Motorized zoom laser beam expander controller

# **BEZM controller User's Manual**

Ver. 1.01



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## 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.

WARNIG	<b><u>CAUTION</u></b>
This symbol marks warnings that should be read	This symbol indicates where caution should be
and used to prevent serious injury or death.	used to avoid possible injury to yourself or
	others, or damage to property.

# The Symbols Used in This Manual

The above indications are used together with the following symbols to indicate the exact nature of the warning or caution.

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• Do not use this product in the presence of flammable gas, explosives, or corrosive •Because some electrical change remains after the power has been cut, do not substances, in areas touch the input or output terminals for ten seconds after the product has been exposed to high levels of moisture or humidity, in poorly ventilated areas, or near turned off. flammable materials • When connecting peripherals to the product, adjust the product's initial Do not connect or check the product while the power is on. setting (parameter settings) to suit the peripheral. Installation and connection should be performed only by a qualified technician. • Turn off the power before connecting the product to other devices. Do not touch the products internal parts. Connection should be performed following the connection diagram. Do not bend, pull, damage, or modify the power or connecting cables. •Before turning the equipment on (or when beginning operations), be sure Connect the earth terminal to ground. that you can turn the power off immediately in the event that an abnormality Should the product overheat, or should you notice an unusual smell, heat, or should occur. unusual noises coming from • The product can only be repaired, modified, or disassembled by a qualified the product, turn off the power immediately. technician. •Do not turn on the power in the event that it has received a strong physical shock •Do not use in outdoors. as the result of a fall or other accident. Use dry clothes only for cleaning the equipment. • Do not operate the product with wet hands or otherwise cause electric shock. • Do not leave the product in a place subject to vibration, a closed place, or a place exposed to direct sunlight.



## Chapter1. Before You Begin

#### 1. Package Contents

Check the package contents using the following checklist. Contact your retailer as soon as possible in the event that you should find that any item is missing or damaged.

BEZM Controller	:1
Simple instruction manual	:1
Rubber feet	:4

% It is up to the customer to attach the rubber feet. Please paste it as you like.

#### Options (sold separately)

BEZM main unit	BEZM-1/8-1030/1100

BEZM-1/8-500/570

%The BEZM controller is compatible with our motorized zoom laser beam expanders.

 $\Box BEZM \text{ connection cable} BEZM-CA-\Delta$ 

XA cable for connecting an electric zoom laser beam expander.

The model number  $\Delta$  contains the cable length (2, 3, 5[m]).

\*Operation cannot be guaranteed if multiple extension cables are connected to a length of 5m or more.

 $\Box$ RS232C cable RS232C/STR- $\Delta$ A

RS232C/STR-4.5

&Used for connection with the controller. The model number  $\triangle$  contains the cable length (2, 3, 5 [m]).

□AC adapter AC-ADP-2427

XUsed when connecting the power supply voltage of the controller.

□USB micro-B cable

XSince we do not handle it, please connect according to the usage of each product.

\*To control the BEZM controller from a PC via USB connection, it is necessary to install a driver on the PC side. Please refer to Chapter 3 for installation instructions.



#### 2. Overview

• External control via RS232C and USB interfaces is possible as a controller for the motorized zoom laser beam expander.

- ·Compatible with BEZM series motorized zoom laser beam expanders.
- ·Comes with control software for PC (Windows 11 64-bit compatible).
- 3. Name of each part and function
- 3-1. Name of each part







3-2. Each part function

**②Power LED** 

①Power terminal	Supply power by DC+24V. The screw	size is M3
-----------------	-----------------------------------	------------

Lights up in red when powered.

③Micro USB Type B Connector

When control by USB Interface trough PC, please use USB.

(4) RS232C Connector (Female, M2.6 screw)

:When control by RS232C Interface through PC, please use RS232C.

Either ③ or ④ should be connected.

⑤BEZM Connector	Connect to BEZM.
6 Earth terminal	Should be grounded properly in your environment.
⑦Fixing screw hole	:Please use it for fixing the controller. M3 screw length 5mm can be
	used.

## Chapter2. Basic operations

4. Connecting method

4-1. Pre-use confirmation and grounding of ground terminal

Before using the BEZM controller, make sure that the power is turned off and ground the countermeasure ground terminal.

①Make sure that the BEZM controller is not powered.

<sup>(2)</sup>Properly ground the earth terminal for countermeasures against electric leakage, fire, etc.

- 4-2. Connect BEZM controller and BEZM main unit
  - Connect the BEZM controller and the BEZM main unit with the BEZM connection cable.
  - ①Make sure the BEZM controller is not powered.
  - (2)Connect the BEZM connection cable to the connector labeled BEZM on the BEZM controller.
- 4-3. Connect the BEZM controller and RS232C or USB cable
  - Connect BEZM controller and PC using RS232C or USB cable.
  - ①Make sure the BEZM controller is not powered.
  - ②Select either RS232C or USB cable and connect it to the connector indicated.

