Motoman

RM2-250 STX
Positioner Manual

Part Number: 148911-1CD
Revision 0
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Chapter 1

Introduction

1.1 About This Document

This manual provides instructions for the RM2-250 STX positioner and contains the following sections:

SECTION 1 - INTRODUCTION
Provides general information about the structure of this manual, a list of reference documents, and customer service information.

SECTION 2 - SAFETY
This section provides information regarding the safe use and operation of the RM2-250 STX positioner.

SECTION 3 - RM2-250 STX SERVICE MANUAL
Provides detailed information about the RM2-250 STX, including installation, wiring, specifications, and maintenance.

1.2 Reference to Other Documentation

For additional information refer to the following:

- Vendor manuals for system components not manufactured by Motoman

1.3 Customer Service Information

If you are in need of technical assistance, contact the Motoman service staff at (937) 847-3200. Please have the following information ready before you call:

- Robot Type (UP6, UP20, etc.)
- Application Type (welding, handling, etc.)
- Robot Serial Number (located on back side of robot arm)
- Robot Sales Order Number (located on back of controller)
Chapter 2

Safety

2.1 Introduction

It is the purchaser’s responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06. The address is as follows:

RoboticIndustriesAssociation
900VictorsWay
P.O.Box3724
AnnArbor,Michigan48106
TEL:(734)994-6088
FAX:(734)994-3338

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. The robot must not be operated by personnel who have not been trained!

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.
This safety section addresses the following:

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming Safety (Section 2.6)
- Operation Safety (Section 2.7)
- Maintenance Safety (Section 2.8)

### 2.2 Standard Conventions

This manual includes information essential to the safety of personnel and equipment. As you read through this manual, be alert to the four signal words:

**DANGER!**

**WARNING!**

**CAUTION!**

**NOTE:**

Pay particular attention to the information provided under these headings which are defined below (in descending order of severity).

⚠️ **DANGER!**
Information appearing under the DANGER caption concerns the protection of personnel from the immediate and imminent hazards that, if not avoided, will result in immediate, serious personal injury or loss of life in addition to equipment damage.

⚠️ **WARNING!**
Information appearing under the WARNING caption concerns the protection of personnel and equipment from potential hazards that can result in personal injury or loss of life in addition to equipment damage.

⚠️ **CAUTION!**
Information appearing under the CAUTION caption concerns the protection of personnel and equipment, software, and data from hazards that can result in minor personal injury or equipment damage.

>Note: Information appearing in a Note caption provides additional information which is helpful in understanding the item being explained.
2.3 General Safeguarding Tips

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator’s manuals, the system equipment, and options and accessories should be permitted to operate this robot system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06, section 6.13.4 and 6.13.5, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4 Mechanical Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06 safety standards, and other local codes that may pertain to the installation and use of industrial equipment. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety measures are available:

- Safety fences and barriers
- Light curtains
- Door interlocks
- Safety mats
- Floor markings
- Warning lights

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
2.5 Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows:

- Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06 safety standards are permitted to install the equipment.
- Identify the work envelope of each robot with floor markings, signs, and barriers.
- Position all controllers outside the robot work envelope.
- Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.
- Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).
- Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.

2.6 Programming Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Programming tips are as follows:

Any modifications to PART 1 of the JRC controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1. Making any changes without the written permission of Motoman will VOID YOUR WARRANTY!

Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.

Back up all programs and jobs onto a floppy disk whenever program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

The concurrent I/O (Input and Output) function allows the customer to modify the internal ladder inputs and outputs for maximum robot performance. Great care must be taken when making these modifications. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations that may damage the robot or other parts of the system.
• Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

• Inspect the robot and work envelope to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.

• Be sure that all safeguards are in place.

• Check the E-STOP button on the teach pendant for proper operation before programming.

• Carry the teach pendant with you when you enter the workcell.

• Be sure that only the person holding the teach pendant enters the workcell.

• Test any new or modified program at low speed for at least one full cycle.

2.7 Operation Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Operation tips are as follows:

• Be sure that only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories are permitted to operate this robot system.

• Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

• Inspect the robot and work envelope to ensure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.

• Ensure that all safeguards are in place.

• Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

• Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.

• The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.

• This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
• All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

2.8 Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Maintenance tips are as follows:

• Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.

• Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

• Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

• Back up all your programs and jobs onto a floppy disk whenever program changes are made. A backup must always be made before any servicing or changes are made to options, accessories, or equipment to avoid loss of information, programs, or jobs.

• Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.

• The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.

• Be sure all safeguards are in place.

• Use proper replacement parts.

• This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

• All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

• Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
MOTOMAN XRC
SERVICE MANUAL
Positioner RM2-250 STX

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN ROBOTICS EUROPE
A subsidiary of YASKAWA Electric Corporation

MANUAL NO. MRS54430
Reference list

Installation and Wiring of XRC cabinet
Optional Cabinet for XRC
Electrical drawings, see list inside document

Revision

020916
First release of this manual.

021018
Correction of part number.

030117
Correction of data.

030203
Correction of part number.
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   • Signal transfer, LTN 37
Service and installation manual

Positioner type: MOTOMAN RM2-250 STX.

1. About this manual
   This manual shall be available to service personnel.
   ✔ Machine safety
   ✔ Installation

   For operating instruction, see Operator’s Manual.

   Together with this manual, please find enclosed mechanical and electrical documentation. These documents may not be copied without our written permission and the contents thereof must not be imparted to a third party nor be used for any unauthorized purpose.

   Text written in BOLD letters means command or button.
   Text written in ITALIC means text shown on display.

2. General
   ■ Positioner comprises
     ✔ Two-station horizontal positioner, type RM2-250 STX.
     ✔ Cable set between positioner and controller.
     ✔ Assembly kit for XRC-controller (Servopacks, etc).

   ■ Available options
     See separate chapter for pneumatic option kits.
     ✔ Controlled air in +/- in fixture discs in support/drive side incl. valves.
     ✔ Two air channels in fixture discs in support/drive side.
     ✔ Two air channels in all fixture discs.
     ✔ Signal transfer units in support side.
     ✔ Fixture brackets
2.1 Identification

This machine shall be used for welding of workpiece. The machine is designed to be used together with a MOTOMAN industrial robot.

This equipment is constructed, produced and tested according to the laws of the Member States relating to machinery (98/37/EEC) and the demands of the EMC-directives (89/336/EEC) and (93/68/EEC) as well as the LVD-directive (73/23/EEC).

Motoman Robotics Europe AB’s responsibility does not cover errors or safety risks that may occur in equipment connected to the Motoman Robotics Europe AB machine, nor errors or safety risks that may occur in the machine caused by equipment connected to the Motoman Robotics Europe AB’s machine.

The Motoman Robotics Europe AB machine must not be used until the complete production unit correspond to the laws of the Member States relating to machinery (98/37/EEC).

External cables must be specified and connected according to our cable connection Guide included in this document.

The machine must only be operated by specially trained persons.
3.1 Manufacturer

Address: Motoman Robotics Europe AB
Box 504
SE-385 25 Torsås
Sweden

Telephone: +46 486 48800
Telefax: +46 486 41410

Machine type: RM2-250 STX
Machine No.: See machine sign
Year of manufacturing: See EC-declaration

4. Installation

4.1 Technical specifications

Refer to MOTOMAN dimension drawing No. 214371-XX

<table>
<thead>
<tr>
<th>Model</th>
<th>Load</th>
<th>Index torque</th>
<th>Index time</th>
<th>Orbital torque (Dynamic)</th>
<th>Orbital speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>-90 to -93</td>
<td>2x 250 kg</td>
<td>1000 Nm</td>
<td>4 sec</td>
<td>1050 Nm</td>
<td>0-16.8 rpm</td>
</tr>
</tbody>
</table>

- Compressed air
  - Working pressure 0.6 MPa
  - Minimum pressure 0.5 MPa
  - Consumption 10 liter free air / cycle

- Welding capacity
  - Duty cycle 100% 700A
  - Duty cycle 60% 920A

- Positioning
  - Position accuracy ± 0.1 mm

- Maximum unbalance
  - Difference between A - B 150 kg

- Max. offset (static)
  - Payload 250 kg 0.339 m

- Colour
  - Stand BLUE IT 60LDP1
4.2 Lifting instruction

When lifting the machine use straps, applied to the centre beam according to sketch.

The straps shall be certificated for at least 3.000 kg each.

