User's Manual

Piezo Drive Controller

PDM-ID-02 manual

Copyright 2021, SIGMAKOKI Co.,Ltd.

Notes regarding these materials

- These materials are intended as a reference to assist our customers in the use of the SIGMAKOKI CO., LTD. Product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to SIGMAKOKI CO., LTD. or a third party.
- SIGMAKOKI CO., LTD. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagram, charts, programs, or algorithms contained in these materials.
- All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by SIGMAKOKI CO.,LTD. without notice due to product improvements or other reasons.
- When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithm, please be sure to evaluate all information and products. SIGMAKOKI CO., LTD. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
- SIGMAKOKI CO., LTD. products are not designed or manufactured for use in equipment or system that is used under circumstances in which human life is potentially at stake. SIGMAKOKI CO., LTD. products cannot be used for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- The prior written approval of SIGMAKOKI CO., LTD. is necessary to reprint or reproduce in whole or in part these materials.
- If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license Japanese government and cannot be imported into a country other than the approved destination.

  Any diversion or re-export contrary to the export control laws and regulations of Japan and/ or the country of destination is prohibited.

Copyright 2021, SIGMAKOKI Co.,Ltd.

Contents

For Your Safety ____ *4*

Chapter 1 Before you begin ____ *5*

1.Package contents ____ 5

2.Overview ____ 5

3.Name of each part and function ____ 5

Chapter 2 Connection and Setting ____ *7*

4.PDM-ID-02 connection procedure ____ 7

5.PDM-ID-02 Setting ____ 8

Chapter 3 PDM-ID-02 operation ____ *10*

6. Controlling the piezo drive motor (PDM series) by manual operation. ____ 10

7. Piezo drive motor (PDM series) control by PC. ____ 10

Chapter 4 Specification ____ *15*

8. Specification ____ 15

9. Connector Pin Number ____ 16

10. Outer dimension ____ 17

Copyright 2021, SIGMAKOKI Co.,Ltd.

For Your Safety

● Before using this product, read this manual and all warnings or cautions in the documentation provided.

● Only Factory Authorized Personnel should be changes and/or adjust the parts of controller.

The Symbols Used in This Manual

⚠WARNING	⚠CAUTION
This symbol marks warnings that should be read and used to prevent serious injury or death.	This symbol indicates where caution should be used to avoid possible injury to yourself or others, or damage to property.

This symbol indicates where caution should be used to avoid possible injury to yourself or others, or damage to property.

Disclaimer of Liability

① SIGMAKOKI CO., LTD. does not accept liability for damages resulting from the use of this product or the inability to use this product.

② SIGMAKOKI CO., LTD. does not accept liability for damages resulting from the use of this product that deviates from that described in the manual.

③ SIGMAKOKI CO., LTD. does not accept liability for damages resulting from the use of this product in extraordinary conditions, including fi re, earthquakes, and other acts of God, action by any third party, other accidents, and deliberate or accidental misuse.

④ If the equipment is used in a manner not specifi ed by the SIGMAKOKI CO., LTD., the protection provided by the equipment may be impaired.

⚠ WARNING

● Do not use this product in the presence of flammable gas, explosives, or corrosive substances, in areas exposed to high levels of moisture or humidity, in poorly ventilated areas, or near flammable materials.

●Do not connect or check the product while the power is on.

●Installation and connection should be performed only by a qualified technician.

●Do not bend, pull, damage, or modify the power or connecting cables.

●Do not touch the products internal parts.

●Connect the earth terminal to ground.

●Should the product overheat, or should you notice an unusual smell, heat, or unusual noises coming from the product, turn off the power immediately.

●Do not turn on the power in the event that it has received a strong physical shock as the result of a fall or other accident.

●Do not touch the stage while operation.

●Use dry clothes only for cleaning the equipment.

●Do not leave the product in an enclosed area or in areas in which it would be exposed to direct sunlight or vibration.