4-4.Power ON

- Connect to DC+24V and turn on the power.
- At this time, check that the Power LED is lit and that the power is on.
- \*If the Power LED does not light up, check the power connection.

**CAUTION** Be sure to turn off the power before connecting cables.



## Chapter3. Operate BEZM controller by PC

- 5. BEZM controller connection procedure
- 5-1. Driver installation method (Windows 10 example)

When connecting this device to a PC with a USB cable, it uses STM32 manufactured by STMicroelectronics for USB serial communication. So you need to install the driver on your PC first. The following example explains the installation procedure for Windows 32bit driver Ver.2.12.36.1.

①Access the following URL from the ST Microelectronics website. https://www.st.com/ja/development-tools/stsw-stm32102.html

②After reading and agreeing to the disclaimer, download the ZIP file (en.stsw-stm32102.zip).

(3) Unzip en.stsw-stm32102.zip in the downloaded ZIP file and run VCP\_V1. $\triangle$ . $\triangle$ \_Setup.exe. \* Please use the latest version at the time of download for the version marked with  $\triangle$ .

The following is for V1.4.0.

🚽 Virtual Com port driver V1.	4.0 - InstallShield Wizard	×	Virtual Com port driver V1.4.0	0 - InstallShield Wizard
2	Welcome to the InstallShield Wizard for Virtual Com port driver VI.4.0 The InstallShield (R) Wizard vill install Virtual Com port d VI.4.0 on your computer. To continue, disk Next.	driver	× 3	Preparing to Install Virtual Con port driver V1.4.0 Setup is preparing the ZivistalSheek Witzerd, which will guide you through the program setup process. Please wait.
	WARIDNG: This program is protected by copyright law international treaties.	and	2	Extracting: Virtual Com port driver V1.4.0.msi
	<back next=""> Ca</back>	incel		Cancel
	Virtual Com port drive	er V1.4.0 - InstallShield Wizard	×	
	Bendu to Install the I	Program		
	The wizard is ready to	begin installation.		
	If you want to review exit the wizard. Current Settings:	or change any of your installation setting	s, click Back. Click Cancel to	
	Setup Type:			
	Typical			
	Destination Folder:			
	C: Program Files (	(x86) (STMicroelectronics (Software )		
	User Information: Name:			
	Company: Microso	oft		
	TextsIChield			
	TO POINT ACTO			



④ ③ After execution, the device driver installation file will be placed in "C:¥Program Files (x86)¥STMicroelectronics¥Software¥Virtual comport driver".

The Visual COM Port device driver will be installed by executing the installation file written in the table below according to the OS you are using.

OS	installation file
Windows 10	C:\Program Files (x86)\STMicroelectronics\Software\Virtual comport
64bit	driver¥Win8¥dpinst_amd64.exe
Windows 10	C:\Program Files (x86)\STMicroelectronics\Software\Virtual comport
32bit	driver¥Win8¥dpinst_x86.exe
Windows 8.1	C:\Program Files (x86)\STMicroelectronics\Software\Virtual comport
64bit	driver¥Win8¥dpinst_amd64.exe
Windows 8.1	C:\Program Files (x86)\STMicroelectronics\Software\Virtual comport
32bit	driver¥Win8¥dpinst_x86.exe
Windows 7	C:\Program Files (x86)\STMicroelectronics\Software\Virtual comport
64bit	driver¥Win7¥dpinst_amd64.exe
Windows 7	C:\Program Files (x86)\STMicroelectronics\Software\Virtual comport
32bit	driver¥Win7¥dpinst_x86.exe

### 6. Communication settings

The communication environment settings for the BEZM controller are shown in the table below. Set the settings on the PC side according to the table below.

Setting items	Settings
Baud rate	115200bps(Factory default value)
	(57600,38400,19200,9600,4800bps Changeable)
Data bits	8bit
Stop bit	1bit
Parity	None
Delimiters	CR+LF



#### 7. Command details

You can control the BEZM itself by sending commands (character strings) from your PC to the BEZM controller.

#### 7-1. Command list

Commands used with BEZM controller shown as below.

