STACCATO TECHNOLOGIES

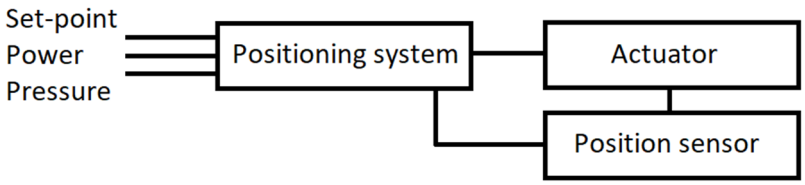
211 8200-XX

User manual

Pneumatic servo system designed for industrial and automotive environments.
Integrated Staccato valves enable fast cylinder travel with high speed and precise position control.

Innehåll

General description



The Positioning System contains electronics, software and valves that together provide closed loop controlling of an actuator. Desired set-point and actuator position is acquired and analyzed by software. With a PID controller in combination with feed forward, an appropriate valve response is calculated and actuator positioned.

Following must be configured for function:

- Actuator piston cross section areas
  Used by controller to calculate amount of air needed to position actuator.
- Position sensor length
  Needed for actuator to accurately interpret position sensor signal.

At delivery, the positioning system is configured for a chosen actuator diameter and position sensor length. If a reconfiguration is required, this is possible through CAN communication. See chapter Setting up parameters. Communication software and hardware can be purchased through Staccato.

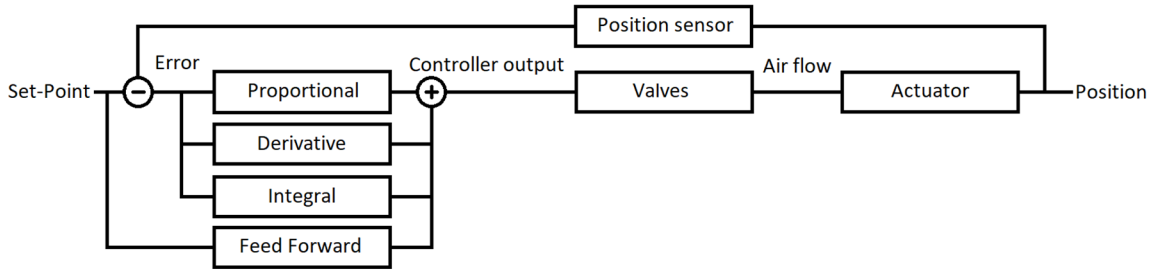
For optimal performance, it's recommended that controller parameters are tuned specifically for your application and requirements. See chapter Parameter setup.

Specification/system requirements

Requirement	Description
Air pressure	- 0.4 to 0.8 MPa (4 to 8 barg) - Filtered, 50 µm or smaller - For optimal performance, pressure should be stabile
Power supply	- 24 V ± 10 % - Minimum power output of 10 W
Environment	- 0 to 60 °C - IP67 compatible
Position sensor signal	- A correct position sensor signal where actuator range is represented by 4 to 20 mA is required for function.

Controller

Controller description simplified



Position of actuator is controlled with a closed loop PID-controller combined with feed forward. PID is an acronym for proportional-integral-derivative. Input to software is position and desired set-point. Controller output from software activates valves that position the actuator.

Block	Description
Proportional	Controller output from this block is proportional to deviation between set-point and position.
Integral	Controller output from this block is proportional to integral of deviation between set-point and position.
Derivative	Controller output from this block is proportional to derivative of deviation between set-point and position.
Feed forward	Set-point is feed forward in system.

Gain of each controller block is possible to adjust individually. Each parameter can be set to a value between 0 and 100 %. There are numerous ways to tune the controller, table below show some recommendations to when to increase or decrease the gain of the different blocks.

Problem	**Solution**
Actuator movement is slow.	- Increase proportional factor.
Overshoot during positioning.	- Decrease proportional factor - Increase derivative factor.
Oscillation in position	- Decrease proportional factor.
Lagging position during increase.	- Increase integral factor.