●Do not touch the product when your hands are wet.

⚠ CAUTION

●Because some electrical change remains after the power has been cut, do not touch the input or output terminals for ten seconds after the product has been turned off.

●When connecting peripherals to the product, adjust the product's initial setting (parameter settings) to suit the peripheral.

●Turn off the power before connecting the product to other devices. Connection should be performed following the connection diagram.

●Before turning the equipment on (or when beginning operations), be sure that you can turn the power off immediately in the event that an abnormality should occur.

Copyright 2021, SIGMAKOKI Co.,Ltd.

Chapter 1　Before you begin

1.Package contents

Before you use this controller, check if your package includes all the items listed below. It is convenient to check in the boxes: If your package does not include all the items, or items are damaged, please contact us.

☐PDM-ID-02 Controller

☐Manual

The edition in memory switch of PDM-ID-02 controller can be done by sample software (SG Sample). SG Sample is available for download from our website.

Web: https://jp.optosigma.com/en_jp/software__sample

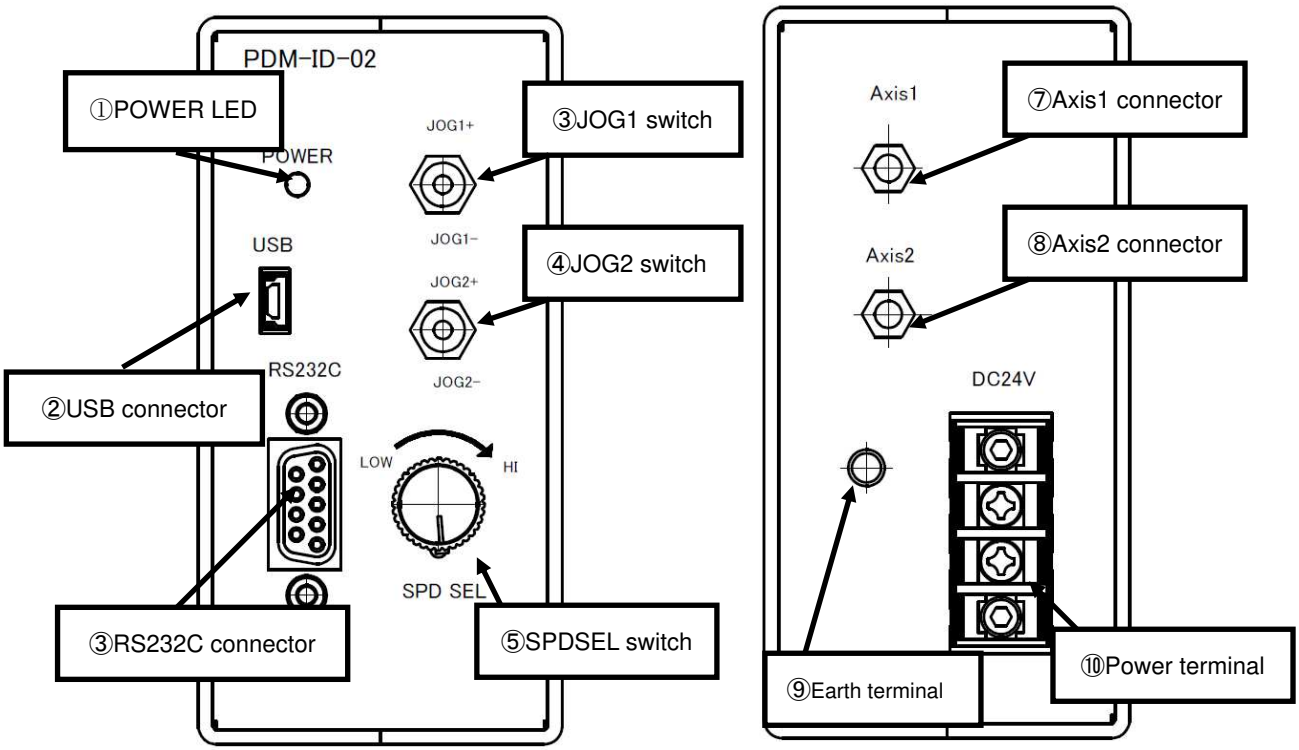
2.Overview

This controller is used for driving ultrasonic motor (PDM series).

