

Servo Drives

Quick Start Guide

PANATERM
Fit-gain tuning



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1 Introduction

1.1 Before you start

Before operating this product, read the safety instructions in the related *Operating Instructions*.

This product is for industrial use only.

Electrical connections must be made by qualified electrical personnel.

1.2 About this document

This *Quick Start Guide* is intended to help you set up a MINAS servo drive system. It is based on information from the MINAS series manuals and the practical experience of our engineers.

Step-by-step instructions will guide you through a fit-gain tuning procedure for a MINAS servo driver. The autotuning is performed with the PANATERM configuration software.

1.3 Related documents

Please refer to the original servo drive manuals for detailed information. Click on the following links to download the documents from our Panasonic Download Center.

- Information on wiring, position control, and parameters:
[Operating Instructions \(Overall\) AC Servo Motors & Driver MINAS A5 series](#)
[Operating Instructions \(Overall\) AC Servo Motors & Driver MINAS A6 series](#)
- Information on using the PANATERM configuration software:
[Operation Manual: Set up support software PANATERM Ver. 6.0](#)
- Information on how to reduce electromagnetic interference (EMI):
[Recommendations for EMC-compliant wiring of servo drivers and motors](#)
- Other Quick Start Guides:
[QS2000, Position control by pulse and direction signals \(MINAS A5/A5E/A6SG/A6SF\)](#)
[QS2001, Position control by block operation using input signals \(MINAS A6SG/A6SF\)](#)
[QS2002, Position control by block operation using Modbus commands \(MINAS A6\)](#)
[QS2003, Position control in EtherCAT networks MINAS A5B/A6B](#)
[QS2004, Position control using RTEX \(MINAS A5N/A6N\)](#)
[QS3000, Velocity control \(MINAS A5/A6F\)](#)

[*QS4000, Torque control \(MINAS A5/A6\)*](#)

[*QS5000, PANATERM - Trial run*](#)

[*QS5001, PANATERM - Auto-tuning*](#)

1.4 Available software

The following software is available free of charge in our Panasonic Download Center. Click on the link to start the download.

- [PC configuration software PANATERM](#)

2 Functional overview

Auto-tuning is required for all applications to adjust the servo motor to the specific mechanical conditions. You can choose one of the following auto-tuning functions:

- Fit-gain tuning
- Real-time auto-gain tuning

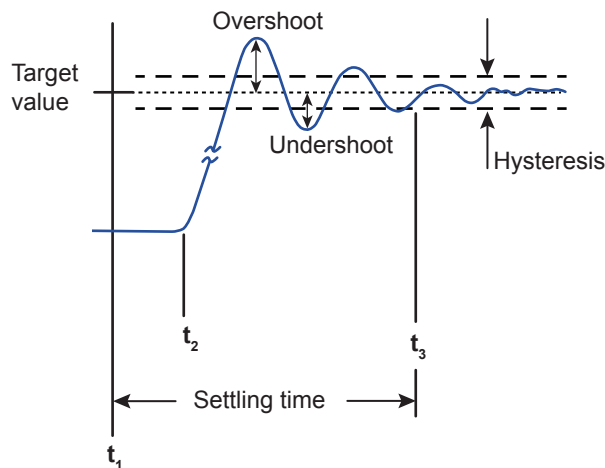
This *Quick Start Guide* explains how to perform fit-gain tuning.

While the fit-gain tuning function guides you through an automatic fine-tuning process, real-time auto-gain tuning mainly adjusts the rigidity of the machine. If you are using a MINAS A6 servo driver, first try fit-gain tuning. If fit-gain tuning was not successful, perform real-time auto-gain tuning. Both methods can be executed using PANATERM.

If possible, you should perform real-time auto gain-tuning on the machine with the servo motor and the mechanical loads connected and with the actual movements.