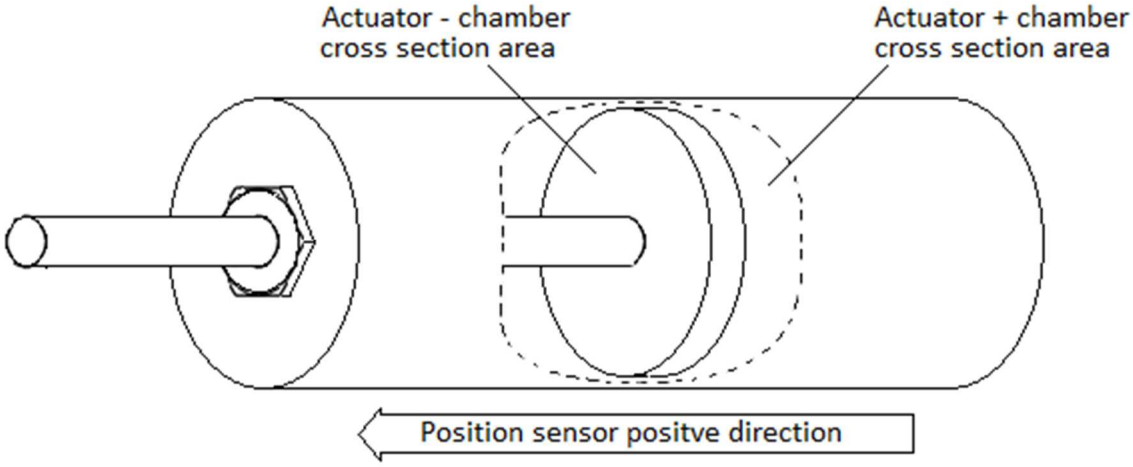
Parameter setup

<table>
<tr><th>Parameter</th><th>Function description</th></tr>
<tr><td>Factory reset</td><td>To return to factory setting of unit. Set this parameter to 255 and restart unit.</td></tr>
<tr><td>Desired Set-Point Channel</td><td>Configures set-point channel.
<table>
<tr><th>Value</th><th>Channel</th></tr>
<tr><td>0</td><td>Manual (on the fly)
Set-point is manually set with CAN communication.</td></tr>
<tr><td>1</td><td>Automatic, 4-20 mA prioritized.
- If analog current is connected, analog current is used.
- If analog current is not connected, but analog voltage is connected.
Analog voltage is used.</td></tr>
<tr><td>2</td><td>Automatic, 1 to 5 V prioritized.
- If voltage is connected, analog voltage is used.
- If analog voltage is not connected, but analog current is connected.
Analog current is used.</td></tr>
<tr><td>3</td><td>Analog current, 4 to 20 mA</td></tr>
<tr><td>4</td><td>Analog voltage, 1 to 5 V</td></tr>
</table></td></tr>
<tr><td>Initiation sequence length</td><td>During start of unit, it is possible to set a time-out period where valve activity is of.
<table>
<tr><th>Value</th><th>Channel</th></tr>
<tr><td>Unit</td><td>1 ms</td></tr>
<tr><td>Maximum value</td><td>0</td></tr>
<tr><td>Minimum value</td><td>10 000</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>Actuator + chamber cross section area</td><td>Piston cross section area of + chamber.
<table><tr><th>Value</th><th>Channel</th></tr><tr><td>Unit</td><td>mm²</td></tr><tr><td>Minimum value</td><td>300</td></tr><tr><td>Maximum value</td><td>15 000</td></tr></table></td></tr>
<tr><td>Actuator - chamber cross section area</td><td>Piston cross section area of - chamber..
<table><tr><th>Value</th><th>Channel</th></tr><tr><td>Unit</td><td>mm²</td></tr><tr><td>Minimum value</td><td>300</td></tr><tr><td>Maximum value</td><td>15 000</td></tr></table></td></tr>
<tr><td>Position sensor length</td><td><table><tr><th>Value</th><th>Channel</th></tr><tr><td>Unit</td><td>µm</td></tr><tr><td>Minimum value</td><td>5000</td></tr><tr><td>Maximum value</td><td>250 000</td></tr></table></td></tr>
<tr><td>Pid parameter, P</td><td><table><tr><th>Value</th><th>Channel</th></tr><tr><td>Unit</td><td>%</td></tr><tr><td>Minimum value</td><td>0</td></tr><tr><td>Maximum value</td><td>100</td></tr></table>For advanced users, see General description for details.</td></tr>
<tr><td>Pid parameter, I</td><td><table><tr><th>Value</th><th>Channel</th></tr><tr><td>Unit</td><td>%</td></tr><tr><td>Minimum value</td><td>0</td></tr><tr><td>Maximum value</td><td>100</td></tr></table>For advanced users, see General description for details.</td></tr>
</table>

