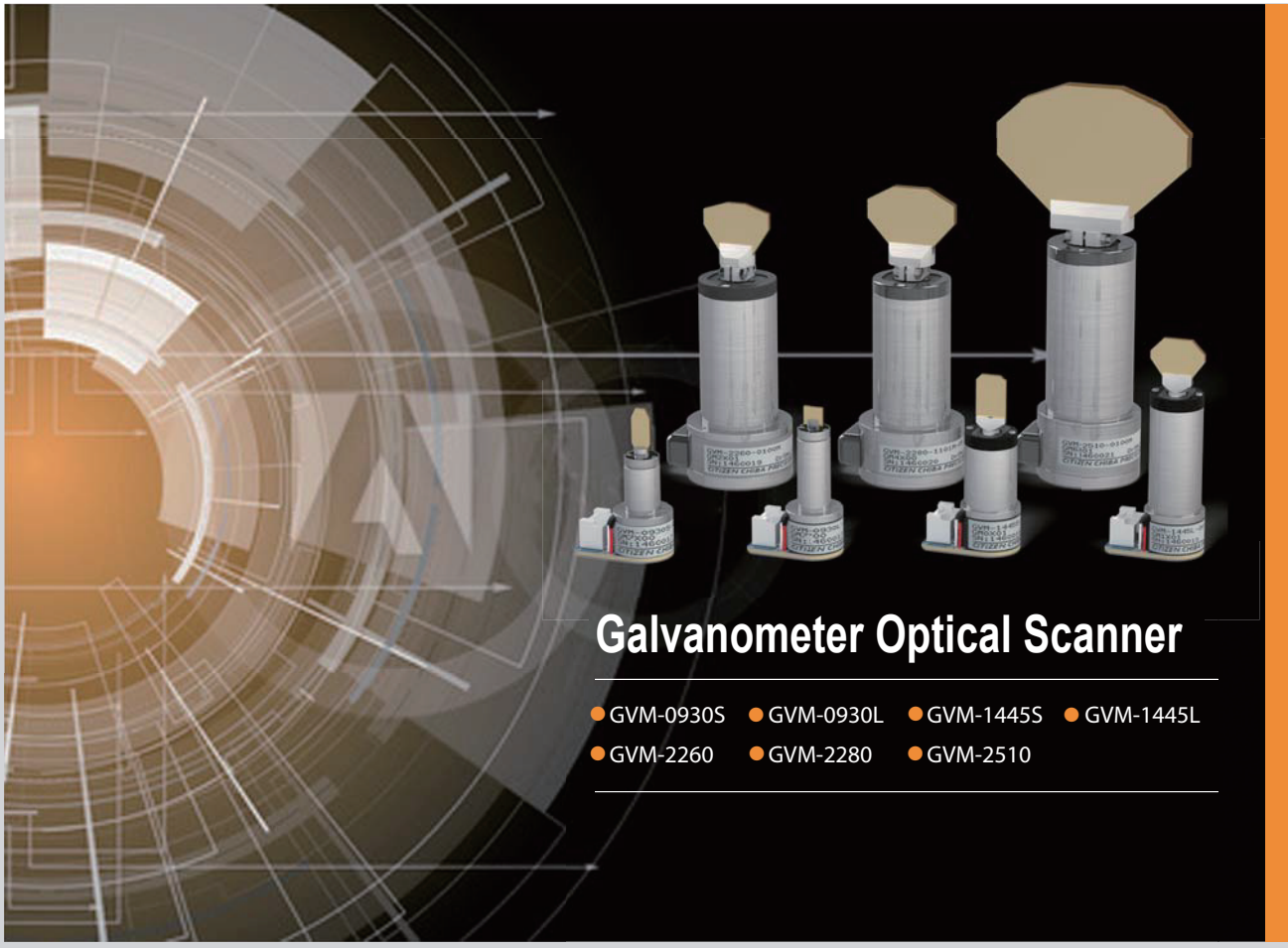
CITIZEN

Galvanometer Optical Scanner



CITIZEN CHIBA PRECISION CO., LTD.
https://ccj.citizen.co.jp/en

Galvanometer Optical Scanner & Driver

■ Galvanometer Optical Scanner (also called as galvo scanner / galvano motor / galvanometer mirror scanner) is the motor with high precision position sensor which detects position to adjust the scan angle of the mirror reflecting laser beam. It has a variety of applications in combination with laser beam, such as laser marker, confocal microscopes, and LiDAR.

■ Features

- Fast response / Low inertia / High torque
- High linearity and positioning accuracy
- Superior temperature characteristics and minimal humidity effect

■ Examples of Application

- Laser marking
- Laser microscope
- Image capturing
- Laser drilling, trimming and cutting
- Non-contact sensoring and measuring
- High speed printing

Contents

Scanner

Scanner Selection

Models	Laser Beam Diameter (mm)							Method to Fix *Mirror Assembly
	φ 3	φ 5	φ 7.5	φ 10	φ 15	φ 20	φ 30	
GVM-0930S	●	○						Fixed to shaft by adhesive
GVM-0930L	●	○						
GVM-1445S		●	○					
GVM-1445L			●	○				
GVM-2260				●				Fixed to shaft by clampe with screws
GVM-2280				○	●			
GVM-2510						●	○	

● Recommended ○ Available *Mirror Assembly : combination of a galvano mirror and a mirror holder

Scanner Model Number

GVM - 1445S - 0 0 1 0 M - ＊＊

Scanner Type
0930S / 0930L
1445S / 1445L
2260 / 2280 / 2510

Registered Custom Number
No Number：Standard Product
*It is only used for customized products

With or Without Mirror
0 ：Without mirror
M：With mirror

Scanning Angle (Mechanical Angle)
0：±10° Bumpers set for ±10° scanning
1：±15° Bumpers set for ±15° scanning
2：±20° Bumpers set for ±20° scanning
C：Custom Bumpers set for customized angle

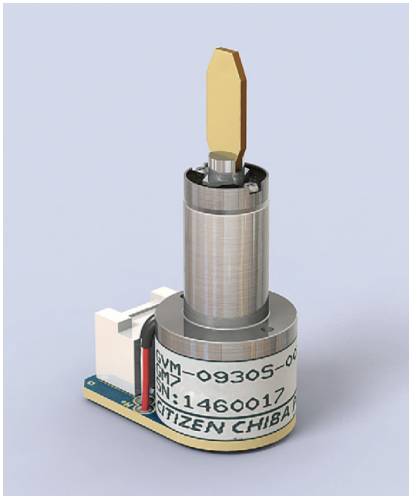
Mirror Angle Against Cable
0：0° (It is also 0 when without mirror)
1：+45° ＋45° to connector
2：−45° −45° to connector
3：−90° −90° to connector
4：+90° ＋90° to connector
5：+180° ＋180° to connector
6：−135° −135° to connector
7：+135° ＋135° to connector
C：Custom Customized angle to connector

Cable Length
0：GVM-0930, GVM-1445 / Connectors are placed on board
1：500mm
2：1000mm
3：2000mm
4：3000mm
5：300mm
C：Custom / Customized cable length

Form of the Top Shaft
0：Straight (GVM-2260, GVM-2280 and GVM-2510 are all 0)
1：With Mirror Holder (GVM-0930 S/L and GVM-1445 S/L are all 1)
C：Custom / Customized Shaft

(Please see page 14 for more details.)

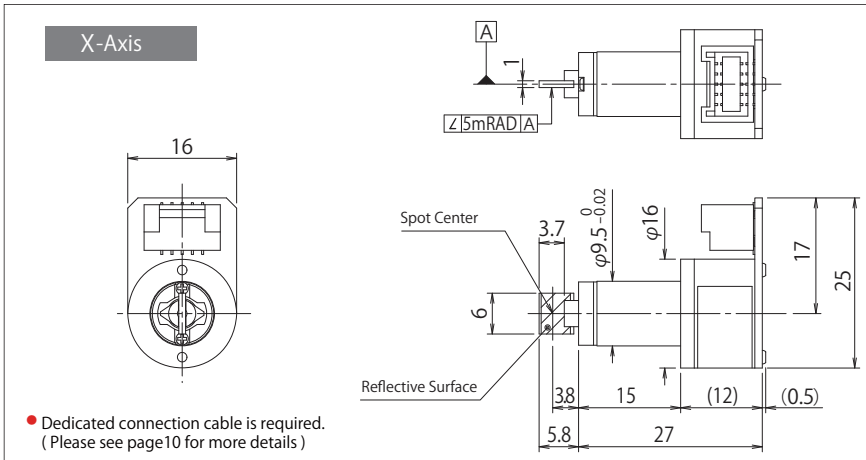
GVM-0930S



■ This drawing indicates the combination with GM7 mirror assembly.

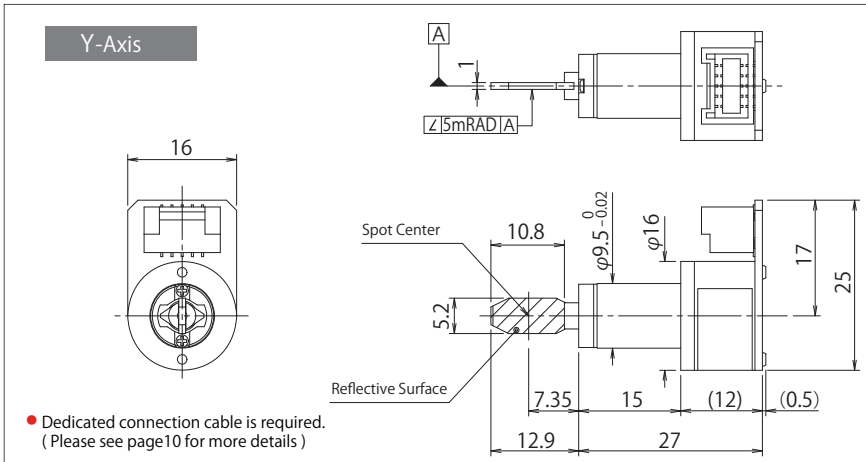
(Unit : mm)

X-Axis



● Dedicated connection cable is required.
(Please see page10 for more details)

Y-Axis



● Dedicated connection cable is required.
(Please see page10 for more details)

■ Connector Pin Assignment

SM10B-ZPDSS-TF (J.S.T.)	
Pin No.	Function
1	A
2	B
3	PD COM
4	AGC RETURN
5	AGC IN
6	SHIELD
7	SHIELD
8	SHIELD
9	− MOTOR WINDING
10	+ MOTOR WINDING