Usually, auto-tuning has the following goals:

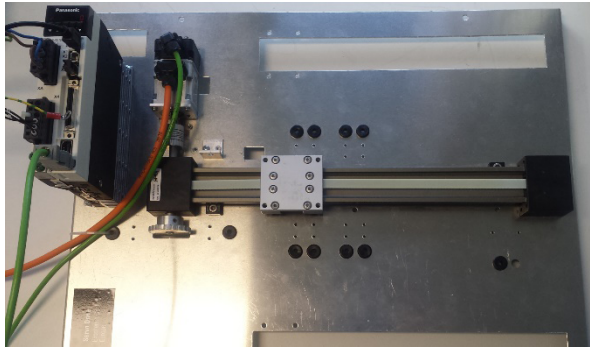
1. Reduce the settling time to reduce cycle times.
2. Reduce mechanical vibration to increase the life time of the machine.
3. Reduce overshoot and undershoot to reach the target position within the allowed hysteresis.
4. Decrease the response time to reach the target position faster.



Overshoot, undershoot, and settling time of the position value

Example

A MINAS A6SF servo driver is connected to a servo motor, which is coupled to a belt. The control mode is position control. A continuous movement within the mechanical limits, no mechanical vibration, no overshoot or undershoot, and a reduced settling time are required.



Continuous movement between two mechanical limits

3 Wiring

3.1 Recommendations for wiring

It is the customer's responsibility to apply the countermeasures that they consider necessary to comply with current regulations on wiring, safety and reducing EMI.

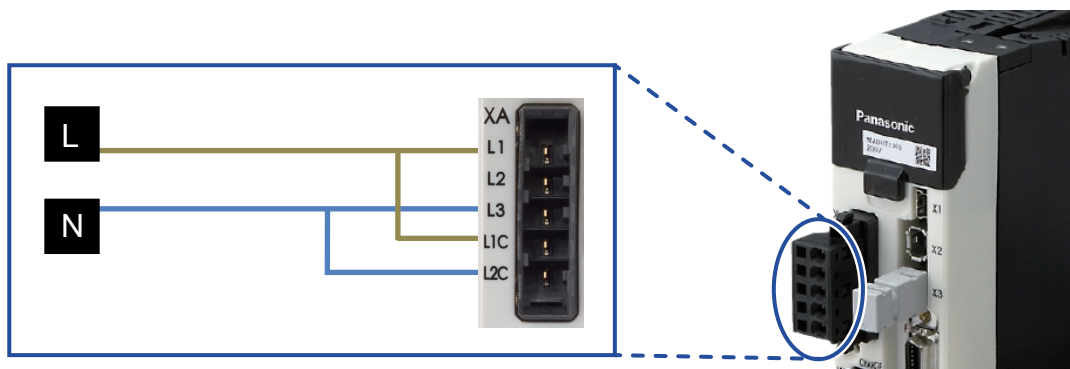
Do not forget to meet the specifications indicated in the hardware manual for each of the devices being wired. If any specifications in the manual conflict with the information in this document, the manufacturer's manual takes preference.

For detailed information on reducing EMI, please refer to [Recommendations for EMC-compliant wiring of servo drivers and motors](#).

3.2 Connectors of the servo driver

XA connector (main power connector)

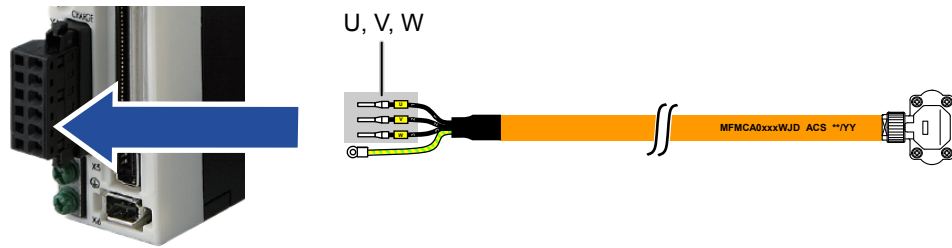
Connect the power supply cable to the XA connector. For a 1-phase power supply of 230V, connect a 2-wire cable to the servo driver as illustrated. The L2 pin is not used in 1-phase mode.