Note!
Crane operation, sling application and forklift truck operation should be performed only by licenced personnel. In handling the positioner, extra care must be taken regarding the following:
- Never place any part of your body under a suspended load or move a suspended load over any part of another person’s body. Careless handling may result in severe personal injury or death.

4.3 Installation safety

Warning signs and restrictive devices such as fence, chains, safety mats or light beams must be placed around the working area of the robot / positioner. The warning signs shall indicate hazardous conditions and results that may occur if the warning is disregarded.

Refer to the local regulation according to Machine Safety.
4.4 Dimensions

■ RM2-250 STX

Fig.3 STX type with dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>L</th>
<th>TL</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>214371-90</td>
<td>1600</td>
<td>3245</td>
<td>1700</td>
</tr>
<tr>
<td>-91</td>
<td>2000</td>
<td>3645</td>
<td>1800</td>
</tr>
<tr>
<td>-92</td>
<td>2636</td>
<td>4281</td>
<td>2000</td>
</tr>
<tr>
<td>-93</td>
<td>3000</td>
<td>4645</td>
<td>2100</td>
</tr>
</tbody>
</table>
4.5 Mounting

The RM2-250 STX should be firmly mounted on a base plate or foundation rigid enough to support the positioner and withstand repulsion forces. The surface of the floor should be levelled and even. If it is uneven, grind the swell and flatten the surface.

The concrete thickness of the floor shall be at least 150 mm.

**Note!**

If the difference in weight between the two sides (A - B) exceed 150 kg the servo motor is overloaded. (e.g. when mounting or exchanging fixtures). Keep swing locked when changing fixtures or use a counterweight.

**Note!**

As the baseplate is rather weak, it is important to adjust the machine after it has been fixed to the floor. Follow the instruction below carefully.

a) Put the machine in place for operation.

b) Place a spirit-level on the surfaces A and B resp. Adjust the level with the screws in both ends of the bed to a level of <0,2/1000 mm.

c) Fix the stand to the floor. Use anchor bolts according to the holes in the stand.

d) Remove shipping brackets.

e) Connect to the robot controller.

f) Place a dial indicator on the swing pointing at the machined surface C of the headstock. Slowly turn the swing ±180°. The dial indicator shall deviate maximum ±0.05 mm. To adjust the deviation, move the tailstock end. If the deviation is too big, the gear wheels will be worn very quickly.

![Machined surface “C”](image)

g) To adjust the tailstock in height and sideways, loosen and move the bearing in the tailstock end D or loosen and move the tailstock sideways on the bed E.
Fig. 4 Level adjustment surfaces
4.6 Connection to air supply
Connect to main supply of compressed air (The air shall be clean and dry.) See pneumatic scheme No. 213671, at the end of this manual.

Note!
Be careful when opening the main valve for the first time, cylinders may do unexpected motions.

4.7 Fixture discs
The RM2-positioner can be equipped with different versions of fixture discs. The discs of drive side and support side may look different depending on preparation for different options.

- **Fixture bracket**
Optional brackets for mounting of fixtures are available. Fixture brackets are delivered in pairs.
One pair contains one complete set, one for the drive side and one for the support side.
### 4.8 Maximum load

To guarantee long and safe operation with high positioning accuracy of the RM2-250 STX, the machine must not be overloaded. Follow restrictions below:

- Maximum static torque of servo axis = 832 Nm.
- Maximum payload = 250 kg (incl. fixtures).
- Maximum offset from rotation centre at 250 kg = 0.339 m

\[
\frac{832}{250 \times 9.81} = 0.339 \text{ m}
\]

**Note!**

If the difference in weight between the two sides (A - B) exceed 150 kg the servo motor is overloaded. (e.g. when mounting or exchanging fixtures). Keep swing locked when changing fixtures or use a counterweight.
4.9 **Connection to MOTOMAN XRC**

Installation and connection to XRC comprises hardware as well as software installation, this moment shall be carried out by MOTOMAN-service personnel. When the RM2 is delivered together with a robot, this installation is already carried out at MOTOMAN factory.

See separate scheme, included in the documentation, for electrical connection:

- ✔ Internal wiring I/O-signals, PNP; 347358-90
- ✔ Internal wiring I/O-signals, NPN (US-version); 347358-92
- ✔ Servo motor power transfer; SIGMA 347271-xx
- ✔ Servo motor signal transfer; SIGMA 347269-xx
- ✔ Servo motor power transfer; USADED 341923-xx
- ✔ Servo motor signal transfer; USADED 341920-xx
- ✔ I/O transfer; 347339-xx

---

**Earth connection**

Connect machine stand to protective earth. Use terminal screw on base of the headstock.