Command	String	Content
Magnification	MG	Magnification setting
Diopter	DO	Diopter setting
Individual adjustment	МО	See 7-3 command details.
value		
Wavelength	WL	Set the wavelength according to the BEZM
		main unit.
Wavelength list	WT	Indicates selectable wavelengths.
Product name	NI	Indicates the product model name.
Firmware version	FV	Indicates Firmware version.
Controller ID	CI	Indicates the Controller ID.
Status inquiry	ST	Indicates the state of the BEZM controller.
Baud rate setting	BR	115200, 57600, 38400, 19200, 9600,
		4800bps
Echo switch (ON/OFF)	EC	Toggles echoing of commands.
Reset	RS	Reset

#### 7-2. Basic protocol

The communication protocol of the BEZM controller consists of the following two packets.

- (1) command packet
- (2) return packet
  - A packet consists of a character string, and a CR code (0xD) and LF code (0xA) are added at the end as data delimiters.
  - A character string consists of uppercase alphanumeric characters.
  - The basics of the protocol are to send a command packet from the PC to the main unit, and then send a return packet from the main unit to the PC as a response.
  - There is a one-to-one correspondence between command packets and return packets. When

the PC sends a command to this product, it must receive a reply.

(1) Command packet

The command packet format is shown below.

		CR LF
(	1	2 3
1	Command	Command string (fixed length of 2 characters) and space characters
		Consists of ASCII alphabetic characters.
		Commands without parameters do not require spaces.
2	Parameter	Parameter string
		Enumerate the required parameters.
		If there are multiple parameters, separate them with "," (comma).
3	Delimiter	data delimiter string
		It consists of CR code and LF code.

### (2)Return packet

The format of the return packet is shown below.



## 7-3. Command detail

# (1) Magnification

Command:	MG	
Parameter:	m.mm <cr><lf></lf></cr>	
	m.mm Magnification: Integer part fixed to 1 digit, decimal point f	ixed
	to 2 digits	
Data range:	$1.00 \sim 8.00$	
Response:	r <cr><lf></lf></cr>	
	r Return code (See return packet)	
Commentary:	Magnification setting	
Example of use:	MG 1.00	
	Set the magnification to 1.00.	

# (2) Diopter

	Command:	DO		
	Parameter:	sd.dd <cr><lf></lf></cr>		
		S	sign: + or –	
		d.dd	Diopter: Integer part fixed to 1 digit, decimal point fixed to	
			2 digits (unit: mm)	
	Data range:	-5.00 ~	+5.00	
	Response:	r <cr><i< td=""><td>_F&gt;</td></i<></cr>	_F>	
		r	Return code (See return packet)	
	Commentary:	Diopter s	etting.	
		+ increases diopter. (The lens moves in the direction in which		
		converges.)		
		- decreases diopter. (The lens moves in the direction in which the diverges.)		
		This setti	ng is saved even if the BEZM controller is powered off.	
Example of use: DO +1.00		DO +1.00	0	
		The internal lens is offset by 1.00mm and moves in the direction of light		
		converge	ence.	

# (3) Individual adjustment value

Command:	MO	
Parameter:	sm.mm<	<cr><lf></lf></cr>
	S	sign: + or –
	m.mm	Individual adjustment value: Integer part fixed to 1 digit, decimal



		point fixed to 2 digits		
Data range : Response :		$-0.48 \sim +0.48$		
		r <cr><lf></lf></cr>		
		r Return code(See return packet)		
Commentary:		The individual adjustment value corrects the magnification difference from		
		the design value including the beam diameter error. Set on the 8x standard.		
		If the expander is specified to be 8x and the incident laser beam diameter is		
		1.05x larger than the designed value, the resulting beam diameter will be		
		8.4x instead of 8x. At this time, if you set MO-0.4, when you specify		
		MG8.00, it will internally move to 8/(8-MO) x (specified MG		
		magnification), so $8/8.4 \ge 8$ = Move to 7.62x. The beam diameter is 1.05		
		times the design value, so if that is also taken into account, the beam will		
		be emitted as a beam that is 8.00 times larger.		
		This setting is saved even if the BEZM controller is powered off.		
	Example of use:	MO +0.10		
		If you send the MG 1.00 command after sending this command, the lens		
		will be positioned at $8/7.9 \times 1=1.01$ times.		
(4) Wave	length list			
	Command:	WL		
	Parameter:	www.w <cr><lf></lf></cr>		
		www.w Wavelength		
	Data range:	532.0, 633.0, 1064.0		
	Response:	r <cr><lf></lf></cr>		
		r Return code (See return packet)		
	Commentary:	Set the wave length according to the BEZM main unit		
		The factory default value is "1064.0".		
		Returns a parameter error for values outside the data range.		
		This setting is saved even if the BEZM controller is powered off.		
	Example of use:	WL 532.0		
		If you send the MG 1.00 command after sending this command, it will be		
		the position of 1 magnification corresponding to 532.0 nm.		
(5) Wave	length list			
	Command:	WT		
	Parameter:	None		
	Response:	r 532.0, 633.0, 1064.0 <cr><lf></lf></cr>		
		r Return code (See return packet)		
	Commentary:	Returns a selectable wave length.		



