.
  Phone lines / lightning rods : Danger of being struck by lightning.
  Along plastic water pipes : Does not act as an earth.

For earth connection, connect the earth line to the hole installed in the bracket.

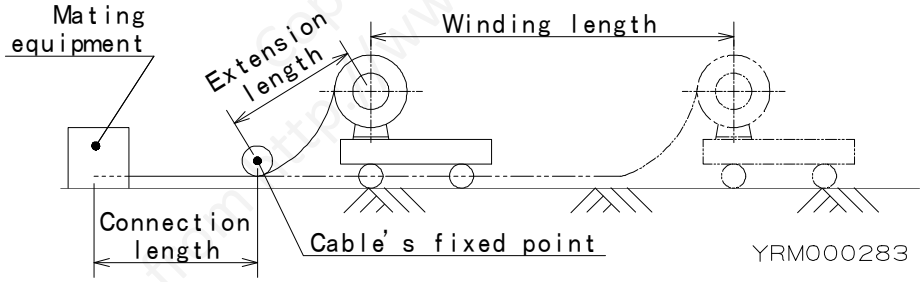
Figure 8



5. Cable connection

5-1. Calculation of required cable length on winding side

Figure 9



Cable length on winding side = Winding length + Extension length + Connection length + Dead turns length + Connection length inside reel.

Winding length = The length wound onto the drum.
Extension length = The length from the cable's fixed point to the end of the winding, which is not wound onto the drum.
Connection length = The length required to connect the mating equipment to the cables fixed point.
Dead turns length = The length of the 2-3 dead turns.
Connection length inside reel = Approx 0.5m.

$$\text{Required dead turns length} = \underline{(\text{Drum diameter} + \text{Cable diameter})} \times \pi \times \underline{2-3}$$

Numbers of dead turns

The lengths of 1 drum turn

5-2. Cable connection

⚠ WARNING

• Electric shock hazard.
Turn off the power before carrying out any work.

⚠ CAUTION

• Do not install cable to drum more than 2-3 times round.
(2-3 times means winding length & initial spring turns)
Make free space in drum, otherwise cable could spill out from drum cover.
If cable spilled, it causes accidents as a cable cutting.
• When used for vertical lift or horizontal stretch application, in order to prevent severing of the cable and then a fall in case of a spring breakage, protect the cable by wrapping rubber or the like around the cable portion which contacts with the oblong hole (F) in the drum cover (See figure 10).
• Check the wire connections are sound and there are no wiring errors.
• Never allow the cable (leads) connected to the terminal plate to protrude over 15mm from the terminal plate upper surface (See figure 11).
If protruding out too far, the fixed side cable and the dust proof cover will contact, damaging the cable insulation due to the drum rotation, causing a spark.
• Leave sufficient room for connecting the cable (leads) to the brushes so as not to apply excessive force to the brushes.
• Securely tighten the cross recessed head screws to attach the dust proof cover and the connector nut to prevent rain penetration.
Take sufficient care not to damage the seal ring during any work.

Figure 10

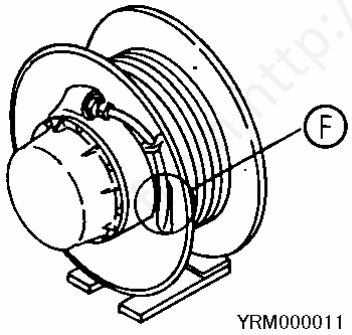
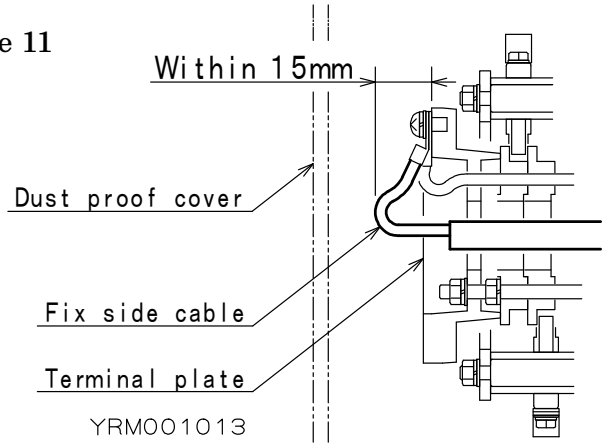


Figure 11

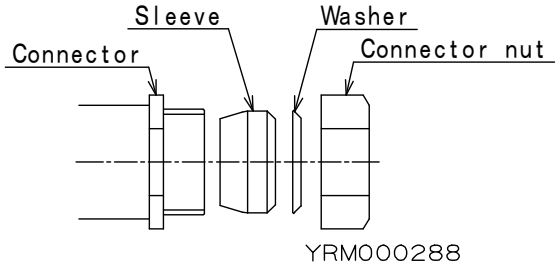


■ Winding side cable (See figure 13)

(1) Loosen the cross recessed head screws and remove the dust proof cover and dust proof spacer.

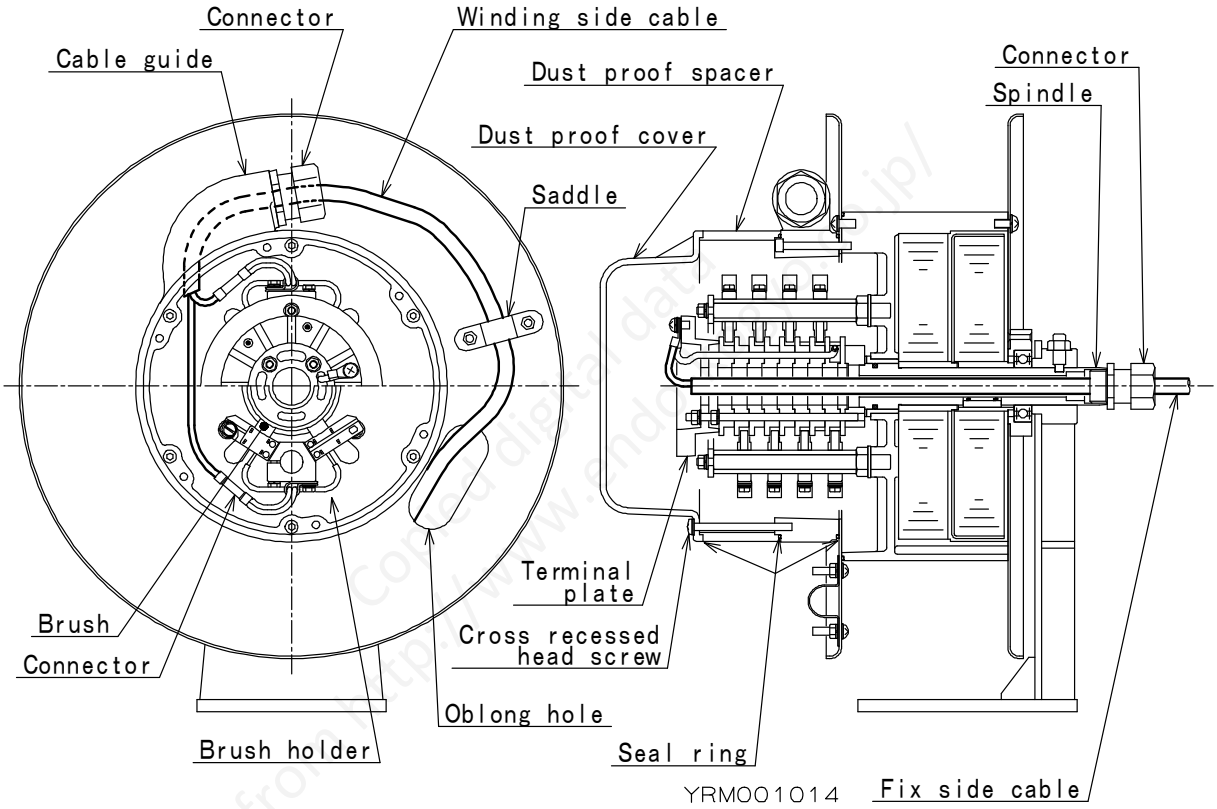
NOTE: The dust proof cover and dust proof spacer will fall when the cross recessed head screws are loosened.
Take care not to drop them into the slip ring assembly.

Figure 12



(2) Remove the saddle and the connector nut on the cable guide side.

Figure 13



(3) Pass the cable through the oblong hole in the drum cover from the drum side. Attach the removed nut, washer and sleeve to the cable (See figure 12).

(4) Peel the required length of jacket from the cable, and pass the cable through the cable guide.
Decide on the required length for peeling to allow sufficient room for connecting the cable core to the farthest brush holder from the cable guide exit.

(5) Tighten the connector nut to secure the cable while leaving sufficient room for connecting each cable core to the brush.
This is important to prevent rain penetration into the slip ring assembly.

NOTE: If the cable cannot be secured by tightening the connector nut, make the cable diameter bigger by wrapping thick tape around the cable, then secure with the connector nut (See figure 14 (page 12)).

Figure 14

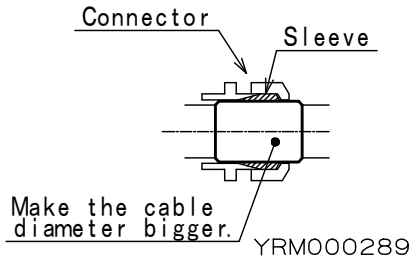
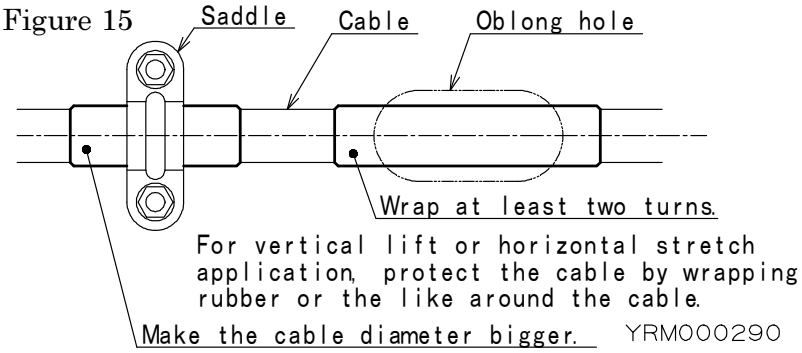


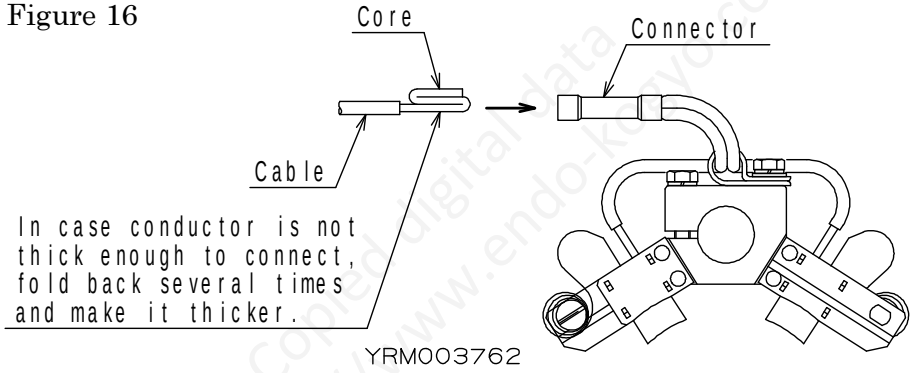
Figure 15



(6) Wrap thick tape around the cable portion which contacts with the oblong hole in the drum cover, and fix with the saddle.
If the cable cannot be secured by the saddle, make the cable diameter bigger by wrapping thick tape around the cable (See figure 15).

(7) Connect each core to the brush.
When each line core connect to solderless terminal, make thicker and connect it.
See figure 16. If it's not thick enough, the line core come out from terminal.

Figure 16



■ Fixed side cable (See figure 13 (page 11))

(1) Remove the connector nut on the spindle side.
Attache the connector nut, washer and sleeve to the cable.

(2) Peel 100 mm of jacket from the cable, and pass the cable through the spindle.

(3) Connect each cable core to the terminal plate.
NOTE: Check the conduction of each cable core to ensure there are no wiring errors.

