Motoman® NX100 Controller

MT1-1500 S2N Positioner Manual
for Sigma III Positioners

Part Number: 155400-1CD
Revision: 0

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Chapter 1

Introduction

1.1 About This Document

This manual provides operating information for the MT1-1500 S2N positioner and contains the following sections:

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

CHAPTER 2 - SAFETY
This section provides information regarding the safe use and operation of Motoman products.

CHAPTER 3 - MT1-1500 S2N INSTRUCTIONS
Provides detailed operator's information for the MT1-1500 S2N positioner.

1.2 Reference to Other Documentation

For additional information refer to the following:

- NX100 Controller Manual (P/N 149201-1)
- Concurrent I/O Manual (P/N 149230-1)
- 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:

- Product (MT1-1500 S2N)
- Application Type (welding, handling, etc.)
- Robot Serial Number (located on back side of robot arm)
- Robot Sales Order Number (located on back of controller)
Notes
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 R15.06-1999. The address is as follows:

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

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)
2.2 Standard Conventions

This manual includes the following alerts – in descending order of severity – that are essential to the safety of personnel and equipment. As you read this manual, pay close attention to these alerts to insure safety when installing, operating, programming, and maintaining this equipment.

DANGER!
Information appearing in a DANGER 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 in a WARNING 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 in a CAUTION 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 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 R15.06-1999, section 4.2.5, Sources of Energy, 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 R15.06-1999 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 equipment is provided as standard:

- Safety fences and barriers
- Light curtains and/or safety mats
- Door interlocks
- Emergency stop palm buttons located on operator station, robot controller, and programming pendant

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 R15.06-1999 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, Operation, and 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. 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 program, operate, and maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- 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 all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Do not enter the robot cell while it is in automatic operation. Be sure that only the person holding the programming pendant enters the workcell.
- Check the E-STOP button on the programming pendant for proper operation before programming. The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before 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.
• Any modifications to PART 1, System Section, of the robot controller concurrent I/O program can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1, System Section. 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.

• The robot controller allows modifications of PART 2, User Section, of the concurrent I/O program and modifications to controller parameters for maximum robot performance. Great care must be taken when making these modifications. 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 and other parts of the system. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations.

• Check and test any new or modified program at low speed for at least one full cycle.

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

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

• Use proper replacement parts.

• 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).
Notes
Upon receipt of this product and prior to initial operation, read these instructions thoroughly, and retain for future reference.
Reference list

MOTOMAN engineers

Revision

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Instruction manual
Positioner MOTOMAN MT1-1500S2N

1. About this manual
This manual shall be available to service personnel.
- Technical data
- Machine safety
- Installation
- Maintenance
- Spare parts

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.

1.1 General
- **Positioner comprises**
  - One-station two axis turn-tilt positioner, type MT1-1500S2N
  - Cable set between positioner and controller
  - Assembly kit for NX100-controller
1.2 Identification

Fig. 1 Identification
2. Safety

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/EC) and the demands of the EMC-directives (89/336/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 (2006/42/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.

2.1 Manufacturer

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

Telephone: +46 480 417 800
Telefax: +46 486 41410

Machine type: MT1-1500S2N
Machine No. See machine sign
Year of manufacturing: See machine sign
2.2 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.
3. Technical specifications

Refer to MOTOMAN dimension drawing No. 215172-100.

- **Technical specification tilt axis**

<table>
<thead>
<tr>
<th>Part No:</th>
<th>Tilt axis torque</th>
<th>Tilt axis nom. speed</th>
<th>Tilt axis max speed</th>
<th>Max. offset</th>
<th>Servo</th>
</tr>
</thead>
<tbody>
<tr>
<td>-100</td>
<td>Dynamic: 8290 Nm Static; 6632 Nm</td>
<td>0-3.4 rpm</td>
<td>9.1 rpm</td>
<td>450 mm</td>
<td>3.7 kW</td>
</tr>
</tbody>
</table>

- **Technical specification rotating axis**

<table>
<thead>
<tr>
<th>Part No:</th>
<th>Rotating axis torque</th>
<th>Rotating nom. axis speed</th>
<th>Rotating axis max. speed</th>
<th>Max. offset</th>
<th>Servo</th>
</tr>
</thead>
<tbody>
<tr>
<td>-100</td>
<td>Dynamic: 6480 Nm Static; 5184 Nm</td>
<td>0-4.3 rpm</td>
<td>11.6 rpm</td>
<td>352 mm</td>
<td>3.7 kW</td>
</tr>
</tbody>
</table>

- **Maximum rotation**

  Rotating axis: Has no mechanical limit (Software limit 540°)
  Endless rotation available.

