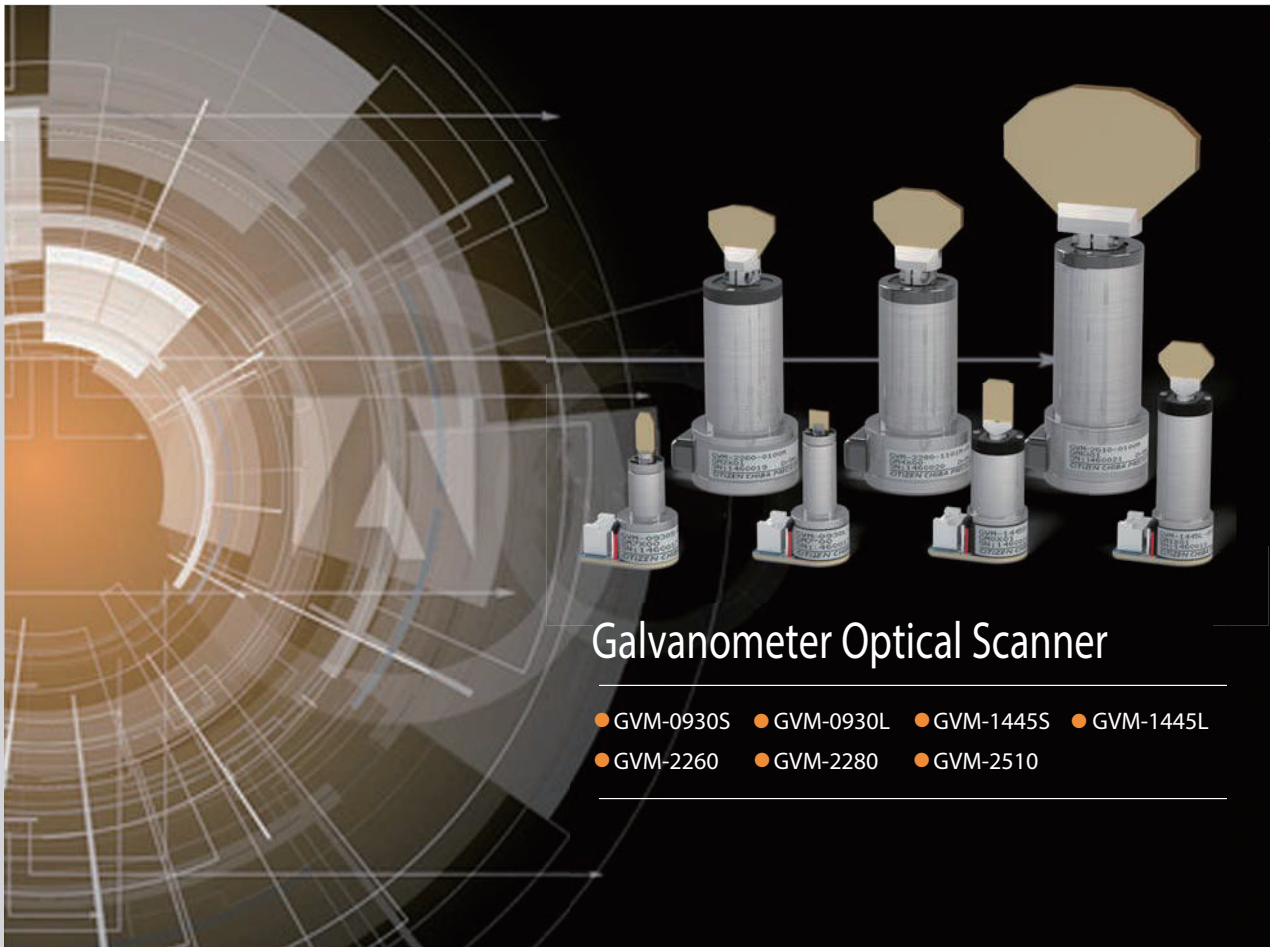


Galvanometer Optical Scanner



Galvanometer Optical Scanner

- GVM-0930S
- GVM-0930L
- GVM-1445S
- GVM-1445L
- GVM-2260
- GVM-2280
- GVM-2510

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 sensing and measuring
- High speed printing

Contents

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GVM-0930L	p.4
GVM-1445S	p.5
GVM-1445L	p.6
GVM-2260	p.7
GVM-2280	p.8
GVM-2510	p.9
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Galvanometer Optical Scanner

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 screws
GVM-2280				○	●			
GVM-2510						●	○	

● Recommended ○ Available

*Mirror Assembly : combination of a galvano mirror and a mirror holder

Model Number

GVM-1445S-0000M-**

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
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

Registered Custom Number

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

With or Without Mirror

0 : Without mirror
M : With mirror

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 Shaft

(Please see page 14 for more details.)

Galvanometer Optical Scanner

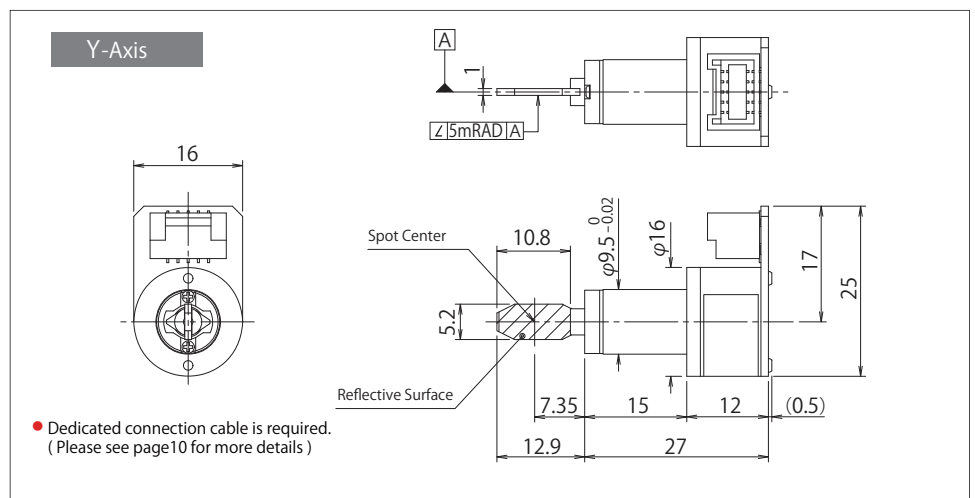
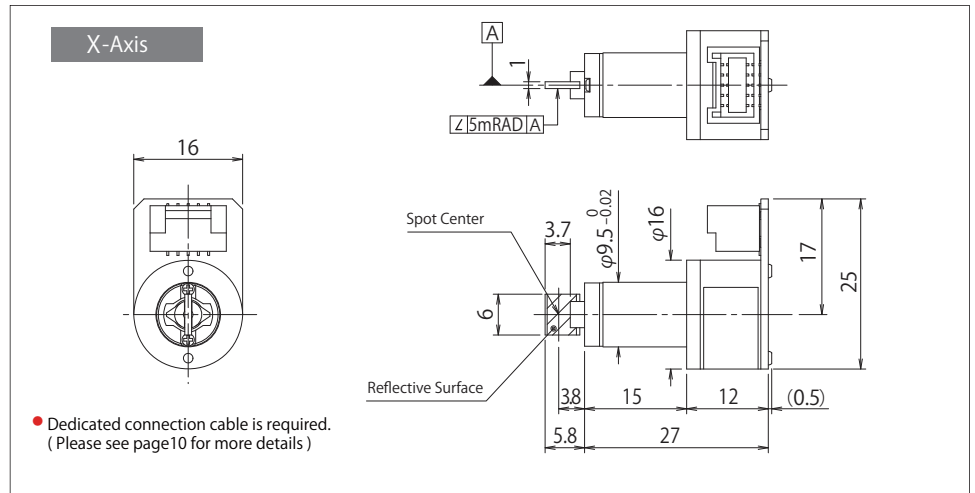
Scanner