■ Specifications

Items	Unit	GVM-0930S
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm²	0.012
Coil Resistance	Ω	2.5 ± 10%
Coil Inductance	mH	0.054 ± 10%
Torque Constant	mN·m/ A	1.28 ± 10%
Back EMF Voltage	mV/ deg/ sec	0.0224 ± 10%
Peak Current	A	9 (Maximum)
Maximum Coil Temperature	°C	110
Weight	g	15

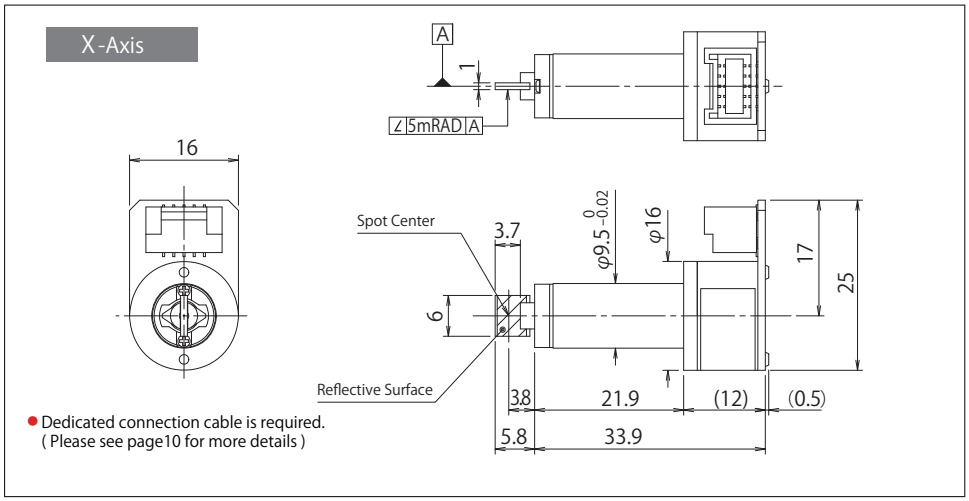
Repeatability		μrad	8
Non-Linearity (±10°)		%	0.1 (Maximum)
Offset Drift		μrad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μsec	*Please see the cautions below
Output Signal	Common Mode	μA	330
	Differential Mode	μA/ deg	11
Input Signal		mA	30

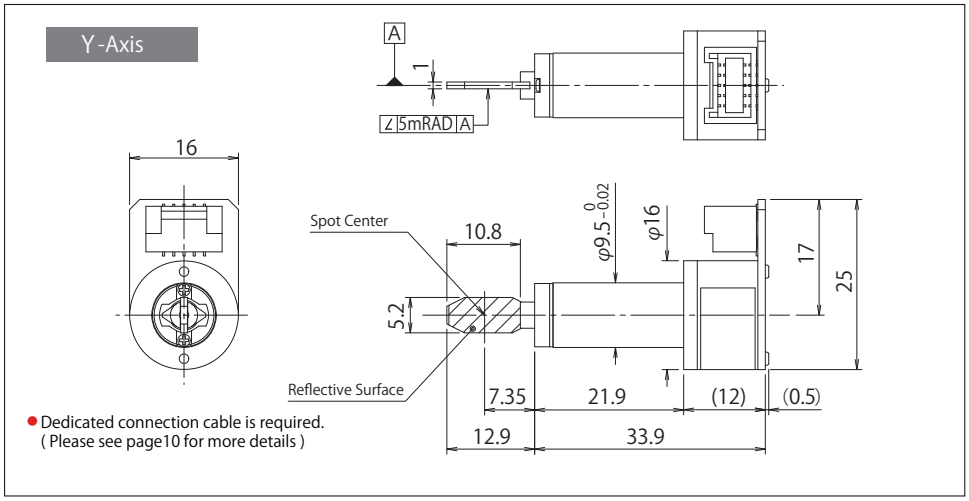
* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are in mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for more details. (Some combinations may not be available.)

GVM-0930L

■ This drawing indicates the combination with GM7 mirror assembly.

(Unit : mm)





Connector Pin Assignment

SM10B-ZPDSS-TF (J.S.T.)	
Pin No.	Function
1	A
2	B
3	PD COM
4	AGC RETURN
5	AGC IN
6	SHIELD
7	SHIELD
8	SHIELD
9	− MOTOR WINDING
10	+ MOTOR WINDING

Specifications

Items	Unit	GVM-0930L
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm²	0.016
Coil Resistance	Ω	1.9 ± 10%
Coil Inductance	mH	0.052 ± 10%
Torque Constant	mN·m/A	1.9 ± 10%
Back EMF Voltage	mV/ deg/ sec	0.0338 ± 10%
Peak Current	A	10 (Maximum)
Maximum Coil Temperature	°C	110
Weight	g	18

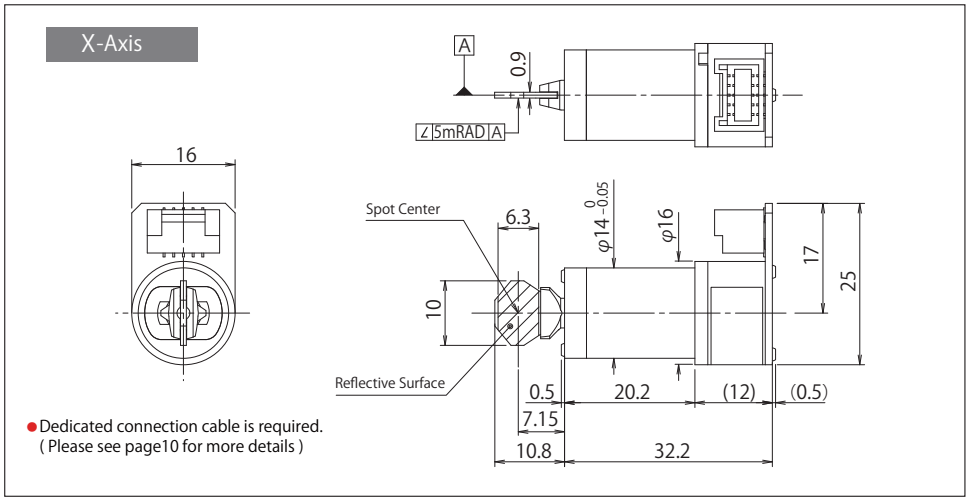
Repeatability		μrad	8
Non-Linearity（±10°）		%	0.1 (Maximum)
Offset Drift		μrad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μsec	*Please see the cautions below
Output Signal	Common Mode	μA	350
	Differential Mode	μA/ deg	11
Input Signal		mA	30

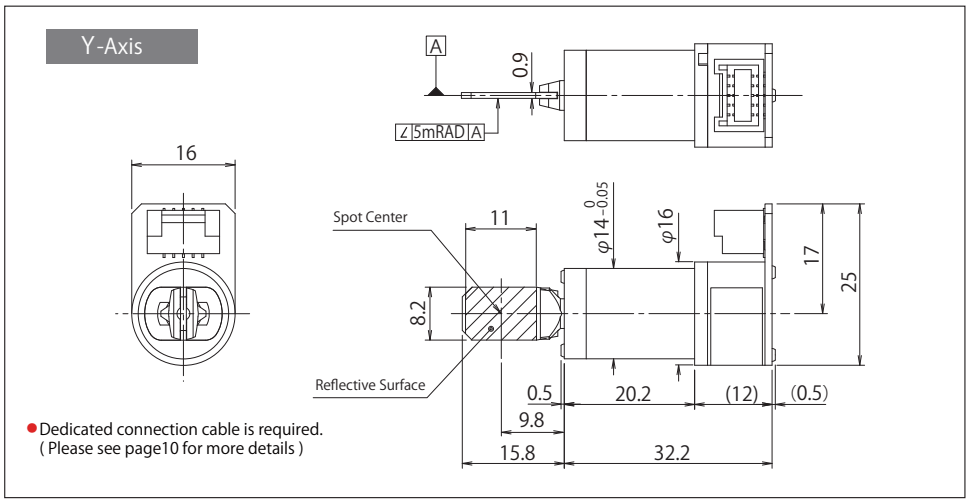
* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are in mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for more details. (Some combinations may not be available).

GVM-1445S

■ This drawing indicates the combination with GM0 mirror assembly.

(Unit : mm)





Connector Pin Assignment

SM10B-ZPDSS-TF (J.S.T.)	
Pin No.	Function
1	A
2	B
3	PD COM
4	AGC RETURN
5	AGC IN
6	SHIELD
7	SHIELD
8	SHIELD
9	− MOTOR WINDING
10	+ MOTOR WINDING

Specifications

Items	Unit	GVM-1445S
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm²	0.059
Coil Resistance	Ω	1.8 ± 10%
Coil Inductane	mH	0.057 ± 10%
Torque Constant	mN·m/ A	2.8 ± 10%
Back EMF Voltage	mV/ deg/ sec	0.049 ± 10%
Peak Current	A	12 (Maximum)
Maximum Coil Temperature	°C	110
Weight	g	28

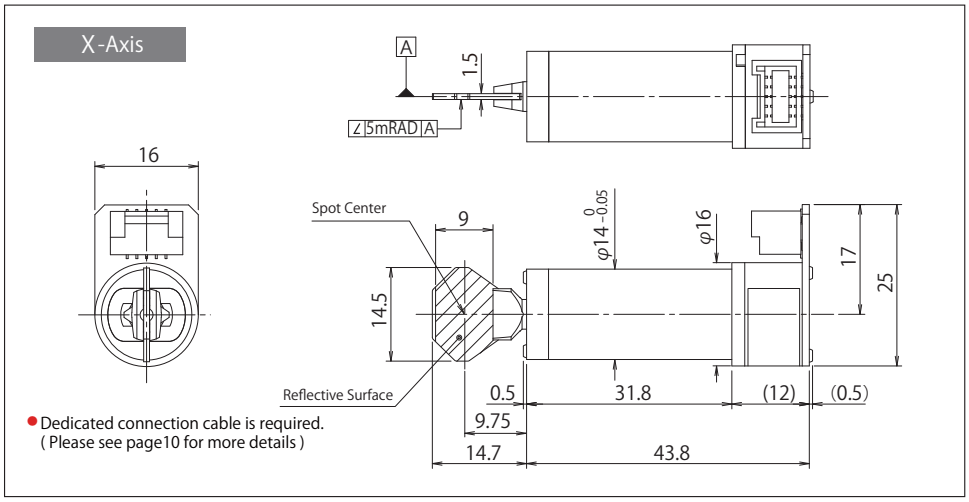
Repeatability		μrad	8
Non-Linearity（±10°）		%	0.1 (Maximum)
Offset Drift		μrad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μsec	*Please see the caution below
Output Signal	Common Mode	μA	350
	Differential Mode	μA/ deg	11
Input Signal		mA	30