---

*Fig.5 Earth connection*
**Note**

Install all electrical cables connecting the positioner, controller, welding machine, and electrical supply wiring cables so that there is no possibility of their being walked on or run over. Do not put any object directly on the cables.

Do not install cables across other cables and do not lay cables underneath the welding machine.

The positioner is controlled from the robot controller / operators panel. Install these so that the positioner is in full view from the controller.
4.10 Before first start

Before starting the operation, the safety fence, shield screens, cover and protective devices must be connected. Personnel should be instructed to stay outside the robot / positioner work area.

■ Shipping bolt

Remove the shipping bolt which stops the motor carriage from sliding back and fourth.

■ Function control

Warning

Check all safety functions emergency stop buttons etc. Failure to do so could result in serious personal injury or death.

Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) may cause unexpected positioner motion which may result in severe personal injury or death.

If RFI or EMI are suspected, contact an electrical noise consultant.

During operation, check the positioner for excessive vibration, unusual noise etc. If any of these occur, stop immediately by pushing EMERGENCY STOP button on the operator’s panel, and contact MOTOMAN-Service.
5. Maintenance

5.1 General

Maintenance of the positioner should be handled only by authorized personnel or MOTOMAN-Service, who are thoroughly familiar with the design and construction of the system.

Before performing maintenance or service work, be sure to:

a) Turn off and lock the electrical supplies.

b) Lock the wiring circuit breaker.

Warning!

Due to possible interconnections of the positioner controller with other equipment, more than one live circuit can exist. Be sure you have turned off all live circuits before servicing.

In order to prevent inadvertent turning on of the machine, post a warning or danger notice on the disconnected main switch, indicating that maintenance is performed.

After completing maintenance work, be sure to check that all the cover clamping bolts are tight and that no tools are left in the interior of the working cell.

5.2 CYCLO reduction gears

Condition at delivery

Check lubrication before putting into service when delivered as spare part.

Mounting of motor

For reduction units with a hollow input sleeve the motor shaft should be coated with MoS2-paste or spray (e.g. Molycote).

Seal between motor and housing with liquid packing.

Overhaul

After about 20,000 hours or 4 to 5 years operation, it is advisable to overhaul the unit and replace the grease.

Disassembly - reassemble

In principle, disassembly of the reduction unit is not recommended. No attempt should be made to change the mesh or clearances within the unit. If the unit is disassembled by other than CYCLO personnel then the operating and performance characteristic cannot be guaranteed.

Type FA-45-119

Mounting torque

Mounting torque between:

- Gear - Stand 8 x M12 135 Nm
- Gear - Motor 4 x M12 135 Nm

Lubrication

The serie CYCLO FA-45-119 is filled with grease at delivery from MOTOMAN. The amount of grease is depending on direction of installation. Grease recom-
mendation is Esso Unirex N2.
Lubrication is carried out from the nipple on the output shaft, draining from the input side of the housing. No additional lubrication is required.

5.3 Guide blocks
RM2-250 STX motor unit is mounted on guide blocks and rails. Two brands of guide blocks may be used; INA or STAR.

Note!
The two brands may not be mixed! Always check which brand of guide blocks before ordering spare part. It is stated on the rail by company name.

5.4 Fixing hubs
Friction locking assemblies shall be mounted slightly oiled. To increase torque by approx. 15%, make a dry mounting by drying the internal and external surfaces of the locking assembly by using a cloth.

Mounting
In order to obtain high performance the right torque must be set, use a dynamometric wrench. This operation shall be carried out gradually.
The friction locking assemblies are self centering.
Torque for CN 910 50x80 41 Nm
Torque for CN 910 80x120 83 Nm

Dismantling
Take off as many screws as the extracting holes are and tighten them again in the latter.

5.5 Cleaning
The machine does not need any special cleaning beside normal cleaning once a shift (dust etc.). Inspection of the guide rails must be carried out on regular basis. Keep an eye on the current transfer discs. If the surface is too worn, bad contact and bad welding result will occur.