GVM-0930S



■ This drawing indicates the combination of GM7 mirror assembly

(Unit : mm)



Connector Pin Sequence

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·cm ²	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 Coil Temperature	°C	110
Weight	g	15

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 cautions below	
Output Signal	Common Mode	μ A	421
	Differential Mode	μ A/ deg	14.1
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.)

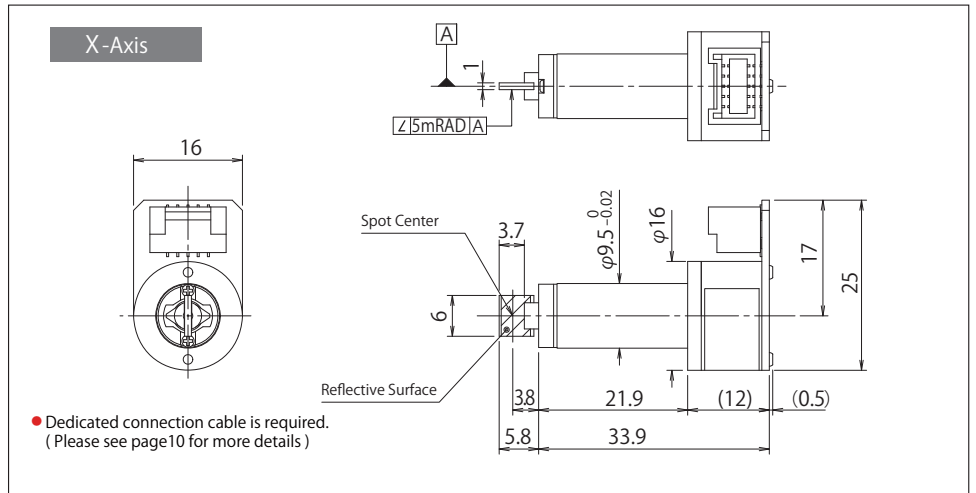
Galvanometer Optical Scanner

Scanner

GVM-0930L

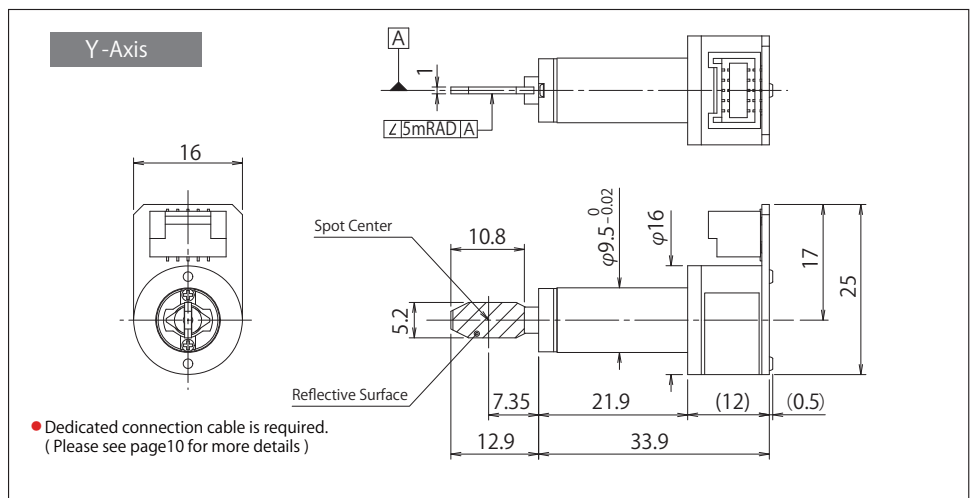
■ This drawing indicates the combination of GM7 mirror assembly

(Unit : mm)



Connector Pin Sequence

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	$g \cdot cm^2$	0.016	
Coil Resistance	Ω	$1.9 \pm 10\%$	
Coil Inductance	mH	$0.052 \pm 10\%$	
Torque Constant	$mN \cdot m/A$	$1.9 \pm 10\%$	
Back EMF Voltage	$mV/deg/sec$	$0.0338 \pm 10\%$	
Peak Current	A	10	
Maximum Coil Temperature	$^{\circ}C$	110	
Weight	g	18	
Repeatability	μrad	8	
Non-Linearity ($\pm 10^{\circ}$)	%	0.1 (Maximum)	
Offset Drift	$\mu rad/^{\circ}C$	10 (Maximum)	
Gain Drift	ppm/ $^{\circ}C$	50 (Maximum)	
Step Response Time	μsec	*Please see the cautions below	
Output Signal	Common Mode	μA	421
	Differential Mode	$\mu A/deg$	14.1
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).