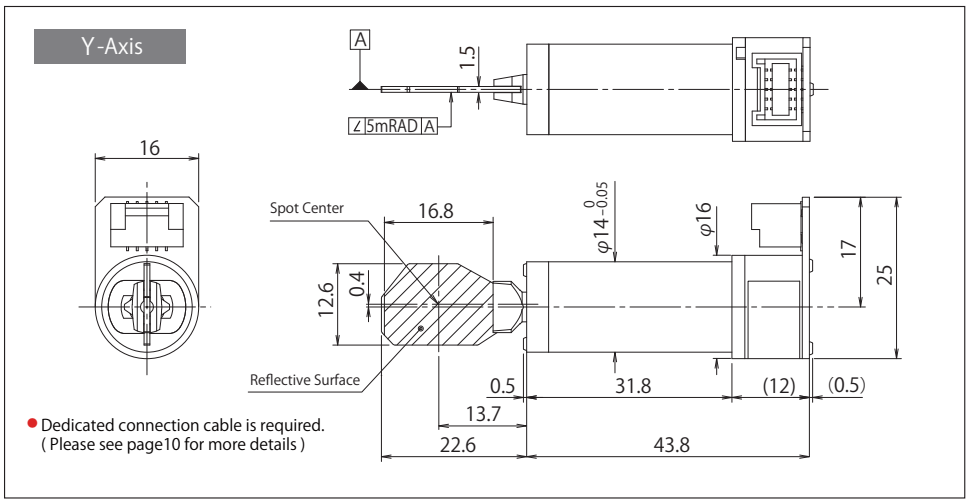
* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for details. (Some combinations may not be available.)

GVM-1445L

■ This drawing indicates the combination with GM1 mirror assembly.

(Unit : mm)





■ Connector Pin Assignment

SM10B-ZPDSS-TF (J.S.T.)	
Pin No.	Function
1	A
2	B
3	PD COM
4	AGC RETURN
5	AGC IN
6	SHIELD
7	SHIELD
8	SHIELD
9	− MOTOR WINDING
10	+ MOTOR WINDING

■ Specifications

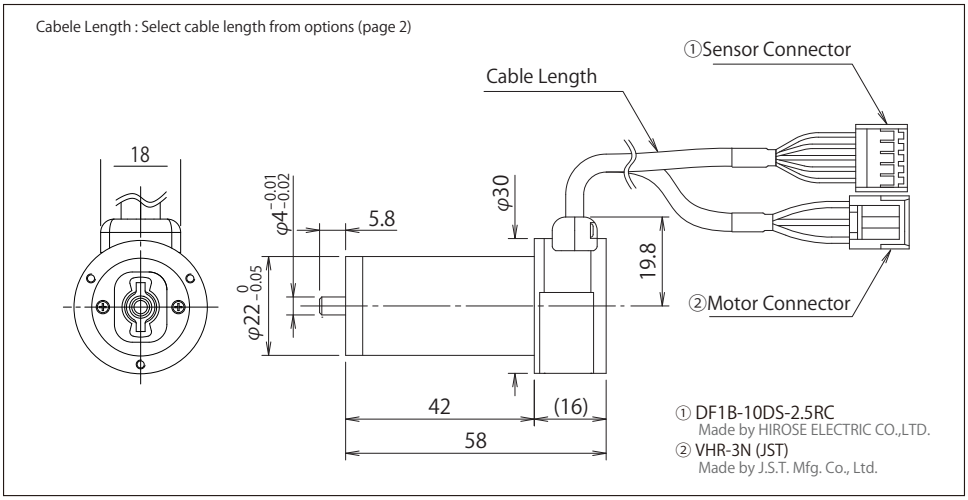
Items	Unit	GVM-1445L
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm²	0.095
Coil Resistance	Ω	1.6 ± 10%
Coil Inductance	mH	0.1 ± 10%
Torque Constant	mN·m/ A	5.04 ± 10%
Back EMF Voltage	mV/ deg/ sec	0.088 ± 10%
Peak Current	A	12 (Maximum)
Maximum Coil Temperature	°C	110
Weight	g	40

Repeatability		μrad	8
Non-Linearity (±10°)		%	0.1 (Maximum)
Offset Drift		μrad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μsec	*Please see the caution below
Output Signal	Common Mode	μA	350
	Differential Mode	μA/ deg	11
Input Signal		mA	30

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for details. (Some combinations may not be available.)

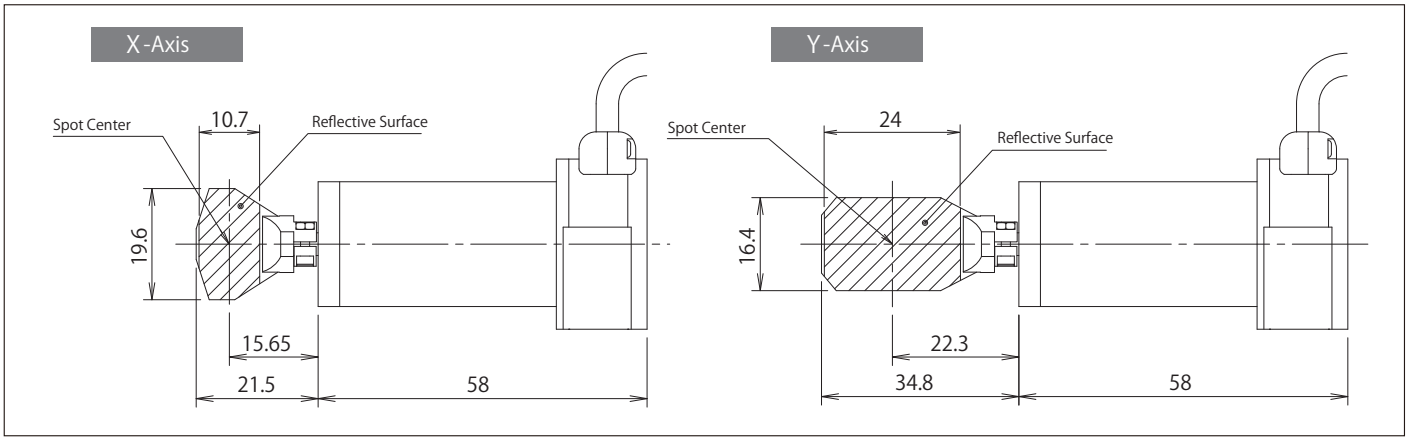
GVM-2260

(Unit : mm)



Mirror + Scanner

■ This drawing indicates the combination with GM2 mirror assembly.



Specifications

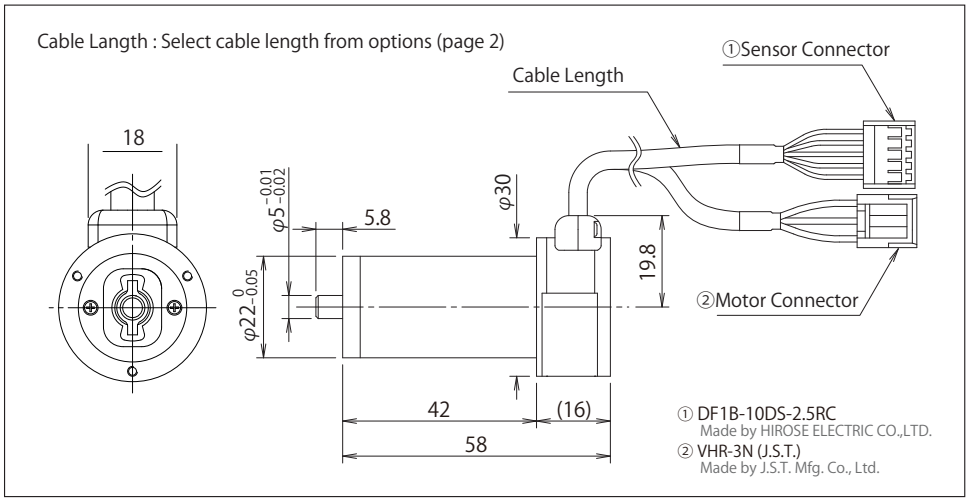
Items	Unit	GVM-2260
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm²	0.52
Coil Resistance	Ω	1.1 ± 10%
Coil Inductance	mH	0.1 ± 10%
Torque Constant	mN·m/ A	8 ± 10%
Back EMF Voltage	mV/ deg/ sec	0.14 ± 10%
Peak Current	A	21.8 (Maximum)
Maximum Coil Temperature	°C	110
Weight	g	155

Repeatability		μrad	8
Non-Linearity（±10°）		%	0.1 (Maximum)
Offset Drift		μrad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μsec	*Please see the caution below
Output Signal	Common Mode	μA	350
	Differential Mode	μA/ deg	11
Input Signal		mA	30

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for details. (Some combinations may not be available.)

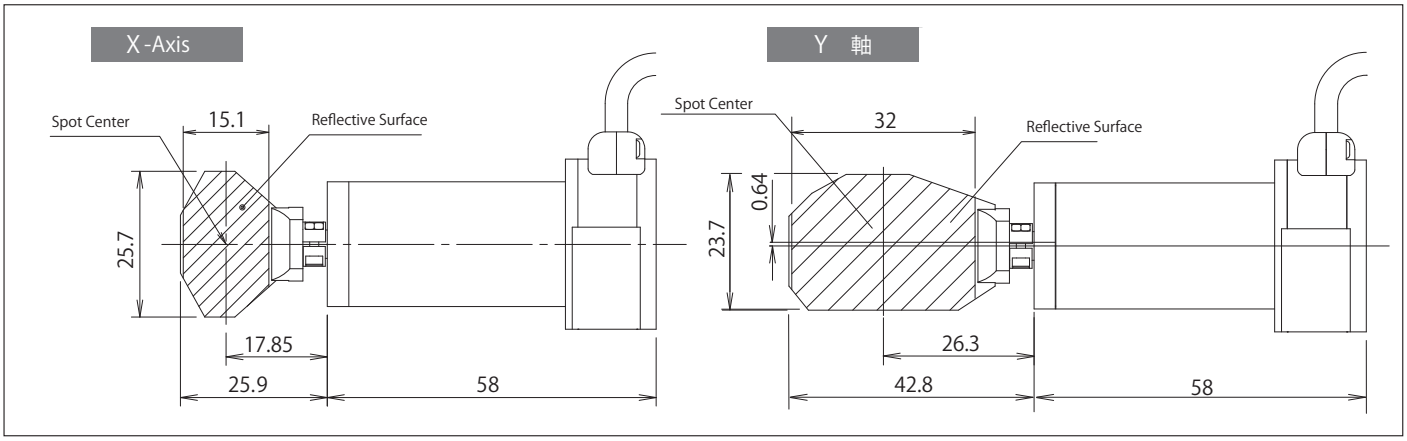
GVM-2280

(Unit : mm)



Mirror + Scanner

■ This drawing indicates the combination with GM4 mirror assembly.