Wiring of the XA connector for a power supply of 230V

XB connector (motor connector)

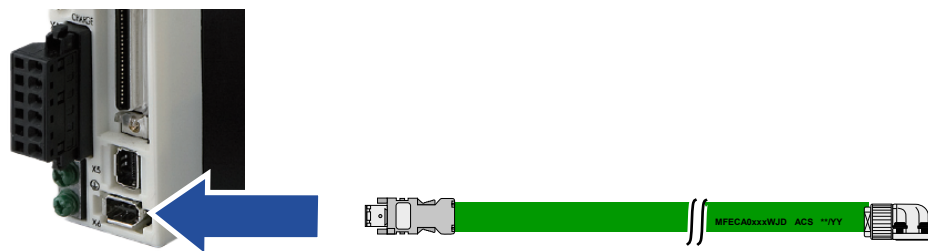
Connect the motor cable to the XB connector. The wires are labeled with the letters U, V, and W. Do not change the sequence of the motor phases, e.g. by connecting V to W.



Wiring of the XB connector for the motor power supply

X6 connector (encoder connector)

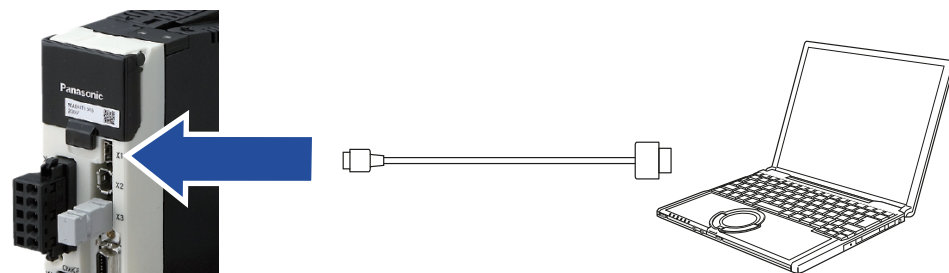
Connect the encoder cable to the X6 connector.



Wiring of the X6 connector for the encoder connection

X1 connector (USB connector for PC connection)

The servo driver is configured using the PC configuration software PANATERM. Use a commercially available USB A to mini-B cable to connect the PC to the servo driver.