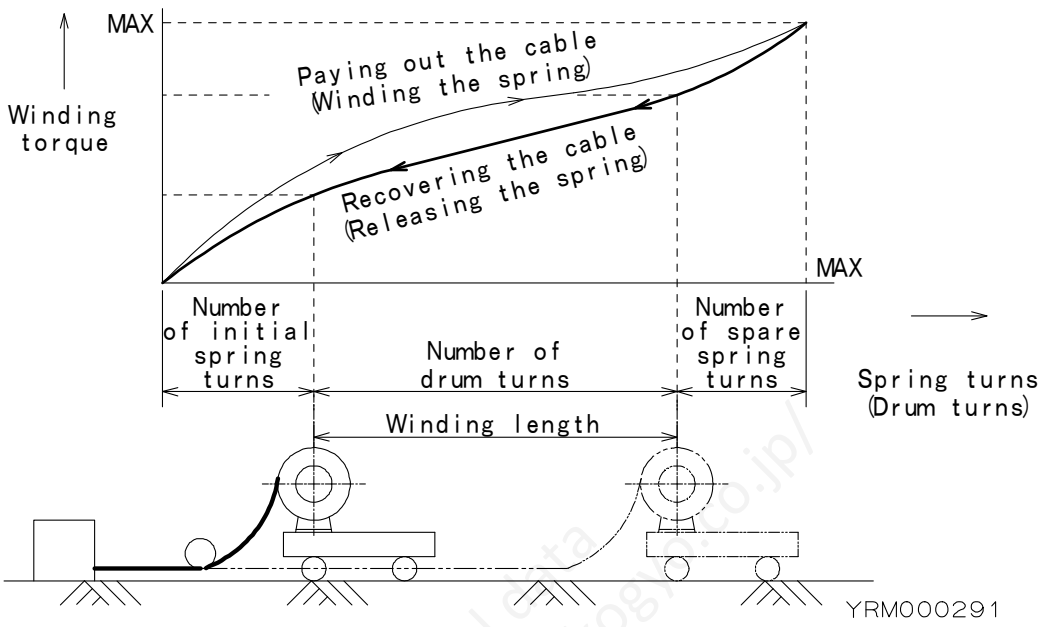
(4) Tighten the connector nut to secure the cable.
This is important to prevent rain penetration into the slip ring assembly.
NOTE: If the cable cannot be secured by tightening the connector nut, make the cable diameter bigger by wrapping thick tape around the cable, then secure with the connector nut (See figure 14).

(5) Attach the dust proof spacer and dust proof cover.

6. Spring tension adjustment

6-1. Relationship between winding torque and drum turns

Figure 17



"Number of initial spring turns" means the number of spring turns which provides the initial tension required for winding the cable onto the drum.

"Number of spare spring turns" means the number of remaining spring turns when the cable is fully paid out.
A shortage of spare spring turns shortens the spring life and causes spring breakage.

6-2. Standard value of initial spring turns and calculation for upper limit of initial spring turns

(1) Check the total number of spring turns using table 1(page 6).
(2) Rotate the drum by hand until the cable of the winding length is fully retracted, checking the number of drum turns.
(3) Check the standard value of initial spring turns and the number of spare spring turns using table 2.

Table 2

Spring combination	Number of sets	Standard value of initial spring turns	Number of spare spring turns
None	1	1 to 3	1.5 or more
W	2	2 to 6	3 or more
T	3	3 to 9	4.5 or more

Upper limit of initial spring turns = Total number of spring turns - (Number of drum turns + Number of spare spring turns)

Example) Model CRL-2A205W, for the case of 20 drum turns
According to table 1, total number of spring turns = 39.
According to table 2, standard value of initial spring turns = 2 - 6,
Number of spare spring turns = 3 or more.
Upper limit of initial spring turns = 39 - (20 + 3) = 16.
Then the allowable number of initial spring turns = 2 - 16.

6-3. Initial tension setting

WARNING

- **Never let go of the drum during any work.**
  When released, the drum suddenly rotates, possibly causing personal injury.
- **After setting the initial tension, wire connection requires more than 2 people to secure the drum and connect the cable.**

(1) Before wire connection, wind the whole cable around the drum.
NOTE: Take care not to twist the cable during winding.

(2) With the cable still wrapped around the drum, rotate the drum by hand in the payout direction the same number of turns as the standard value of initial spring turns.
This becomes "initial spring turns".

(3) Without letting the drum rotate, unwind the cable to the extension length plus the connection length and connect the cable to the mating equipment.
Check there are no twists in the cable before connection.

(4) Pull out the cable to the winding length, then let the cable wind around the drum.
Ensure the drum can recover the cable's full winding length.

(5) If the drum stops during recovery, the initial spring tension is insufficient.
Disconnect the cable from the mating equipment and increase the number of initial spring turns in the same manner.
NOTE: Set the initial tension as small as possible and never exceed the upper limit of the initial spring turns.
Over-tensioning could cause a spring breakage.

7. Measures against uneven winding

"Uneven winding" means the cable is wound on mainly one side of the drum width.
The uneven winding will cause the cable to drop from the drum or recovery problems, resulting in damage to the cable.

7-1. Checks before adjustments

(1) Check the reel position is correct.
Refer to Chapter 4, Section 4-2. "Installation".
Adjust the X and Y axes of the reel.

(2) Check there are no twists in the winding side cable.
Disconnect the cable from the mating equipment and remove any twists.

※ If uneven winding still exists after the above checks, adjust according to the next section.

7-2. Adjustments

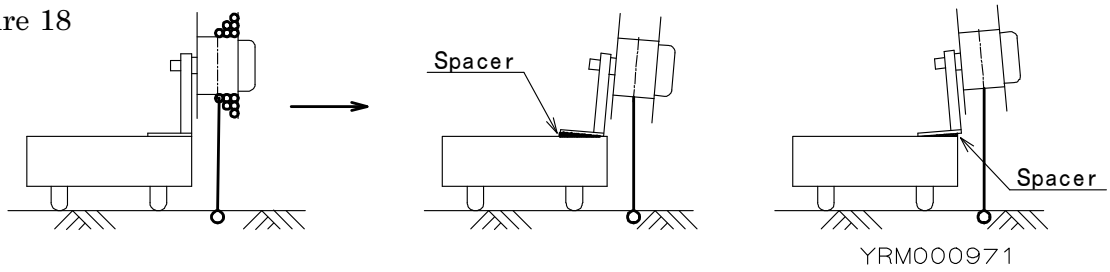
(1) Initial tension modification

Increase the number of initial spring turns one by one without exceeding the upper limit.
If there is no improvement, set the initial tension back to the first value.

(2) X axis modification

Tilt the X axis at a small angle by inserting a spacer under the bracket.

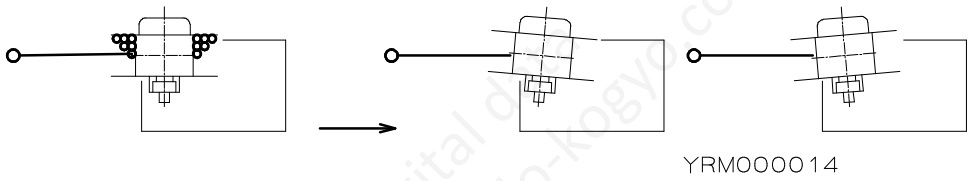
Figure 18



(3) Y axis modification

Tilt the Y axis at a small angle after adjusting the X axis.

Figure 19



8. Safety instructions on use

⚠ WARNING

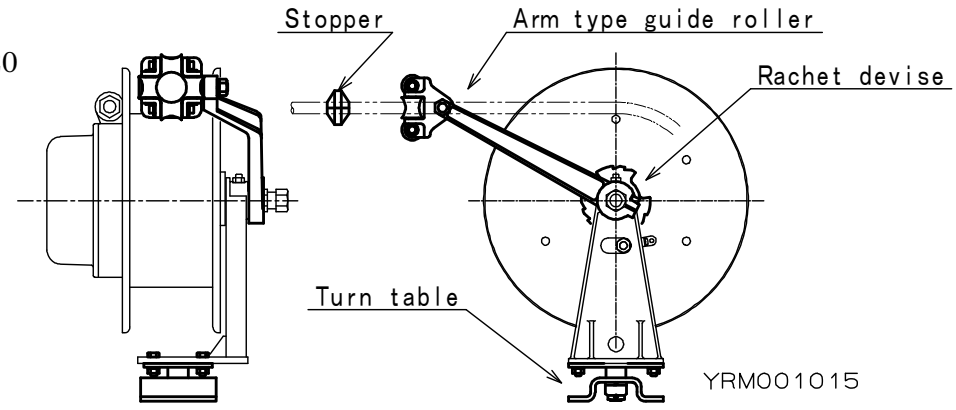
- Never approach the moving parts during operation.
  There is a danger of being caught up.
- Turn off the power immediately in case of any trouble to avoid the problem escalating.
- Never use the reel when damaged or abnormal sound/vibration occurs.
- Never alter the reel or its accessories.
- Never let go of or unfasten the cable from the fixed points when the cable is pulled out.
  The cable will rewind suddenly, possibly causing personal injury.

⚠ CAUTION

- Use within the rated values of the operating voltage and current.
  Refer to the name plate attached to the body.
- Never pull out the cable past the winding length.
  Always leave 2 - 3 dead turns on the drum. (To the sign of red tape)
  Put sign (red tape) on the 2 – 3 dead turns when installing or replacing the cable.

9. Special accessories

Figure 20



(1) Turn table

This can swivel the reel up to 300° .

When turned, take care the fixed side cable is not put under excessive force or contacts the reel or surrounding objects.

An arm type guide roller is required together with the turn table.

The fixing position varies depending on the drum width.

Confirm the model name indicated on the name plate, then check the drum code and width.

Refer to chapter 3, section 3-1. "Model and specifications".

Fix the turn table to the bracket with the enclosed 4 bolts and nuts referring to figure 22.

Figure 21

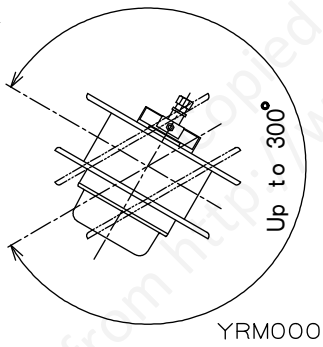
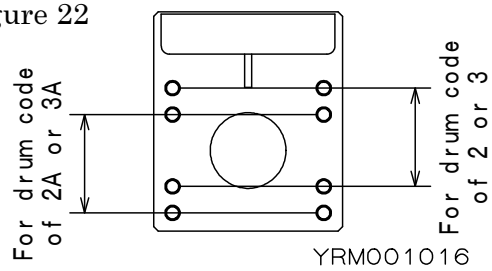


Figure 22



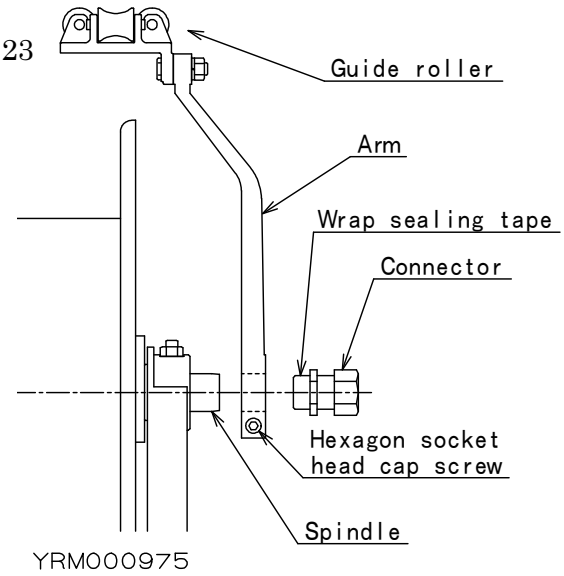
(2) Arm type guide roller

This is required when the reeling direction angle varies during operation.

For installation, remove the connector, then attach the arm to the spindle and fix with the hexagon socket head cap screw.

NOTE: After installation, wrap two turns of sealing tape around the thread of the connector and tighten the connector into the spindle.

Figure 23



(3) Stopper

This will stop the cable at the attached location during a winding operation when used with the arm type guide roller.

(5) Ratchet device (Drawer dedicated manual)
This is used when the winding operation stops and the cable is still paid out.
To stop the drum, pull out the cable slightly then let it return.
If the drum does not stop, pull out the cable a different length and try again.
To release the drum, pull out the cable so as to rotate the drum by 1/2 turns.

10. Periodic inspections

⚠ WARNING

- **Periodically inspect the reel and replace any worn or damaged parts. Carefully check the cable has no damage.**
- **If a malfunction is found during a periodic inspection, never reuse the reel but repair immediately.**
- **Allow the cable to fully wind onto the drum to give the minimum winding tension before carrying out inspections.**

⚠ CAUTION

- **Always put up an instruction sign ("Equipment being inspected", "Do not turn on the power", etc.) before carrying out periodic inspections.**
- **Always use genuine parts for replacement.**

■ Inspect the reel at least every 6 months.
Make the inspection interval shorter when operating frequently or under hostile environments.

10-1. Visual inspections
- Is there any deformation or damage on the reel?
- Are any bolts or screws loose, missing or rusted?
- Are there any twists or damage on the cable?