Specifications

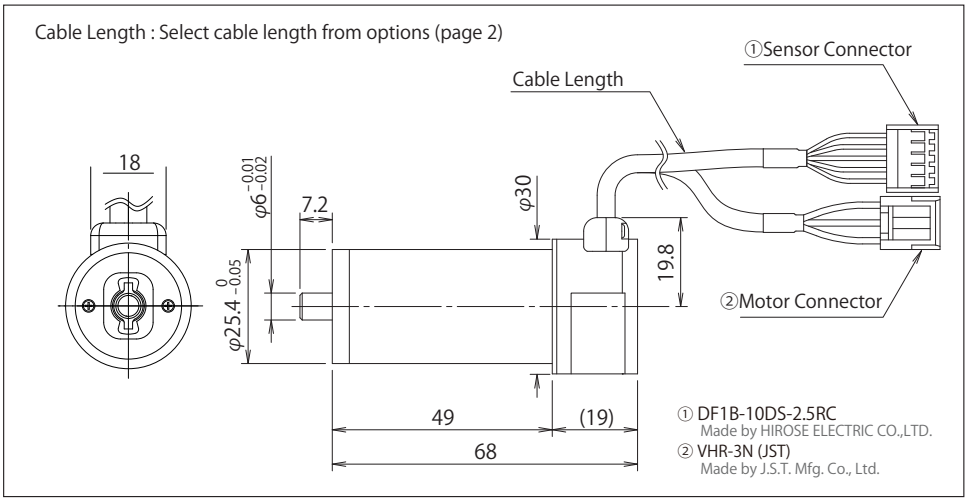
Items	Unit	GVM-2280
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm^2	1.2
Coil Resistance	Ω	1.2 ± 10%
Coil Inductance	mH	0.19 ± 10%
Torque Constant	mN·m/ A	15 ± 10%
Back EMF Voltage	mV/ deg/ s	0.25 ± 10%
Peak Current	A	20 (Maximum)
Maximum Coil Temperature	° C	110
Weight	g	170

Repeatability		μ rad	8
Non-Linearity（±10° ）		%	0.1 (Maximum)
Offset Drift		μ rad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μ sec	*Please see the caution below
Output Signal	Common Mode	μ A	350
	Differential Mode	μ A/ deg	11
Input Signal		mA	30

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for details. (Some combinations may not be available).

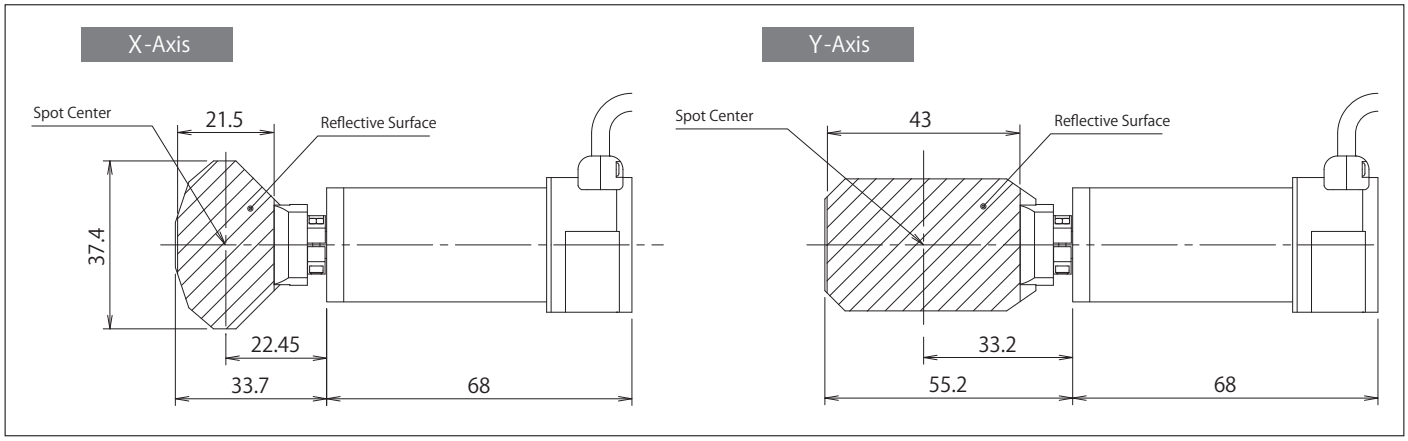
GVM-2510

(Unit : mm)



Mirror + Scanner

■This drawing indicates the combination with GM5 mirror assembly.



Specifications

Items	Unit	GVM-2510
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20
Rotor Inertia	g·cm²	5.6
Coil Resistance	Ω	1.0 ± 10%
Coil Inductance	mH	0.3 ± 10%
Torque Constant	mN·m/ A	32 ± 10%
Back EMF Voltage	mV/ deg/ sec	0.56 ± 10%
Peak Current	A	18.4 (Maximum)
Maximum Coil Temperature	°C	110
Weight	g	220

Repeatability		μrad	8
Non-Linearity（±10°）		%	0.1 (Maximum)
Offset Drift		μrad/ °C	10 (Maximum)
Gain Drift		ppm/ °C	50 (Maximum)
Step Response Time		μsec	*Please see the caution below
Output Signal	Common Mode	μA	350
	Differential Mode	μA/ deg	11
Input Signal		mA	30

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.
* All angles shown are mechanical angles.
* We can provide the data including step response time by preferred combination of the mirror size and the scanner. Please contact our sales representatives for details. (Some combinations may not be available)

GVM-2260/ GVM-2280/ GVM-2510 / Connector Pin Sequence

■Sensor Connector

DF1B-10DS-2.5RC (HIROSE)	
Pin No.	Function
1	A
2	B
3	PD COM
4	AGC RETURN
5	AGC IN
6	NC
7	SHIELD
8	NC
9	NC
10	NC

■Motor Connector

VHR-3N (J.S.T.)	
Pin No.	Function
1	Frame Ground
2	− Motor Winding
3	＋Motor Winding

GVM-0930/ GVM-1445 / Dedicated Connection Cable

■ Cable Model Number

GC0 0 - ＊＊

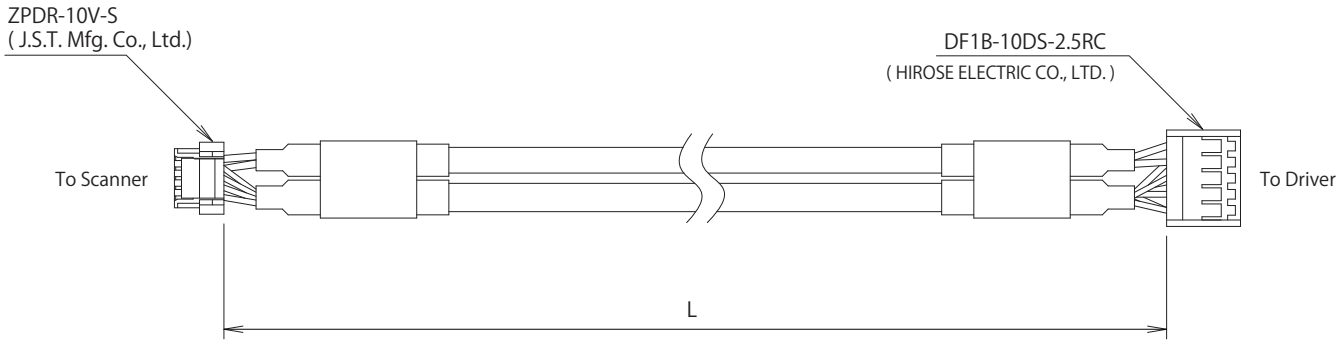
Cable Length
0 : 250mm
1 : 300mm
2 : 500mm
3 : 1000mm
4 : 3000mm
5 : 2000mm
C : Customized Cable Lenght

Connector
0 : Standard
C : Customized Connector

Registered Custom Number
No Number : Standard Product
*It is only used for customized products

■ Cable Drawing

(Unit : mm)



Model	Length L (mm)
GC00	250
GC10	300
GC20	500
GC30	1000
GC40	3000
GC50	2000

■ Connector Pin Sequence

DF1B-10DS-2.5RC	
Pin No.	Function
1	A
2	B
3	PD COM
4	AGC RETURN
5	AGC IN
6	NC
7	SHIELD
8	SHIELD
9	− MOTOR WINDING
10	＋ MOTOR WINDING

Mirror

Mirror Selection

Mirror Substrate : Si (Silicon)

Mirror Model		GM0	GM1	GM2	GM4	GM5	GM6	GM7
Laser Beam Diameter (mm)		φ 5	φ 7.5	φ 10	φ 15	φ 20	φ 30	φ 3
Scanner	GVM-0930S	○						●
	GVM-0930L	○						●
	GVM-1445S	●	○					
	GVM-1445L		●	○				
	GVM-2260			●				
	GVM-2280			○	●			
	GVM-2510					●	○	
Holder Type	Fixed to shaft by adhesive	■	■	※ □				■
	Fixed to shaft by screws			■	■	■	■	
Mirror Assembly Inertia (g·cm²)	X - Axis	0.012	0.072	0.35	1.1	5.7	35	0.0054
	Y - Axis	0.016	0.098	0.45	1.9	7.8	50	0.0059

● Recommended ○ Available

※□ If combining GVM-1445L with φ10 mirror, the mirror holder will be fixed to the shaft by adhesive.

