Panasonic®

Servo Drives

# Quick Start Guide

Position control by
block operation using
Modbus commands
(MINAS A6)



**Servo Drive**
Excellence Center
Europe

QS2002_V1.0_EN

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# Table of contents

# 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 connecting a PLC to a MINAS servo driver and setting the most important parameters in the PC configuration software PANATERM.

## 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 A6 series*

  *Technical Reference – Modbus communication and block operation specification SX-DSV03042*

- 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)*

  *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*

*QS5002, PANATERM - Fit gain 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

- PC programming software Control FPWIN Pro 7

- MC_Modbus_Library with demo program for block operation

# 2 Functional overview

Position control is a control mode in which the motor moves the load to a specified target position.

The servo driver can be controlled by a pulse train in the frequency range between 1Hz and 8MHz from a host controller such as a PLC or a CNC controller or by block operation. With block operation, the user defines the positioning parameters in command blocks. The MINAS A6 servo driver has a block memory capacity of 256 command blocks. All command blocks are saved in a block operation table in the servo driver.



*Block operation table*

You can set the command blocks using the PANATERM configuration software or by Modbus commands if you are using a PLC with a Modbus RTU communication interface. The command blocks are either started by digital signals (e.g. STB, B-SEL1 to B-SEL128) from a PLC, a trigger switch, or by Modbus commands.

This *Quick Start Guide* explains how to wire and configure the servo driver for block operation using Modbus commands.

**Example**

An FP0H PLC and a MINAS A6SF servo driver are connected to control the driver by Modbus commands.
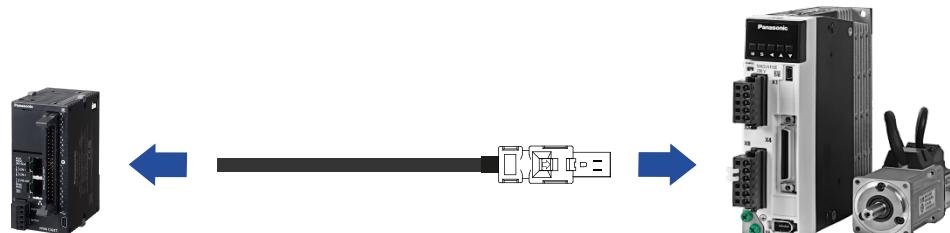


*Data transmission between PLC with Modbus RTU interface and servo driver via serial communication cable*

# 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.
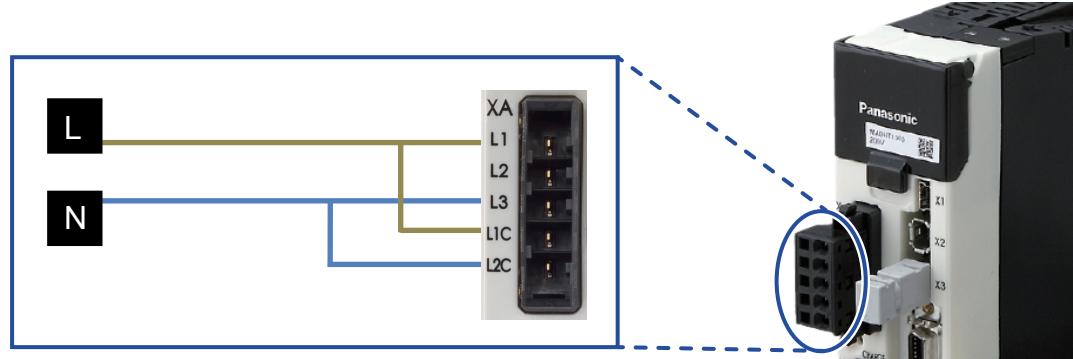


*Wiring of the XA connector for a power supply of 230V*

### 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.
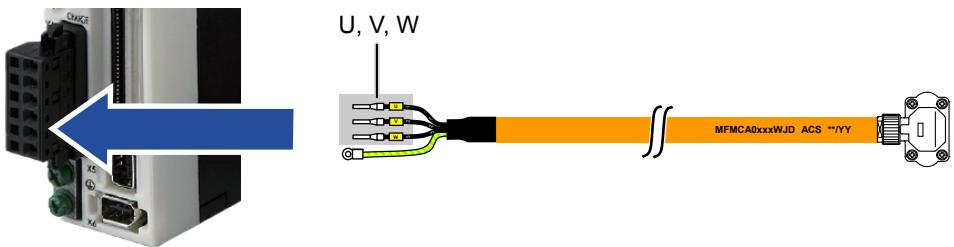
*Wiring of the XB connector for the motor power supply*