<table>
<tr><td>Pid parameter, D</td><td>
<table>
<tr><th>Value</th><th>Channel</th></tr>
<tr><td>Unit</td><td>%</td></tr>
<tr><td>Minimum value</td><td>0</td></tr>
<tr><td>Maximum value</td><td>100</td></tr>
</table>
For advanced users, see General description for details.
</td></tr>
<tr><td>Pid parameter, feed forward</td><td>
<table>
<tr><th>Value</th><th>Channel</th></tr>
<tr><td>Unit</td><td>%</td></tr>
<tr><td>Minimum value</td><td>0</td></tr>
<tr><td>Maximum value</td><td>100</td></tr>
</table>
For advanced users, see General description for details.
</td></tr>
<tr><td>Manual position setup</td><td>
<table>
<tr><th>Value</th><th>Channel</th></tr>
<tr><td>Unit</td><td>µm</td></tr>
<tr><td>Minimum value</td><td>5000</td></tr>
<tr><td>Maximum value</td><td>250 000</td></tr>
</table>
</td></tr>
<tr><td>Maximum speed</td><td>
<table>
<tr><th>Value</th><th>Channel</th></tr>
<tr><td>Unit</td><td>Unit less.</td></tr>
<tr><td>Minimum value</td><td>10</td></tr>
<tr><td>Maximum value</td><td>5 000</td></tr>
</table>
</td></tr>
</table>