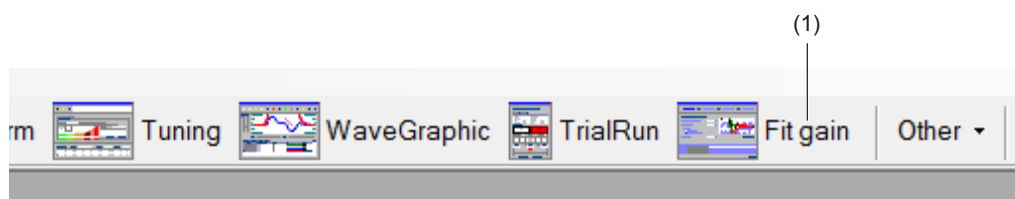


Connector X1 for PC connection

4 Perform fit-gain tuning

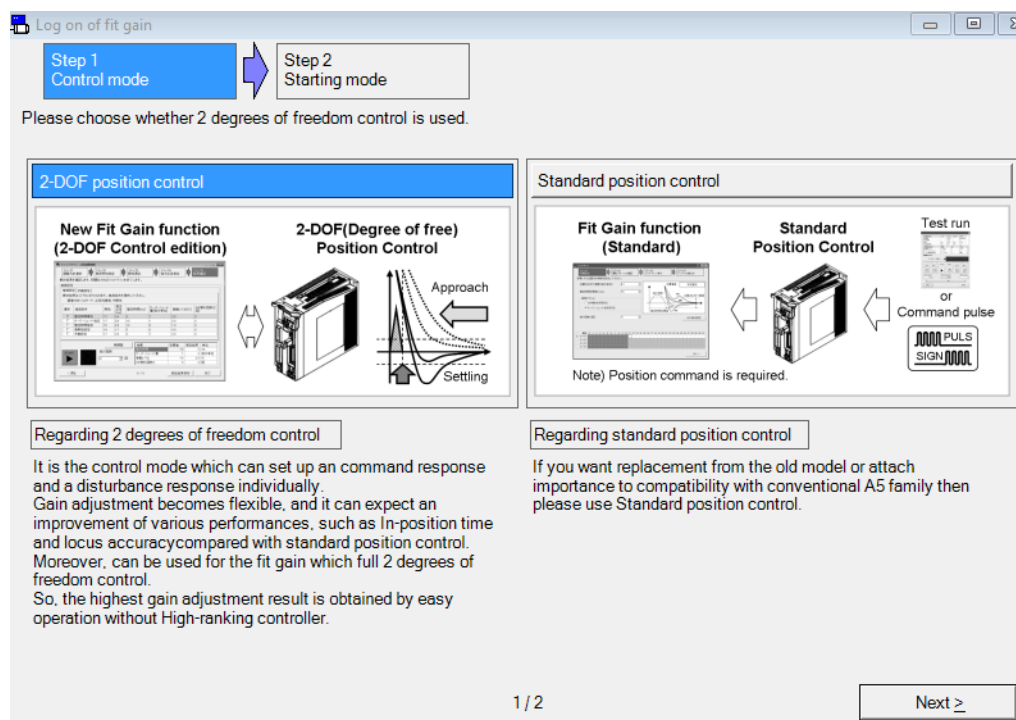
Use the PC configuration software PANATERM to perform auto-tuning.

1. Connect your PC to the X1 connector and turn on the servo driver.
2. Start the PANATERM configuration software.
The software automatically detects the type of servo driver connected.
3. Select "OK" and confirm the connected series by selecting your type of servo driver.
4. Select the "Fit gain" tab.