10-2. Slip ring inspections

⚠ WARNING

- **Electric shock hazard.**
  Turn off the power before removing the dust proof cover.
- **Verify safety using some kind of electrical test sensor before carrying out inspections.**

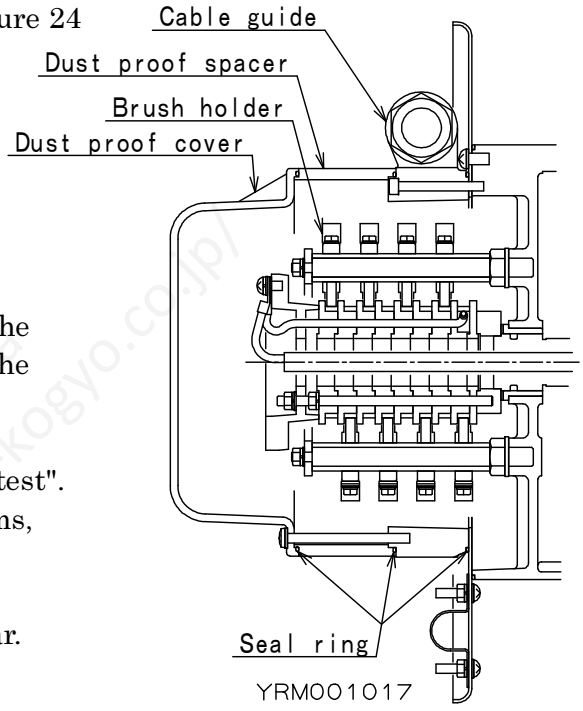
⚠ CAUTION

- **Take care as the slip ring assembly can still be very hot even if the power is cut.**

(1) Dust proof cover and dust proof spacer

- Is there any penetration of rain or dust inside the dust proof cover?
  If penetration is found, the screws are not properly tightened, the seal ring are worn or damaged, or the connector is not properly tightened.
  Check and correct these items.
  After removing any water or dust, disconnect the fixed side cable and remove the brushes from the brush holders, then test the insulation.
  Refer to chapter 12, sections 12-1. "Brush replacement" and 10-2. (6) "Insulation test".
  If the insulation resistance is less than 5M ohms, disassembly and repairs are necessary.
  Dark brown or black color powders are carbon powders produced from the brushes due to wear.
  Wipe off with a cloth or the like.

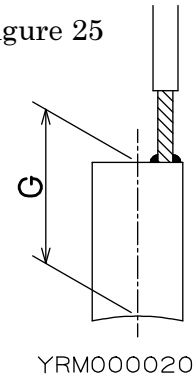
Figure 24



(2) Brushes

- Are the brushes worn?
  Replace the brush with a new one if dimension G shown in figure 25 becomes 17.5mm or less.
  Refer to chapter 12, section 12-1. "Brush replacement".
- Can the brushes move smoothly in the brush holders?

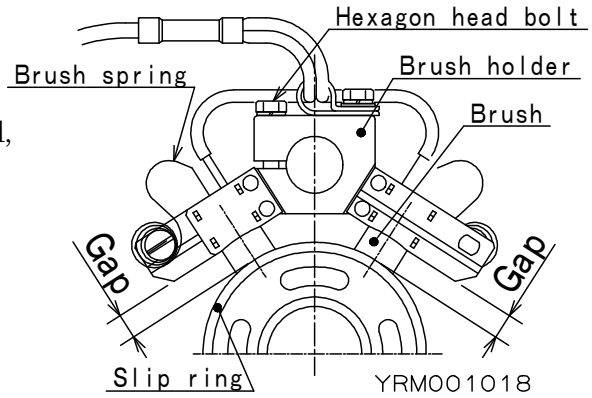
Figure 25



(3) Brush holders

- Are carbon powders adhering to the brush holders?
  Wipe off with a cloth or the like if adhering.
- Are the hexagon head bolt (See figure 26) loose?
  If loose, adjust the brush holder position so that the brush is located at the center of the slip ring width and the gaps between the brush holder and the slip ring are equal, then tighten the hexagon head bolt.
- Are the brush springs broken or rusted?

Figure 26



(4) Slip rings

・ Are carbon powders adhering to the brush holders?
Wipe off with a cloth or the like if adhering.

・ Are the slip ring surfaces rough or discolored?
If there are any scratches or burns on the surface, polish with # 240 or finer sand paper.

(5) Bolts and screws

・ Are any bolts or screws loose, missing or rusted?

(6) Insulation test

・ Check each insulation resistance is 5M ohms or more using a DC 500V insulation tester.

■ When the cable is disconnected;
Measure the insulation resistance among the poles and between each pole and ground.

■ When the cable is connected;
Disconnect the fixed side cable wiring and remove the brushes from the brush holders before the test.
Measure the insulation resistance among the slip rings, among the brush holders and between each slip ring or brush holder and ground.

10-3. Slip ring inspections

⚠ CAUTION

・Test the insulation after the reel has been stored for a long time.
Refer to section 10-2. (6) "Insulation test".

Store the reel in an indoor dry location when not being used for a long time.

11. Troubleshooting

Malfunction	Main causes	Solution
Unable to set the initial tension.	Direction of initial spring turns is incorrect.	Rotate in the cable paying out direction.
	The spring is broken.	Replace with a new spring.
The reel cannot retrieve the cable.	The initial tension is insufficient.	Increase the initial spring turns.
	The spring is broken.	Replace with a new spring.
No conduction between the winding side and the fixed side cables.	Contact error between the brush and the slip ring.	Securely place the end of the brush spring into the brush recess and adjust the brush position.
	Wiring error.	Connect the wiring correctly.
Short - circuit.	The cable insulation jacket is damaged.	Replace the whole slip ring assembly. Test the insulation after replacement. See chapter 10, section 10-2. (6) "Insulation test".
	Invasion of foreign matter into the slip ring assembly.	

12. Brush and slip ring replacement

⚠ WARNING

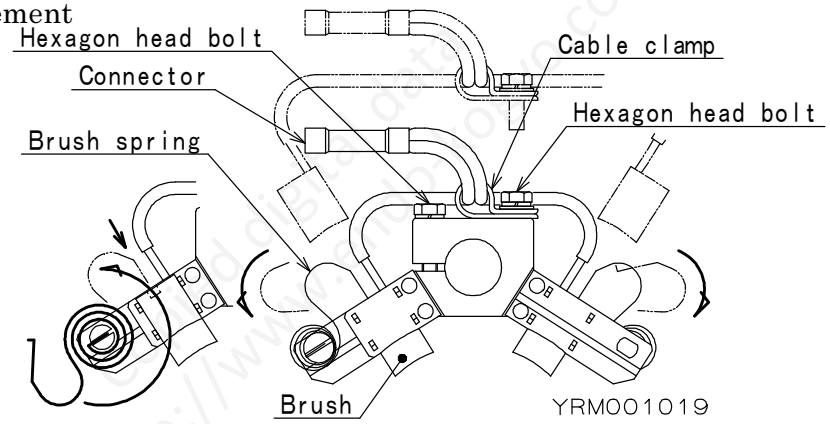
- Electric shock hazard.
  Turn off the power and verify safety using some kind of electrical test sensor before carrying out replacement.
- Allow the cable to fully wind onto the drum to give the minimum winding tension before carrying out replacement.

⚠ CAUTION

- Always put up an instruction sign ("Equipment being inspected", "Do not turn on the power", etc.) before carrying out replacement.
- Take care as the slip ring assembly can still be very hot even if the power is cut.
- After part replacement, test the insulation before connecting the cable.
  Refer to chapter 10, section 10-2. (6) "Insulation test".
- Check the conduction of each cable core after cable connection.

12-1. Brush replacement

Figure 27



(1) Cut the cable at the portion beside the connector.
(2) Loosen the hexagon head bolt and remove the cable clamp from the brush holder.
(3) Lift up the brush spring in the direction indicated by the arrow (See figure 26) and remove the brush from the brush holder.
NOTE: Do not lift up the brush spring more than necessary.
Otherwise, the brush spring will be permanently deformed and replacement will be required.

(4) Attach a new brush in the brush holder and place the end of the brush spring into the brush recess.
(5) Rotate the drum by hand and check the brush properly contacts with the slip ring.
If the contact is not sound, adjust as follows:
1) Prepare # 240 or finer sand paper having the same width as the slip ring.
2) Insert the sand paper between the brush and the slip ring so that the sanding surface contacts with the brush.
3) Move the sand paper back and forth around the slip ring surface to sand down the brush.
(6) Pass the brush lead through the cable clamp and fix the cable clamp with the hexagon head bolt.
(7) Connect the cable to the connector.

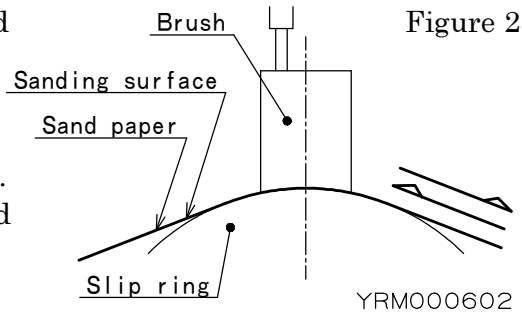


Figure 28

12-2. Brush holder replacement (See figures 27 (page 20) and 29)

Figure 29

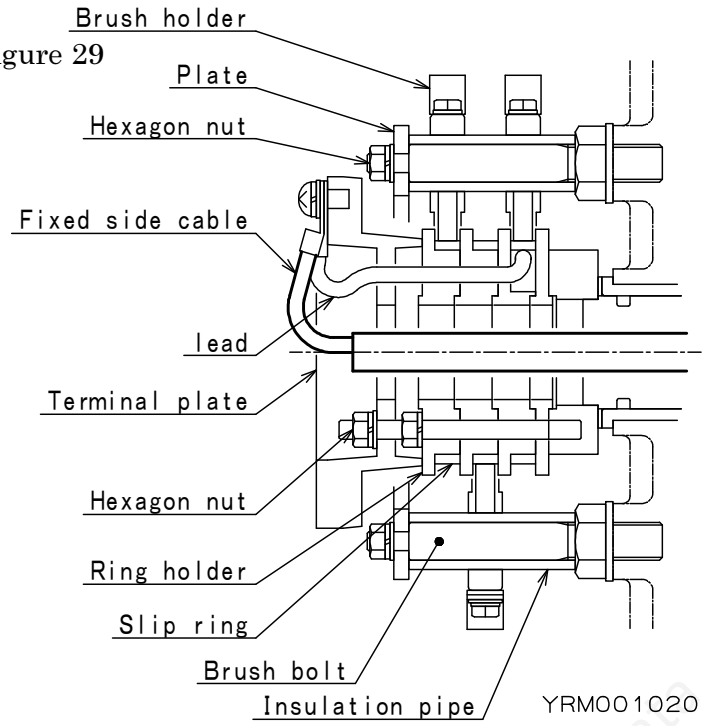
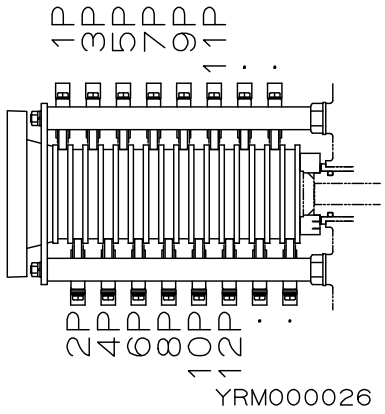


Figure 30

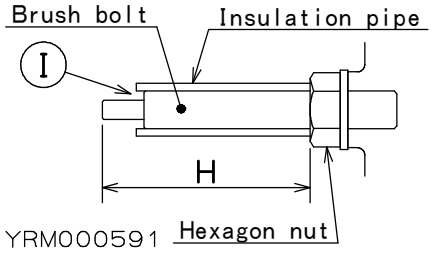


(1) Remove the cable clamp and brush from the brush holder.
(2) Disconnect the fixed side cables and leads from the terminal plate.
(3) Remove the terminal plate and the plate.
(4) Loosen the hexagon head bolt which fixes the brush holder and remove the brush holder from the insulation pipe.
(5) Attach a new brush holder to the insulation pipe and lightly tighten the hexagon head bolt.
NOTE: Attach the brush holder so that each brush holder alternates on each of the two insulation pipes as shown in figure 30.
(6) Attach the plate and the terminal plate, and connect the fixed side cables and leads.
NOTE: When assembling the terminal plate, do not over tighten the hexagon nut. Otherwise, the terminal plate could crack.
(7) Attach the brush to the brush holder, then adjust the brush holder position and fix with the hexagon head bolt.
NOTE: Check the brush is located at the center of the slip ring width and the gaps between the brush holder and the slip ring are equal (See figure 26 (page 18)).

■ When disassembly of the brush bolt is required for spring replacement, etc.:

(1) Before removing the brush bolt, measure dimension H as shown in figure 31.
This dimension is important when reassembling.
(2) Loosen the hexagon nut and remove the brush bolt.
(3) For reassembly, set dimension H to the same value as before and fix the brush bolt with the hexagon nut.
NOTE: Check there is no gap between the insulation pipe and the hexagon nut, and the top of the insulation pipe protrudes from the top of the brush bolt (See location (I) in figure 31).