Model Number

GM 0 X 0 0 - ＊＊

Laser Beam Diameter
0：φ5mm
1：φ7.5mm
2：φ10mm
3：ー
4：φ15mm
5：φ20mm
6：φ30mm
7：φ3mm
C：Custom / Customized mirror

Mirror Shape
X：X or first mirror
Y：Y or second mirror
C：Customized mirror

Mirror Substrate
0：Si Si Silicon
1：ー –
2：SiO_2 SiO_2 Quartz
C：Custom / Customized Substrate

Substrate of Coating
0：Au (Gold) coating (10.6μm)
1：Ag (Silver) coating (1064 nm or 532 nm)
2：Dielectric mutilayer coating (1064 nm)
C：Custom / Customized coating

Registered Custom Number
No Number: Standard Product
*It is only used for customized products

Mirror

Mirror Substrate / Recommended Coating

Mirror Model	Laser Beam Diameter	Mirror Substrate	Recommended Coating
GM 0	φ 5	Si (Silicon)	Ag (Silver) Coating
GM 1	φ 7.5	Si (Silicon)	Au (Gold)/ Ag (Silver) Coating
GM 2	φ 10	Si (Silicon)	Au (Gold)/ Ag (Silver) Coating
		SiO_2 (Quartz)	Dielectric Multilayer Coating (For YAG 1064nm)
GM 4	φ 15	Si (Silicon)	Au (Gold)/ Ag (Silver) Coating
		SiO_2 (Quartz)	Dielectric Multilayer Coating (For YAG 1064nm)
GM 5	φ 20	Si (Silicon)	Au (Gold) Coating
		SiO_2 (Quartz)	Dielectric Multilayer Coating (For YAG 1064nm)
GM 6	φ 30	Si (Silicon)	Au (Gold) Coating
		SiO_2 (Quartz)	Dielectric Multilayer Coating (For YAG 1064nm)
GM 7	φ 3	SiO_2 (Quartz)	Ag (Silver) Coating

■ You can select coating depending on the wavelength of the laser beam.

- Au (Gold) Coating : Mainly for CO_2 laser (wavelength 10.6 μm)
- Ag (Silver) Coating : Mainly for visible ray laser (wavelength : 532nm, 1064nm etc.)
- Dielectric Multilayer Coating : Mainly for maximum reflectance with YAG laser (wavelength : 1064nm etc.)
  *The coating layer of the Dielectric Multilayer Coating differs depending on the wavelength used.

Coating-Reflectance Data (Incident Angle 45°)

Table1

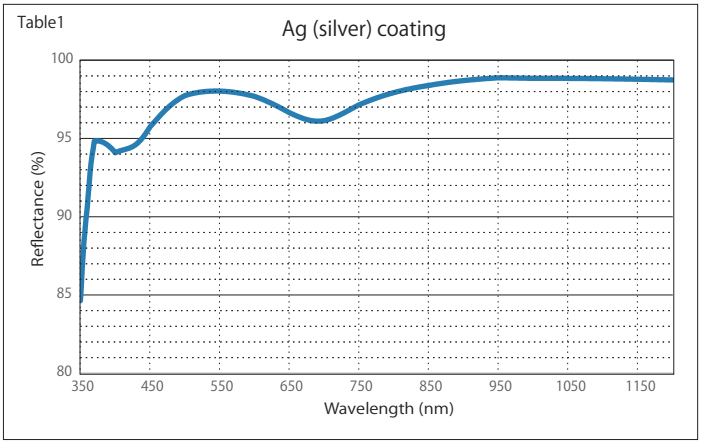


Table2

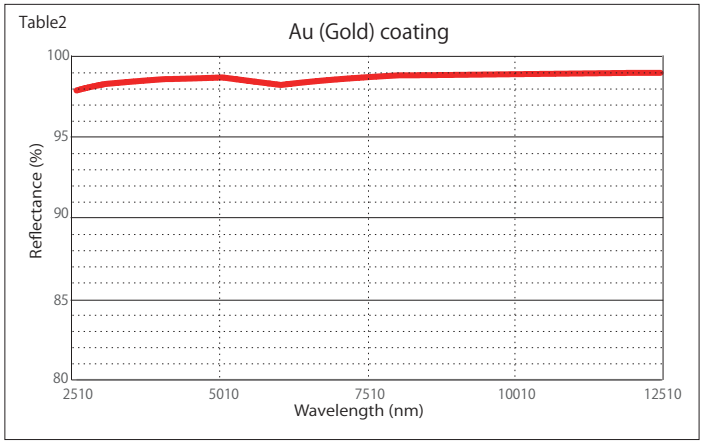
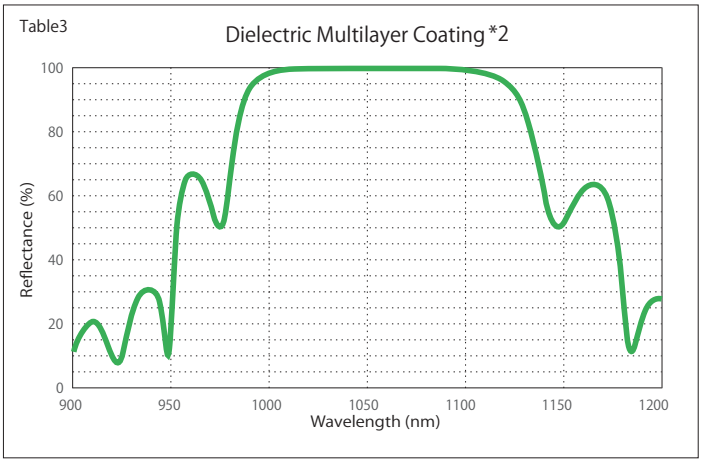


Table3



*1 Reflectance values in the line graph are simulated result and are not guaranteed. Please note that values may differ from the actual data.

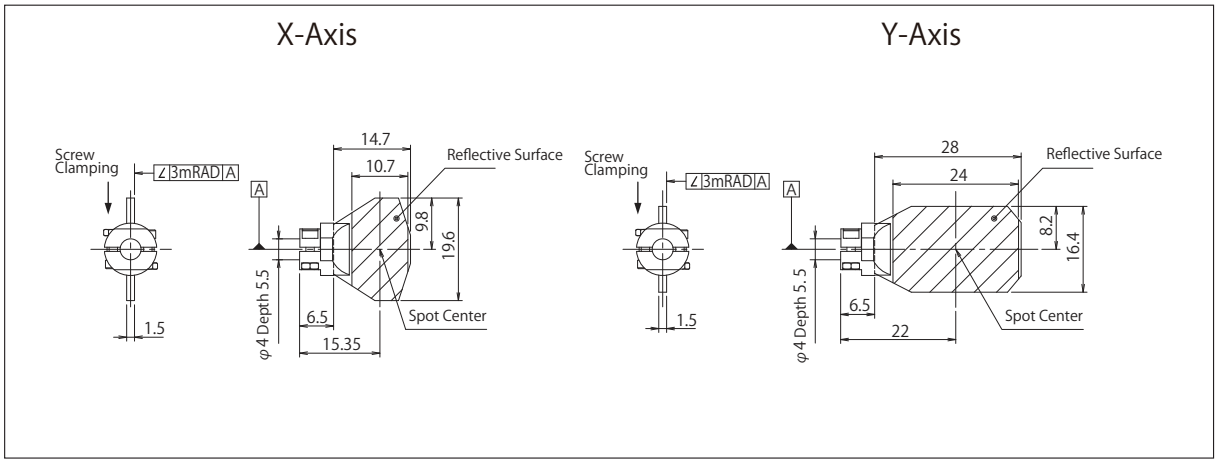
*2 Dielectric multilayer coating will be able to have high reflectance values by matching appropriate wavelength.
Table3 is a data with our standard wavelength.
Please contact the sales representative for customization with different wavelengths.