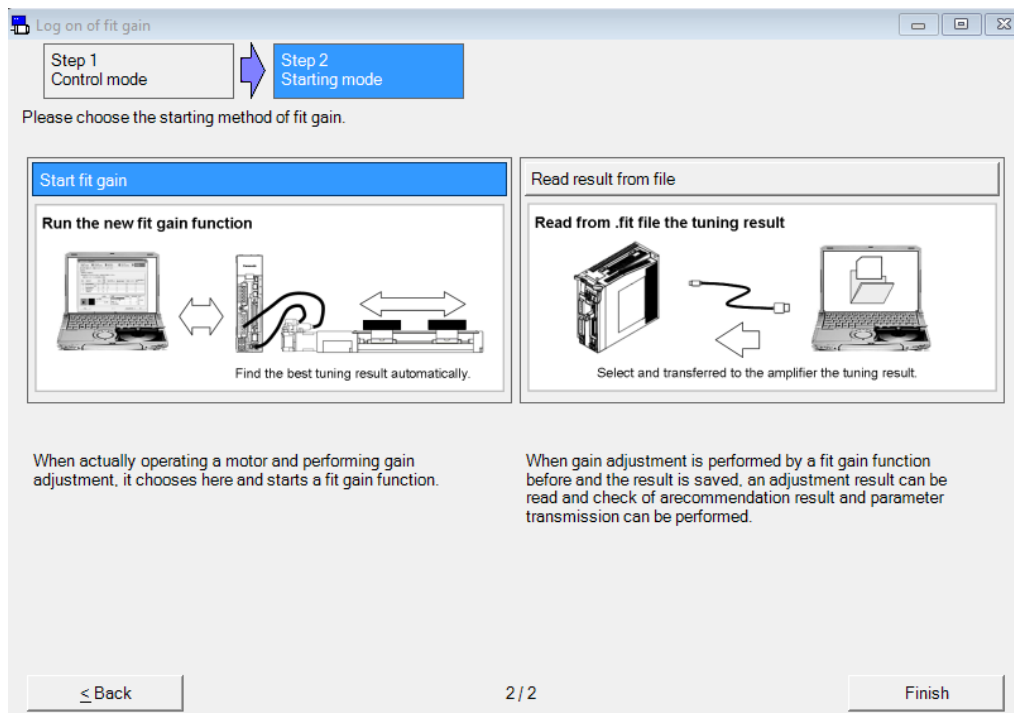


(1) "Fit gain" tab

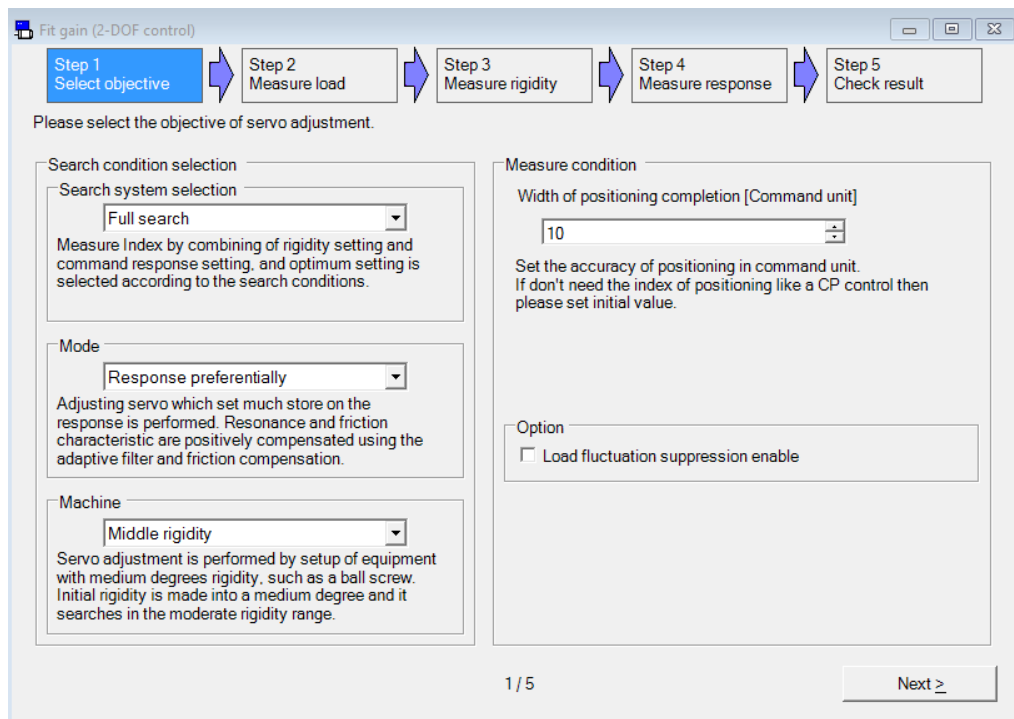
5. Select "2-DOF position control" and select "Next".