Figure 31

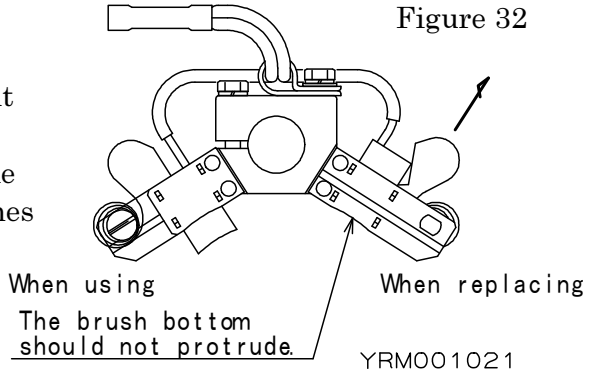


12-3. Slip ring replacement (See figure 29 (page 21))

(1) Remove the terminal plate, plate and brush holders in the same manner as section 12-2. "Brush holder replacement".

NOTE: When replacing the slip rings alone, the slip rings can be removed without removing the brush holders.
Lift up the brush springs and pull the brushes upward, then hold the brushes by the brush springs (See figure 31).

Figure 32



(2) Loosen the hexagon head bolts which fix the ring holder, and remove the ring holder and the slip ring together.

(3) Attach a new slip ring.
Reassemble the terminal plate, plate and brush holders in the same manner as section 12-2. "Brush holder replacement".

13. Spring replacement

⚠ WARNING

- Electric shock hazard.
  Turn off the power and verify safety using some kind of electrical test sensor before carrying out replacement.
- When disconnecting the mating equipment side wiring on the cable winding side, the drum may suddenly rotate.
  Allow the cable to fully wind onto the drum to give the minimum winding tension, then dismantle the mating equipment side wiring with more than 2 people to secure the drum and dismantle the wiring.
  Allow the dismantled cable to wind around the drum, slowly turning the drum until the winding tension in the drum is released.
- Never disassemble until the reel's winding tension is released.
  The spring will burst out and cause personal injury.
  Even if the spring seems to be broken, never disassemble before ensuring no winding tension remains by rotating the drum by hand.
- Never disassemble using any other disassembly procedure.
  Treat and dispose of the spring according to the instructions.

⚠ CAUTION

- Always put up an instruction sign ("Equipment being inspected", "Do not turn on the power", etc.) before carrying out replacement.

Before disassembly, check the winding direction (forward winding or reverse winding) and the spring structure (A - D) of the reel.
Confirm the model name indicated on the name plate, then refer to chapter 3, section 3-1. "Models and specifications".
Disassembly and reassembly procedures are different depending on the winding direction and spring structure.

13-1. Disassembly of slip ring assembly and bracket

(Common method for all spring structures)

(1) Turn off the power and allow the cable to fully wind onto the drum to give minimum winding tension, then dismantle the mating equipment side wiring.
Allow the dismantled cable to wind around the drum, slowly turning the drum until the winding tension in the drum is released.
This work requires more than two people.

(2) Remove the slip ring assembly from the reel in the same manner as chapter 12. "Brush and slip ring replacement".

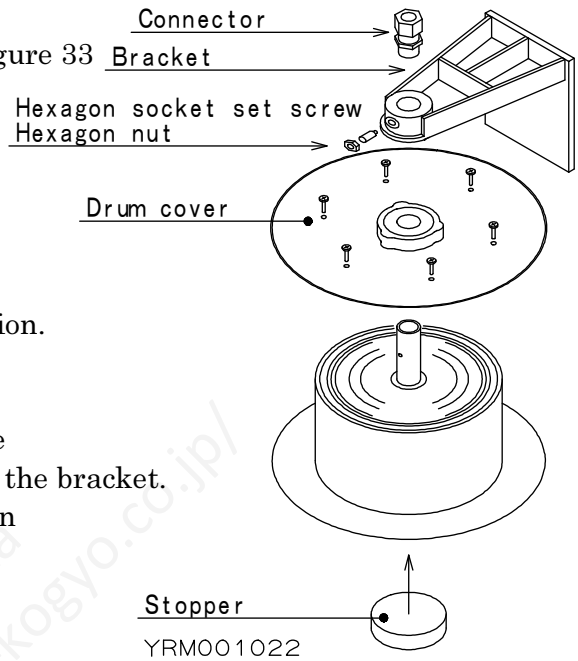
(3) Dismantle the fixed side cable, and remove the connector which is attached to the spindle.

(4) Unwind the cable and remove from the drum, then remove the reel from the installation position.

(5) Place the reel on a work table with the slip ring side downward.
Place a stopper under the spindle to prevent the spindle from moving downward when removing the bracket.

(6) Loosen the hexagon nut and remove the hexagon socket set screw.
Pull out the bracket from the spindle.
Remove the drum cover from the drum.

Figure 33



⚠ WARNING

- **Move the drum cover upward about 15mm and check the internal spring does not pop out, then remove the drum cover.**

(7) Follow the disassembly and reassembly procedures depending on the spring structure.

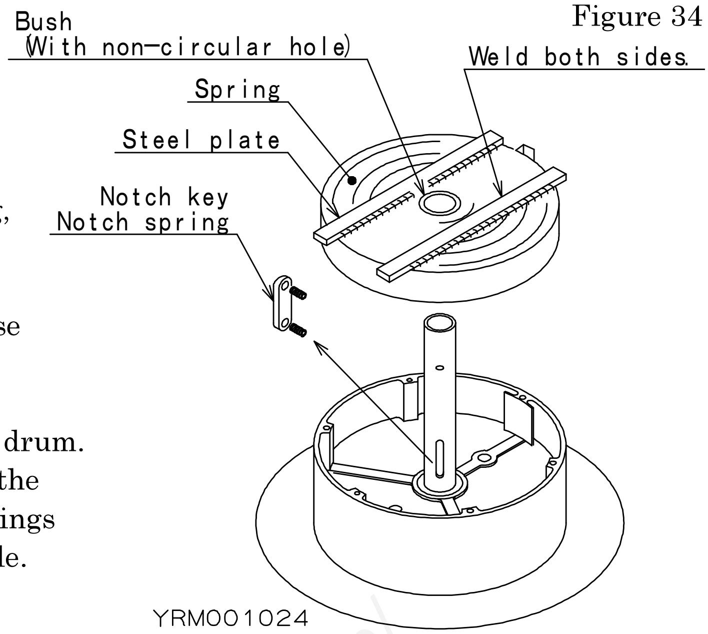
13-2. Disassembly and reassembly according to spring structure

⚠ WARNING

- **The spring is dangerous due to its tensional energy.**
  If incorrectly handled, the spring will expand explosively and causing personal injury.
- **Never remove the spring, which is not installed in the case, from the drum without welding the steel plates to the spring.**
  Never use gas welding, only use arc welding.
- **Never remove the spring from the spring case.**
- **Never remove the band from the new spring before replacement.**
- **Hold the center of the new spring, which is bound with the band, by hand to prevent from falling when handling.**
- **Never turn the spring case upside down.**
  If upside down, the spring will expand explosively and cause personal injury.

■ For spring structure A (1 spring)

Figure 34



(1) Weld steel plates to the spring in order to prevent the spring from expansion.
Use steel plates with enough length to cover the periphery of the spring, and weld along the whole length.
NOTE: Wipe off all grease from the spring surface to avoid grease combustion.

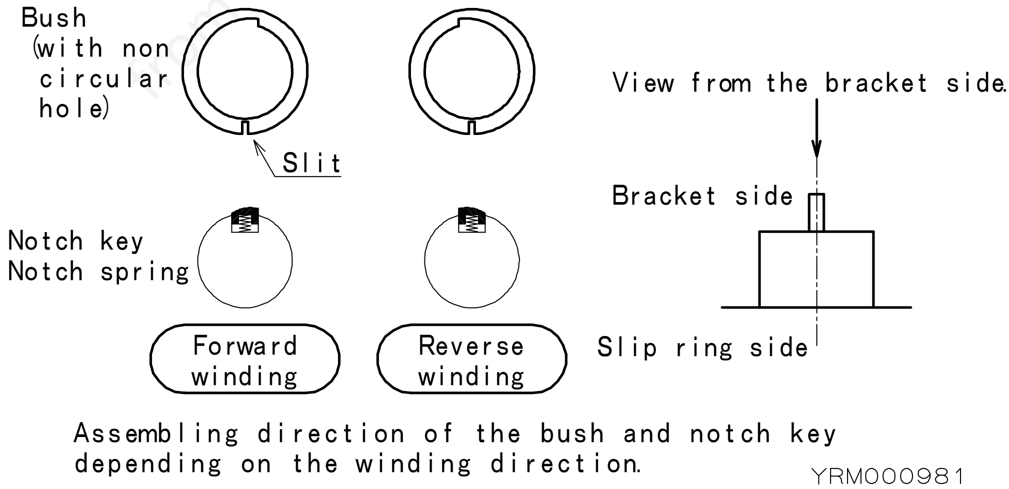
(2) Remove the welded spring from the drum.
NOTE: When removing the spring, the notch key and two notch springs will drop out from the spindle. Take care not to lose them.

(3) Remove the bush from the spring.

(4) Before reassembly, clean and inspect all the disassembled parts.
Replace worn, cracked, damaged or deformed parts.

(5) Lightly lubricate the bush attaching portion of the spindle and the inside surface of the bush with grease (IDEMITHU, DAPHNE EPONEX GREASE EP-1 or equivalents).
Place the notch key and notch springs into the slot of the spindle and attach the bush with the non-circular hole to the spindle.
Take care as the assembling direction of the notch key depends on the winding direction of the reel. See figure 35.
The machined end of the bush should face upward.

Figure 35

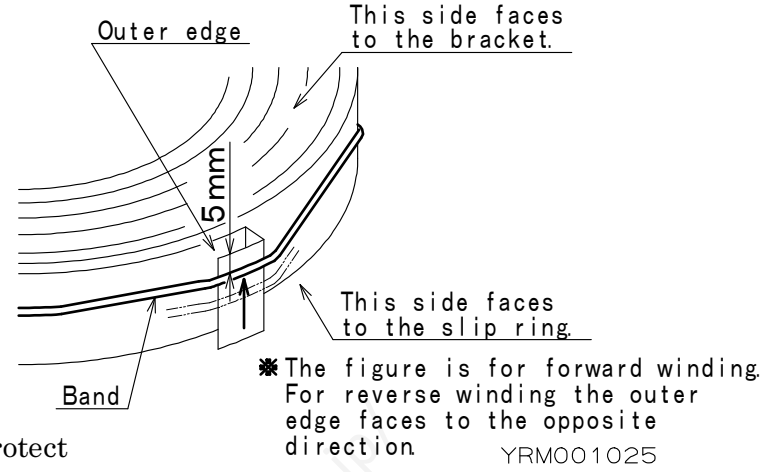


(6) Install the spring into the drum.

1) Before installation, check the assembling direction which depends on the winding direction of the reel. See figure 37.

2) Slightly move the band upward in order to make the removal easy. See figure 36.

Figur e 36



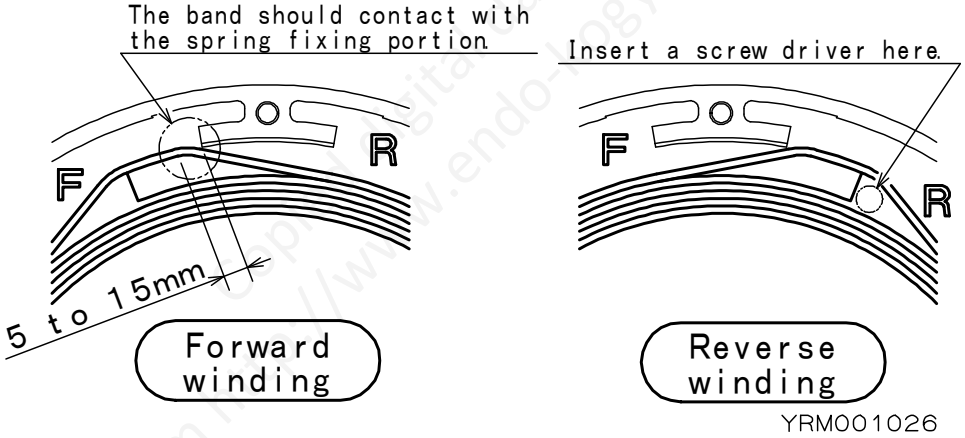
⚠ WARNING

Never move the band too much.
If moved too much, the band will come off and the spring will expand explosively, causing personal injury.

3) Place the spring into the drum. Fit the center edge of the spring into the slit of the bush by hammering.
Put a steel plate or the like to protect the spring when hammering.

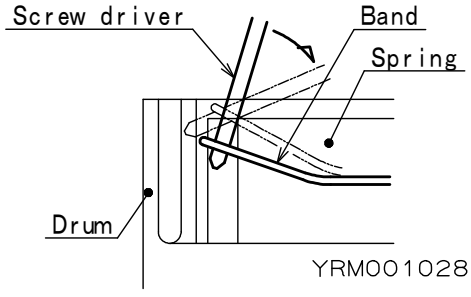
4) Place the outer edge of the spring on the spring fixing portion of the drum. See figure 37.

Figure 37



5) Insert a screw driver into the space between the band and the spring as shown in figure 38, then remove the band.