5.6 Pneumatic equipment
Check the air-treatment unit regularly, empty the filter bowl.
See, separate pneumatic scheme.

Pneumatic valve
FESTO CPE, double solenoid valve. The valve is actuated by means of alternate switching of the voltage supply to the solenoid coils, and retains its switched position, even after the signal is removed, until a counter-signal is received.
The valve can be run with lubricated or unlubricated air.
Operating pressure 0,3 up to 0,8 MPa.
Coil: 24 V, 1 W
Flow rate: 750 l/min.
Ambient temperature -10°C up to +50°C.
5.7 **AC servo**

**Servo motor**
The AC servo motor has no wearing parts (e.g. brushes), so simple daily inspection is sufficient. The inspection schedule for the motor is shown in table. Do not disassemble the motor. If disassembly should become necessary, contact MOTOMAN-service.

**Servopack**
The servopack does not require any special maintenance. Remove dust and tighten screws periodically.

**Maintenance of AC servo motor**

<table>
<thead>
<tr>
<th>Inspection item</th>
<th>Frequency</th>
<th>Inspection operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration</td>
<td>Daily</td>
<td>Feel manually</td>
</tr>
<tr>
<td>Noise</td>
<td>Daily</td>
<td>Aurally</td>
</tr>
<tr>
<td>Exterior and cleaning</td>
<td>As required</td>
<td>Clean with dry cloth or compressed air.</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>Annually</td>
<td>Make sure that it is more than 10 Mohm by measuring with a 500V megger after disconnection the motor from the controller.</td>
</tr>
<tr>
<td>Shaft seal</td>
<td>Every 5,000 h</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Overhaul</td>
<td>Every 20,000 hours or 5 years</td>
<td>If worn or damaged, replace after disconnecting the motor from the machine. Contact MOTOMAN-service.</td>
</tr>
</tbody>
</table>

**Troubleshooting**

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor does not start</td>
<td>Loose connection</td>
<td>Tighten connection</td>
</tr>
<tr>
<td></td>
<td>Wrong wiring</td>
<td>Correct wiring</td>
</tr>
<tr>
<td></td>
<td>Overload</td>
<td>Reduce load</td>
</tr>
<tr>
<td>Unstable operation</td>
<td>Wrong wiring</td>
<td>Inspect and correct wiring across motor terminals L1, L2, L3 and PE.</td>
</tr>
<tr>
<td>Motor overheats</td>
<td>Excessive ambient temperature</td>
<td>Reduce ambient temperature below 40°C.</td>
</tr>
<tr>
<td></td>
<td>Motor surface is dirty</td>
<td>Clean motor surface</td>
</tr>
<tr>
<td></td>
<td>Overload</td>
<td>Reduce load</td>
</tr>
<tr>
<td>Trouble</td>
<td>Cause</td>
<td>Remedy</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>Unusual noise</td>
<td>Motor loosely mounted</td>
<td>Tighten foundation bolts</td>
</tr>
<tr>
<td></td>
<td>Motor misaligned</td>
<td>Realign</td>
</tr>
<tr>
<td></td>
<td>Coupling out of balance</td>
<td>Balance coupling</td>
</tr>
<tr>
<td></td>
<td>Noisy bearing</td>
<td>Check alignment, noise of bearing, lubrication and contact MOTOMAN-service.</td>
</tr>
<tr>
<td></td>
<td>Vibration of driven machine</td>
<td>Contact machine manufacturer, MOTOMAN-service.</td>
</tr>
</tbody>
</table>

**NOTE!**

*Shaded text, remedies should be carried out after turning power OFF.*
5.8 Lubrication and maintenance schedule