Mirror Assembly Drawing

*Please see page 5 for GM0 / page 6 for GM1 / page 3 or 4 for GM7

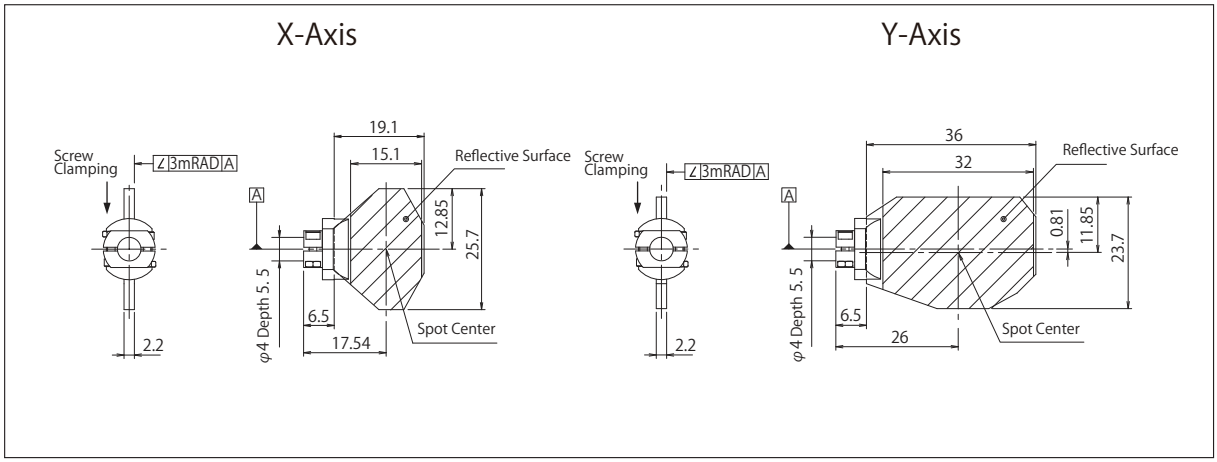
GM2

Laser Beam Diameter φ 10



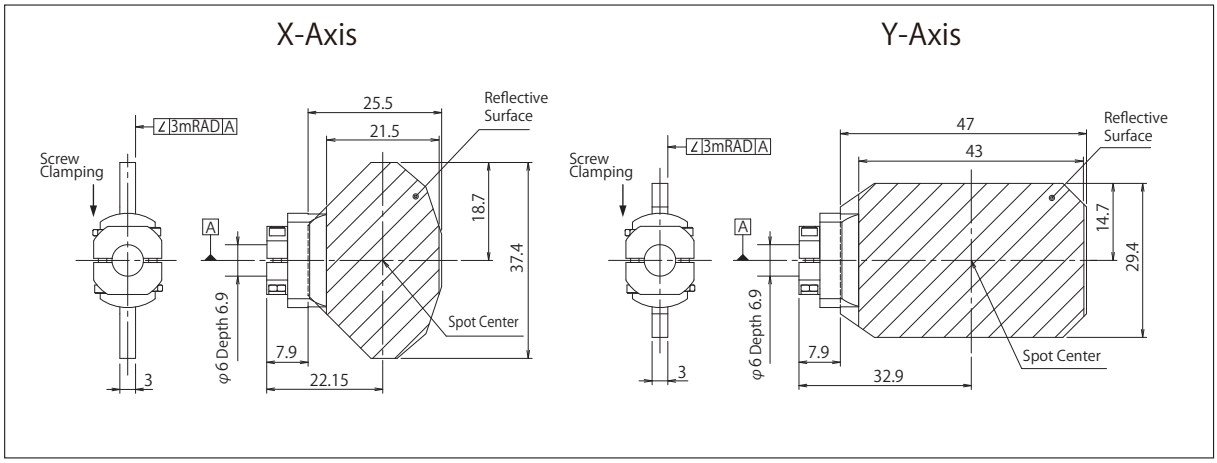
GM4

Laser Beam Diameter φ 15



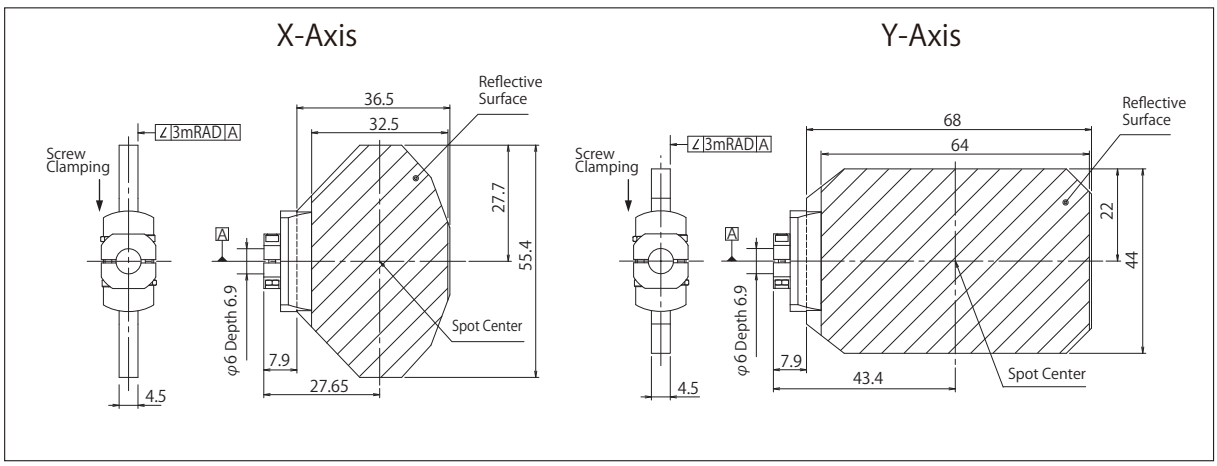
GM5

Laser Beam Diameter φ 20



GM6

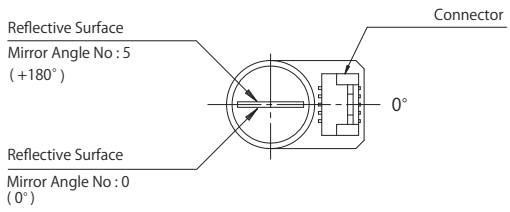
Laser Beam Diameter φ 30



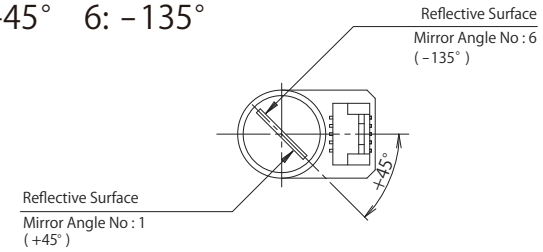
Mirror Mounting Angle

GVM-0930 ／ GVM-1445

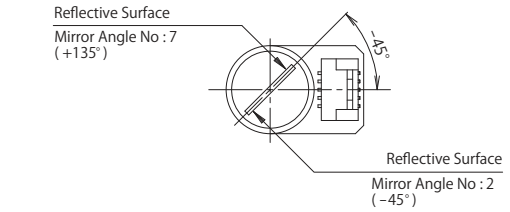
0: 0°　5: +180°



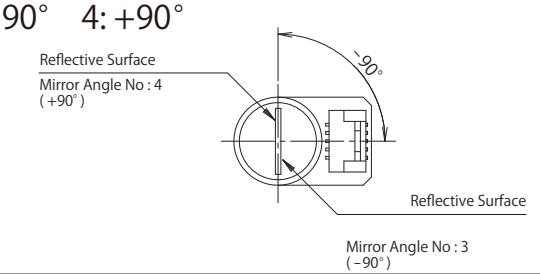
1: +45°　6: −135°



2: −45°　7: +135°

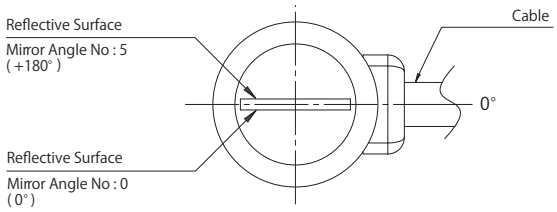


3: −90°　4: +90°

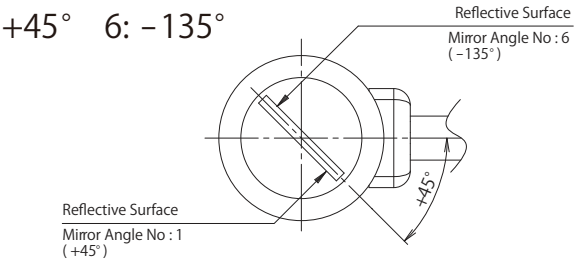


GVM-2260 ／ GVM-2280 ／ GVM-2510

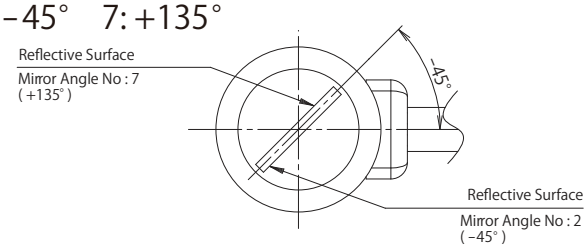
0: 0°　5: +180°



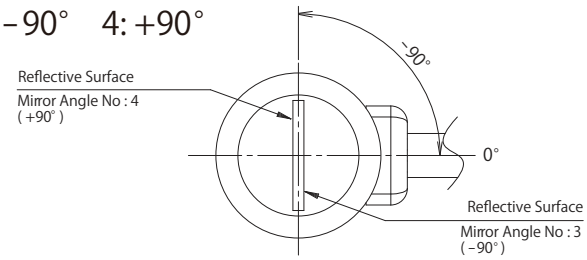
1: +45°　6: −135°



2: −45°　7: +135°



3: −90°　4: +90°



* All mirrors above are designed with mechanical angle ± 10 ° for each laser diameter. If you would like to use it at an angle more than ± 10 °, please contact our sales representatives for details.

GVM-1445S- 0 0 0 0 M - **

Scanner Type

0930S / 0930L
1445S / 1445L
2260 / 2280 / 2510

Scanning Angle (Mechanical Angle)

0 : ±10°　Bumpers set for ±10° scanning
1 : ±15°　Bumpers set for ±15° scanning
2 : ±20°　Bumpers set for ±20° scanning
C : Custom　Bumpers set for customized angle

Cable Length

0 : GVM-0930, GVM-1445 / Connectors are placed on board
1 : 500mm
2 : 1000mm
3 : 2000mm
4 : 3000mm
5 : 300mm
C : Custom　Customized cable length

Form of the Top Shaft

0 : Straight (GVM-2260, GVM-2280 and GVM-2510 are all 0)
1 : With Mirror Holder (GVM-0930 S/L and GVM-1445 S/L are all 1)
C : Custom / Customized Shaft

Mirror Angle Against Cable

0 : 0°　(It is also 0 when without mirror)
1 : +45°　+ 45°　to connector
2 : −45°　− 45°　to connector
3 : −90°　− 90°　to connector
4 : +90°　+ 90°　to connector
5 : +180°　+ 180°　to connector
6 : −135°　− 135°　to connector
7 : +135°　+ 135°　to connector
C : Custom　Customized angle to connector

With or Without Mirror

0 : Without mirror
M : With mirror

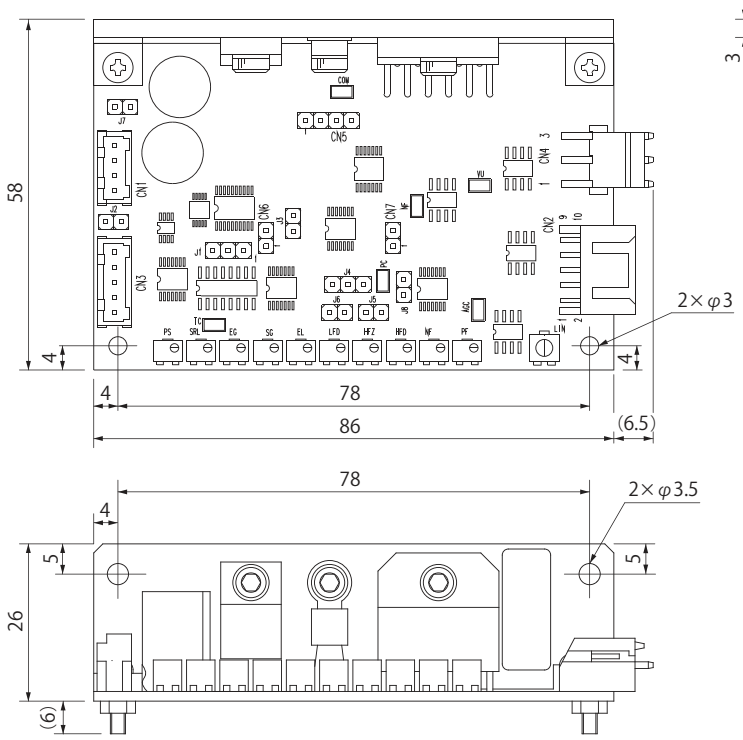
Registered Custom Number

No Number : Standard Product
*It is only used for customized products

GVD0

Outline Drawing

(Unit : mm)



Specifications

Model		GVD0 - ✱✱✱✱✱✱ - ✱✱
Power	Power Voltage	± 15V or ± 24V
	Maximum Operating Current	2.5A RMS
	Peak Current *	10A
Command Signal Input	Voltage (Differential)	±3V／±5V／±10V
	Input Impedance	20kΩ (At differential input)
Monitor Output	Position Output	±1.5V／±2.5V／±5V
Function	Input Signal	Servo ON
	Output Signal	Ready
	Protection	Over heating
		Over positioning
		Over current
		Sensor error
Ambient Temperature Range		0℃ to +50℃
Dimension		93 x 57.5 x 31 mm
Weight		60g (with heat sink)

Our Galvanometer Optical Scanner Servo Drivers (GVD Series) have two options in control system : P Control and PI Control Systems.
Please read the following description of the control systems and select one according to your application.