With the connection with user PC through RS232C or USB interface, user can send a simple command to control ultrasonic motor (PDM series). Beside by PC, user can control manually by JOG switch as well.

3.Name of each part and function

3-1.Name of each part



Copyright 2021, SIGMAKOKI Co.,Ltd.

3-2.Each part function

①POWER LED	:Light up in red when powered
②USB connector	:A control by PC through USB interface
③RS232C connector	:A control by PC through RS232C interface
④JOG1 switch	:Manual control to ultrasonic motor (PDM series) axis 1
⑤JOG2 switch	:Manual control to ultrasonic motor (PDM series) axis 2
⑥SPDSEL switch	:Switching speed for manual operation.
	HI：Continuous operation LOW：STEP operation(3pattern)
⑦Axis1 connector	:Connector for connection to ultrasonic motor (PDM series) axis 1
⑧Axis2 connector	:Connector for connection to ultrasonic motor (PDM series) axis 2
⑨Earth terminal	:Should be grounded properly in your environment

⚠ Caution Grounding properly in your environment is a must.

⑩Power terminal :Supply power by (DC+24V,2A)

⚠ Make sure to set up and wire the cable supplying DC+24V and GND to the PDM-ID-02 so that the maximum length of cable is not longer than 2m.

※When the LED ① blinks during operation.

A cable not connected error will occur. The piezo drive motor cannot be driven.

Make sure the cables are connected correctly.

Copyright 2021, SIGMAKOKI Co.,Ltd.

Chapter 2 Connection and Setting

4.PDM-ID-02 connection procedure

4-1. Connecting Ultrasonic motor (PDM series) to PDM-ID-02 controller.

① Checking PDM-ID-02 controller power off.

② Connecting 1 axis of the ultrasonic motor (PDM series) to Axis1 of PDM-ID-02 as the axis number 1 and Connecting 2 axis of the ultrasonic motor (PDM series) to Axis 2 of PDM-ID-02 as the axis number 2.

4-2. Connecting PDM-ID-02 to PC

The connection between PDM-ID-02 and PC is RS232C or USB interface.

RS232C/USB interface communication setting of PDM-ID-02 at PC side is shown as below.

Setting items	Setting contents
Baud rate	38400bps
Delimit	CR+LF
Parity	None
Data bit	8bit
Stop bit	1bit
Flow control	Hardware (RTS/CTS)

Connection of PDM-ID-02 to PC

① Checking PDM-ID-02 controller power off.

② RS232C cable is a D-sub9 pin straight (male)/(female) inch screw cable. (Genuine cable: RS232C/STR)

③ Connecting to RS232C interface connector of PDM-ID-02 with male connector of RS232C cable. Female connector of RS232C cable is uses to connect to PC.

Caution All the cable connection must be done in the status of power off.

4-3. Power on

Turning PDM-ID-02 controller power on.

Supplying power (DC24V) to power supply terminal.

POWER LED at front panel will light up after power on.

※Caution: The incorrect connection in power supply polarity may cause the malfunction.

Copyright 2021, SIGMAKOKI Co.,Ltd.

4-4. USB Driver installation Method

please use after the installation of the USB-driver in the following content.

(In the case of Windows 7/ Windows 8/ Windows 8.1/ Windows 10)　While the Internet is connected, when connected toGIP-101B, the installation of an automatic driver will start.