This symbol indicates a location to perform inspection or maintenance according to the list below.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Point</th>
<th>Method</th>
<th>Lubricant</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>Ball bearing, permanently lubricated</td>
<td>--</td>
<td>Klüber Microlube GL-261</td>
</tr>
<tr>
<td>Weekly</td>
<td>Pneumatic system</td>
<td>Empty if necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check filter bowl</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Security</td>
<td>Visually, wrench key</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check bolts for fixtures and anchor bolts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visual inspection of the guide blocks and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rails. Particles in the welding fumes in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>combinations with grease leaves brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>coating on the rail. If these brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>coatings appear, they have to be removed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and the lubrication interval shortened.***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 h</td>
<td>Current transfer disc</td>
<td>Visually</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check for worn surfaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gear wheel *</td>
<td>Grease gun</td>
<td>20 gram Klüber grafloscon</td>
</tr>
<tr>
<td></td>
<td>If the cycle time is shorter than 2</td>
<td></td>
<td>C-SG 0 ULTRA</td>
</tr>
<tr>
<td></td>
<td>minutes, grease every 15.000 indexes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To access gears, covers must be removed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cables and hoses</td>
<td>Visually</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check wear and condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotary stud</td>
<td>Manually with a</td>
<td>Klüber Microlube GL-261</td>
</tr>
<tr>
<td></td>
<td></td>
<td>brush</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stud</td>
<td>Grease gun</td>
<td>Klüber Microlube GL-261</td>
</tr>
<tr>
<td></td>
<td>Guide blocks (four)</td>
<td>Grease gun</td>
<td>Klüber Microlube GL-261</td>
</tr>
<tr>
<td></td>
<td>Amount of grease for each carriage = 2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cm$^3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plunger for locking of fixture discs.</td>
<td>Grease gun</td>
<td>Klüber Microlube GL-261</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacing</td>
<td>FA-45-119 Reduction gear</td>
<td>--</td>
<td>Esso Unirex N2</td>
</tr>
<tr>
<td></td>
<td>The gear is lubricated at delivery. No</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>need to lubricate before putting into</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>service.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.000 h</td>
<td>Reduction gear, overhaul</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>See separate instruction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) See lubrication note, mounted on the cover.
**) MOTOMAN lubricates the gear before shipping as spare part.
***) If no coating is visible, the inspection interval can be extended.
5.9 Pneumatic diagram

- **Standard**
  - Air supply in fixture discs
  - 2x1/4”

- **Option 1**
  - Controlled air in fixture discs
  - 2x1/4”

- **Option 2**
  - Air supply in fixture discs
  - 2x1/4”

- **Option 3**
  - Air supply in fixture discs
  - 1x3/8”

Air cleaning unit
## Pneumatic options

Following options are available for the RM2-250 STX positioner.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Option P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Drive side = Air supply 1x1/4” in each disc</td>
<td>-</td>
</tr>
<tr>
<td>Option 1</td>
<td>Support/drive side = Controlled air 2x1/4” in each disc</td>
<td>314281</td>
</tr>
<tr>
<td>Option 2</td>
<td>Support/drive side = Air supply 2x1/4” in each disc</td>
<td>314281-81</td>
</tr>
<tr>
<td>Option 3</td>
<td>Support/drive side = Air supply 1x3/8” in each disc</td>
<td>314402</td>
</tr>
<tr>
<td>Option 4</td>
<td>Support side = 350° Signal transfer device</td>
<td>314259-80</td>
</tr>
<tr>
<td>Option 5</td>
<td>Support side = Signal transfer device, endless rotation 24 channels</td>
<td>313737-81</td>
</tr>
<tr>
<td>Option 6</td>
<td>Support side = Signal transfer device, endless rotation 2 channels for bus communication</td>
<td>313737-82</td>
</tr>
</tbody>
</table>

**Note!**

Adding any of the options 1, 2 or 3 on the drive side enables the standard air supply on the drive side.

Only one of the options 1, 2, 3, 4, 5 or 6 may be used at the same time (on each side).
6. Spare parts

Guarantee and machine function is valid only when using original Motoman spare parts. Using defect parts in the machine may result in severe accidents.

When ordering spare parts, always state:
✔ Machine type
✔ Machine no.
✔ Part no.
✔ Part name.
✔ Number of parts.

However, it is always advisable to keep some of the most frequent spare parts in stock, close to the machine.

For RM2-250 STX the following parts are recommended:

<table>
<thead>
<tr>
<th>Name</th>
<th>Part No.</th>
<th>No. of p.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet valve CPE-18-MIH</td>
<td>7027083</td>
<td>1</td>
</tr>
<tr>
<td>Limit switch XCK-M102</td>
<td>8410010</td>
<td>1</td>
</tr>
<tr>
<td>Limit switch XCK-J767</td>
<td>8410026</td>
<td>1</td>
</tr>
<tr>
<td>Carbon brush R=35</td>
<td>413569</td>
<td>2</td>
</tr>
<tr>
<td>Grease Klüber Grafloscon</td>
<td>9100551</td>
<td>1</td>
</tr>
</tbody>
</table>

If there are several indexing equipment of the same kind in the factory it is advisable to keep following parts in stock.