## (6) Product name

Command:	NI <cr></cr>	<lf></lf>
Parameter:	None	
Response:	r BEZM<	CR> <lf></lf>
	r	Return code (See return packet)
Commentary:	Returns E	BEZM.

## (7) Firmware version

Command:	FV <cr><lf></lf></cr>		
Parameter:	None		
Response:	r vv.vv,rrr <cr><lf></lf></cr>		
	r	Return code (See return packet)	
	vv.vv version number		
	rrr	revision number	
Commentary:	Returns the firmware version of the BEZM controller.		

# (8) Controller ID

Command:	CI <cr><lf></lf></cr>
Parameter:	None
Response:	r nnnnnnnn <cr><lf></lf></cr>
	r Return code (See return packet)
Commentary:	Returns the ID number of the BEZM controller.

## (9) Status inquiry

Command:	ST <cr><lf></lf></cr>			
Parameter:	None			
Response :	r ss <cr< td=""><td colspan="3">r ss<cr><lf></lf></cr></td></cr<>	r ss <cr><lf></lf></cr>		
	r	Return code (See return packet)		
ss Status:00 A A 2-digit string repres 0x01 0: Stopped		Status: $00 \sim 7F$		
		t string representing the following bit pattern in base 1		
		0: Stopped (ready), 1: Running (busy)		
	0x02	0: Out of on-position range, 1: On-position		
	0x04	0: Normal operation		
		1: Motion error (Position signal does not change even if the lens		
		is moved)		
	0x08	0: motor normal		
		1: Motor error		

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		0x10	0: BEZM main unit normal, 1: BEZM main unit not connected	
		0x20	0: Normal operation	
			1 : Timeout error	
			(Position is not stable even after a certain amount of time has	
			passed)	
		0x40	0: Specified magnification range normal	
			1: Outside specified magnification range	
		0x80	0: not used	
	Commentary:	From the	e response of this command, it can be determined whether the lens	
		is movin	g or has reached the target position.	
		Returns	0x00 if the BEZM controller is powered on and the MG command	
		has not b	been sent. Send MG command and return 0x01 during movement.	
		Continues to return 0x02 after completion of movement.		
(10) Bau	d rate setting			
	Command:	BR		
	Parameter:	bbbbb <cr><lf></lf></cr>		
		bbbbbb	Baud rate	
	Data range:	115200、	57600, 38400, 19200, 9600, 4800	
	Response:	r <cr>&lt;</cr>	LF>	
		r	Return code (See return packet)	
	Commentary:	Baud rat	e setting.	
		Valid va	lues are 115200, 57600, 38400, 19200, 9600, and 4800.	
		The fact	ory default value is "115200".	
		Any othe	er value will return a parameter error.	
		This sett	ing is saved even if the BEZM controller is powered off.	
	Example of use:	BR 1152	200	
		Set the b	aud rate to 115200.	
(11) Ech	o ON/OFF			
	Command:	EC		
	Parameter:	e <cr>&lt;</cr>	LF>	
		e	0: Echo OFF, 1: Echo ON	

Response: e<CR><LF>

r Return code(See return packet) Commentary: Sets the echo function for communication commands. When echo is ON, the character string sent and received is returned. This setting is saved even if the BEZM controller is powered off.



## (12)Reset

Command:	RS <cr></cr>	<lf></lf>
Parameter:	None	
Response:	r <cr><i< td=""><td>_F&gt;</td></i<></cr>	_F>
	r	Return code (See return packet)
Commentary:	Reset the	BEZM controller.

8. Controller software (SGBEZM)

BEZM controller software (for Windows) is available for using the BEZM main unit.

You can use it by accessing the following URL from our website, downloading the ZIP file, and entering the password. For the password, please refer to the enclosed expander controller simple manual. URL:<u>https://jp.optosigma.com/en\_jp/software\_\_sample</u>

# Chapter4. Specification

## 9. Specification

Compatible devices	BEZM series
Power requirement	DC+24V
Power consumption	Standby: 1.7W
	BEZM Operating: 9.0W
Operation temperature	10~40°C
Storage temperature	-10~50°C
Ambient humidity	20~80%RH(no condensation)
Outer dimension	122×49×100mm
Weight	0.45kg
Interface	USB2.0 FS, RS232C
Supported baud rate	4800,9600,19200,38400,57600,115200bps
RoHS	Compliant
CE, UKCA	Compliant
Appurtenance	Rubber feet 4 Pieces, Simple instruction manual
Compatible software	Controller software (SGBEZM)



# 10. External dimensions