***) If unconnected to the Internet, from FTDI's website on a PC connected to the Internet, please download the driver from (VCP Drivers). The port the downloaded driver on unconnected PC and perform the installation of the driver to connect PDM-ID-02 controller.**

The FTDI website (https://ftdichip.com/drivers/vcp-drivers/)

5.PDM-ID-02 Setting

5-1. Memory switch setting

All setting of PDM-ID-02 is done by Memory switch.

The edition of memory switch is done by sample software (SG Sample).

SG Sample is available for download at Sigma-Koki website

(**https://jp.optosigma.com/en_jp/software__sample**).

5-2. Content of Memory switch

Memory switch consists of 4 items as below.

No.	Memory switch	Range of setting	Default value	Content
1	LOW3	1～999	100	LOW3：pulse/STEP〔pulse〕
2	LOW2	1～999	10	LOW2：pulse/STEP〔pulse〕
3	LOW1	1～999	1	LOW1：pulse/STEP〔pulse〕
4	SPEED	1～1500	1000	SPEED〔pps〕
5	HIGH RESOLUTION	ON ／ OFF	OFF	HIGH RESOLUTION MOVE

5-3. Memory switch setting

1、2、3)LOW

Setting of the number of 1STEP pulses when the SPD SEL switch is LOW.

[Range of setting]　1～999[pulse]

4)SPEED

Setting the speed of the piezo drive motor for each axis.

[Range of setting]　1～1500[pps]

※This value applies to manual operation (jog, STEP), operation by command , and all axes.

Copyright 2021, SIGMAKOKI Co.,Ltd.

5) HIGH RESOLUTION

Reduce the minimum movement of the piezo drive motor for each axis.

[Range of setting] ON/OFF

※When it is turned ON, the minimum movement amount of the piezo drive motor is reduced, but the speed and thrust are reduced.

The piezo drive motor varies depending on individual differences and installation conditions, so it depends on ON/OFF　There are variations in the changes.　If the operation is hindered by turning it on, turn it OFF and use it.

Copyright 2021, SIGMAKOKI Co.,Ltd.

Chapter 3　PDM-ID-02 operation

6. Controlling the piezo drive motor (PDM series) by manual operation.

User can simply do a manual operation to ultrasonic motor (PDM series) by『JOG switch』at front panel.

・JOG1 Switch

Turning JOG1 toward + side to operate a movement of piezo drive motor (PDM series) axis 1 to + direction.

Turning JOG1 toward - side to operate a movement of piezo drive motor (PDM series) axis 1 to - direction.

・JOG2 switch

Turning JOG2 toward + side to operate a movement of piezo drive motor (PDM series) axis 2 to + direction.

Turning JOG2 toward - side to operate a movement of piezo drive motor (PDM series) axis 2 to - direction.

・SPDSEL switch

Switching speed for manual operation.

HI side: Continuous motion　LOW side: STEP motion

LOW side: 3 type setting (pulse/STEP)

7. Piezo drive motor (PDM series) control by PC.

User can control the ultrasonic motor (PDM series) by command (string) from PC.

7-1. Command list

Commands used with PDM-ID-02 controller shown as below.

Command	String	Content
Absolute travel by pulse number setting	A:	Set an absolute travel by pulse number
Relative travel by pulse number setting	M:	Set a relative travel by pulse number
Drive command	G:	Start moving
Return to logical origin	N:	Return to logical origin
Stop	L:	Stop moving
Logical origin setting	R:	Reset the coordinate
Status	Q:	Response by the status of current position
Status2	!:	Response by B(Busy)/R(Ready)
Internal information	?:	Response by the internal information

Copyright 2021, SIGMAKOKI Co.,Ltd.

7-2. Command format

PC and communication protocol can make one response format toward one command only.

Command string : Received

Response string : Sent

Response string will show『OK』when command string was received normally, but response string will show『NG』when command string was not received properly.

Note: confirmation command (Q:、!:、?:) will be responded by data, instead of『OK』.

7-3. Command detail

(1)A command (Command for setting absolute travel by pulse number)

・Description

This command is to specify traveling axis, direction, absolute coordinate number (pulse number). The command must be followed by a drive (G) command.