Send your order to:
Address: Motoman Robotics Europe AB
Box 504
SE-385 25 Torsås
Sweden

Telephone: +46 486 48800
Telefax: +46 486 41410

Or nearest Motoman dealer.......
**Covers**

- **1**
- **2**
- **3**
- **4**
- **5**
- **6**
- **7**
- **8**
- **9**
<table>
<thead>
<tr>
<th>Pos. No</th>
<th>Part No.</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>313679</td>
<td>Lid</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>313679</td>
<td>Lid</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>413738</td>
<td>Rubber cover</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>113636</td>
<td>Hood</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8090101</td>
<td>Earth connection</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>315041</td>
<td>Upper cover</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>314067</td>
<td>Lower cover</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>213372-xx</td>
<td>Bed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>214135-xx</td>
<td>Center beam</td>
<td></td>
</tr>
</tbody>
</table>
■ Drive unit, gear
<table>
<thead>
<tr>
<th>Pos. No</th>
<th>Part No.</th>
<th>Description</th>
<th>Note</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>413569</td>
<td>Carbon brush</td>
<td>Incl. in pos. 2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>213660</td>
<td>Current transfer</td>
<td>Complete</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>413956</td>
<td>Insulation plate</td>
<td>Incl. in pos. 2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>213658</td>
<td>Bracket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8410010</td>
<td>Limit switch</td>
<td>XCK-M102</td>
<td>SLA/B</td>
</tr>
<tr>
<td>6</td>
<td>314062</td>
<td>Gear wheel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>6040010</td>
<td>Ball bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6015046</td>
<td>Locking ring</td>
<td>SGA 50</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>313646</td>
<td>Stud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>113405</td>
<td>Arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>213531</td>
<td>Shaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>213455</td>
<td>Bearing cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>6040066</td>
<td>Ball bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>413685-80</td>
<td>Indicator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>6046817</td>
<td>Fixing hub</td>
<td>CN10 910 80x120</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>313736-81</td>
<td>Earth connection</td>
<td>L=750</td>
<td></td>
</tr>
</tbody>
</table>
■ Headstock, drive unit
MOTOMAN ROBOTICS EUROPE

Service manual RM2-250 STX

Note!

STAR and INA components may not be mixed. However, they are fully interchangeably.

<table>
<thead>
<tr>
<th>Pos. No</th>
<th>Part No.</th>
<th>Description</th>
<th>Note</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7028140</td>
<td>Cylinder DNC-100-50-PPV-A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7028141</td>
<td>Proximity switch SME-8-L-LED-24</td>
<td>S2R, S2S</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>413954</td>
<td>Rod nut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8410026</td>
<td>Limit switch XCK-J767</td>
<td>1S2S</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>7027083</td>
<td>Pneumatic valve CPE-18-MIH-5J-1/4</td>
<td>Y2S, Y2R</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8413120</td>
<td>Pressure switch 801-10-211SP4.8</td>
<td>SB1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>113726</td>
<td>Motor bracket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>113543-90</td>
<td>Servo drive unit USADED-22-YG21, FA-45-119</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>113826-90</td>
<td>Servo drive unit SGMDH-22A2A-YR32, FA-45-119</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9*</td>
<td>6045239</td>
<td>Guide block INA:KWVE 35V1G4</td>
<td>STAR:1651-314-10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6045139</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10*</td>
<td>6045295</td>
<td>Rail INA: THVD35V-476-38/38</td>
<td>STAR:160-304-31,475</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6045195</td>
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<tr>
<td>11</td>
<td>314165</td>
<td>Fork</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>414136</td>
<td>Shoulder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>8411213</td>
<td>Connection box PNP</td>
<td>X10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8411223</td>
<td></td>
<td>NPN (US-version)</td>
<td></td>
</tr>
</tbody>
</table>