Figure 38



⚠ WARNING

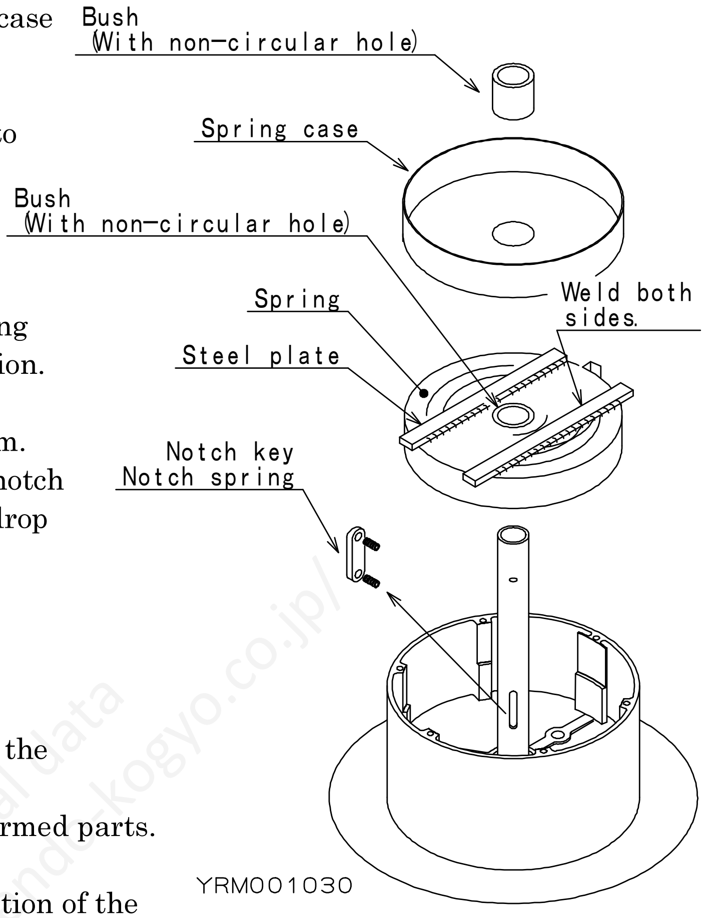
Take care not to catch your finger in the spring since the spring will expand explosively when the band is remove.

6) Lubricate the spring with 22cm^3 (mL) of grease (KYODO, ONELUBER MP No.2 or equivalents). Spread grease all over the spring.

(7) Follow the procedure given in section 13-3. "Common reassembly

■ For spring structure B (1 spring and an empty spring case)

Figure 39



(1) Remove the bush and the empty spring case from the drum.

(2) Weld steel plates to the spring in order to prevent the spring from expansion.
Use steel plates with enough length to cover the periphery of the spring, and weld along the whole length.
NOTE: Wipe off all grease from the spring surface to avoid grease combustion.

(3) Remove the welded spring from the drum.
NOTE: When removing the spring, the notch key and two notch springs will drop out from the spindle.
Take care not to lose them.

(4) Remove the bush from the spring.

(5) Before reassembly, clean and inspect all the disassembled parts.
Replace worn, cracked, damaged or deformed parts.

(6) Lightly lubricate the bush attaching portion of the spindle and the inside surface of the bush with grease (IDEMITHU, DAPHNE EPONEX GREASE EP-1 or equivalents).
Place the notch key and notch springs into the slot of the spindle and attach the bush with the non-circular hole to the spindle.
Take care as the assembling direction of the notch key depends on the winding direction of the reel. See figure 35 (page 24).
The machined end of the bush should face upward.

(7) Install the spring into the drum.
1) Before installation, check the assembling direction which depends on the winding direction of the reel. See figure 37 (page 25).
2) Slightly move the band upward in order to make the removal easy.
See figure 36 (page 25).

⚠ WARNING

Never move the band too much.
If moved too much, the band will come off and the spring will expand explosively, causing personal injury.

3) Place the spring into the drum.
Fit the center edge of the spring into the slit of the bush by hammering.
Put a steel plate or the like to protect the spring when hammering.

4) Place the outer edge of the spring on the spring fixing portion of the drum.
See figure 37 (page 25).

5) Insert a screw driver into the space between the band and the spring as shown in figure 38 (page 25), then remove the band.

⚠ WARNING

Take care not to catch your finger in the spring since the spring will expand explosively when the band is removed.

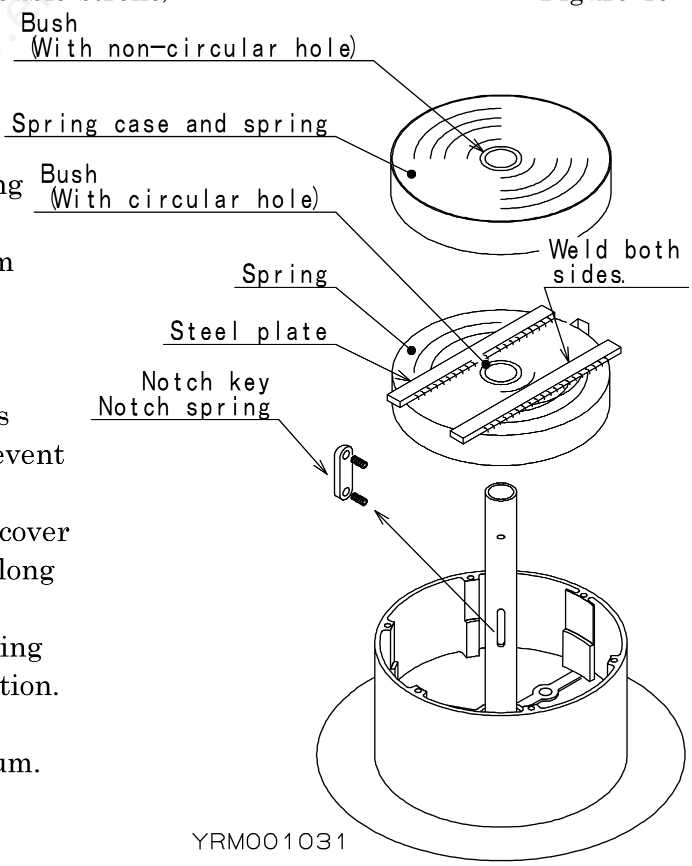
6) Lubricate the spring with 22 cm^3 (mL) of grease (KYODO, ONELUBER MP No.2 or equivalents).
Spread grease all over the spring.

(8) Install the empty spring case in to the drum.
Lightly lubricate the inside surface of the bush with grease (IDEMITHU, DAPHNE EPONEX GREASE EP-1 or equivalents) and install the bush into the drum.
The machined end of the bush should face upward.

(9) Follow the procedure given in Section 13-3. "Common reassembly method".

■ For spring structure C (2 or 3 springs, double-stroke)

Figure 40



(1) Remove the upper spring case and spring together from the drum.
Grip the spring case with pliers and slowly pull out from the drum by hand.
NOTE: When removing the upper spring case, the notch key and two notch springs will drop out from the spindle.
Take care not to lose hem.

(2) Weld steel plates to the spring, which is not installed in the case, in order to prevent the spring from expansion.
Use steel plates with enough length to cover the periphery of the spring, and weld along the whole length.
NOTE: Wipe off all grease from the spring surface to avoid grease combustion.

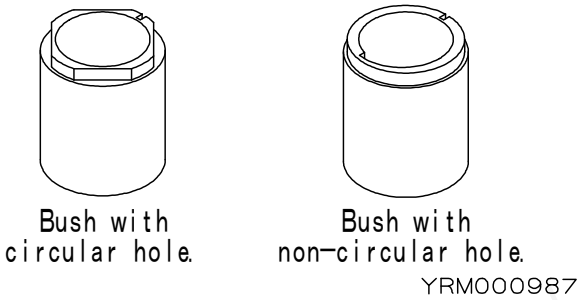
(3) Remove the welded spring from the drum.

(4) Remove the bush from the spring.

(5) Before reassembly, clean and inspect all the disassembled parts.
Replace worn, cracked, damaged or deformed parts.

(6) Lightly lubricate the bush attaching portion of the spindle and the inside surface of the bush with grease (IDEMITHU, DAPHNE EPONEX GREASE EP-1 or equivalents).
Attach the bush with the circular hole to the spindle.
The machined end of the bush should face upward.

Figure 41



(7) Install the spring without the spring case into the drum.
1) Before installation, check the assembling direction which depends on the winding direction of the reel. See figure 36 (page 23).
2) Slightly move the band upward in order to make the removal easy.
See figure 36 (page 25).

⚠ WARNING

Never move the band too much.
If moved too much, the band will come off and the spring will expand explosively, causing personal injury.

3) Place the spring into the drum.
Fit the center edge of the spring into the slit of the bush by hammering.
Put a steel plate or the like to protect the spring when hammering.
4) Place the outer edge of the spring on the spring fixing portion of the drum.
See figure 37 (page 25).
5) Insert a screw driver into the space between the band and the spring as shown in figure 38 (page 25), then remove the band.

⚠ WARNING

Take care not to catch your finger in the spring since the spring will expand explosively when the band is removed.

6) Lubricate the spring with 22 cm^3 (mL) of grease (KYODO, ONELUBER MP No.2 or equivalents).
Spread grease all over the spring.

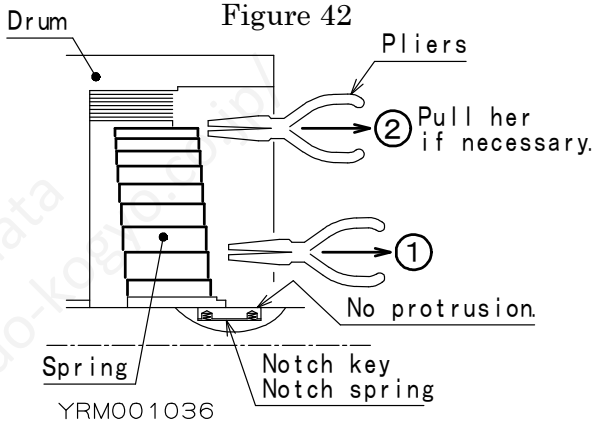
(8) Attach the bush with the non-circular hole to the spring with the spring case.
The machined end of the bush should face upward.

(9) Stand the drum with the spindle being horizontal.
Secure the drum by some means not to allow falling or moving.

(10) Place the notch key and notch springs into the slot of the spindle.
Take care as the assembling direction of the notch key depends on the winding direction of the reel. See figure 35 (page 22).

(11) Keep the notch key in the slot using the installed bush.
While pressing the attached notch key in the slot with a finger, grip the spring near the bush by pliers and slowly pull about 30mm, then release.
The spring will move back for some length which varies depending on the spring type.
Check the notch key does not protrude from the spindle surface.
If protruding, pull the spring near the peripheral portion about 10mm, then pull the spring near the bush about 10mm.
Try until the notch key does not protrude from the spindle surface.
See figure 42.

Figure 42



⚠ WARNING
Never pull the spring too much or roughly.
Otherwise, the spring will burst out and cause personal injury.

(12) Lightly lubricate the bush attaching portion of the spindle and the inside surface of the bush with grease (IDEMITHU, DAPHNE EPONEX GREASE EP-1 or equivalents).
Install the spring with the spring case to the spindle by holding the spring case with one hand and holding the bush with another hand.

⚠ WARNING
Take care not to allow the spring center to fall and burst out.

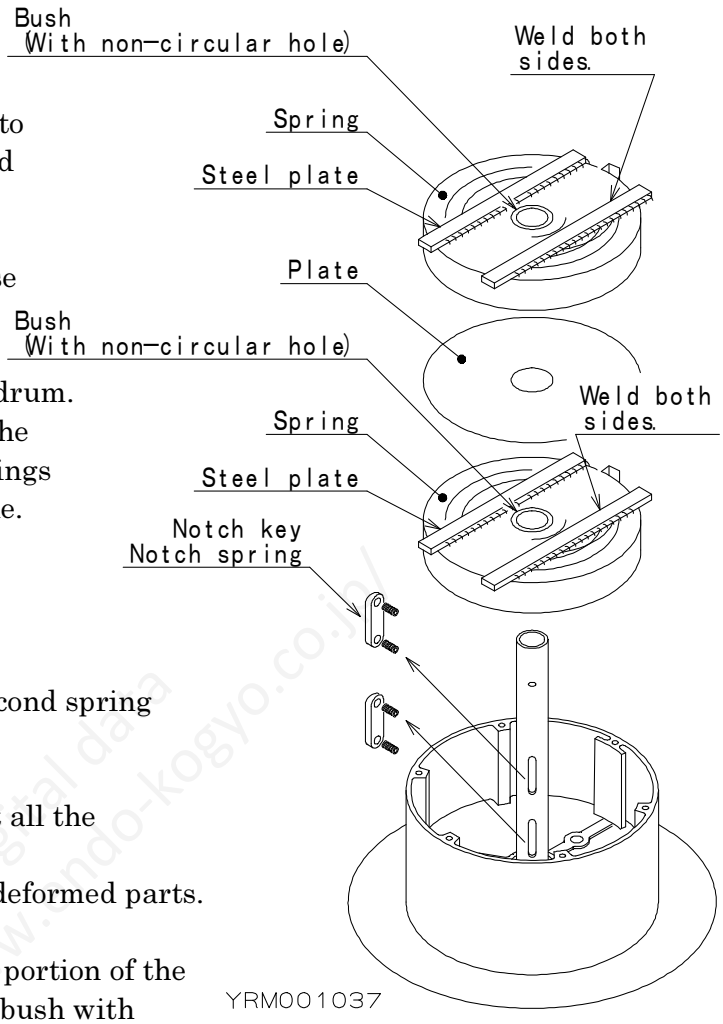
(13) Lay the drum again on a work table.
Rotate the spring case back and forth until the spring case fits into the bush.