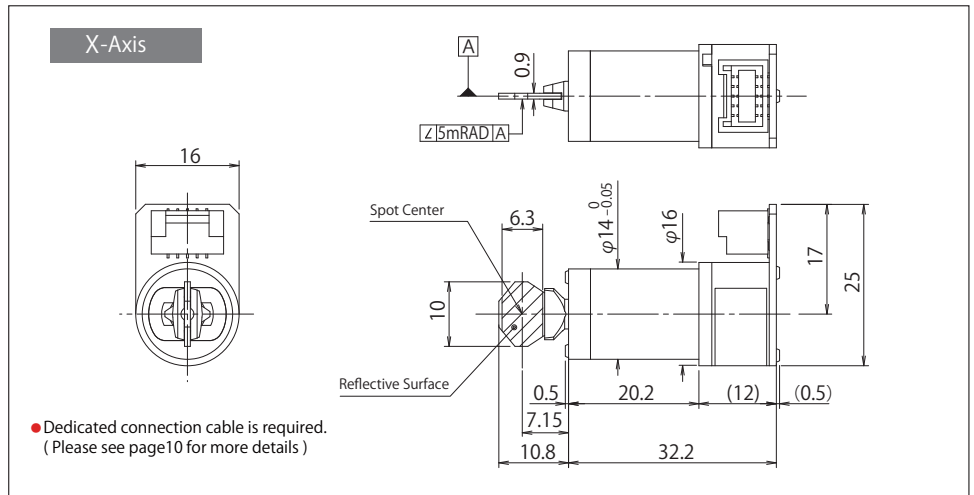
Galvanometer Optical Scanner Scanner

GVM-1445S



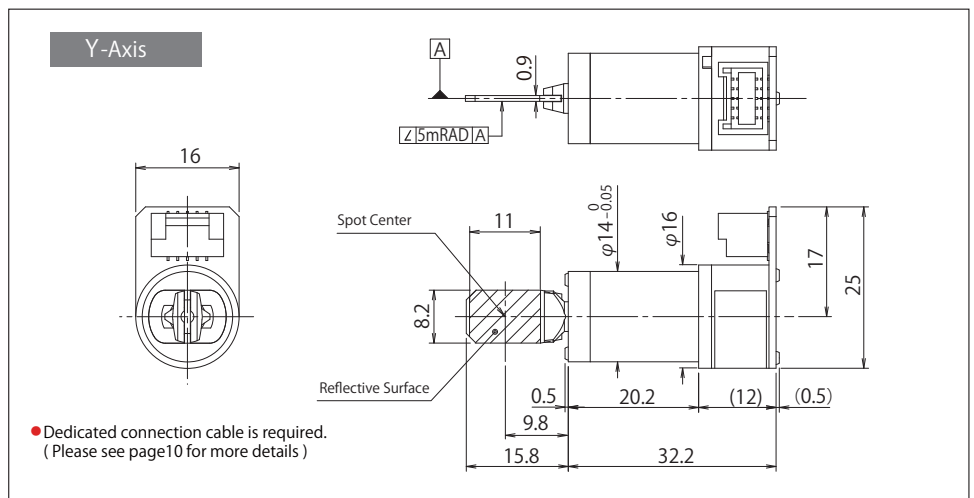
■ This drawing indicates the combination of GM0 mirror assembly

(Unit : mm)



Connector Pin Sequence

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	$g \cdot cm^2$	0.059
Coil Resistance	Ω	$1.8 \pm 10\%$
Coil Inductance	mH	$0.057 \pm 10\%$
Torque Constant	$mN \cdot m / A$	$2.8 \pm 10\%$
Back EMF Voltage	$mV / deg / sec$	$0.049 \pm 10\%$
Peak Current	A	12
Maximum Coil Temperature	$^{\circ}C$	110
Weight	g	28

Repeatability	μrad	8	
Non-Linearity ($\pm 10^{\circ}$)	%	0.1 (Maximum)	
Offset Drift	$\mu rad / ^{\circ}C$	10 (Maximum)	
Gain Drift	ppm/ $^{\circ}C$	50 (Maximum)	
Step Response Time	μsec	*Please see the caution below	
Output Signal	Common Mode	μA	421
	Differential Mode	$\mu A / deg$	14.1
Input Signal	mA		30

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.

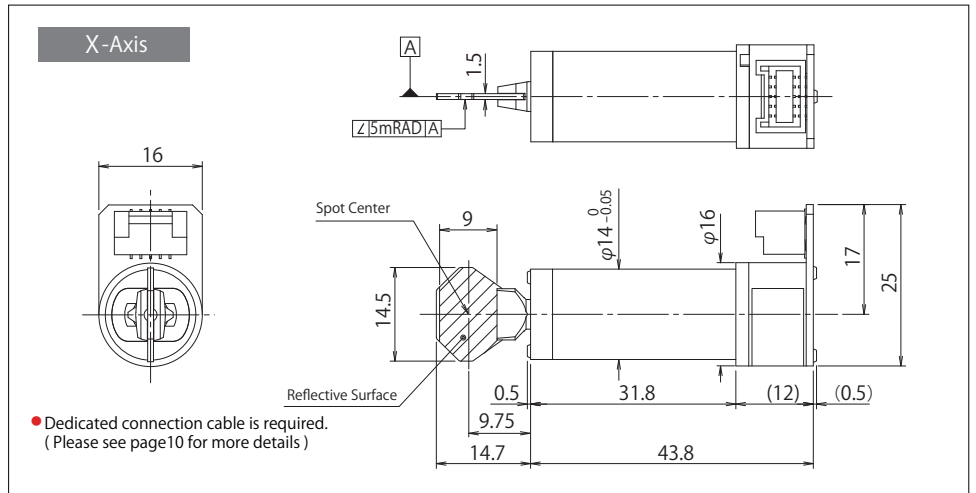
* All angles shown are mechanical angles.

* 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

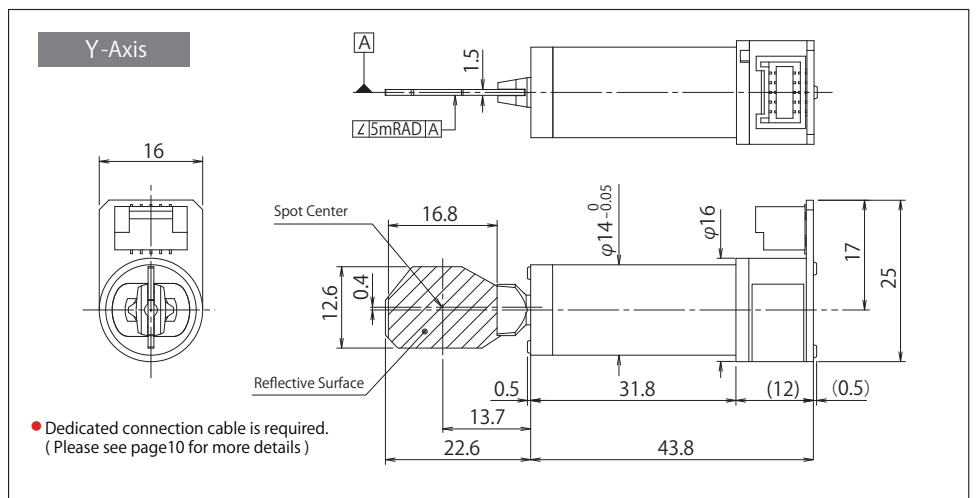
■ This drawing indicates the combination of GM1 mirror assembly

(Unit : mm)



Connector Pin Sequence

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 · cm ²	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 Coil Temperature	°C	110
Weight	g	40

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	421
	Differential Mode	μ A/ deg	14.1
Input Signal	mA		30

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.