## X6 connector (encoder connector)

Connect the encoder cable to the X6 connector.
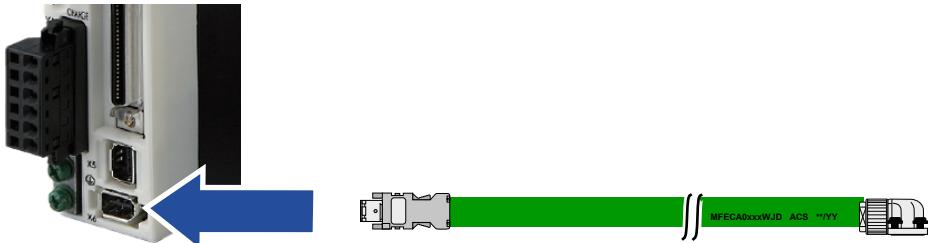


*Wiring of the X6 connector for the encoder connection*

## X2 connector (serial communication interface)

Connect the serial communication cable DV0PM20024CAB to the X2 connector and to COM port 0 (RS232C interface) of the FP0H PLC.
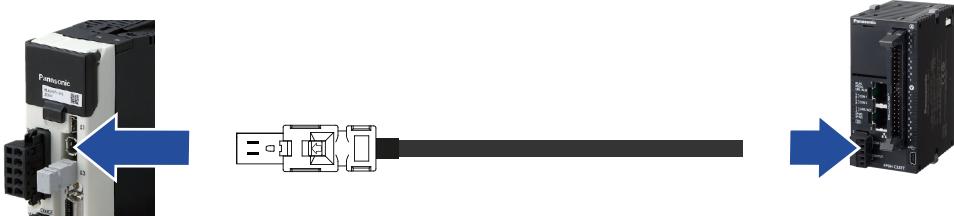


*Connector X2 for serial communication cable*

## 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.
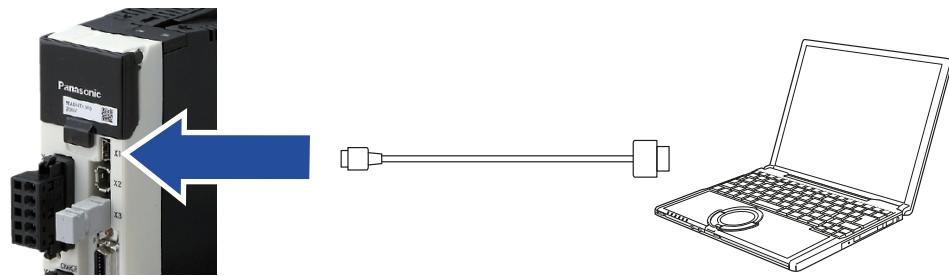
*Connector X1 for PC connection*

# 4 Make parameter settings in PANATERM

Use the PC configuration software PANATERM to configure the MINAS servo driver.

Click on the following link to download PANATERM from our Panasonic Download Center:
PC configuration software PANATERM

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 "Parameter" tab.
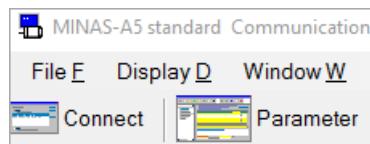


5. In the "Selection of parameter to be read" dialog, select "Read the default". There is a message if the parameter values in the servo driver are not the default values. To overwrite the parameters in the servo driver, select the "Trans" icon.

6. Select the parameter list for your type of servo driver.
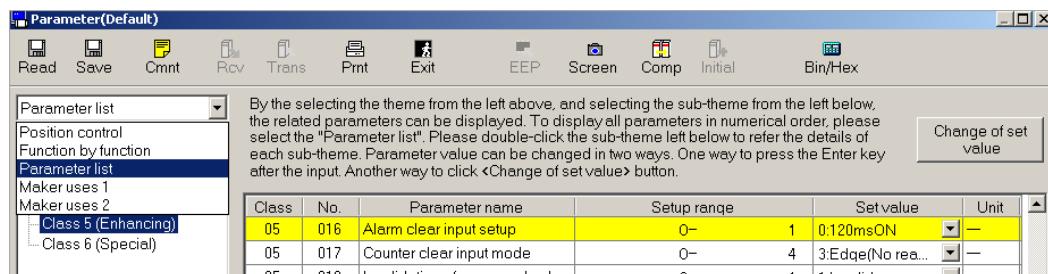


7. To change a parameter setting, select the desired parameter class and enter a value. For parameter descriptions, please refer to the Operating Instructions. You can find each parameter by its unique parameter number. The parameter number is written in the format PrX.YY (X: Class, YY: No.).