P Control :
This control will output the signal proportional to the error which is obtained by comparing position feedback and command signal.
The scanner responds fast and stabilizes position quickly because servo closed loop band becomes high by not integrate the time.
In case of distortion or friction, a position error may occur against the command.

PI Control :
This control will output the time-integrated signal of the error which is obtained by comparing the position feedback with the command signal.
Therefore, it is possible to maintain a stationary state (a state with extremely small position error) regardless of distortion or friction.
This integration provides very high position repeatability.

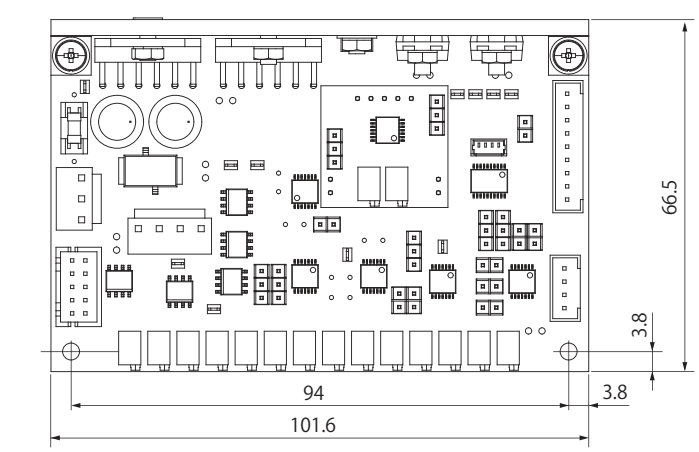
Please select P Control if you are focusing on high speed stabilization time, or PI Control for high position repeatability.

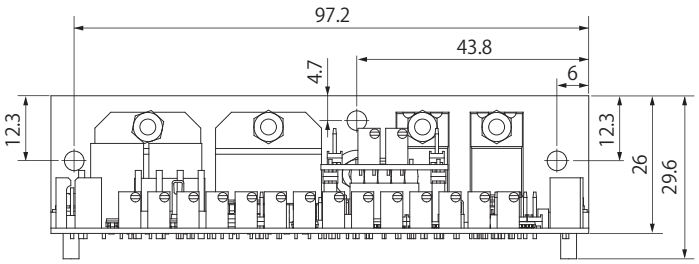
*Peek current may have limit, depends on Galvo type and power supply voltage.

GVD1

Outline Drawing

(Unit : mm)





Specifications

Model		GVD1 - ****** - **
Power	Power Voltage	±15V or ±30V
	Maximum Operating Current	5.0A RMS
	Peak Current *	11.5A
Command Signal Input	Voltage (Differential)	±3V ／±5V ／±10V
	Input Impedance	20kΩ (At differential input)
Monitor Output	Position Output	±1.5V ／±2.5V ／±5V
Function	Input Signal	Servo OFF
	Output Signal	Position, Speed, Current, Position error, Alarm, 90% Load warning
	Protection	Over heating
		Over positioning
		Over current
		Sensor error
		Power source voltage
		Alarm
		90% Load warning
Ambient Temperature Range		0℃ to +50℃
Dimension		101.6 x 66.5 x 30.8 mm
Weight		90g (with heat sink)

Our Galvanometer Optical Scanner Servo Drivers (GVD Series) have two options in control system : P Control and PI Control Systems.

Please read the following descriptions of the control systems and select one according to the application.

P Control :

This control will output the signal proportional to the error which is obtained by comparing position feedback and command signal.
The scanner responds fast and stabilizes position quickly because servo closed loop band becomes high by not integrate the time.
In case of distortion or friction, a position error may occur against the command.

PI Control :

This control outputs the time-integrated signal of the error which is obtained by comparing the position feedback with the command signal.
Therefore, it is possible to maintain a stationary state (a state with extremely small position error) regardless of distortion or friction.
This integration provides very high position repeatability.

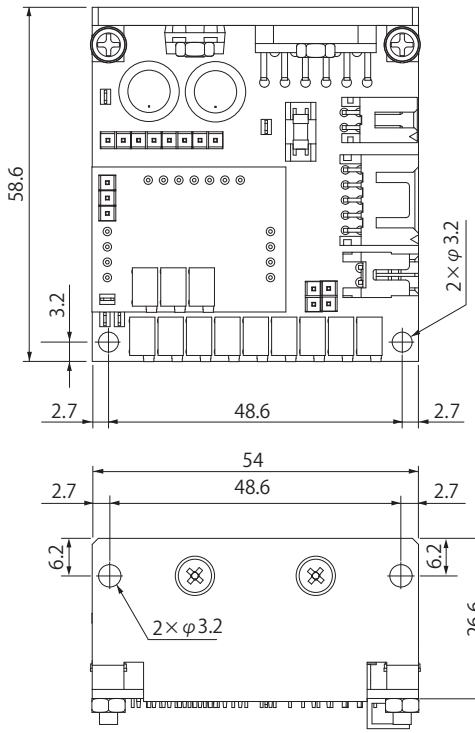
Please select P Control if you are focusing on high speed stabilization time, or PI control for high position repeatability.

*Peek current may have limit, depends on Galvo type and power supply voltage.

GVD2

Outline Drawing

(Unit : mm)



Specifications

Model		GVD2 - ****** - **
Power	Power Voltage	± 15V or ± 24V
	Maximum Operating Current	2.5A RMS
	Peak Current*	10 A
Command Signal Input	Voltage (Differential)	± 3V ／± 5V ／± 10V
	Input Impedance	20kΩ (At differential input)
Monitor Output	Position Output	± 1.5V ／± 2.5V ／± 5V
Function	Input Signal	Servo OFF
	Output Signal	Position, Speed, Current, Ready Position error
	Protection	Over heating
		Over positioning
		Over current
		Sensor error
Ambient Temperature Range		0℃ to + 50℃
Dimension		58.6 x 54 x 31.6 mm
Weight		55g (with heat sink)

Our Galvanometer Optical Scanner Servo Drivers (GVD Series) have two options in control system : P Control and PI Control Systems.
Please read the following description of the control systems and select one according to the application.

P Control :
This control will output the signal proportional to the error which is obtained by comparing position feedback and command signal.
The scanner responds fast and settles position quickly because servo closed loop band becomes high by not integrate the time.
In case of distortion or friction, a position error may occur against the command.

PI Control :
This control outputs the time-integrated signal of the error which is obtained by comparing the position feedback with the command signal.
Therefore, it is possible to maintain a stationary state (a state with extremely small position error) regardless of distortion or friction.
This integration provides very high position repeatability.

Please select P Control if you are focusing on high speed of settling time, or PI control for high position repeatability.

*Peek current may have limit, depends on Galvo type and power supply voltage.

Model Number

GVD0/1/2- 0 0 0 0 0 0 - **

Power Voltage
0 : ±15V
1 : ±24V

Control System
0 : P Control
1 : PI Control

Command Voltage
0 : ±10V
1 : ±3V
2 : ±5V
C : Customized Voltage

Mechanical Angle

0 : ±10°	Bumpers set for ±10° scanning
1 : ±5°	Bumpers set for ±5° scanning
2 : ±7.5°	Bumpers set for ±7.5° scanning
3 : ±12.5°	Bumpers set for ±12.5° scanning
4 : ±15°	Bumpers set for ±15° scanning
5 : ±20°	Bumpers set for ±20° scanning
C : Customized	/ Bumpers set for customized angle

Scanner Type
0 : 0930S
1 : 0930L
2 : 1445S
3 : 1445L
4 : 2260
5 : 2280
6 : 2510

Beam Diameter (Mirror size)
0 : φ3mm
1 : φ5mm
2 : φ7.5mm
3 : φ10mm
5 : φ15mm
6 : φ20mm
7 : φ30mm
C : Customized Size

Registered Custom Number
No Number : Standard Product
*It is only used for customized products

⚠ Cautions for Handling Our Products

Our scanners, drivers, and accessories are precision-machined products and it is assumed that all the cautions and warnings listed below are correctly understood and handled.

Please do not install, operate, maintain or inspect the product until you have a full knowledge on the product, safety information and cautions.

The minimum cautions required for your safety are as follow.

【Caution When Unpacking】

● When you received the product, please check the package for damage and if it is the product you ordered.

【Cautions for Handling】

1. Be sure to check the wiring before turning on the power. Failure to follow this caution may result in mechanical damage and/or operation error.
2. The cables or lead wires should not be damaged, stressed excessively, loaded heavily, or pinched. Failure to follow this causion may result in malfuncition and/or the products would not operate correctly.
3. Since they are small precision products, there are many parts where strength is secured by adhesion. Please handle with care such as do not apply impact or stress to the joints of the gear and encoder. Failure to follow this caution may result in injury and/or malfunction.
4. Please do not apply impact or radial load to the shaft. Failure to follow this caution may result in malfunction.
5. Please process the lead wire in an anti-static environment.
6. Failure to follow this caution, such as screws are too long or fixing torque excessive, may result in a malfunction for mechanical parts inside may be deformed or destroyed.
7. Please do not use or store the product in an environment subject to corrosive gas or any other hazardous gas. Also, please keep dust, water or oil out of the product.
8. If smoke, abnormal heat generation, strange odor, abnormal noise, abnormal vibration, etc. occur, please stop operating immediately and turn off the power.
9. When mounting the driver and other optional items, please use screws that conform to the specifications in the outline drawing. Especially, if the screw for fixing the driver is too long, it may damage the board, causing malfunction, short circuit, or fire.
10. Since the life of the linear actuator and its accessories varies greatly depending on the load conditions, operating mode and operating environment, please check the operation of the actual machine thoroughly.