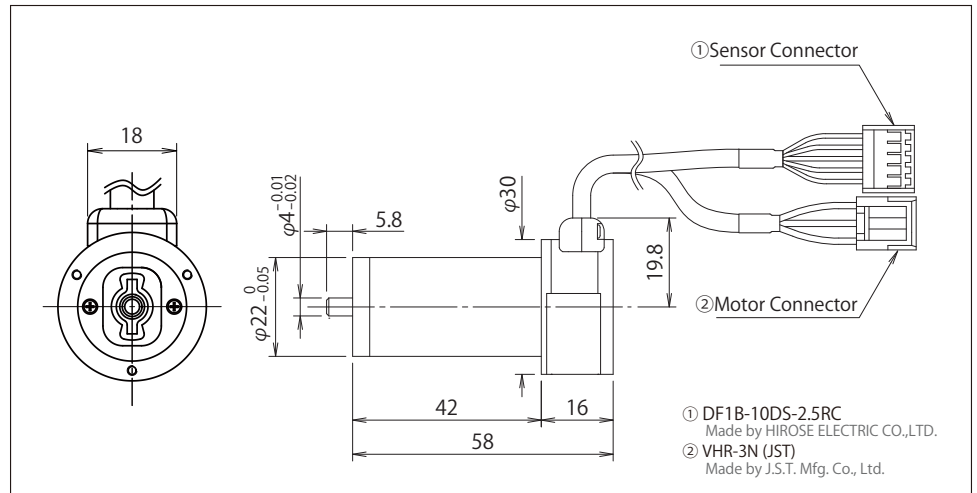
* All angles shown are mechanical angles.

* 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.)

Galvanometer Optical Scanner Scanner

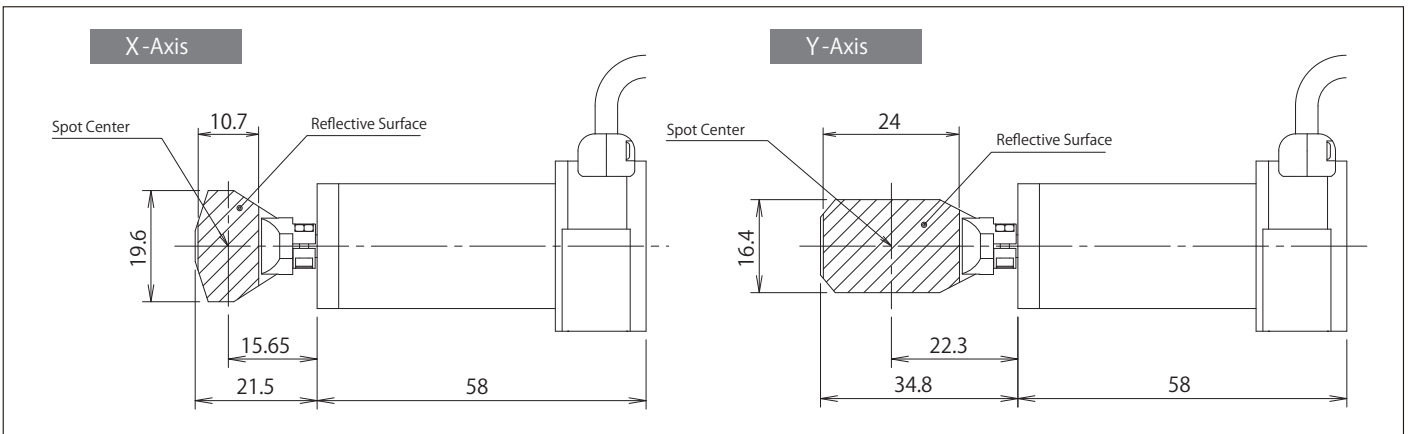
GVM-2260

(Unit : mm)



Mirror + Scanner

■ This drawing indicates the combination of GM2 mirror assembly



Specifications

Items	Unit	GVM - 2260	
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20	
Rotor Inertia	g · cm ²	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 Coil Temperature	°C	110	
Weight	g	155	
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	421
	Differential Mode	μ A / deg	14.1
Input Signal	mA	30	

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.

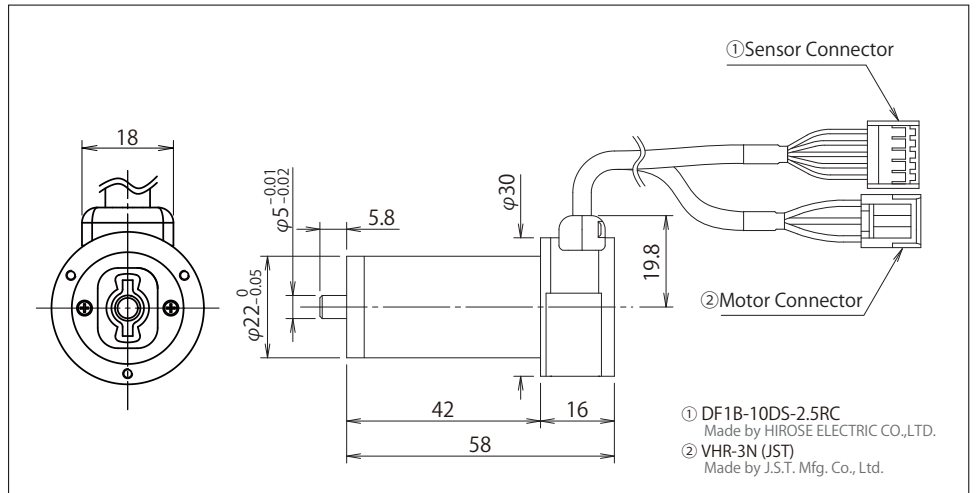
* All angles shown are mechanical angles.