(14) Lubricate the spring with 22 cm^3 (mL) of grease (KYODO, ONELUBER MP No.2 or equivalents).
Spread grease all over the spring.

(15) Follow the procedure given in Section 13-3. "Common reassembly method".

■ For spring structure D (2 springs, double-torque) Figure 43

(1) Weld steel plates to the spring in order to prevent the spring from expansion.
Use steel plates with enough length to cover the periphery of the spring, and weld along the whole length.
NOTE: Wipe off all grease from the spring surface to avoid grease combustion.



(2) Remove the welded spring from the drum.
NOTE: When removing the spring, the notch key and two notch springs will drop out from the spindle. Take care not to lose them.

(3) Remove the bush from the spring.

(4) Remove the plate and remove the second spring in the same manner as (1) to (3).

(5) Before reassembly, clean and inspect all the disassembled parts.
Replace worn, cracked, damaged or deformed parts.

(6) Lightly lubricate the bush attaching portion of the spindle and the inside surface of the bush with grease (IDEMITHU, DAPHNE EPONEX GREASE EP-1 or equivalents).
Place the notch key and notch springs into the slot of the spindle and attach the bush to the spindle.
Take care as the assembling direction of the notch key depends on the winding direction of the reel. See figure 35 (page 24).
The machined end of the bush should face upward.

(7) Install the spring into the drum.
1) Before installation, check the assembling direction which depends on the winding direction of the reel. See figure 37 (page 25).
2) Slightly move the band upward in order to make the removal easy.
See figure 36 (page 25).

⚠ WARNING

Never move the band too much.
If moved too much, the band will come off and the spring will expand explosively, causing personal injury.

3) Place the spring into the drum.
Fit the center edge of the spring into the slit of the bush by hammering.
Put a steel plate or the like to protect the spring when hammering.

4) Place the outer edge of the spring on the spring fixing portion of the drum.
See figure 37 (page 25).

5) Insert a screw driver into the space between the band and the spring as shown in figure 38 (page 25), then remove the band.

⚠ WARNING

Take care not to catch your finger in the spring since the spring will expand explosively when the band is removed.

6) Lubricate the spring with 22 cm^3 (mL) of grease (KYODO, ONELUBER MP No.2 or equivalents).
Spread grease all over the spring.

(8) Install the plate, and install the upper spring into the drum in the same manner as (6) to (7).

(9) Follow the procedure given in Section 13-3. "Common reassembly method".

13-3. Common reassembly method

(1) Check the top spring does not project out from the drum top, then attach the drum cover to the drum.

(2) Attach the bracket to the spindle so that the tapped hole of the bracket faces to the hole of the spindle, then tighten the hexagon socket set screw and fix with the hexagon nut.

(3) Rotate the drum in the payout direction by hand and check the drum has winding torque.

(4) Install the slip ring assembly.
Refer to Chapter 12. "Brush and slip ring replacement".

(5) Install the cable.
Refer to Chapter 5. "Cable connection".

(6) Adjust the spring tension.
Refer to chapter 6. "Spring tension adjustment".

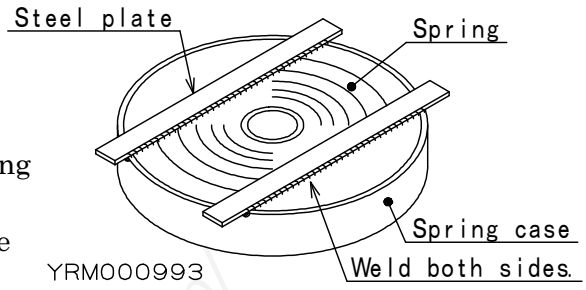
13-4. Spring disposal

⚠ WARNING

The spring is dangerous due to remaining tension even if it is broken.
Weld steel plates to the spring even if the spring is in the spring case in order to prevent the spring from expansion before disposal.
Never use gas welding, only use arc welding.

- For the spring already welded during disassembly, check the welding is sound and will not break due to rough handling.
  If not, weld steel plates to the spring again.
- For the spring with the spring case, weld steel plates to the spring in order to prevent the spring from expansion.
  Use steel plates with enough length to cover the spring case, and weld along the whole length.
  NOTE: Wipe off all grease from the spring surface to avoid grease combustion.

Figure 44



- Give a warning to disposal companies that the spring will expand explosively if the welding is broken due to rough handling.

14. Parts list

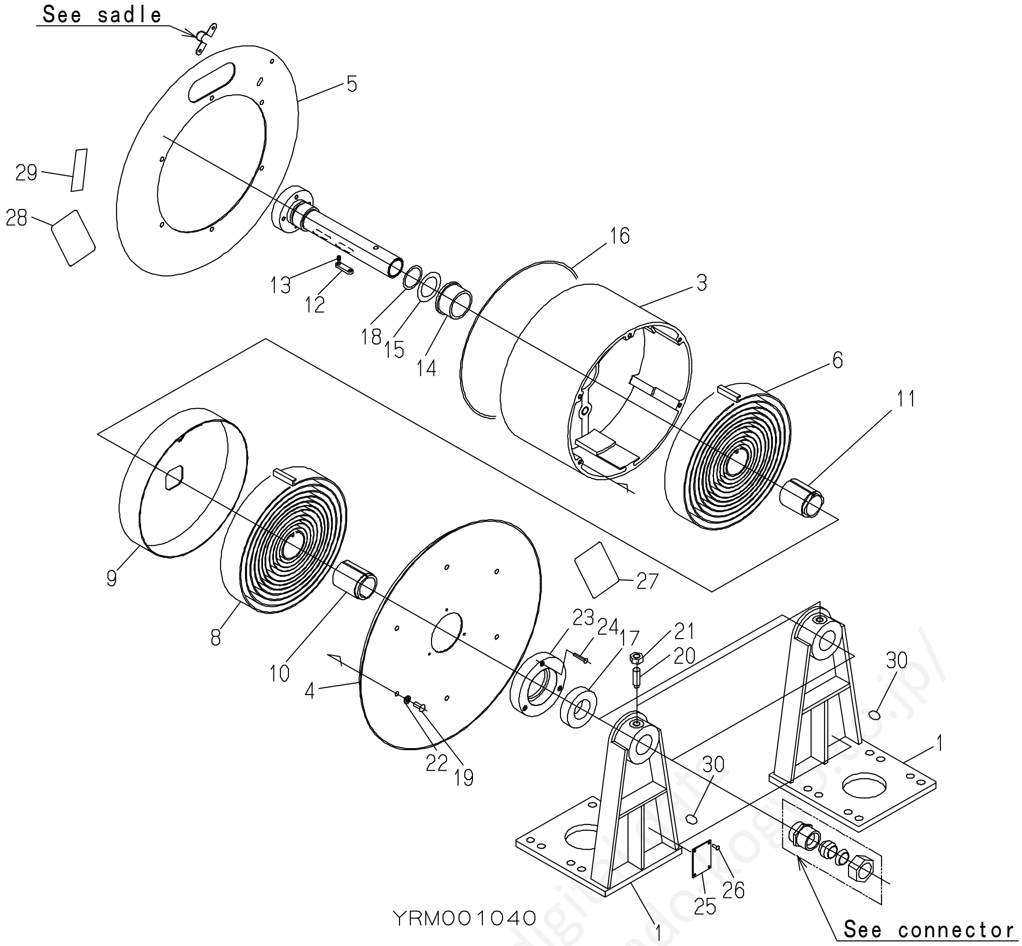
■ When ordering parts:
- State the MODEL, SER. NO. and DATE indicated on the name plate.
- State the part number and description.
- Parts without a part number cannot be supplied individually.
  Please purchase a set or complete unit.

■ How to read parts list

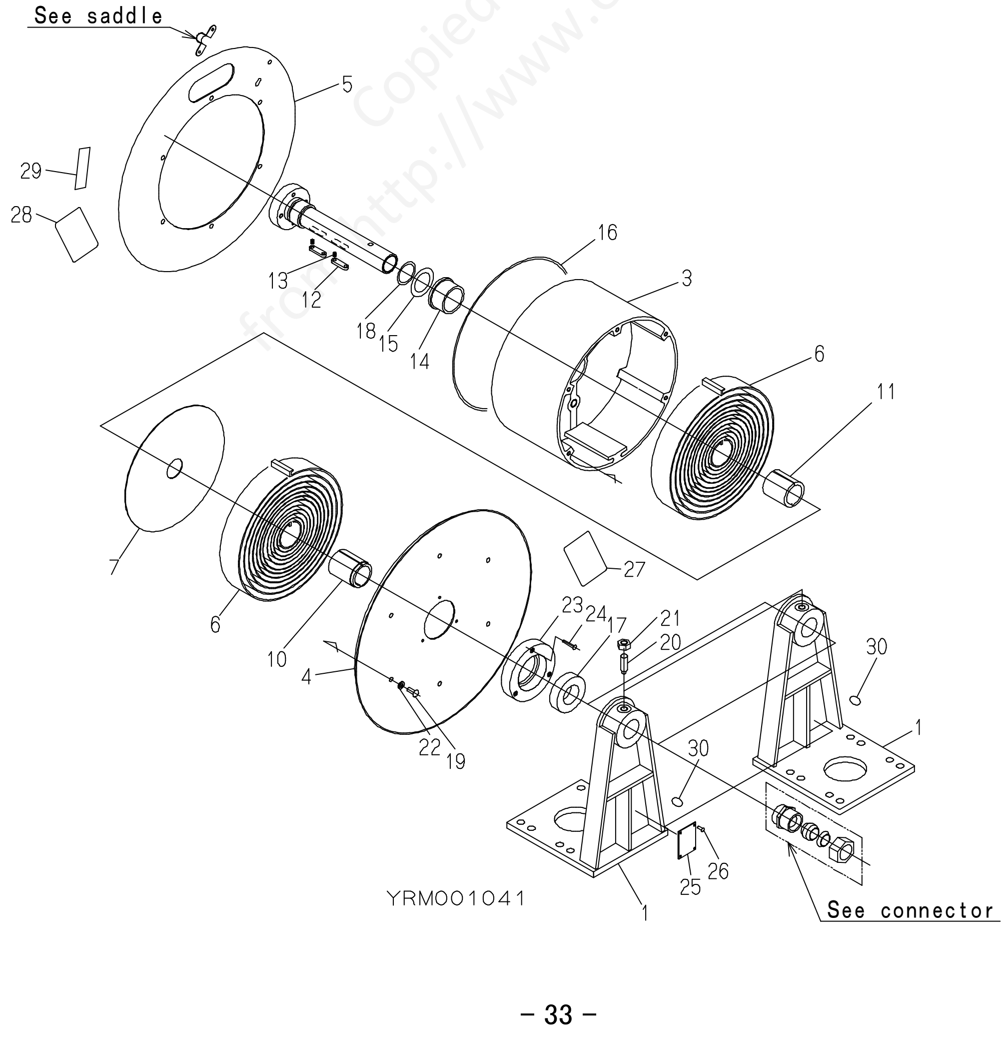
No.	List No. or Part No.	Description	Quantity		
			2205	2A210	2A05W
—	LRP003827	Spring assembly	—	—	1
8	—	— Spring	—	—	1
9	—	— Spring case	—	—	1

The mark indicates the range of the set or the complete unit.