【Product Warranty】

1. Duration of this warranty is one year from the date of delivery. If the customer discovered a defect in material and workmanship within this period, we will repair the product for free charge.
   Please note that it would take several days to repair.
2. For the defect caused by “misuse” or “mishandling” by any party, or the defect caused later than one year from the date of delivery, the customer is responsible for repairing charges. We will repair the product only if the customer carried it in or sent it back to our company address by customer’s expense.
   Please note that since it would take several days to repair, please consider to purchase spare parts if installing our product into an important system.
3. We are not liable to the damages caused while in transit. Please pack the product with sufficient cushioning materials to prevent external vibration.

【Other】

1. If you got any problem with our product, please do not disassemble it and keep it as it is. Then please contact our sales representatives and follow fhe intstrutions.
2. Information listed above is subject to change without notice.
   For further information, please contact our sales representatives or our authorized distributors.

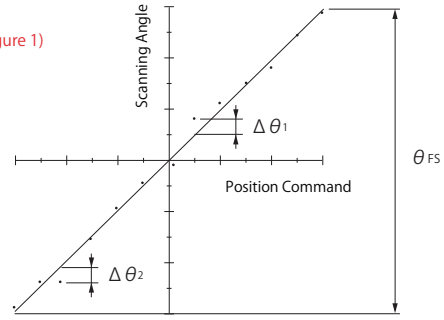
Terms and Definitions

● Non-Linearity (Figure 1)

This is a ratio of error against ideal scan angle. Measure the angle between each command and find the linear approximation at first. Then calculate non linearity by setting approximation of full-scale value as the denominator and difference of peak value from approximation as the numerator.

$$\text{Non-Linearity} = \frac{|\Delta\theta_1| + |\Delta\theta_2|}{\theta_{FS}} \times 100\,(\%)$$

(Figure 1)



● Offset drift (Figure 2)

This is an amount of offset (position) which changes by ambient temperature. Fix the scan angle to 0° then calculate the amount of positional change by changing ambient temperature from 10℃ to 50℃.

● Gain drift (Figure 3)

This is an amount of gain (positional scale) which changes by ambient temperature. Measure the amount of positional change by changing ambient temperature from 10℃ to 50℃ at maximum scan angle ± n° .

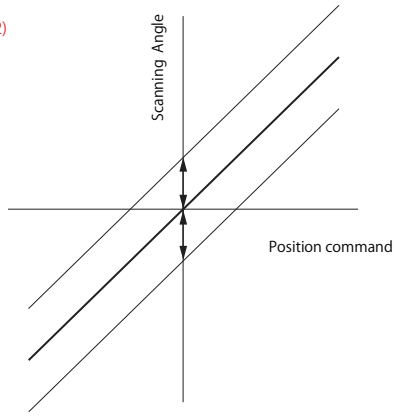
● Thermal drift (Figure 4)

This is the maximum amount of positional change which is the sum of offset drift and gain drift.

● Step response time (Figure 5)

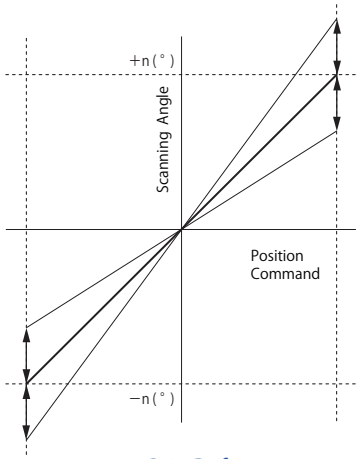
This is the time measured from the input of position command signal to start scanning until the mirror is stabilized to the final position.
* In this catalogue, response time is determined as when the mirror is settled within ±0.01° difference in width by scanning angle ±0.1° in final position.

(Figure 2)



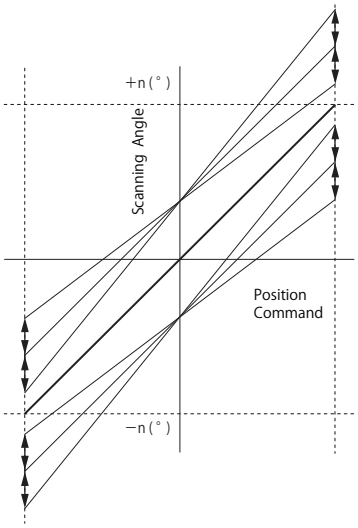
Offset Drift

(Figure 3)



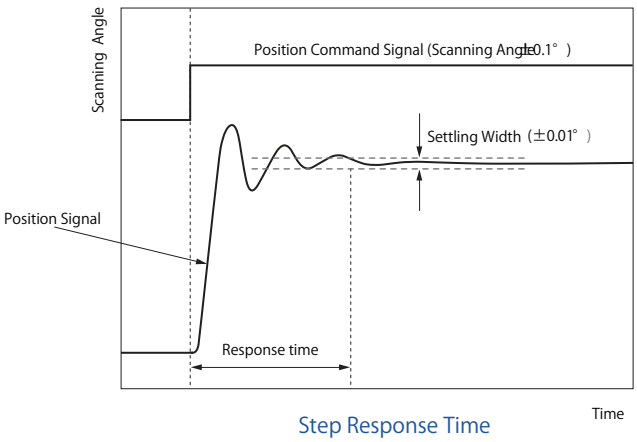
Gain Drift

(Figure 4)



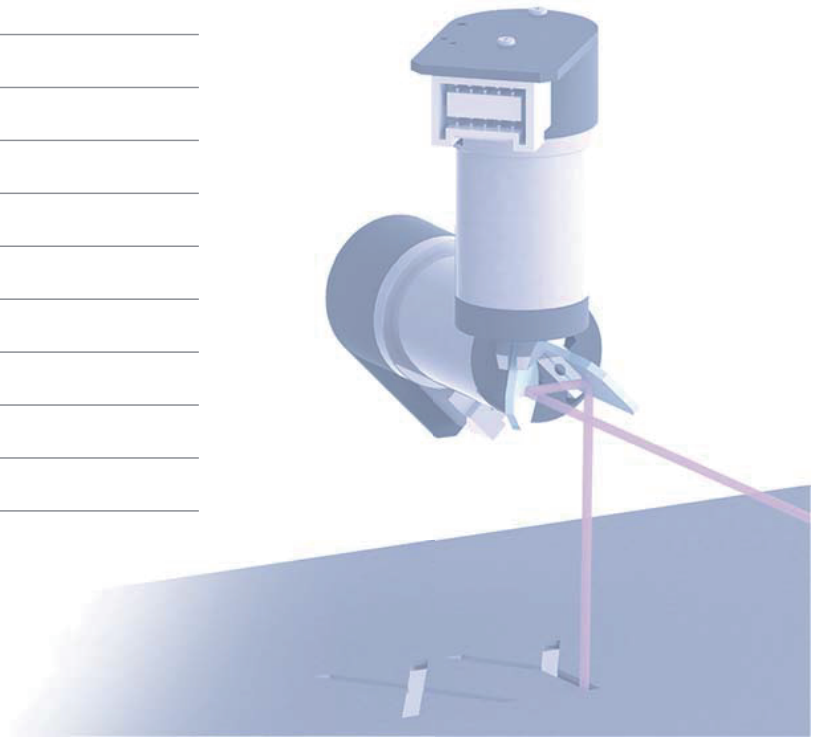
Thermal Drift (Offset Drift + Gain Drift)

(Figure 5)

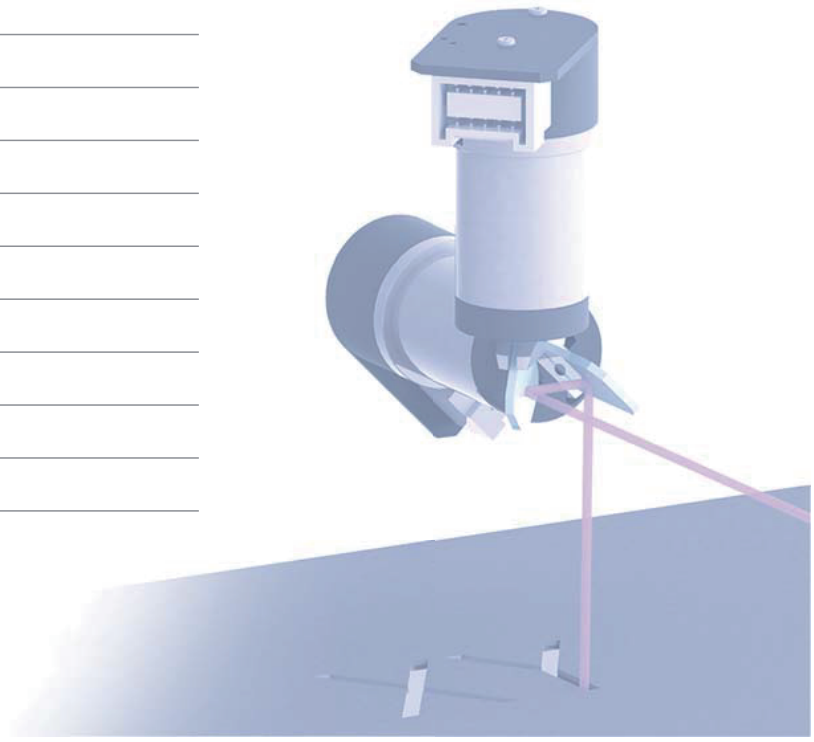


Step Response Time

Memo



Memo



■ Product Lineup


Coreless DC motors


Brushless motors


AC servomotors


Linear actuators


Galvanometer optical scanners


Gearheads


Tachometer Generator/ Encoder

■ Application for Solution

● Please visit our website for more details.

https://ccj.citizen.co.jp/case

■ Semiconductor Equipment :
Lithography Machine / Wafer Inspection System / Turbo Molecular Pumps / Wafer Dicing Machine / Conveyance System for Semiconductor Factories

■ Medical and Clinical Equipment :
Denture Processing Machine / Down Flow Masks for Virus Protection / OCT / Ultrasonic Diagnostic System / Lens Edger / Cancer Treatment / Autoclavable Medical Equipment / Robotic Exoskeleton

■ Beauty and Cosmetic Equipment :
Handpieces for Nail Art

■ Measuring and Analyzing Equipment :
LiDAR / Electron Microscope / Confocal Microscope / Railway Track Measuring Device / Surface Roughness Tester

■ Factory Automation and Robots :
Laser Marking Machine / Motors for Robots / Grinding Machine / Optical Disk Equipment

* Technical data and products are subject to change without prior notice. For further information, please contact our sales representatives or authorized distributors.

CITIZEN

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Website (contact) : https://ccj.citizen.co.jp/en/contact

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