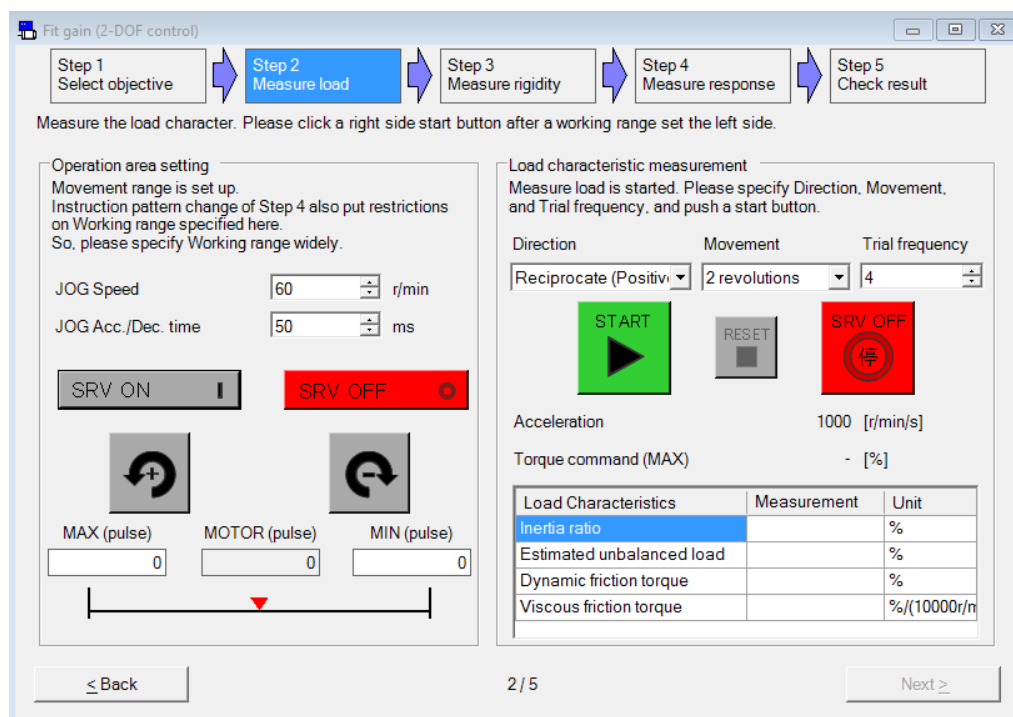
6. Select “Start fit gain” and select “Finish”.



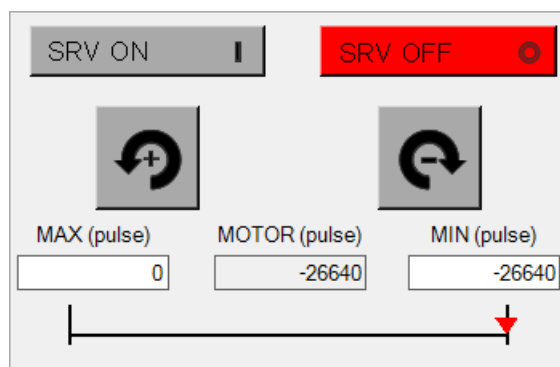
7. In “Step 1” of the autotuning procedure, select one of the following modes: “Response preferentially”, “Balanced”, or “Stability preferentially”. Then select “Next”.



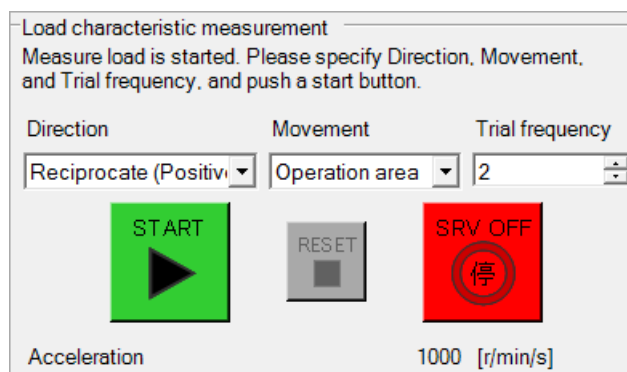
8. In “Step 2”, select the “SRV ON” button. Observe the safety note which is displayed, and confirm with “OK”.