Typical values

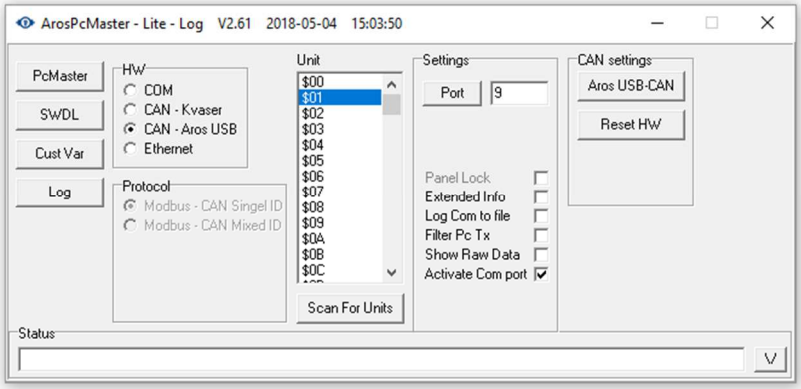


Nominal cylinder diameter	Diameter of piston rod	Actuator + chamber cross section area	Actuator - chamber cross section area
6 mm	3 mm	28 mm²	21 mm²
10 mm	4 mm	79 mm²	66 mm²
12 mm	6 mm	113 mm²	85 mm²
16 mm	6 mm	201 mm²	173 mm²
20 mm	8 mm	314 mm²	264 mm²
25 mm	10 mm	491 mm²	412 mm²
32 mm	12 mm	804 mm²	691 mm²
40 mm	16 mm	1 257 mm²	1 056 mm²
50 mm	20 mm	1 963 mm²	1 649 mm²
63 mm	20 mm	3 117 mm²	2 803 mm²
80 mm	25 mm	5 027 mm²	4 536 mm²
100 mm	30 mm	7 854 mm²	7 147 mm²
125 mm	32 mm	12 272 mm²	11 468 mm²
160 mm	40 mm	20 106 mm²	18 850 mm²
180 mm	45 mm	25 447 mm²	23 856 mm²
200 mm	50 mm	31 416 mm²	29 452 mm²
250 mm	60 mm	49 087 mm²	46 260 mm²
300 mm	70 mm	70 686 mm²	66 837 mm²

- For rod-less actuators, use actuator + chamber cross section area for both chambers.
- For double rod actuators, use actuator – chamber cross section area for both chambers.
- If position sensor positive direction is reversed, areas should be reversed.

Software instructions

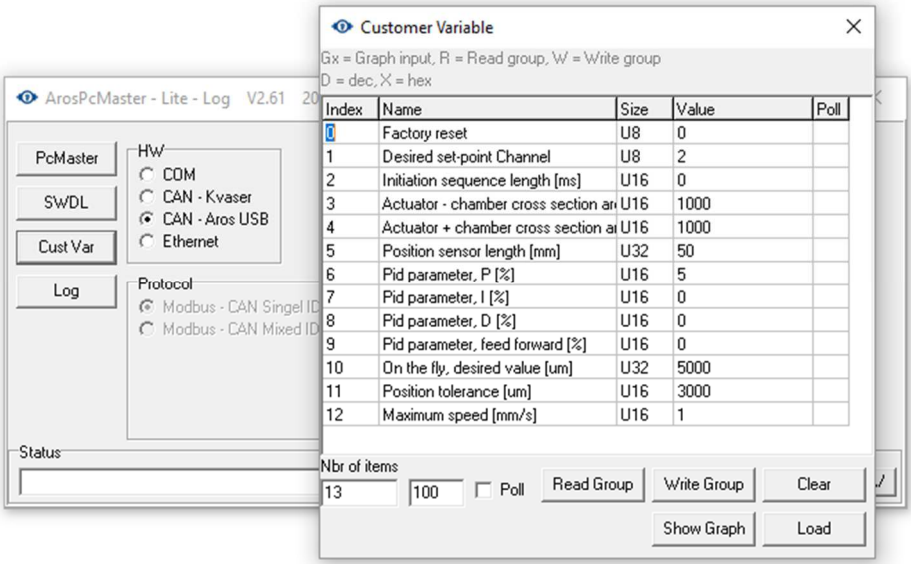
Pc master, getting started

Connect PC to Positioning system with CAN dongle.
Open PcMasterLite.exe    Set up following parameters: - CAN - Aros USB - Adress $01 - Select port CAN dongle is connected to. - Select Active Com Port