* 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.)

Galvanometer Optical Scanner Scanner

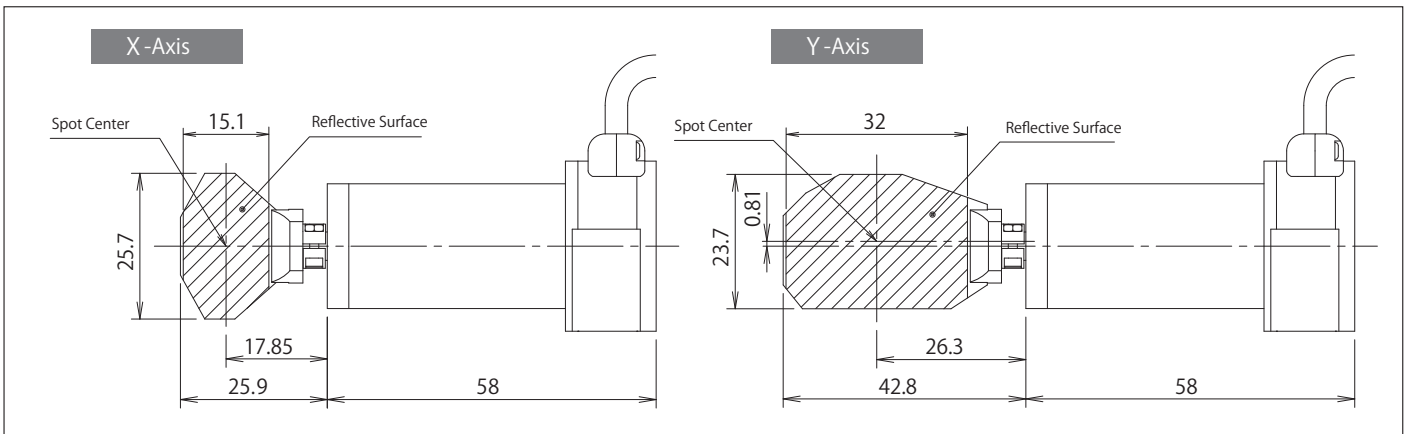
GVM-2280

(Unit : mm)



Mirror + Scanner

■ This drawing indicates the combination of 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 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	421
	Differential Mode	μ A/ deg	14.1
Input Signal	mA	30	

* The values of the specification are based on the combination of Citizen Chiba Precision Servo Driver and Mirror.

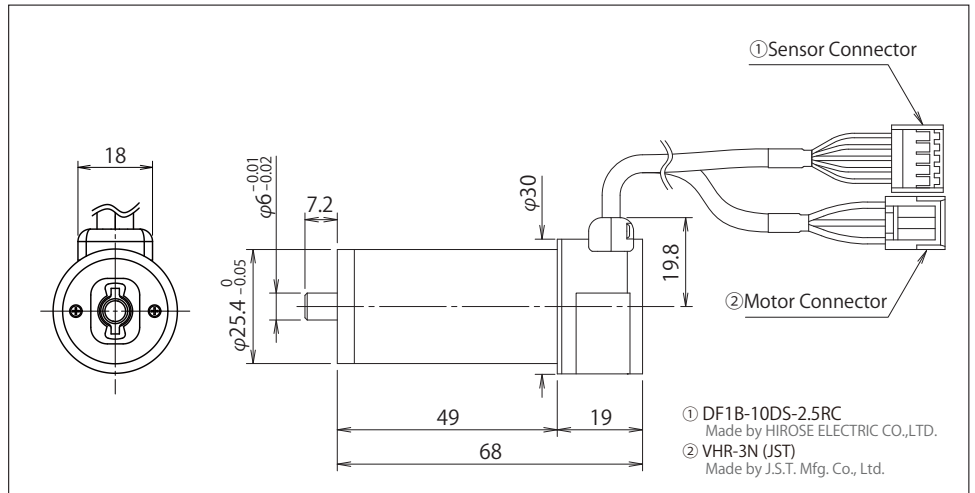
* All angles shown are mechanical angles.

* 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).

Galvanometer Optical Scanner Scanner

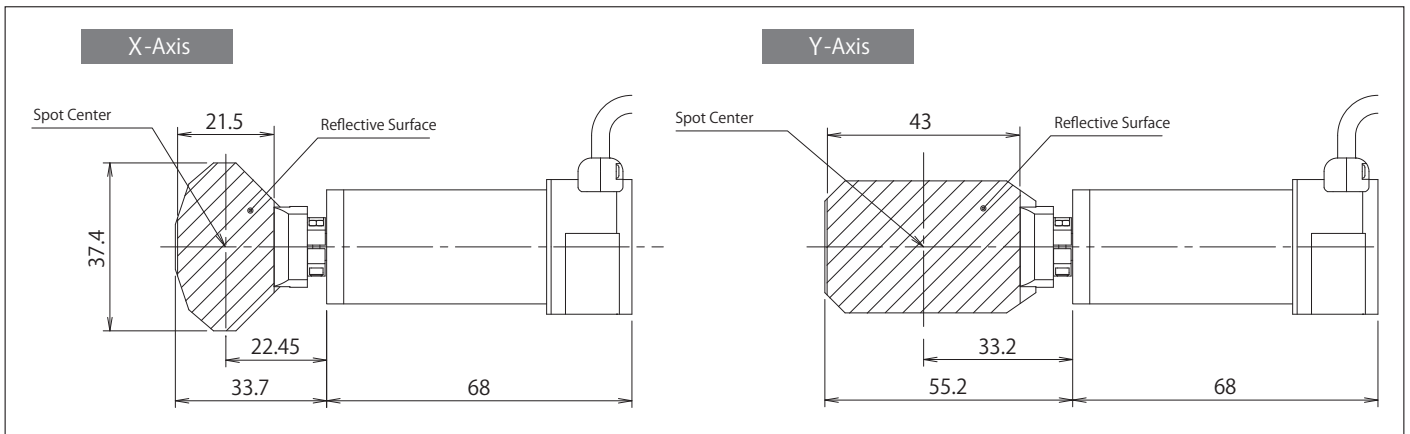
■ GVM-2510

(Unit : mm)