9. Use the “JOG” buttons to specify a short moving distance for the motor.



10. In the “Trial frequency” list box, select option 2 to reduce the time for fit-gain tuning.

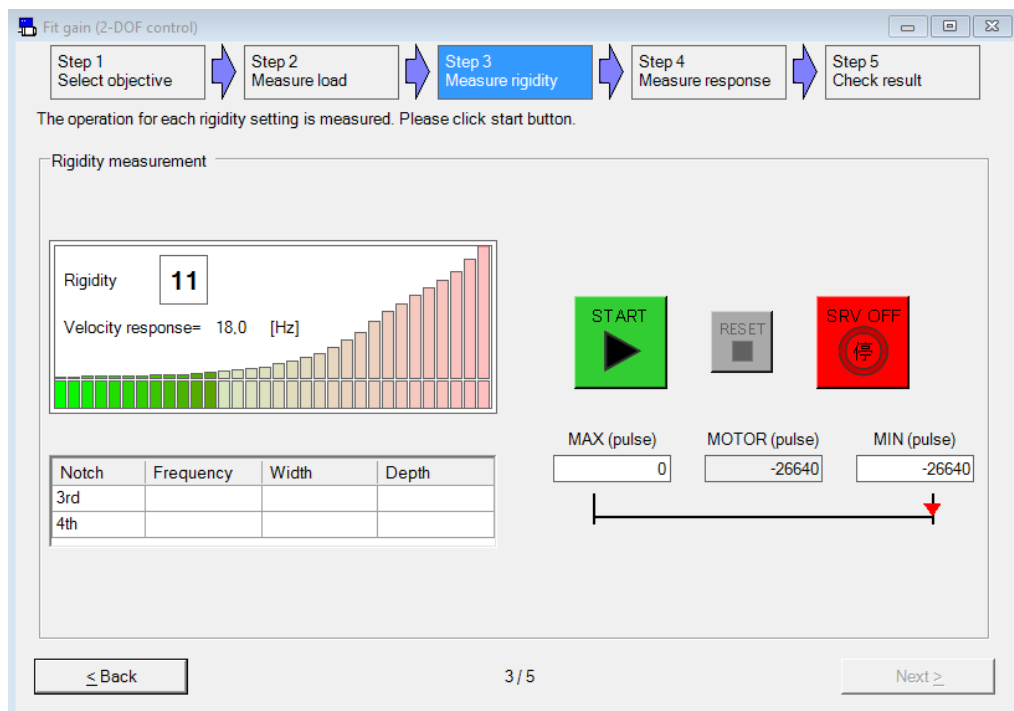


11. In the “Movement” list box, select “Operation area”.
12. Select the green “START” button to measure the actual load. When the measurement is finished, confirm the measurement results displayed with “OK”. Then select “Next”.