*) Note!
■ Headbeam, drive units
<table>
<thead>
<tr>
<th>Pos. No</th>
<th>Part No.</th>
<th>Description</th>
<th>Note</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>313528</td>
<td>Current transfer</td>
<td>Complete</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>313678</td>
<td>Sleeve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>313736</td>
<td>Earth connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8411044</td>
<td>Inductive proximity switch</td>
<td>PNP</td>
<td>S1RB,</td>
</tr>
<tr>
<td></td>
<td>8411045</td>
<td></td>
<td>NPN</td>
<td>S1RA</td>
</tr>
<tr>
<td>5</td>
<td>6017222</td>
<td>O-ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>413572</td>
<td>Ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>413952</td>
<td>Rotary stud</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>314470</td>
<td>Safety disc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>213655-80</td>
<td>Gear wheel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>313579</td>
<td>Index plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>413157</td>
<td>Bushing</td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>6046811</td>
<td>Clamping sleeve</td>
<td>CN 910 50x80</td>
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<tr>
<td>13</td>
<td>313578-80</td>
<td>Fixture plate</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>313578-81</td>
<td></td>
<td>US-version</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>6015439</td>
<td>Locking ring</td>
<td>SGH60</td>
<td></td>
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<tr>
<td>15</td>
<td>413152</td>
<td>Cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>6015439</td>
<td>Locking ring</td>
<td>SW55</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>313176</td>
<td>Housing</td>
<td></td>
<td></td>
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<tr>
<td>18</td>
<td>6034080</td>
<td>Spring</td>
<td>TF 5x20x130</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>413154</td>
<td>Spacer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>313177-81</td>
<td>Plunger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>413953</td>
<td>Sliding heel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
■ Tailstock
<table>
<thead>
<tr>
<th>Pos. No</th>
<th>Part No.</th>
<th>Description</th>
<th>Note</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6070028</td>
<td>Bearing</td>
<td>FY60TF</td>
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</tr>
<tr>
<td>2</td>
<td>114082</td>
<td>Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>113406-81</td>
<td>Arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>213473</td>
<td>Shaft</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6017222</td>
<td>O-ring</td>
<td>Option</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>213492-82</td>
<td>Shaft</td>
<td>Option</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6040902</td>
<td>Ball bearing</td>
<td>incl. clip</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6015046</td>
<td>Clip</td>
<td>SGA 50</td>
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<td>10</td>
<td>313678</td>
<td>Sleeve</td>
<td>Option</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>313094-82</td>
<td>Fixture disc</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>313094-81</td>
<td></td>
<td>US-version</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>313736</td>
<td>Earth connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>213473</td>
<td>Shaft</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>413572</td>
<td>Ring</td>
<td>Current transfer</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>313528</td>
<td>Current transfer</td>
<td>Complete</td>
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## Air cleaning unit

<table>
<thead>
<tr>
<th>Pos. No</th>
<th>Part No.</th>
<th>Description</th>
<th>Note</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>7006051</td>
<td>Pressure gauge</td>
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<tr>
<td>2</td>
<td>-</td>
<td>Air filter regulator</td>
<td>LRF-D-MIDI</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>Valve</td>
<td>HE-D-MIDI</td>
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<tr>
<td>4</td>
<td>-</td>
<td>Non-return valve</td>
<td>FRM-H-D-MIDI</td>
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<tr>
<td></td>
<td>7027930</td>
<td>Complete service unit</td>
<td>Incl. pos 1-4</td>
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<tr>
<td>6</td>
<td>413951</td>
<td>Connection block</td>
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<tr>
<td>7</td>
<td>314034</td>
<td>Insulation plate</td>
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## Signal transfer, LTN

<table>
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<th>Pos.</th>
<th>Part.No.</th>
<th>Description</th>
<th>Note</th>
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<tbody>
<tr>
<td>1</td>
<td>8291015</td>
<td>Slip ring device, LTN</td>
<td>12-channel / Bus comm.</td>
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<tr>
<td></td>
<td>8291017</td>
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<td>24-channel</td>
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<td>2</td>
<td>214185</td>
<td>Shaft</td>
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<tr>
<td>3</td>
<td>6002048</td>
<td>Bolt</td>
<td>M8x30</td>
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<td>4</td>
<td>314750-80</td>
<td>Cover</td>
<td>for 12-channel device</td>
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<tr>
<td></td>
<td>314750-81</td>
<td>Cover</td>
<td>for 24-channel device</td>
</tr>
</tbody>
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