・Command format

A:nmPx

・Parameter

n :1, 2 or W	1 represents axis 1 2 represents axis 2 W represents axis both axis 1 and axis 2
m :+ or -	+ represents + direction - represents - direction
x :Absolute coordinate number	Range of pulse setting 0～99999999

Example)

A:W+P1000+P3000	Move axis 1 to position of +1000 pulse and move axis2 to position of +3000 pulse.
G:	Start moving

(2) M command (Set number of pulses for relative travel)

・Description

This command is to specify travel axis, direction, relative travel number (pulse number). The command must be followed by a drive (G) command.

・Command format

M:nmPx

・Parameter

n:1, 2 or W	1 represents axis 1 2 represents axis 2 W represents axis both axis 1 and axis 2

 Copyright 2021, SIGMAKOKI Co.,Ltd.

m：+ or -	+ represents + direction
	- represents - direction
x：Relative travel number	Range of pulse setting 0～99999999

Example)

M:1+P1000	Move axis 1 to + direction by 1000 pulse
G:	Start moving

(3) G Command (Drive command)

・Description

Start driving the piezo drive motor (PDM series). The command must be applied after A and M command.

・Command format

G:	Start moving

(4) N Command (Return to logical origin)

・Description

Return to the piezo drive motor (PDM series) to the logical origin (0 pulse position).

・Command format

N:1	Return axis 1 to logical origin
N:2	Return axis 2 to logical origin
N:W	Return both axis 1 and axis 2 to logical origin

(5) L command (Stop moving)

・Description

Stop moving of piezo drive motor (PDM series).

・Command format

L:1	Stop moving of axis 1
L:2	Stop moving of axis 2
L:W	Stop moving of both axis 1 and axis 2
L:E	Stop moving of both axis 1 and axis 2

(6) R command (Logical origin setting)

・Description

Reset coordinate and memorize the current position as a logical origin (0 pulse position).

・Command format

R:1	Set the logical origin of axis 1
R:2	Set the logical origin of axis 2
R:W	Set the logical origin of both axis 1 and axis 2

 Copyright 2021, SIGMAKOKI Co.,Ltd.

(7) Q command (Checking status command)

・Description

A response by the current position status of piezo drive motor (PDM series) from PDM-ID-02 controller.

・Command format

Q:

・Responded data format

Coordinate number of axis 1, Coordinate number of axis 2 , ACK1, ACK2, ACK3

Coordinate number of axis 1	Coordinate number of current position of axis 1 (pulse number)		
Coordinate number of axis 2	Coordinate number of current position of axis 2 (pulse number)		
ACK1	X	command error	
	K	command received normally	
ACK2	Ignore		
ACK3	B	busy status	L, Q, ! command can be received.
	R	Ready status	All commands can be received.

※Coordinate number for each axis has a fixed length of ten digits, including symbols. (symbols are left-aligned and coordinate numbers right-aligned).

Example)

Q:		Checking status
- 1000,	2000,K,K,R	Returned data

Coordinate number of axis 1 : -1000 pulse and Coordinate number of axis 2 : 2000 pulse

Command received normally Ready status

 Copyright 2021, SIGMAKOKI Co.,Ltd.

(8) ! command (Checking status command 2)

・Description

A response of stage status from PDM-ID-02 controller with (ACK3 of Q command)

・Command format

!:

・Responded data format

B	busy status	L, Q, ! command can be received.
R	Ready status	All commands can be received.

(9) ? command (Checking internal information)

・Description

A response of internal information of PDM-ID-02

・Command format

?:N	Checking system name
?:V	Checking version

Copyright 2021, SIGMAKOKI Co.,Ltd.