13. In “Step 3”, select the green “START” button to measure the optimum rigidity (or stiffness) parameter for the load.

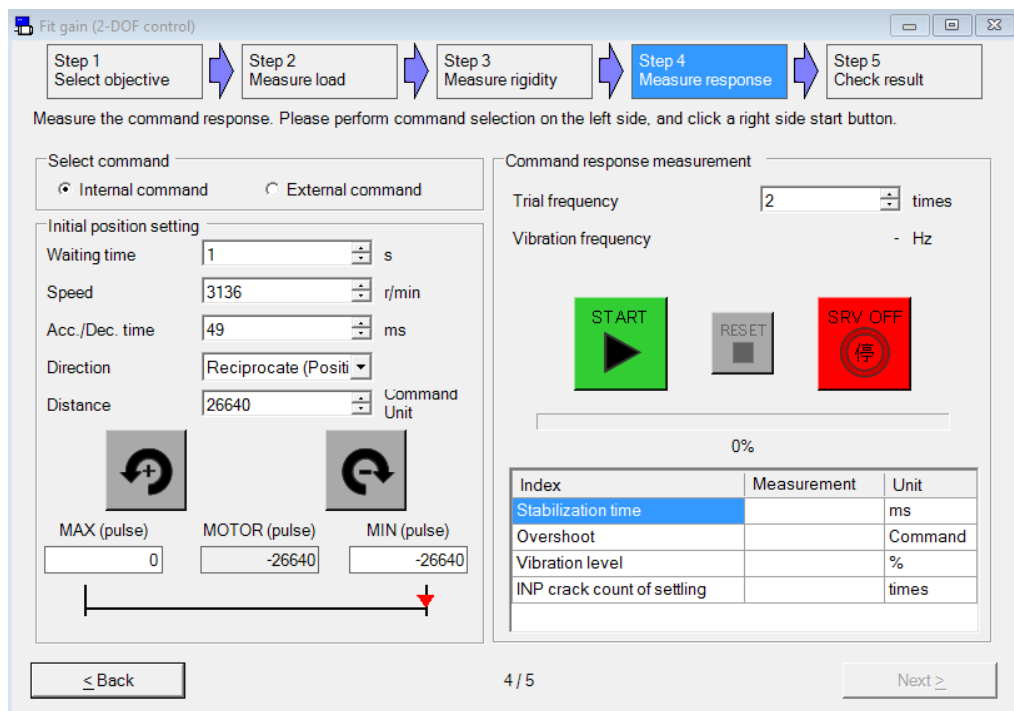
! Notice

When this step is performed, the load may oscillate shortly. To prevent damage, make sure you can stop the movement at any time by turning off the servo function.



When the measurement is completed, confirm the message displayed and select “Next”.

14. In “Step 4”, select the green “START” button to measure the command response.



When the measurement is completed, confirm the message displayed and select “Next”.

15. In “Step 5”, four different tuning results are displayed. The recommended result has a check mark. Select “Save fit gain data” to save the tuning results in a file.

Step 1 Select objective → Step 2 Measure load → Step 3 Measure rigidity → Step 4 Measure response → Step 5 Check result

Check the result. If satisfactory to the result then exit the fit gain.

Recommendation setting | Manual setting

The end result becomes as follows. Please choose recommendation condition.

Adjustment objective: Full search, Response preferentially, Middle rigidity

Select	Recommendation	Rigidity	Command response[ms]	Stabilization time[ms]	Overshoot[Command unit]	Vibration level[%]	INP crack count of settling[times]
<input checked="" type="checkbox"/>	Minimum stabilization	18	0.3	-1.0	10	0.20	0
<input type="checkbox"/>	Designate overshoot	21	1.5	4.0	1	0.20	0
<input type="checkbox"/>	Designate stabilization	21	2.2	8.0	0	0.20	0
<input type="checkbox"/>	High rigidity setting	22	1.5	4.0	0	0.40	0
<input type="checkbox"/>	Manual setting						

START SRV OFF

Trial frequency: 2 times

Fine adjustment

Index	Target	Measurement	Unit
Stabilization time	10	10	ms
Overshoot	1	1	Command unit
Vibration level	10.0	10.0	%
INP crack count of settling	0	0	times

< Back 5 / 5 Save fit gain data Finish

16. Select “Finish”.
17. In the “Writing to EEPROM” dialog, select “OK” to save the parameters in the MINAS A6 servo driver.

Writing to EEPROM

Parameters in the table below are changed. Do you write the changes to EEPROM?

Class	No.	Title	Before the ch...	After the chan...
00	002	Real-time auto tuning setting	1	0
00	003	Real-time auto tuning stiffness set	13	18
00	004	Inertia ratio	250	19
01	000	1st position loop gain	48.0	135.0
01	001	1st velocity loop gain	27.0	75.0
01	002	1st velocity integration time constant	21.0	9.0
01	004	1st torque filter	0.84	0.30
01	005	2nd position loop gain	48.0	135.0

OK Cancel

18. Turn the power supply of the MINAS A6 servo driver off and on again to apply the settings.
- The system is now ready to perform the desired positioning movements.

5 Help us improve

Please feel free to contact us if you have any questions, or if you have any suggestions for improvement. In that case, we ask you to include the Quick Start Guide number in the email subject line. You can find the number starting with "QS" on the cover page.

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6 Record of changes

QS5002_V1.0_EN, 2019.07

First edition



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