8. Depending on the parameter, select the "Trans" or the "EEP" icon to transfer a setting to the servo driver. For yellow parameters, select the "EEP" icon. The parameters will be saved in the EEPROM of the servo driver. To activate the settings, you need to restart the servo driver.
   All other parameters are transferred simply by selecting the "Trans" icon.

## 4.1 Basic parameters overview

There are basic parameters which are associated to position control.

The following table shows the setting range and description of the basic parameters.

| Parameter | Range | Description |
|---|---|---|
| Pr0.00 | 0 or 1 | Motor rotation direction |
| Pr0.01 | 0 to 6 | Control mode |
| Pr0.08 | 0 to 1048576 [pulse] (MINAS A5)<br>0 to 8388608 [pulse] (MINAS A6) | Number of pulse signals per motor revolution |
| Pr4.05 | 0 to 16777215 | Function assignment for pin 29 of X4 connector |
| Pr5.29 | 0 to 7 | RS232C baud rate |
| Pr5.30 | 0 to 7 | RS485 baud rate |
| Pr5.31 | 0 to 127 | Axis number |
| Pr5.37 | 0 to 2 | Communication protocol |
| Pr5.38 | 0 to 5 | Modbus parity and stop bit setting |
| Pr5.39 | 0 to 10000 | Modbus response waiting time |
| Pr6.28 | 0 to 2 | Block operation mode |

## 4.2 Pr0.00 (Motor rotation direction)

PANATERM parameter: "Rotational direction setting"

Setting range: 0 or 1

The default value is 1: Rotation in CCW direction (counterclockwise direction).

## 4.3 Pr0.01 (Control mode)

PANATERM parameter: "Control mode setting"

Setting range: 0 to 6

The default value is 0: Position control

Select 0: Position control (block operation mode only supports position control)

## 4.4 Pr0.08 (Number of pulse signals per motor revolution)

PANATERM parameter: "Command pulse number per one motor revolution"

Setting range: 0 to 1048576 [pulse] (MINAS A5), 0 to 8388608 [pulse] (MINAS A6)

The default value is 10000 pulses per motor revolution.

## 4.5 Pr4.05 (Function assignment for pin 29 of X4 connector)

PANATERM parameter: "SI6 input selection"

Setting range: 0 to 16777215

The default value is 197379: servo-on input

Select 0 to disable the default pin assignment.

## 4.6 Pr5.29 (RS232C baud rate)

Set this parameter if the servo driver is connected via RS232C.

PANATERM parameter: "RS232 communication baud rate setting"

Setting range: 0 to 7 (2400 to 230400bit/s)

The default value is 2 (9600bit/s).

Make sure the baud rate setting in the PLC program and in the servo driver are identical. In this example, select 6: 115200bit/s.

## 4.7 Pr5.30 (RS485 baud rate)

Set this parameter if the servo driver is connected via RS485.

PANATERM parameter: "RS485 communication baud rate setting"

Setting range: 0 to 7 (2400 to 230400bit/s)

The default value is 2 (9600bit/s).

Make sure the baud rate setting in the PLC program and in the servo driver are identical. In this example, select 6: 115200bit/s.

## 4.8 Pr5.31 (Axis number)

PANATERM parameter: "Axis number"

Setting range: 0 to 127

The default value is 1.

Select a value between 1 and 127. 0 is not accepted with Modbus RTU. Make sure the axis number setting in the PLC program and in the servo driver are identical. In this example, set axis 1.

## 4.9    Pr5.37 (Communication protocol)

PANATERM parameter: "Modbus connection setting"

Setting range: 0 to 2

The default value is 0 (MINAS standard protocol).

Select 1: Modbus-RTU (RS232 communication) or (RS485 communication), depending on your requirements.

## 4.10    Pr5.38 (Modbus parity and stop bit setting)

PANATERM parameter: "Modbus communication setting"

Setting range: 0 to 5

The default value is 0: Even/1 bit

Make sure the parity and stop bit setting in the PLC program and in the servo driver are identical.

In this example, select "Odd/1 bit".

## 4.11    Pr5.39 (Modbus response waiting time)

PANATERM parameter: "Modbus response waiting time"

Setting range: 0 to 10000

The default value is 0.

Set 5ms for the FP0H. (If you are using a different PLC type, set 0ms for the FP7 and 50ms for the FP-X or FPΣ).

## 4.12    Pr6.28 (Block operation mode)

PANATERM parameter: "Special function selection"

Setting range: 0 to 1

The default value is 0.

