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

MOTOMAN MANUALS

- STEM PLATFORM GEN-II SYSTEM MANUAL
- MH5F/MH5S or MHJ MANIPULATOR MANUAL
- MH5(L)S/F, -MH5(L)S II MAINTENANCE MANUAL
- FS100 OPERATOR’S MANUAL
- FS100 MAINTENACE MANUAL
- FS100 INFORM LANGUAGE MANUAL
- FS100 OPTION INSTRUCTIONS FOR CONCURRENT I/O MANUAL
- FS100 BRAKE RELEASE MANUAL

Make sure to use the appropriate manual.
MANDATORY

General items related to safety are listed in Chapter 1: Safety of the FS100 Instructions. To ensure correct and safe operation, carefully read the FS100 instructions.

CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating or completing maintenance.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modifications will void the product's warranty.
Notes for Safe Operation

Read manuals carefully before installing, operating, maintenance, or inspecting the STEM Platform Gen-II.

In this manual, the Notes for Safe Operation are classified as "DANGER", "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".

- **DANGER**: Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

- **WARNING**: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

- **CAUTION**: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

- **MANDATORY**: Always be sure to follow explicitly the items listed under this heading.

- **PROHIBITED**: Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

---

To ensure safe and efficient operation at all times, make sure to follow all instructions, even if not designated as "DANGER", "WARNING" and "CAUTION".

---

**DANGER**

- Maintenance and inspection must be performed by a person specific person who took the maintenance training course at Yaskawa.

Failure to observe this caution may result in electric shock or injury.

- For disassembly or repair, contact your Yaskawa representative.

- Do not remove the motor, and do not release the brake.

Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the robot's arm.
WARNING

• Before operating the STEM Platform Gen-II, check that servo power is turned OFF when the emergency stop button on the teach pendant is pressed. When the servo power is turned OFF, the SERVO ON LED on the teach pendant is turned OFF. Injury or damage to machinery may result if the emergency stop circuit cannot stop the robot during an emergency.

Figure 1: Emergency Stop Button

• In the case of not using the teaching pendant, be sure to supply the emergency stop button on the equipment. Then before operating the STEM Platform Gen-II, check to be sure that the servo power is turned OFF by pressing the emergency stop button. Connect the external emergency stop button to the 5-6 pin and 16-17 pin of the robot system signal connector (CN2).
• Upon shipment of the STEM Platform Gen-II, this signal is connected by a jumper cable in the dummy connector. To use the signal, make sure to supply a new connector, and then input it. If the signal is input with the jumper cable connected, it does not function, which may result in personal injury or equipment damage.
• Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the STEM Platform Gen-II. Then turn the servo power ON. Injury may result from unintentional or unexpected robot motion.

Figure 2: Release of Emergency Stop

• Observe the following precautions when performing teaching operations within the robots operating range:
  – Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  – Always follow the predetermined operating procedure.
  – Keep in mind the emergency response measures against the robot’s unexpected motion toward you.
  – Ensure that you have a safe place to retreat in case of emergency.
Improper or unintended STEM Platform Gen-II operation may result in injury.
• Confirm that no person is present in the robot’s operating range and you are in a safe location before:
  – Turning ON the FS100 power.
  – Moving the robot with the teach pendant.
  – Running the system in the check mode.
  – Performing automatic operations.
Injury may result if anyone enters the operating range during operation. Always press the emergency stop button immediately if there is a problem.
A emergency stop button is on the right of the teaching pendant.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN STEM Platform Gen-II consists of a robot, controller, robot cables, and teach pendant.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS100 controller</td>
<td>FS100</td>
</tr>
<tr>
<td>FS100 teaching pendant</td>
<td>Teach pendant</td>
</tr>
<tr>
<td>Cable between the robot and the controller</td>
<td>Robot Cable</td>
</tr>
</tbody>
</table>

CAUTION

- Perform maintenance inspection using a specific person who took the maintenance training course at Yaskawa.

Failure to observe this may result in electric shock or injury.

- When the maintenance inspection is performed, be sure to mount the battery pack before removing the motor encoder connector.

Failure to observe this caution may result in disappearance of the home position data.

- Perform the following inspection procedures prior to conducting robot teaching. If problems are found, repair them immediately, and make sure all other necessary processes are performed.
  - Check for problems with robot movement.
  - Check for damage to insulation and heating of external wires.

- Always return the teaching pendant to the hook on the STEM Platform Gen-II.

The teaching pendant can be damaged if it is left in the work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the FS100 Instructions before operating the STEM Platform Gen-II.
Registered Trademarks

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or bland names for each company or corporation. The indications of (R) and TM are omitted.

Safeguarding Tips

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system 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 equipment, the included manuals, the system equipment, and options and accessories should be permitted to operate this equipment.

• Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

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

• In accordance with ANSI/RIA R15.06-2012, 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).

Mechanical Safety Devices

The safe operation of this equipment 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 R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this 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 barriers

• Door interlocks

• Emergency stop palm buttons located at operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
Programming, Operation, and Maintenance Safety

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system 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 equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment 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.
- Check the E-Stop button on the operator station for proper operation before programming. The equipment 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 the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from Yaskawa will void the warranty.
- Some operations require standard passwords and some require special passwords.
- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications.

All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.

- 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 equipment. All connections must be made within the standard voltage and current ratings of the equipment.
Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by Yaskawa-trained, qualified personnel.

Summary of Warning Information

This manual is provided to help users establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by Yaskawa. Address any questions regarding the safe and proper operation of the equipment to Yaskawa Motoman Customer Support.
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   1.2 Items Included ...................................................................................................................... 1-1  
      1.2.1 Technical Documentation ............................................................................................... 1-1  
   1.3 Tools Required ...................................................................................................................... 1-2  
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3 Powering Up STEM Cart ............................................................................................................. 3-1  

4 Moving Robot to Home Position ............................................................................................... 4-1  

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1 Introduction

1.1 Purpose

This manual is intended to supply information for:

- Uncrating STEM Cart, see “STEM Platform Gen-II READ ME”
- “Assembly of STEM Cart” see chapter 2
- “Powering Up STEM Cart” see chapter 3
- “Moving Robot to Home Position” see chapter 4
- “Common Parts” see chapter 5
- “Parts List” see chapter 6

1.2 Items Included

Please make sure the following items are included with your new Yaskawa Motoman STEM Platform GEN-II shipment.

- STEM Platform Gen-II
- STEM Platform Gen-II READ ME
- Teaching Pointers
- MotoSim SW Package and USB Dongles
- Technical Documentation

1.2.1 Technical Documentation

Review the following information before installing or operating the system

- STEM Platform GEN-II Manual
- FS100 Inform Language Manual
- FS100 Instructions Manual
- FS100 Maintenance Manual
- FS100 Option Instructions for Concurrent I/O Manual
- FS100 Brake Release Manual
- MH5F/MH5S Manipulator Manual or MHJ Manipulator Manual
- MH5(L)S/F, -MH5(L)S II Maintenance Manual (For MH5F only)
- Third Party Manuals
1.3 Tools Required

The following items are required to unpack and assemble the Yaskawa Motoman STEM Platform GEN-II:

- Screw Driver/Power Drill
- Phillip bits
- Square bits
- Utility Knife

1.4 Customer Support Information

If you need assistance, please contact Yaskawa Motoman Customer Support at the 24-hour telephone number (937) 847-3200.

For routine technical inquiries, you can contact Yaskawa Motoman Customer Support at techsupport@motoman.com.

When using e-mail to contact Yaskawa Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Yaskawa Motoman Customer Support at (937) 847-3200.

Please have the following information ready before calling:

<table>
<thead>
<tr>
<th>System</th>
<th>STEM Platform GEN-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robots</td>
<td>MHJF or MH5F</td>
</tr>
<tr>
<td>Primary Application</td>
<td>Educational</td>
</tr>
<tr>
<td>Controller</td>
<td>FS100</td>
</tr>
<tr>
<td>Software Version</td>
<td>Access this information on the Teaching Pendant’s LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}</td>
</tr>
<tr>
<td>Robot Serial Number</td>
<td>Located on the robot data plate</td>
</tr>
<tr>
<td>Robot Sales Order Number</td>
<td>Located on the robot data plate</td>
</tr>
</tbody>
</table>
2 Assembly of STEM Cart

Before beginning this chapter complete the Unpacking section of the STEM Platform Gen-II READ ME.

1. Move the STEM Platform to the appropriate location and set the wheel brakes.

2. Remove the door handle and pendant bracket from the cart.

3. Connect the door handle to the door of the cart using the screws supplied.
4. Attach the pendant bracket to the front left side of the cart using the screws provided.

5. Place the pendant on the pendant bracket just installed and connect the pendant cable into the pendant location on the controller.

6. Peel the protective paper from the interior and exterior protective panels.
3 Powering Up STEM Cart

The STEM Platform Gen-II is designed to run on 110 VAC, 15 amp circuit.
1. Make sure the switch on the controller is in the OFF position.

2. Plug the power strip into a standard 110 VAC, 15 amp outlet. Ideally this is a dedicated circuit.

3. Double check the jumper is installed in the appropriate location on the Step up/down transformer.

WARNING

Read and follow all local federal regulation when connecting the STEM Platform Gen-II to the required power sources.
4. Flip the switch on the front of the controller to turn the controller on.

