X-Series Gripper

Wire Actuated 2-Finger Gripper

Assembly Instructions
General Warnings and Cautions

Danger (May cause serious injury or death)
• Keep water, flammables, solvents and other liquids clear from actuator.
• Never place fingers, arms, toes and other body parts near actuator during operation.
• Cut power if actuator emits strange odors or smoke.
• Keep actuator out of reach of children.

Warning (May cause injury or damage to actuator)
• Before operating, read all applicable instructions and notices found here:
  http://docs.hebi.us/#quickstart-guide-x-series-actuator
• Comply with the operating temperature (-10°C to 50°C)
• Turn off power source before connecting or disconnecting actuator power.
• Do not expose the actuator to permanent and strong magnetic fields.
• The actuator must not be exposed to dusty or wet environments.
• If actuator is under load, abruptly removing the power connection can cause permanent damage.
• Do not force screws into the bottom of the actuator.
  - X5: 5mm tap depth  - X8: 7mm tap depth
• Use provided hardware with accessories and hand tighten as needed.
• Do not attempt to disassemble actuator, this will void the warranty and can cause permanent damage.

For more information please visit: docs.hebi.us
Technical Specifications

<table>
<thead>
<tr>
<th>Spool Module</th>
<th>Max Finger Torque</th>
<th>Max Finger Force at 50mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>X5-1</td>
<td>0.1 Nm</td>
<td>2 N</td>
</tr>
<tr>
<td>X5-4</td>
<td>0.5 Nm</td>
<td>10 N</td>
</tr>
<tr>
<td>X5-9</td>
<td>1.1 Nm</td>
<td>23 N</td>
</tr>
<tr>
<td>X8-3</td>
<td>0.4 Nm</td>
<td>8 N</td>
</tr>
<tr>
<td>X8-9</td>
<td>1.1 Nm</td>
<td>23 N</td>
</tr>
<tr>
<td>X8-16</td>
<td>2.0 Nm</td>
<td>40 N</td>
</tr>
</tbody>
</table>

*Values assume a symmetric two-finger grasp

Finger Torque

50mm from the Center of the Rotation

Finger Force

5mm

10mm

30mm

17mm

19mm

90°

R22.5mm

4 X M3 THRU

22.5mm

8mm
Technical Specifications

Wire Actuated Gripper Assembly Instructions
Examples of Uses
Bill of Materials

Default Configuration

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM-2292-01</td>
<td>X8-9 Spool</td>
</tr>
<tr>
<td>PM-2293-01</td>
<td>X8-1 Spool Housing</td>
</tr>
<tr>
<td>PM-2290-01</td>
<td>Cable Clamp</td>
</tr>
<tr>
<td>A-2055-01</td>
<td>Gripper Assembly</td>
</tr>
<tr>
<td>PM-2343-01</td>
<td>Gripper Cover (part of A-2055-01)</td>
</tr>
<tr>
<td>A-2143-02</td>
<td>Parallel Linkage Add-on</td>
</tr>
<tr>
<td>PP-2222-01</td>
<td>Cable Housing Adapter (part of A-2055-01)</td>
</tr>
<tr>
<td>PP-2239-01</td>
<td>Cable</td>
</tr>
<tr>
<td>PP-2240-01</td>
<td>Cable Housing (Standard Road Bike Brake Cable Set)</td>
</tr>
<tr>
<td>PP-2241-01</td>
<td>Cable Housing End Cap</td>
</tr>
<tr>
<td>PM-2467-01</td>
<td>M3 5.9mm OD Flat Washer (Use for X8 Spool ONLY)</td>
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<td>PM-2222-01</td>
<td>Cable Housing Adapter (part of A-2055-01)</td>
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*X-Series Actuators sold separately*

*Fasteners included, not shown*
Wire Actuated Gripper Assembly Instructions

1 x
X5-9

Spool
Default X5-9
1 x PM-2292-01 Spool
1 x PM-2293-01 Spool Housing

*If the spool module is an X8 MODULE, SKIP this page and go to the NEXT Page. Rest of the steps are the same for both.

*M5x12mm
*M3x35mm

*Clocking for the Spool does not matter
**Wire Actuated Gripper Assembly Instructions**

*For using an X8 MODULE ONLY. If the spool module is an X5, SKIP this page.*

*Clocking for the Spool does not matter*
Align with actuator output hub tick mark (Fingers perpendicular to the tick mark)
1 x PP-2239-01 Cable
1 x PP-2240-01 Cable Housing
1 x PM-2222-01 Cable Housing Adapter
Running the Cable Through

- Make sure to use a Standard Road Bike Brake Cable.
- Run the cable to fit your system.
- Run both the cable and the cable housing before cutting them to ensure that the cable is long enough.
- Cut the cable housing first, and then cut the cable.

*Cross Section View of the Cable

Make sure that the Cable Housing is long enough to be fully inserted into the Housing End Cap and the Housing Adapter

About 100mm of Cable should stick out from the Cable Housing

Cable Housing minimum bend radius 25mm
Cable Routing Example
(6-Dof Arm)
Wire Actuated Gripper Assembly Instructions

1 x  
PP-2241-01  
Cable Housing End Cap

*Top View
Do NOT operate the gripper at this state. The pins at the pivot of the fingers will fall out.

1 x PM-2290-01 Cable Clamp

M3x8mm
Wire Actuated Gripper Assembly Instructions

1 x
A-2143-02
Parallel Linkage Add-on

M3x6mm
Low Profile

M2x8mm
Use PM-2343-01 when the parallel linkage is not needed.
I. Connect the Spool Module into the network, and turn it on

II. Open HEBI Scope GUI

III. Set the Strategy of the Spool Module to “STRATEGY_4”
   1. Click on your Spool Module
   2. Go to “Gains” tab
   3. Use the Control Strategy drop down menu to select a Suitable Strategy for your Application
   4. Click “Send”

IV. Command the Effort to -5 Nm
   1. Go to “Monitoring” tab
   2. Click the “Target Button” for the Effort
   3. Type “-5” and Click “OK”

⚠️ The Spool will wind the Cable and close the Fingers.
V. While Commanding the Effort, set the current position to “-0.7”
   1. Go to “Dashboard” tab
   2. Toggle “Params” as shown
   3. Type “-0.7” for Position
   4. Click “Apply”

VI. Stop commanding the effort, and command the position to 0.
   1. Go to “Monitoring” tab
   2. Click the “Target Button” for Position
   3. Type “0” and Click “OK”

⚠️ The Spool will unwind the Cable and open the Fingers.
*To close the gripper, turn the spool clockwise.*
*To open the gripper, command the spool to zero position.*
VII. Set Safety Limits for the Spool

1. Go to “Gains” tab
2. Type “-0.9” for Min Position
3. Type “0” for Max Position
4. Toggle “Persist Sends” as shown
5. Click “Send”

*If the Safety Limits are not set, the spool can turn to a position greater than zero, and break the cable.*

*To close the gripper, turn the spool clockwise (negative effort).*

*To open the gripper, turn the spool counterclockwise (positive effort)*