- **Maximum payload**

  MT1-1500S2N 1500 kg (incl. fixture)

- **Welding capacity**

  - Continuous duty 100% 700 A
  - Duty factor 60% 920 A

- **Positioning**

  - Repetitive pos. accuracy ± 0.2 mm

- **Colour**

  Type Two-pack convertible painting
  Stand Weduren 50 Motoman blue

- **Gear ratio (tilting axis)**

  Reduction gear 141:1
  Gear wheels 137:44
  Reduction total 439,0227 (19317/44)
  Efficiency total 0.80

- **Gear ratio (rotating axis)**

  Reduction gear 141:1
  Gear wheels 129:53
  Reduction total 343,1887 (18189/53)
  Efficiency total 0.80
3.1 **Maximum load**

To guarantee long and safe operation with high positioning accuracy of the MT1-1500S2N, the machine must not be overloaded.

- **Rotation around tilt axis**
  Maximum static torque of tilt axis = 6632 Nm  
  Maximum payload = 1500 kg (incl. fixture)  
  Maximum tilt axis offset from rotation centre at 1500 kg = 450 mm

- **Rotation around rotating axis**
  Maximum static torque of rotating axis = 5184 Nm  
  Maximum payload = 1500 kg (incl. fixture)  
  Maximum rotating axis offset from rotation centre at 1500 kg = 352 mm

---

**Fig. 2  Maximum load**

\[
\text{Tilt axis offset} = \frac{6632}{1500 \times 9.81} = 0.450 \text{ m}
\]

\[
\text{Rotating axis offset} = \frac{5184}{1500 \times 9.81} = 0.352 \text{ m}
\]
4. Installation

4.1 Lifting instruction

When lifting the machine use straps, applied to the centre beam according to sketch, or use a fork lift with its forks in their outer position.

Total weight for MT1-1500S2N; 3.400 kg (incl. counter weight).

*The straps shall be certificated for at least 5.000 kg each.*

---

**Warning!**

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.
4.2 Dimensions

Fig. 4 Main drawing with dimensions for tilt and rotating units
4.3 Mounting

The MT1-1500S2N 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 level 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.

1. Remove the cover before leveling.
2. Place a spirit-level on the surfaces A. Adjust the level with the screws in the corners to a level < 0.2 / 1000 mm.
3. Fix the bed to the floor. Use anchor bolts according to the holes in the stand.
4. Mount the L-arm (rotating axis) if necessary. Check the surface B, adjust if necessary.
5. Connect motor and signal cables between controller and positioner.

![Fig.5 Adjustment level surfaces](image-url)
4.4 Fixture design

4.4.1 Fixture disc 314196

Fig. 6 Fixture disc
4.5 Maximum fixture size

Fig. 7 Maximum fixture size

<table>
<thead>
<tr>
<th>Positioner type</th>
<th>max r</th>
<th>max h</th>
</tr>
</thead>
<tbody>
<tr>
<td>215172-100</td>
<td>1190</td>
<td>1465</td>
</tr>
</tbody>
</table>
4.6 Connection to MOTOMAN NX100

Installation and connection to NX100 comprises hardware as well as software installation, this moment shall be carried out by MOTOMAN-service personnel.

When the MT1-1500S2N is delivered together with a robot, this installation is already carried out at MOTOMAN factory.

Se separate scheme, included in this documentation, for electrical connection.

- Servo motor power transfer; SIGMA-III 347763-xx
- Servo motor signal transfer; SIGMA-III 347262-xx
- Internal wiring 347924-90

---

**Warning!**

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.

4.6.1 Safety components

Due to safety regulations, two limit switches incorporated in the safety circuits are mounted on each servo axis. It is not allowed to remove these limit switches.

If the servo motor starts when the operator is in the restricted area, safety circuit is tripped.

---

*Fig. 8 Safety switches*
4.7 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.

Warning!
Check all safety functions emergency stop buttons etc. Failure to do so could result in serious personnel 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 MOTO-MAN-service, who are thoroughly familiar with the design and construction of the system.

Before performing maintenance or service work, be sure to:
1. Turn off and lock the electrical supplies
2. 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 gear F2C-T555-141

5.2.1 Condition at delivery

The reduction units are filled with grease and ready for operation.

5.2.2 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.

5.2.3 Mounting torque

<table>
<thead>
<tr>
<th>Mounting torque between:</th>
<th>Gear - Shaft - Gear wheel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer circle</td>
<td>6 x M16 12.9 333 Nm</td>
</tr>
<tr>
<td>Centre circle</td>
<td>3 x M12 12.9 136 Nm</td>
</tr>
<tr>
<td>Inner circle</td>
<td>6 x M12 12.9 136 Nm</td>
</tr>
</tbody>
</table>

---

5.2.4 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, the operating and performance characteristic cannot be guaranteed.