■CRL－2205・2305・2A205W・2A305W MAIN BODY



■CRL－2A210 MAIN BODY



No.	List No. or part No.	Description	Quantity				
			2205	2305	2A210	2A205W	2A305W
1	LRP001137	Bracket	1	—	1	1	—
1	LRP001139	Bracket	—	1	—	—	1
—	LRP003794	Spindle assembly	1	1	—	—	—
—	LRP003795	Spindle assembly	—	—	1	—	—
—	LRP003796	Spindle assembly	—	—	—	1	1
2	P1R306848	– Spindle	1	1	—	—	—
2	P1R306850	– Spindle	—	—	1	—	—
2	P1R306849	– Spindle	—	—	—	1	1
18	KA50300250	– O–ring	1	1	1	1	1
—	LRP003800	Drum assembly	1	1	—	—	—
—	LRP003801	Drum assembly	—	—	1	—	—
—	LRP003802	Drum assembly	—	—	—	1	1
3	—	– Drum	1	1	—	—	—
3	—	– Drum	—	—	1	—	—
3	—	– Drum	—	—	—	1	1
16	P1R400508	– Seal ring	1	1	1	1	1
—	LRP003811	Drum cover assembly	1	—	1	1	—
—	LRP003821	Drum cover assembly	—	1	—	—	1
—	LRP002006	– Drum cover assembly	1	—	1	1	—
—	LRP002007	– Drum cover assembly	—	1	—	—	1
4	—	–– Drum cover	1	—	1	1	—
4	—	–– Drum cover	—	1	—	—	1
23	—	–– Bearing case	1	1	1	1	1
24	KA46300318	–– Rivet	3	3	3	3	3
17	KA60103054	– Ball bearing	1	1	1	1	1
5	P1R300362	Drum cover	1	—	1	1	—
5	P1R300359	Drum cover	—	1	—	—	1
6	P1R300334	Spring	1	1	2	1	1
7	P1R400123	Plate	—	—	1	—	—
—	LRP003827	Spring assembly	—	—	—	1	1
8	—	– Spring	—	—	—	1	1
9	—	– Spring case	—	—	—	1	1
10	P1R300461	Bush	1	1	1	1	1
11	P1R300482	Bush	—	—	1	—	—
11	P1R300475	Bush	—	—	—	1	1
—	LRP003836	Notch key assembly	1	1	2	1	1
12	—	– Notch key	1	1	2	1	1
13	P1R400112	– Notch spring	2	2	4	2	2
14	P1R411592	Metal	1	1	1	1	1
15	P1R400150	Washer	1	1	1	1	1
19	KA10130512	Machine screw	6	6	6	6	6
20	KA16330825	Set screw	1	1	1	1	1
21	KA20130800	Hex. nut	1	1	1	1	1
22	KA31130500	Spring washer	6	6	6	6	6
25	P1R309126	Name plate	1	1	1	1	1
26	KA14549803	Drive screw	4	4	4	4	4
27	P1R304994	Warning label	1	1	1	1	1
28	P1R305037	Label	1	1	1	1	1
29	P1R401833	Label	1	1	1	1	1
30	P1R406024	Label	1	1	1	1	1

Parts without a part number cannot be supplied individually.

■CRL－2205－1～2A305W－1　MAIN BODY

(In case of reverse seating, replace corresponding parts with these parts)

No.	List No. or part No.	Description	Quantity				
			2205	2305	2A210	2A205W	2A305W
1	LRP001137	Bracket	1	—	1	1	—
1	LRP001139	Bracket	—	1	—	—	1

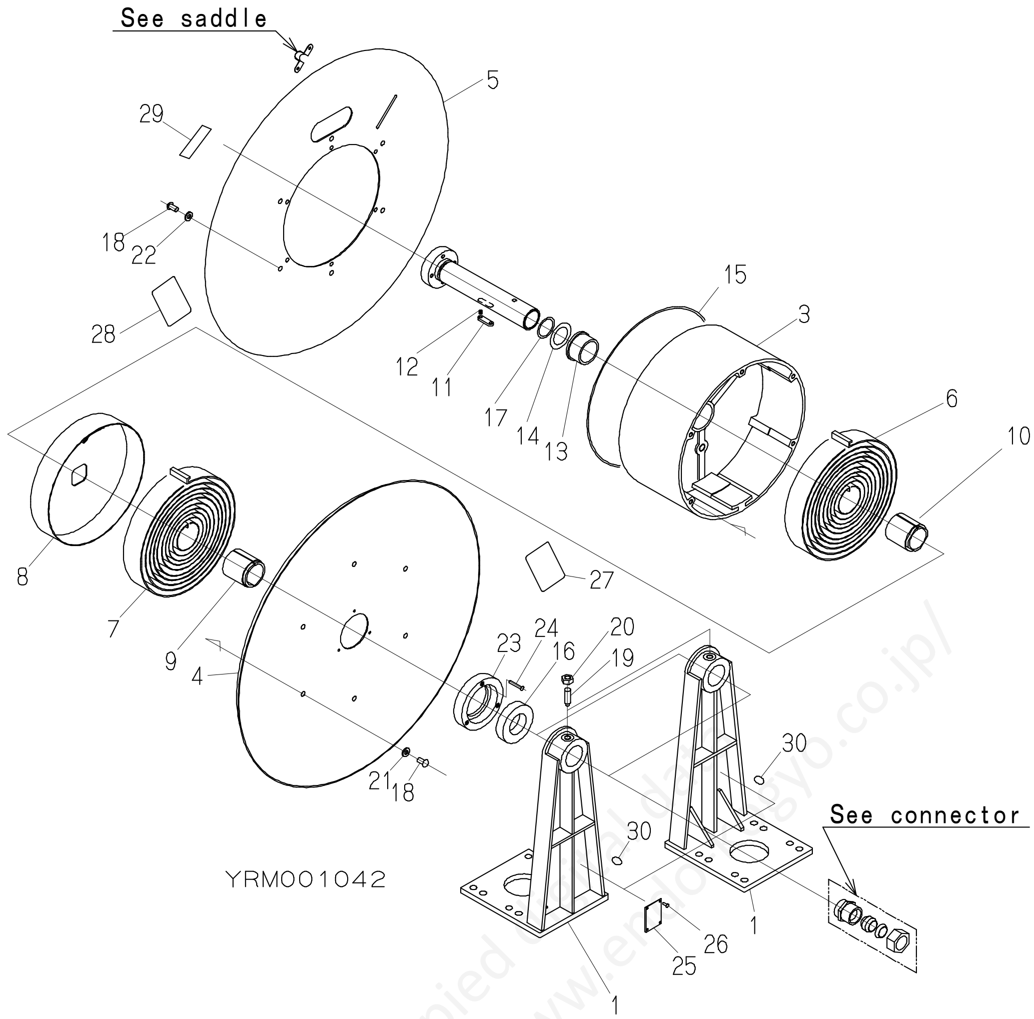
■CRL－2205－R～2A305W－R　MAIN BODY

(In case of reverse winding, replace corresponding parts with these parts)

No.	List No. or part No.	Description	Quantity				
			2205	2305	2A210	2A205W	2A305W
—	LRP003800	Drum cover assembly	1	1	—	—	—
—	LRP003801	Drum cover assembly	—	—	1	—	—
—	LRP003802	Drum cover assembly	—	—	—	1	1
3	—	- Drum	1	1	—	—	—
3	—	- Drum	—	—	1	—	—
3	—	- Drum	—	—	—	1	1
16	P1R400508	- Seal ring	1	1	1	1	1
5	P1R300363	Drum cover	1	—	1	1	—
5	P1R300360	Drum cover	—	1	—	—	1
6	P1R300334	Spring	1	1	2	1	1
—	LRP003960	Spring assembly	—	—	—	1	1
8	—	- Spring	—	—	—	1	1
9	—	- Spring case	—	—	—	1	1
10	P1R300462	Bush	1	1	1	1	1
29	P1R401834	Label	1	1	1	1	1

Parts without a part number cannot be supplied individually.

■CRL－3316～3A409W MAIN BODY



No.	List No. or part No.	Description	Quantity						
			3316	3A316W	3A309W	3416	3409	3A416W	3A409W
1	LRP001145	Bracket	1	1	—	—	—	—	—
1	LRP001139	Bracket	—	—	1	—	—	—	—
1	LRP001147	Bracket	—	—	—	1	—	1	—
1	LRP001141	Bracket	—	—	—	—	1	—	1
—	LRP003797	Spindle assembly	1	—	—	1	—	—	—
—	LRP003794	Spindle assembly	—	—	—	—	1	—	—
—	LRP003798	Spindle assembly	—	1	—	—	—	1	—
—	LRP003799	Spindle assembly	—	—	1	—	—	—	1
2	P1R306855	– Spindle	1	—	—	1	—	—	—
2	P1R306848	– Spindle	—	—	—	—	1	—	—
2	P1R306857	– Spindle	—	1	—	—	—	1	—
2	P1R306851	– Spindle	—	—	1	—	—	—	1
17	KA50300250	– O–ring	1	1	1	1	1	1	1
—	LRP003803	Drum assembly	1	—	—	1	1	—	—
—	LRP003804	Drum assembly	—	1	1	—	—	1	1
3	—	– Drum	1	—	—	1	1	—	—
3	—	– Drum	—	1	1	—	—	1	1
15	P1R400509	– Seal ring	1	1	1	1	1	1	1
—	LRP003812	Drum cover assembly	1	1	—	—	—	—	—
—	LRP003813	Drum cover assembly	—	—	1	—	—	—	—
—	LRP003814	Drum cover assembly	—	—	—	1	—	1	—
—	LRP003815	Drum cover assembly	—	—	—	—	1	—	1
—	LRP002010	– Drum coverassembly	1	1	—	—	—	—	—
—	LRP002008	– Drum coverassembly	—	—	1	—	—	—	—
—	LRP002011	– Drum coverassembly	—	—	—	1	—	1	—
—	LRP002009	– Drum coverassembly	—	—	—	—	1	—	1
4	—	–– Drum cover	1	1	1	—	—	—	—
4	—	–– Drum cover	—	—	—	1	1	1	1
23	—	–– Bearing case	1	1	—	1	—	1	—
23	—	–– Bearing case	—	—	1	—	1	—	1
24	KA46300318	–– Rivet	3	3	3	3	3	3	3
16	KA60103064	– Ball bearing	1	1	—	1	—	1	—
16	KA60103054	– Ball bearing	—	—	1	—	1	—	1
5	P1R300356	Drum cover	1	1	1	—	—	—	—
5	P1R300353	Drum cover	—	—	—	1	1	1	1
6	P1R300338	Spring	1	1	—	1	—	1	—
6	P1R300336	Spring	—	—	1	—	1	—	1
—	LRP003828	Spring assembly	—	1	—	—	—	1	—
—	LRP003829	Spring assembly	—	—	1	—	—	—	1
7	—	– Spring	—	1	—	—	—	1	—
7	—	– Spring	—	—	1	—	—	—	1
8	—	– Spring case	—	1	—	—	—	1	—
8	—	– Spring case	—	—	1	—	—	—	1
9	P1R300463	Bush	1	1	—	1	—	1	—
9	P1R300461	Bush	—	—	1	—	1	—	1
10	P1R300476	Bush	—	1	—	—	—	1	—
10	P1R300475	Bush	—	—	1	—	—	—	1
—	LRP003836	Notch key assembly	1	1	1	1	1	1	1
11	—	– Notch key	1	1	1	1	1	1	1
12	P1R400112	– Notch spring	2	2	2	2	2	2	2

Parts without a part number cannot be supplied individually.

No.	List No. or part No.	Description	Quantity						
			3316	3A316W	3A309W	3416	3409	3A416W	3A409W
13	P1R411592	Metal	1	1	1	1	1	1	1
14	P1R400150	Washer	1	1	1	1	1	1	1
18	KA10130612	Masine screw	12	12	12	12	12	12	12
19	KA16330825	Set screw	1	1	1	1	1	1	1
20	KA20130800	Hex. nut	1	1	1	1	1	1	1
21	KA31130600	Spring washer	6	6	6	6	6	6	6
22	P1R302406	Seal washer	6	6	6	6	6	6	6
25	P1R309126	Name plate	1	1	1	1	1	1	1
26	KA14549803	Drive screw	4	4	4	4	4	4	4
27	P1R304994	Warning label	1	1	1	1	1	1	1
28	P1R305037	Label	1	1	1	1	1	1	1
29	P1R401833	Label	1	1	1	1	1	1	1
30	P1R406024	Label	1	1	1	1	1	1	1

■CRL−3316−1～3A409W−1 MAIN BODY

(In case of reverse seating, replace corresponding parts with these parts)

No.	List No. or part No.	Description	Quantity						
			3316 −1	3A316W −1	3A309W −1	3416 −1	3409 −1	3A416W −1	3A409W −1
1	LRP001145	Bracket	1	1	−	−	−	−	−
1	LRP001139	Bracket	−	−	1	−	−	−	−
1	LRP001147	Bracket	−	−	−	1	−	1	−
1	LRP001141	Bracket	−	−	−	−	1	−	1