Controller Switch
ON Position
4 Moving Robot to Home Position

**WARNING**

- Before operating the robot, make sure the SERVO ON LED is turned OFF when the emergency stop button on the teaching pendant is pressed. Injury or damage to machinery may result if the robot cannot be stopped in case of an emergency.
- Observe the following precautions when performing teaching operations within the robot’s operating range:
  - View the robot from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Keep in mind the emergency response measures against the robot's unexpected motion toward you.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended robot operation may result in injury.
- Confirm that no person is present in the robot’s operating range and that you are in a safe location before:
  - Turning ON the FS100 power.
  - Moving the robot with the teaching pendant.

Injury may result if anyone enters the robot's operating range during operation. Always press the emergency stop button immediately if there is a problem. The emergency stop button is located on the right of the teaching pendant.
1. Using the teach pendant to place the robot in a safe position press the (ROBOT button) on the Main Menu.

If the button is not seen on the Main Menu press the button.

CAUTION

- Perform the following inspection procedures prior to conducting robot teaching. If a problem is found, correct the problem and implement all other necessary measures immediately.
  - Check for problems in robot movement.
  - Check for damage to insulation and outer materials of external wires.
- Always return the teaching pendant to the hook on the FS100 cart after use.

If the teaching pendant is inadvertently left on a fixture, or on the floor, the robot or a tool may collide with the teaching pendant during robot movement, which may result in personal injury or equipment damage.

- Make sure the key of the mode select switch on the teaching pendant is stored in a safe place.

After operation, the key should be removed and stored in a safe place. Improper or unintended robot operation may result in injury.

Also, the key or the mode select switch may be damaged if the teaching pendant is dropped with the key inserted.
2. Press the \( \text{START} \) button once the JOB LIST displays.

3. Observe the SECOND HOME POS screen appears. (The screen will look similar to the figure below besides the values will differ).

4. Move robot to the HOME position by pressing and holding the \( \text{Dead Man switch (D.M.S.)} \), \( \text{button} \), and \( \text{button} \) until the \( \text{CURRENT} \) column is selected and release.

   **NOTE** While pressing the Dead Man switch DO NOT press the switch to hard or it will not work.
1. **Dead Man Switch**
   (Back of Pendant)

2. **FAST button**

3. **FWD button**
5. Using the outlines on the template for guidance place the Block Nests and Styrofoam Pad onto the template.
6. Install the teaching pointer (TCP) to the gripper mount using two thumb screws.

7. Place the fixed pointer in either nest with the rubber tip pointing up.

You are Now Ready to Use Your New STEM Platform Gen-II!
## Common Parts

The following table is a list of common parts not listed in chapter 6 “Parts List” that may be required at some point with your STEM Platform Gen-II.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>Qty/</th>
<th>MHJF</th>
<th>MH5F</th>
</tr>
</thead>
<tbody>
<tr>
<td>171294-1</td>
<td>ACCESSORY, ROBOT CALIBRATION POINTER ASSY</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>160893-2</td>
<td>CABLE ASSY, I/O, D-SUB, 25 COND, MALE/FEM, 2M</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>162669-8</td>
<td>CABLE ASSY, USER I/O, MHJ ROBOT BASE, FLYING LEADS, 1.3M</td>
<td>1</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>160894-2</td>
<td>CABLE ASSY, I/O, D-SUB, 37 COND, MALE/FEM, 2M</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>705940-1</td>
<td>EJECTOR, 1.0MM NOZZLE, 85% EVAC, EDUCATIONAL CELL</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>160895-2</td>
<td>CABLE ASSY, I/O, D-SUB, 50 COND, MALE/FEM, 2M</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>705939-1</td>
<td>NIPPLE, CONNECTION, SUCTION PAD, EDUCATIONAL CELL</td>
<td>1</td>
<td>X</td>
<td>xx</td>
</tr>
<tr>
<td>171330-1</td>
<td>CABLE ASSY, MAIN POWER, FS100, SINGLE PHASE, STEM</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>705938-2</td>
<td>PAD, BELLOWS SUCTION, FSGA 43, 1.5 FOLDS, NBR</td>
<td>1</td>
<td>X</td>
<td>X</td>
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<tr>
<td>171224-1</td>
<td>PANEL, TEACH GRID, EDUCATION CELL GEN II</td>
<td>1</td>
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<td>X</td>
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<tr>
<td>171180-1</td>
<td>BLOCK, NEST</td>
<td>2</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>171179-1</td>
<td>BLOCK, TRAINING</td>
<td>6</td>
<td>X</td>
<td>X</td>
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<tr>
<td>171356-1</td>
<td>DIAGRAM, SYSTEM, STEM GEN II, FS100</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>155139-1</td>
<td>BOX ASSY, I/O, 8 INPUTS/8 OUTPUT, SIMPLE EDUCATION SYSTEM</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
6 Parts List