Select 1: Block operation valid (Modbus)

# 5 Function test

To quickly test your settings, use one of the demo programs included in our MC_Modbus_Library

Click on the following link to download the library from our Panasonic Download Center: MC_Modbus_Library with demo program for block operation

> ⚠ **CAUTION**
>
> ⚠ Conduct trial operation on the servo motor only with the motor shaft disconnected from the machine to avoid any unexpected accidents.

1. Connect the PLC to the servo driver as described in this *Quick Start Guide*.

2. Install the MC_Modbus library by executing the setup file.

3. Select "FP0R Example" or "FP7 Example" from "Start" menu. FPWIN Pro starts and opens the demo project included in the library.

4. Select "Online" > "PLC type" and set the connected PLC type.

5. Check the communication settings of the serial port you are using and make sure the system register settings match the settings in PANATERM.
   The "Communication mode" must be "Modbus RTU master/slave".

   The baud rate setting in this demo program is 115200 baud, the parity is odd, and the number of stop bits is 1.

6. Select "Online" > "Online mode". When asked, select "Compile all" and "Download program code and PLC configuration to PLC" to download the demo program to the connected PLC.

7. Select "Online" > "Change PLC mode" or double-click on "PROG" in the status bar to switch to RUN mode

8. Double-click the POU "_999_Sample_MoveRelative" in the navigator.
   The POU opens in the programing window:
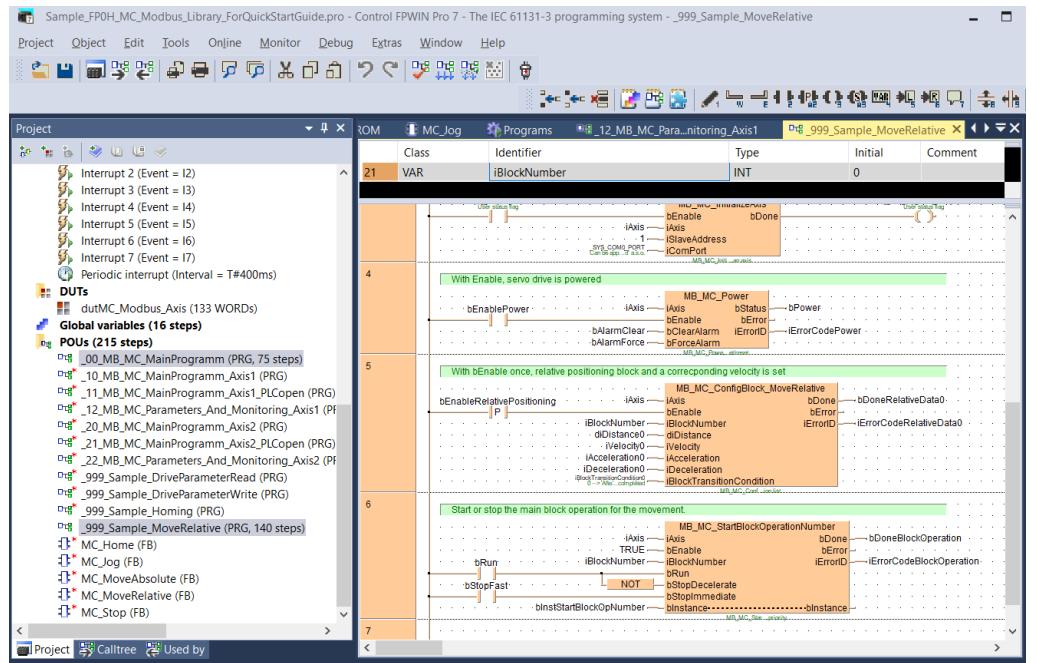
*POU "_999_Sample_MoveRelative" of MC_Modbus_Library in Control FPWIN Pro 7*

This program performs a relative movement on axis 1. Make sure the same axis is set in PANATERM.

9.    Set **g_bUseAxis1** of **MB_MC_InitializeAxis** to TRUE. When data transmission to axis 1 starts, the SD/RD LED of the selected COM port begins to flicker.

10.    Set **bEnablePower** of **MB_MC_Power** to TRUE to send a servo ON request signal to the servo driver. When the servo is on, bPower will be TRUE.

11.    Set **bEnableRelativePositioning** of **MB_MC_ConfigBlock_MoveRelative** to TRUE to transmit the positioning parameters specified with this function to block operation table of the servo driver.

12.    Set **bRun** of **MB_MC_StartBlockOperationNumber** to TRUE to start the movement.

# 6      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      Help us improve

# 7    Record of changes

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First edition

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