■ Mirror + Scanner

■ This drawing indicates the combination of GM5 mirror assembly



■ Specifications

Items	Unit	GVM - 2510	
Maximum Scan Angle (Mechanical Angle)	deg mech.	± 20	
Rotor Inertia	g·cm ²	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 Coil Temperature	°C	110	
Weight	g	220	
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	421
	Differential Mode	μ A/ deg	14.1
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)

Galvanometer Optical Scanner

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

■ Model Number

GC00 - **

Cable Length

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

Registered Custom Number

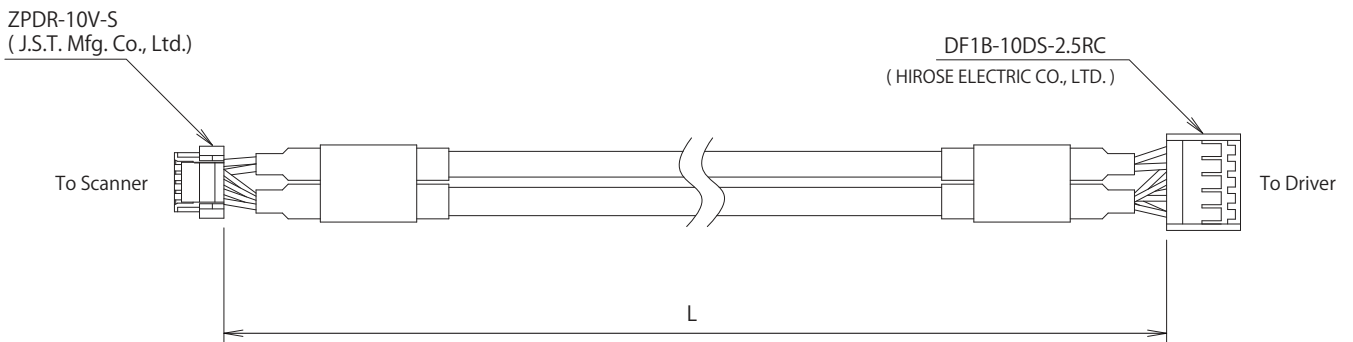
No Number : Standard Product
*It is only used for customized products

Connector

- 0 : Standard
- C : Customized Connector

■ 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

Galvanometer Optical Scanner

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·cm ²)	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

GM0X00 - **

Laser Beam Diameter

- 0 : φ5mm
- 1 : φ7.5mm
- 2 : φ10mm
- 3 : —
- 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 : — —
- 2 : SiO₂ SiO₂ Quartz
- C : Custom / Customized Substrate

Registered Custom Number

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

Substrate of Coating

- 0 : Au (Gold) coating (10.6 μm)
- 1 : Ag (Silver) coating (1064 nm or 532 nm)
- 2 : Dielectric multilayer coating (1064 nm)
- C : Custom / Customized coating

Galvanometer Optical Scanner

Mirror

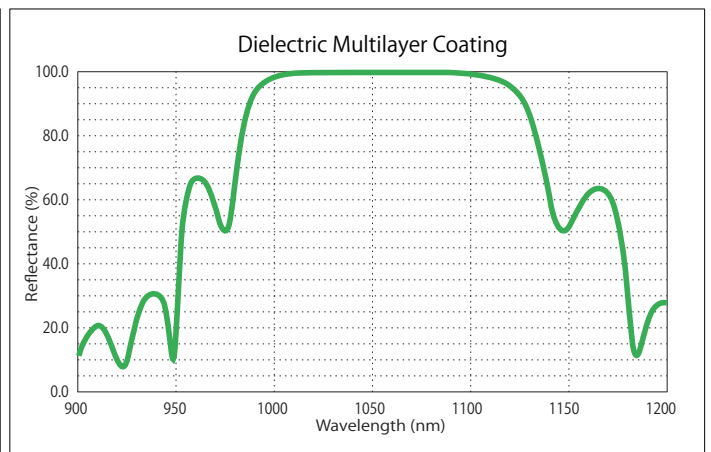
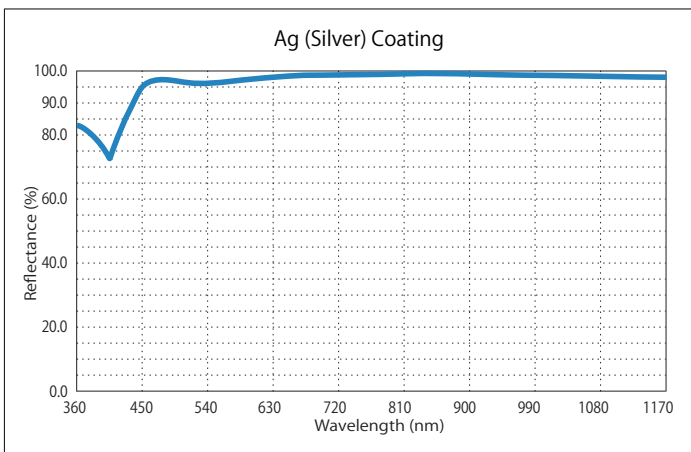
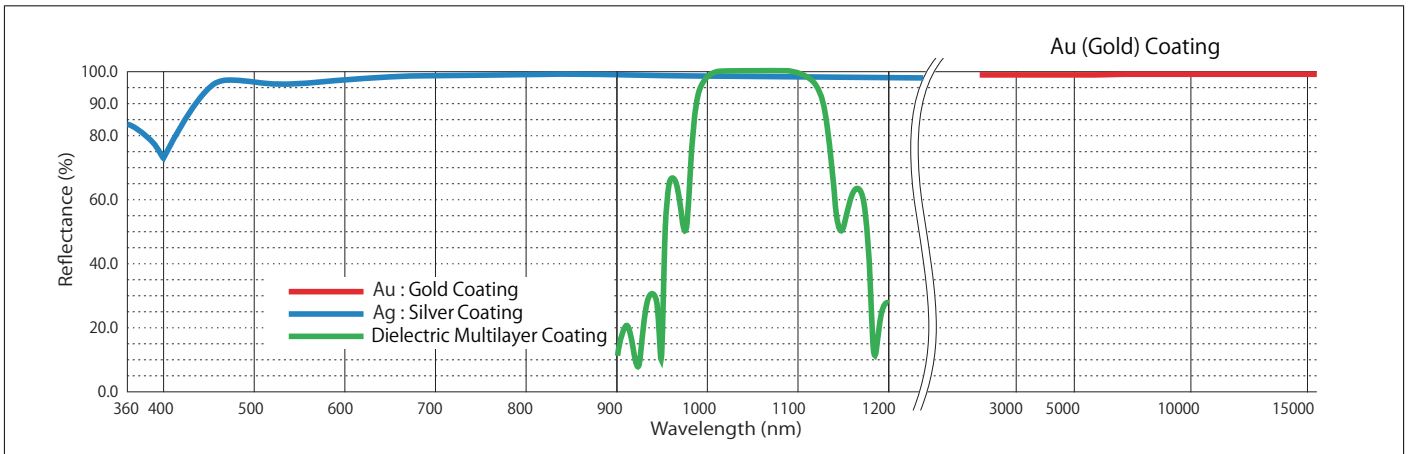
Mirror Substrate / Recommended Coating

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 the coating depending on the laser beam wavelength.