5.3 Cleaning

The machine does not need any special cleaning beside normal cleaning once a shift (dust etc.). Keep an eye on the current transfer disc. If the surface is too worn, bad contact will occur.
5.4 AC servo

5.4.1 Servomotor
The AC servomotor 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.

5.4.2 Servopack
No specific maintenance. Remove dust and tighten screws periodically.

5.4.3 Maintenance

<table>
<thead>
<tr>
<th>Inspection item</th>
<th>Frequency</th>
<th>Inspection operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration and noises</td>
<td>Daily</td>
<td>Feel and listen manually</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>

5.4.4 Trouble shooting

<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>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 MOTOMAN-service</td>
</tr>
</tbody>
</table>

Information!
Shaded text, remedies should be carried out after turning power OFF.


5.5 Lubrication scheme

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>Bearing, permanently lubricated</td>
<td>--</td>
<td>---</td>
</tr>
<tr>
<td>Weekly</td>
<td>Security</td>
<td>Visually</td>
<td>Wrench key</td>
</tr>
<tr>
<td></td>
<td>Check bolts for fixture and anchor bolts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Counter weight</td>
<td>Wrench key</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check fastening of counter weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 h</td>
<td>Gear</td>
<td>Manually with a brush</td>
<td>Klüber Grafoscon C-SG 0 Ultra</td>
</tr>
<tr>
<td></td>
<td>If the cycle time is shorter than 4 minutes, grease every 15,000 indexes. Covers must be removed to access lubrication point</td>
<td></td>
<td></td>
</tr>
<tr>
<td></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>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>5000 h</td>
<td>Slewing bearing</td>
<td>Grease gun</td>
<td>Klüber Microlube GL-262</td>
</tr>
</tbody>
</table>
6. Spare parts

Guarantee and machine function is valid only when using original Motoman Robotics Europe AB 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 MT1-1500 S2N, 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>Carbon brush</td>
<td>414757</td>
<td></td>
</tr>
<tr>
<td>Klüber Grafloscon</td>
<td>9100551</td>
<td>1</td>
</tr>
<tr>
<td>Safety limit switch ES13RS</td>
<td>8410031</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:
Motoman Robotics Europe AB
Box 504
SE-385 25 Torsås
Sweden

Telephone: +46 480 417 800
Telefax: +46 486 41410

...or nearest MOTOMAN dealer...
6.1 Spare part lists

6.1.1 MT1-1500S2N complete

<table>
<thead>
<tr>
<th>Pos</th>
<th>Part no</th>
<th>Part name</th>
<th>Remark</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>114823-100</td>
<td>X-unit</td>
<td>H=1200</td>
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<tr>
<td>2</td>
<td>114827-100</td>
<td>Arm (Complete)</td>
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### 6.1.2 X-unit 114823-

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<tr>
<th>Pos</th>
<th>Description</th>
<th>Part no.</th>
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<tbody>
<tr>
<td>1</td>
<td>Switch bracket</td>
<td>314697-81</td>
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<tr>
<td>2</td>
<td>Ground disc</td>
<td>314617</td>
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<tr>
<td>3</td>
<td>Proximity switch</td>
<td>8410030</td>
<td>ES 13 RS</td>
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<td>4</td>
<td>Cam shaft</td>
<td>213176-80</td>
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<tr>
<td>5</td>
<td>Slew bearing</td>
<td>6044915</td>
<td>z=137 m=5</td>
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<td>6</td>
<td>Gear wheel</td>
<td>213771</td>
<td>z=44 m=5</td>
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<td>7</td>
<td>Stand</td>
<td>113656-</td>
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<td>8</td>
<td>Ring</td>
<td>413945</td>
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<td>9</td>
<td>Servo unit</td>
<td>215165-100</td>
<td>F2C-T555-141/3.7</td>
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<td>10</td>
<td>Earth plinth</td>
<td>314033</td>
<td>3-pol</td>
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<td>11</td>
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6.1.3 Arm 114827-100

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<td>Current transfer unit</td>
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<td>See paragraph below</td>
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<td>Servo Unit</td>
<td>215165-100</td>
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<td>Limit switch</td>
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6.1.4 Current transfer unit 315439-82

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<td>Current transfer complete</td>
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<td>Housing, current</td>
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<td>3</td>
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<td>Carbon brush</td>
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<td>Spring</td>
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<td>Screw</td>
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<td>M8x25</td>
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<td>Ø19,5x6</td>
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