Chapter 4 Specification

8. Specification

(1) General specification

Power requirement	DC24V
Power consumption	2.0A
Operation temperature	5～40℃
Storage temperature	-20～60℃
Altitude	up to 2000m
Indoor use only	
Installation category	Ⅱ
Pollution degree	2
Ambient humidity	20～80% (no condensation)
Outer dimension	50W×152.4D×100H [mm] (Excluding extrusion)
Weight	0.6 kg

(2) Performance

Controlling axis	2 axis	
Interface	RS232C/ USB Interface (Serial communication) interface	
	Communication parameter	
	・Baud rate	38400bps
	・Data bit	8bit
	・Parity	None
	・Stop bit	1bit
	・Flow control	Hardware (RTS/CTS)
	・Delimiters	CR+LF

Copyright 2021, SIGMAKOKI Co.,Ltd.

9. Connector Pin Number

9-1.Axis1 and Axis2 connector

Connector : 731000158 (Molex)

9-2.RS232C connector

No.	Name	No.	Name
1	-	6	DTR
2	TxD	7	CTS
3	RxD	8	RTS
4	DSR	9	-
5	SG		

Connector : XM3B-0922-502 (made by OMRON Corporation)

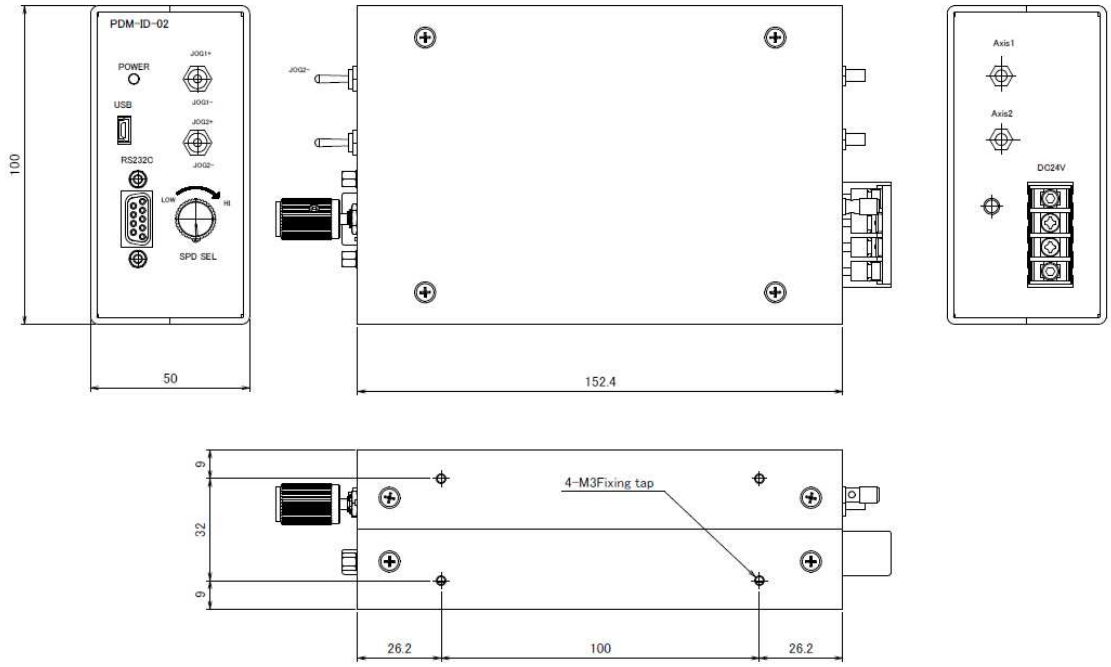
9-3.USB connector

No.	Name	No.	Name
1	-	4	-
2	DATA-	5	GND
3	DATA+		

Connector : UX60SC-MB-5S8 (made by Hirose Electric Corporation)

Copyright 2021, SIGMAKOKI Co.,Ltd.

10. Outer dimension



SIGMAKOKI CO., LTD.

Copyright 2021, SIGMAKOKI Co.,Ltd.