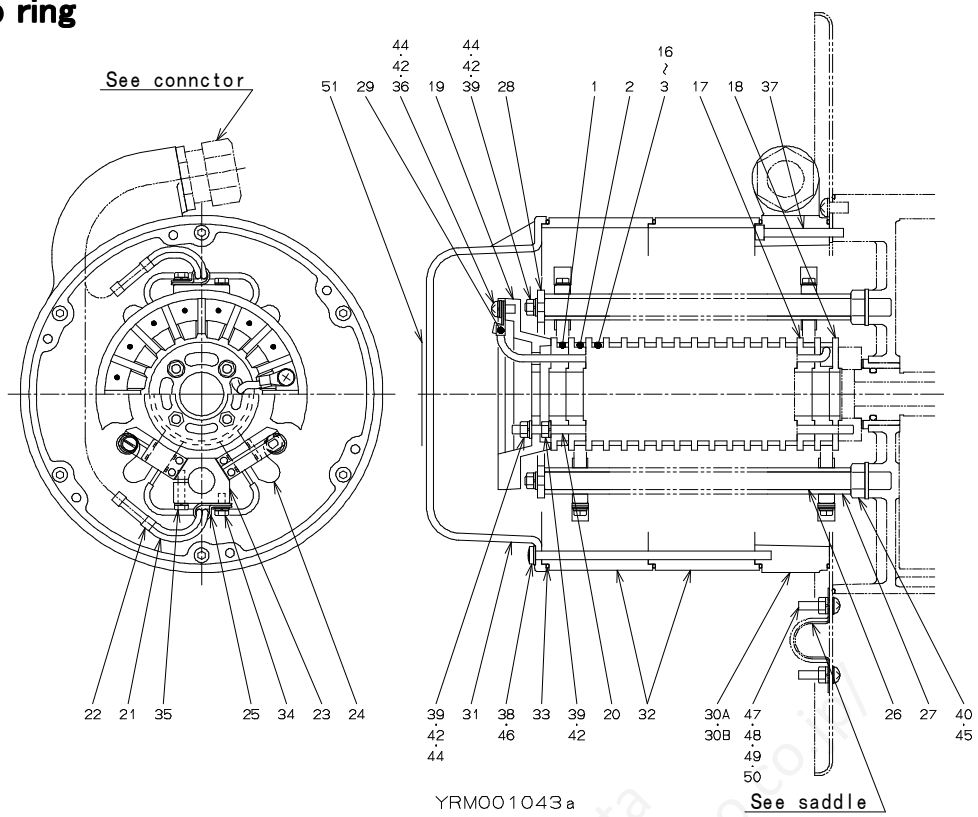
■CRL−3316−R～3A409W−R MAIN BODY

(In case of reverse winding, replace corresponding parts with these parts)

No.	List No. or part No.	Description	Quantity						
			3316 −R	3A316W −R	3A309W −R	3416 −R	3409 −R	3A416W −R	3A409W −R
−	LRP003803	Drum assembly	1	−	−	1	1	−	−
−	LRP003804	Drum assembly	−	1	1	−	−	1	1
3	−	- Drum	1	−	−	1	1	−	−
3	−	- Drum	−	1	1	−	−	1	1
15	P1R400509	- Seal ring	1	1	1	1	1	1	1
5	P1R300357	Drum cover	1	1	1	−	−	−	−
5	P1R300354	Drum cover	−	−	−	1	1	1	1
6	P1R300338	- Spring	1	1	−	1	−	1	−
6	P1R300336	- Spring	−	−	1	−	1	−	1
−	LRP003961	Spring assembly	−	1	−	−	−	1	−
−	LRP003962	Spring assembly	−	−	1	−	−	−	1
7	−	- Spring	−	1	−	−	−	1	−
7	−	- Spring	−	−	1	−	−	−	1
8	−	- Spring case	−	1	−	−	−	1	−
8	−	- Spring case	−	−	1	−	−	−	1
9	P1R300464	Bush	1	1	−	1	−	1	−
9	P1R300462	Bush	−	−	1	−	1	−	1
29	P1R401834	Label	1	1	1	1	1	1	1

Parts without a part number cannot be supplied individually.

■30A Slip ring



No.	List No. or Part No.	Description	Quantity							
			3P	4P	6P	8P	10P	12P	14P	16P
—	LRP003501	Slip ring assembly	1	—	—	—	—	—	—	—
—	LRP003502	Slip ring assembly	—	1	—	—	—	—	—	—
—	LRP003503	Slip ring assembly	—	—	1	—	—	—	—	—
—	LRP003504	Slip ring assembly	—	—	—	1	—	—	—	—
—	LRP003505	Slip ring assembly	—	—	—	—	1	—	—	—
—	LRP003506	Slip ring assembly	—	—	—	—	—	1	—	—
—	LRP003507	Slip ring assembly	—	—	—	—	—	—	1	—
—	LRP003508	Slip ring assembly	—	—	—	—	—	—	—	1
1	LRP003012	- Slip ring	1	1	1	1	1	1	1	1
2	LRP003013	- Slip ring	1	1	1	1	1	1	1	1
3	LRP003014	- Slip ring	1	1	1	1	1	1	1	1
4	LRP003015	- Slip ring	—	1	1	1	1	1	1	1
5	LRP003016	- Slip ring	—	—	1	1	1	1	1	1
6	LRP003017	- Slip ring	—	—	1	1	1	1	1	1
7	LRP003018	- Slip ring	—	—	—	1	1	1	1	1
8	LRP003019	- Slip ring	—	—	—	1	1	1	1	1
9	LRP003020	- Slip ring	—	—	—	—	1	1	1	1
10	LRP003021	- Slip ring	—	—	—	—	1	1	1	1
11	LRP003022	- Slip ring	—	—	—	—	—	1	1	1
12	LRP003023	- Slip ring	—	—	—	—	—	1	1	1
13	LRP003024	- Slip ring	—	—	—	—	—	—	1	1
14	LRP003025	- Slip ring	—	—	—	—	—	—	1	1
15	LRP003026	- Slip ring	—	—	—	—	—	—	—	1
16	LRP003027	- Slip ring	—	—	—	—	—	—	—	1
17	P1R301970	- Ring holder	3	4	6	8	10	12	14	16
18	P1R400475	- Ring cover	1	1	1	1	1	1	1	1
19	LRP013537	- Terminal plate	1	1	1	—	—	—	—	—
19	LRP013538	- Terminal plate	—	—	—	1	1	1	—	—
19	LRP013539	- Terminal plate	—	—	—	—	—	—	1	1
20	LRP003311	- Ring bolt	4	—	—	—	—	—	—	—

Parts without a part number cannot be supplied individually.

No.	List No. or Part No.	Description	Quantity							
			3P	4P	6P	8P	10P	12P	14P	16P
20	LRP003312	- Ring bolt	–	4	–	–	–	–	–	–
20	LRP003314	- Ring bolt	–	–	4	–	–	–	–	–
20	LRP003316	- Ring bolt	–	–	–	4	–	–	–	–
20	LRP003318	- Ring bolt	–	–	–	–	4	–	–	–
20	LRP003320	- Ring bolt	–	–	–	–	–	4	–	–
20	LRP003321	- Ring bolt	–	–	–	–	–	–	4	–
20	LRP003322	- Ring bolt	–	–	–	–	–	–	–	4
–	LRP003784	- Brush assembly	3	4	6	8	10	12	14	16
–	LRP013662	-- Brush assembly	3	4	6	8	10	12	14	16
21	–	--- Brush	6	8	12	16	20	24	28	32
22	KA91200500	--- Connector	3	4	6	8	10	12	14	16
–	LRP003789	-- Brush holder set	3	4	6	8	10	12	14	16
23	LRP003247	--- Brush holder	3	4	6	8	10	12	14	16
24	P1R300594	--- Brush spring	6	8	12	16	20	24	28	32
35	P1R404880	--- Hex. head bolt with washer	3	4	6	8	10	12	14	16
25	P1R402581	-- Cable clamp	3	4	6	8	10	12	14	16
34	P1R404740	-- Hex. head bolt with washer	3	4	6	8	10	12	14	16
–	LRP016907	- Brush bolt	2	–	–	–	–	–	–	–
–	LRP016908	- Brush bolt	–	2	–	–	–	–	–	–
–	LRP016910	- Brush bolt	–	–	2	–	–	–	–	–
–	LRP016912	- Brush bolt	–	–	–	2	–	–	–	–
–	LRP016913	- Brush bolt	–	–	–	–	2	–	–	–
–	LRP016914	- Brush bolt	–	–	–	–	–	2	–	–
–	LRP016915	- Brush bolt	–	–	–	–	–	–	2	–
–	LRP016916	- Brush bolt	–	–	–	–	–	–	–	2
26	–	- -Brush bolt	2	2	2	2	2	2	2	2
27	–	- Insulation pipe	2	2	2	2	2	2	2	2
28	KA20121000	- -Hex. nut	2	2	2	2	2	2	2	2
28	P1R411544	- Plate	1	1	1	1	1	1	1	1
29	KA91300305	- Terminal lug	3	4	6	8	10	12	14	16
36	P1R404737	- Machine screw with washer	3	4	6	8	10	12	14	16
39	KA20120500	- Hex. nut	10	10	10	10	10	10	10	10
42	KA31120500	- Spring washer	10	10	10	10	10	10	10	10
44	KA30220500	- Plain washer	6	6	6	6	6	6	6	6
45	KA30221000	- Plain washer	2	2	2	2	2	2	2	2
–	LRP003393	Cable guide assembly (CS-23)	1	1	1	1	1	1	1	1
–	LRP003394	Cable guide assembly (CS-27)	1	1	1	1	1	1	1	1
30A	–	- Cable guide (CS-23)	1	1	1	1	1	1	1	1
30B	–	- Cable guide (CS-27)	1	1	1	1	1	1	1	1
33	P1R400508	- Seal ring	2	2	2	2	2	2	2	2
31	P1R401322	Dust proof cover	1	1	1	1	1	1	1	1
–	LRP003381	Dust proof spacer assembly	–	–	1	–	–	–	–	–
–	LRP003382	Dust proof spacer assembly	–	–	–	1	–	–	–	–
–	LRP003383	Dust proof spacer assembly	–	–	–	–	1	–	–	2
–	LRP003384	Dust proof spacer assembly	–	–	–	–	–	1	–	–
–	LRP003385	Dust proof spacer assembly	–	–	–	–	–	–	1	–
32	–	- Dust proof spacer	–	–	1	–	–	–	–	–
32	–	- Dust proof spacer	–	–	–	1	–	–	–	–
32	–	- Dust proof spacer	–	–	–	–	1	–	–	2
32	–	- Dust proof spacer	–	–	–	–	–	1	–	–
32	–	- Dust proof spacer	–	–	–	–	–	–	1	–
33	P1R400508	- Seal ring	–	–	1	1	1	1	1	2

Parts without a part number cannot be supplied individually.

No.	List No. or Part No.	Description	Quantity							
			3P	4P	6P	8P	10P	12P	14P	16P
37	P2H400177	Hex. cap screw	6	6	6	6	6	6	6	6
38	KA10530516	Cross recessed head screw	6	6	—	—	—	—	—	—
38	KA10530535	Cross recessed head screw	—	—	6	—	—	—	—	—
38	P1R411522	Cross recessed head screw	—	—	—	6	—	—	—	—
38	P1R411523	Cross recessed head screw	—	—	—	—	6	—	—	—
38	P1R411524	Cross recessed head screw	—	—	—	—	—	6	—	—
38	P1R411525	Cross recessed head screw	—	—	—	—	—	—	6	—
38	P1R411526	Cross recessed head screw	—	—	—	—	—	—	—	6
46	P1R302405	Seal washer	6	6	6	6	6	6	6	6
47	KA10130520	Machine screw	2	2	2	2	2	2	2	2
48	KA20130500	Hex. nut	2	2	2	2	2	2	2	2
49	KA31130500	Spring washer	2	2	2	2	2	2	2	2
50	KA30230500	Plain washer	2	2	2	2	2	2	2	2
51	P1R305075	Warning label	1	1	1	1	1	1	1	1

Parts without a part number cannot be supplied individually.

■30A Slip ring

(In case of reverse winding, replace corresponding parts with these parts.)

No.	List No. or Part No.	Description	Quantity							
			3P	4P	6P	8P	10P	12P	14P	16P
—	LRP003395	Cable guide assembly (CS-23)	1	1	1	1	1	1	1	1
—	LRP003396	Cable guide assembly (CS-27)	1	1	1	1	1	1	1	1
30A	—	- Cable guide (CS-23)	1	1	1	1	1	1	1	1
30B	—	- Cable guide (CS-27)	1	1	1	1	1	1	1	1
33	P1R400508	- Seal ring	2	2	2	2	2	2	2	2

■ACCESSORIES

Parts No.	Description	Size	Selection by cable diameter
LRP003421	Connector	CS－15	～φ14. 5
LRP003422	Connector	CS－17	φ14. 6～φ16. 5
LRP003423	Connector	CS－20	φ16. 6～φ19. 5
LRP003424	Connector	CS－23	φ19. 6～φ22. 0
LRP003425	Connector	CS－27	φ22. 1～φ26. 0

Parts No.	Description	Size	Remarks
P1R400219	Connector bush	M22×M27	
P1R402696	Connector bush	M22×M32	
P1R400220	Connector bush	M27×M32	

Parts No.	Description	Size	Selection by cable diameter
P1R411610	Saddle	9 (SUS)	～φ10. 0
P1R411611	Saddle	13 (SUS)	φ10. 1～φ13. 0
P1R411612	Saddle	15 (SUS)	φ13. 1～φ16. 0
P1R411613	Saddle	19 (SUS)	φ16. 1～φ19. 0
P1R411614	Saddle	16 (SUS)	φ19. 1～φ22. 0
P1R411615	Saddle	25 (SUS)	φ22. 1～φ25. 0
P1R411616	Saddle	22 (SUS)	φ25. 1～φ27. 0

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