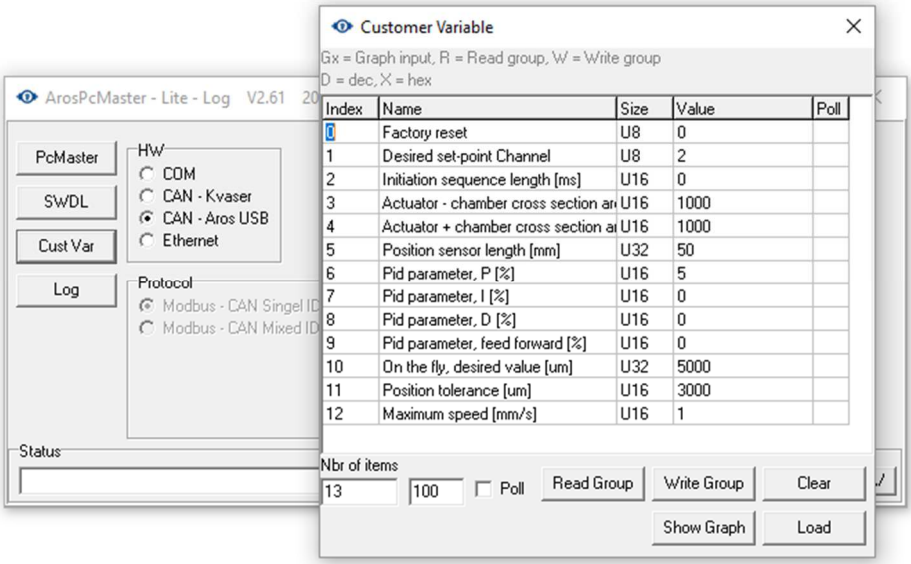
Setting up parameters

Complete instructions for Pc master, getting started.

Open Customer Variable window by clicking on CustVar button in ArosPcMaster – Lite window.



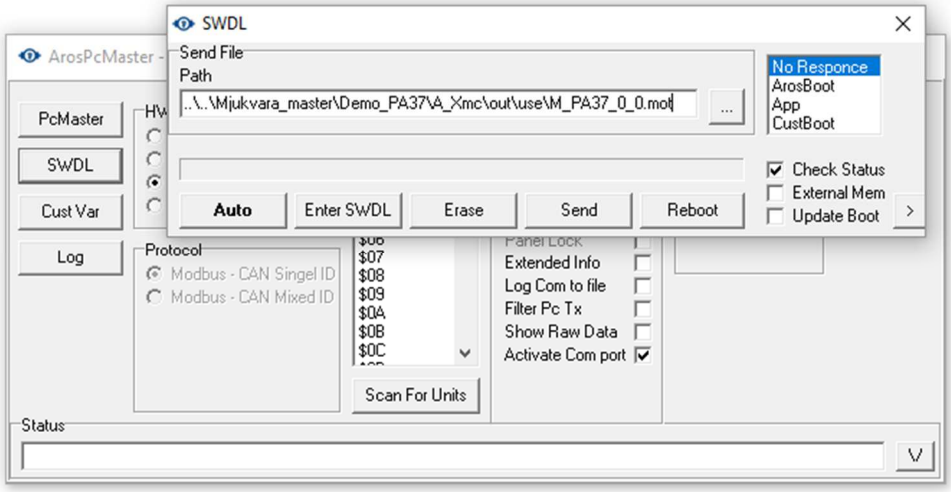
Load parameter list by clicking load button in Customer Variable window and chosing CustVarList.txt.



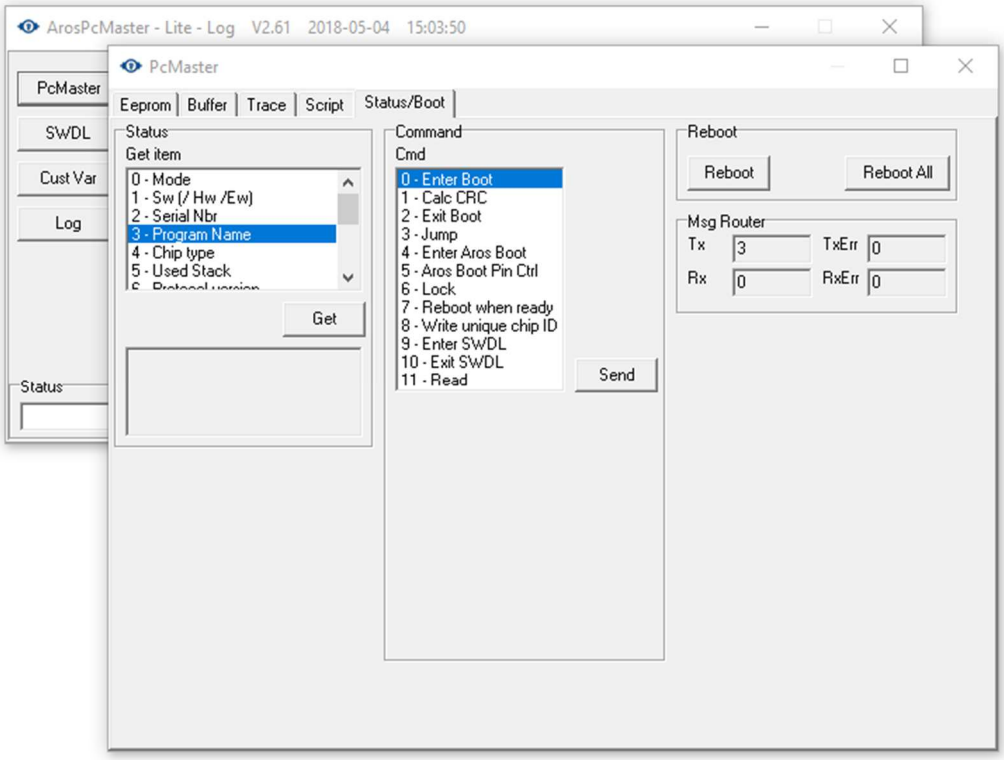
To read value, select value column for desired variable and press F12 key on keyboard.