### 6.1 MHJ Gripper Kit

<table>
<thead>
<tr>
<th>Item</th>
<th>P/N</th>
<th>Title</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>161008-2</td>
<td>MOUNT, GRIPPER, SCHUNK KKG 80 SERIES</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>479154-2</td>
<td>CLAMP, CABLE SUPPORT</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>145515-6</td>
<td>FITTING, TUBE TO M5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>162669-8</td>
<td>CABLE ASSY, USER I/O, MHJ (NOT SHOWN)</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>705940-1</td>
<td>EJECTOR, 1.00MM NOZZLE, 85% EVAC</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>705939-1</td>
<td>NIPPLE, CONNECTION, SUCTION PAD</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>705938-2</td>
<td>PAD, BELLOWS SUCTION, ROUND</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>171013-1</td>
<td>CABLE, UPPER ARM, MHJF-STEM (NOT SHOWN)</td>
<td>1</td>
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<tr>
<td>13</td>
<td>705936-1</td>
<td>SENSOR, GRIPPER, MMS 22, M8 CONNECTOR</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>706420-1</td>
<td>FITTING, TUBE, M3X4MM, BARB, 90DEG</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>705934-1</td>
<td>GRIPPER, PARALLEL, KGG 80-30</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>171178-1</td>
<td>FINGER, GRIPPER</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>171280-1</td>
<td>PLATE, WASHER, M4 12mm SPACING</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>479295-6</td>
<td>SCREW, SHC, M4X16</td>
<td>6</td>
</tr>
<tr>
<td>19</td>
<td>145515-4</td>
<td>FITTING, TUBE TO MALE BSPP</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>145558-1</td>
<td>TUBING, 4MM, BLACK, POLYURETHANE,</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>145522-2</td>
<td>FITTING, ELBOW, MALE, 4MM X 1/8 BSPP</td>
<td>3</td>
</tr>
</tbody>
</table>
6.2 MH5 Gripper Kit

<table>
<thead>
<tr>
<th>Item</th>
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<th>Title</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>161008-1</td>
<td>MOUNT, GRIPPER, SCHUNK KKG 80 SERIES</td>
<td>1</td>
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<tr>
<td>2</td>
<td>479154-4</td>
<td>CLAMP, CABLE SUPPORT</td>
<td>2</td>
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<tr>
<td>3</td>
<td>145515-1</td>
<td>FITTING, TUBE TO MALE, 4mm X M5</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>479154-1</td>
<td>CLAMP, CABLE SUPPORT</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>146220-4</td>
<td>SLEEVING, 3/4 (NOT SHOWN)</td>
<td>3000</td>
</tr>
<tr>
<td>7</td>
<td>130431-8</td>
<td>CLAMP, WIRE, PLASTIC, P-STYLE, 9/16&quot; (NOT SHOWN)</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>703698-7</td>
<td>CABLE, PICO, FEMALE, 4/26 AWG, STRAIGHT, 6 METER, COUPLING NUT (NOT SHOWN)</td>
<td>2</td>
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<tr>
<td>9</td>
<td>705547-1</td>
<td>CONNECTOR, PICO SPLITTER (NOT SHOWN)</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>706624-5</td>
<td>CABLE, PICO, FEMALE, 4/26 AWG, STRAIGHT, 2 METER, PUR (NOT SHOWN)</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>145514-4</td>
<td>FITTING, TUBE TO MALE BSPT, 6mm X 1/4 BSPT, (NOT SHOWN)</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>145558-7</td>
<td>TUBING, 8MM, BLACK, POLYURETHANE, (NOT SHOWN)</td>
<td>5000</td>
</tr>
<tr>
<td>13</td>
<td>145515-10</td>
<td>FITTING, TUBE TO MALE BSPP, 8mm X 1/8 G, (NOT SHOWN)</td>
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<td>TUBING, 4MM, BLACK, POLYURETHANE, (NOT SHOWN)</td>
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<td>EJECTOR, 1.00MM NOZZLE, 85% EVAC</td>
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<td>705936-1</td>
<td>SENSOR, GRIPPER, MMS 22, M8 CONNECTOR</td>
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<td>PLATE, WASHER M4 12mm SPACING</td>
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<td>FINGER, GRIPPER</td>
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<td>FITTING, TUBE, M3X4MM, BARB, 90DEG</td>
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<td>GRIPPER, PARALLEL, KGG 80-30</td>
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<td>705938-2</td>
<td>PAD, BELLows SUCTION ROUND</td>
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<td>479295-3</td>
<td>SCREW, SHC, M4X8, CLASS 12.9</td>
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<td>27</td>
<td>705939-1</td>
<td>NIPPLE, CONNECTION, SUCTION PAD</td>
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Specifications are subject to change without notice for ongoing product modifications and improvements.