To assign value, select value column for desired variable. Write desired value and press enter key on keyboard.

Reprograming

Complete instructions for Pc master, getting started.
Open SWDL window by clicking on SWDL button in ArosPcMaster – Lite window. 
Click on … button and find desired software .mot file.
Click on Auto button.

Check program version

Complete instructions for Pc master, getting started.
Open PcMaster window by clicking on PcMaster button in ArosPcMaster – Lite window. 
Select Status/Boot tab in PcMaster window.
Select 3-Program Name in Status and press Get button.

Performance

Valve diameter	Cylinder diameter					
	Ø 25	Ø 32	Ø 35	Ø 40	Ø 50	Ø 63
Ø 1,0	0,3 m/s	0,2 m/s	0,1 m/s	0,1 m/s	0,1 m/s	0,0 m/s
Ø 1,5	0,7 m/s	0,4 m/s	0,3 m/s	0,3 m/s	0,2 m/s	0,1 m/s
Ø 3,0	2,6 m/s	1,6 m/s	1,3 m/s	1,0 m/s	0,7 m/s	0,4 m/s
Ø 4,0	4,7 m/s	2,9 m/s	2,4 m/s	1,8 m/s	1,2 m/s	0,7 m/s
Ø 5,1	7,6 m/s	4,6 m/s	3,9 m/s	3,0 m/s	1,9 m/s	1,2 m/s

Valve diameter	Cylinder diameter					
	Ø 25	Ø 32	Ø 35	Ø 40	Ø 50	Ø 63
Ø 1,0	± 0,13 mm	± 0,08 mm	± 0,07 mm	± 0,05 mm	± 0,03 mm	± 0,02 mm
Ø 1,5	± 0,29 mm	± 0,18 mm	± 0,15 mm	± 0,11 mm	± 0,07 mm	± 0,05 mm
Ø 3,0	± 1,15 mm	± 0,70 mm	± 0,59 mm	± 0,45 mm	± 0,29 mm	± 0,18 mm
Ø 4,0	± 2,05 mm	± 1,25 mm	± 1,04 mm	± 0,80 mm	± 0,51 mm	± 0,32 mm
Ø 5,1	± 3,33 mm	± 2,03 mm	± 1,70 mm	± 1,30 mm	± 0,83 mm	± 0,52 mm

Trouble shoot

Problem	Solution
No response over CAN communication.	- Restart PcMasterLite - Run check program instruction. If program version is returned, CAN communication is ok. - If program version is not returned, restart computer. - Run check program instruction to check that program version is returned.
All leds off	- Check if power is connected. - Check if voltage is correct.
Pressure led is flashing.	- Check if supply pressure is connected - Check if supply pressure is between 2 and 10 barg - Move actuator between end point by changing set-point.
Position led is flashing	- Check if position sensor is connected - Check position sensor settings, see position sensor manual.
Set-point led is flashing	- Check if set point contact is connected