- Au (Gold) Coating : Mainly for CO₂ laser (wavelength 10.6 μ m)
 - 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

Mirror Assembly-Reflectance Data (Incident Angle 45°)



Galvanometer Optical Scanner

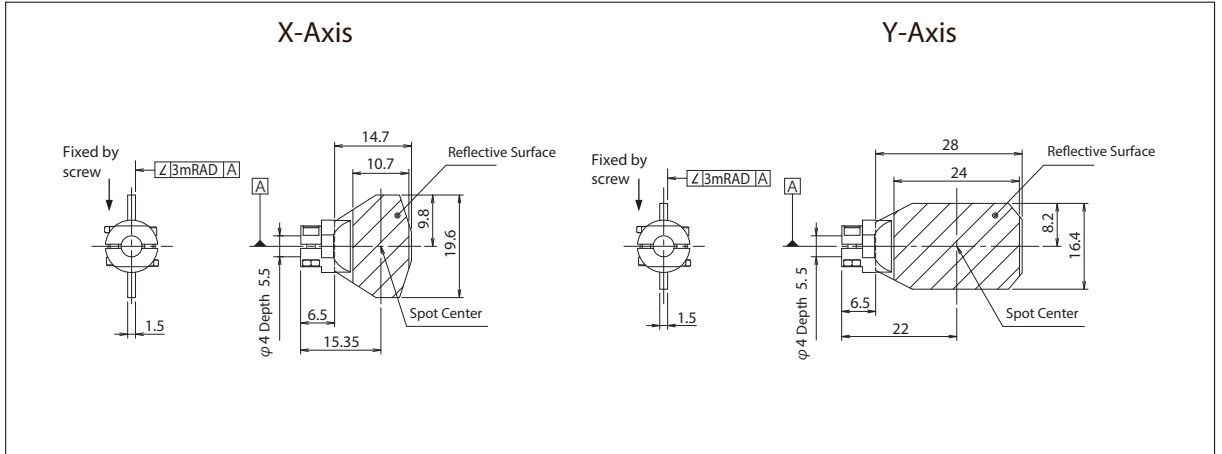
Mirror

Mirror Assembly Drawing

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

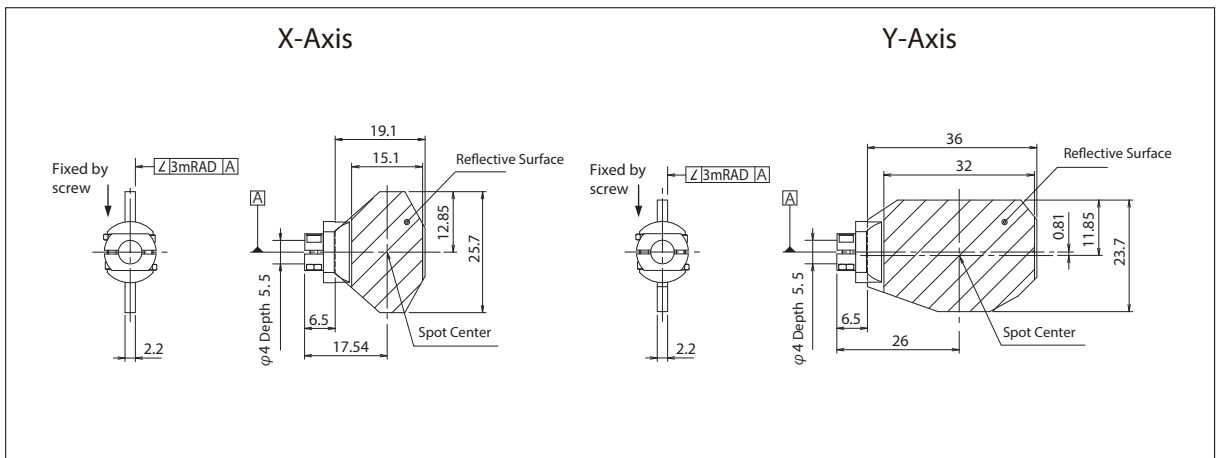
GM2

Laser Beam Diameter $\varphi 10$



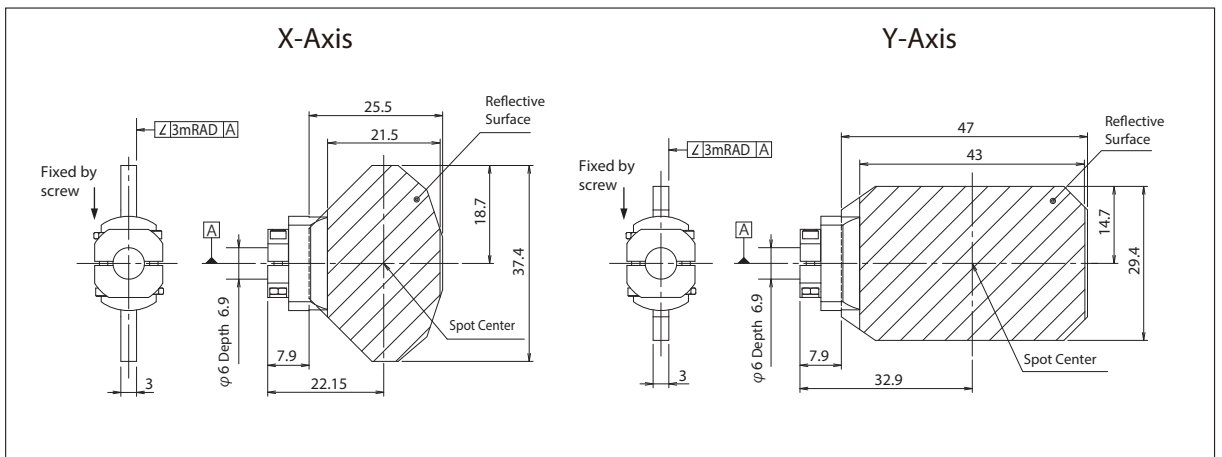
GM4

Laser Beam Diameter $\varphi 15$



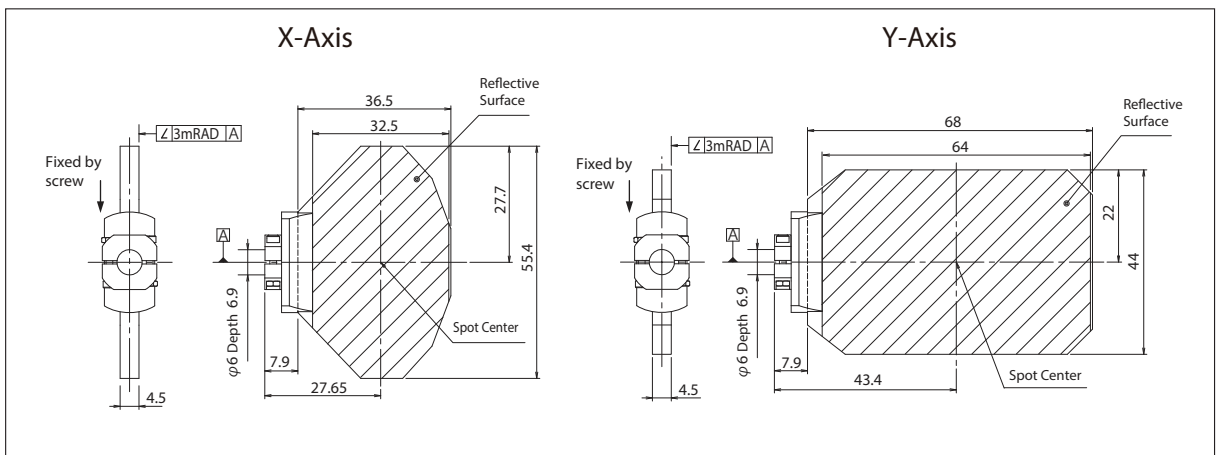
GM5

Laser Beam Diameter $\varphi 20$



GM6

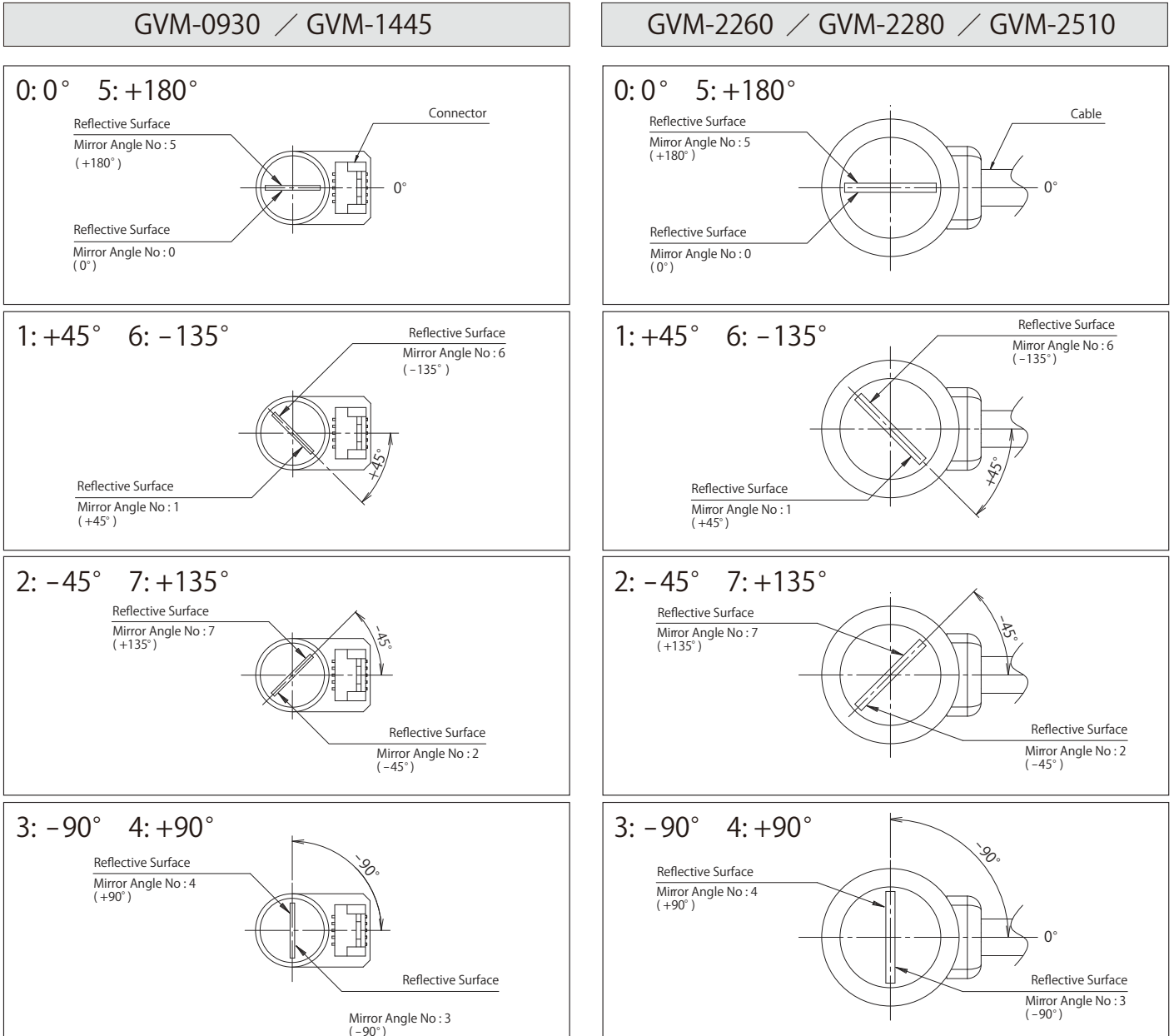
Laser Beam Diameter $\varphi 30$



Galvanometer Optical Scanner

Mirror

Mirror Mounting Angle



*The above mirrors are designed with a mechanical angle of 0° for each laser diameter. If you would like to use it at an angle more than ±10°, please contact our sales representatives.

GVM-1445S- 0000M - **

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
C : Custom Customized cable length

Form of the Top of the 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

Registered Custom Number

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

With or Without Mirror

0 : Without mirror
M : With mirror

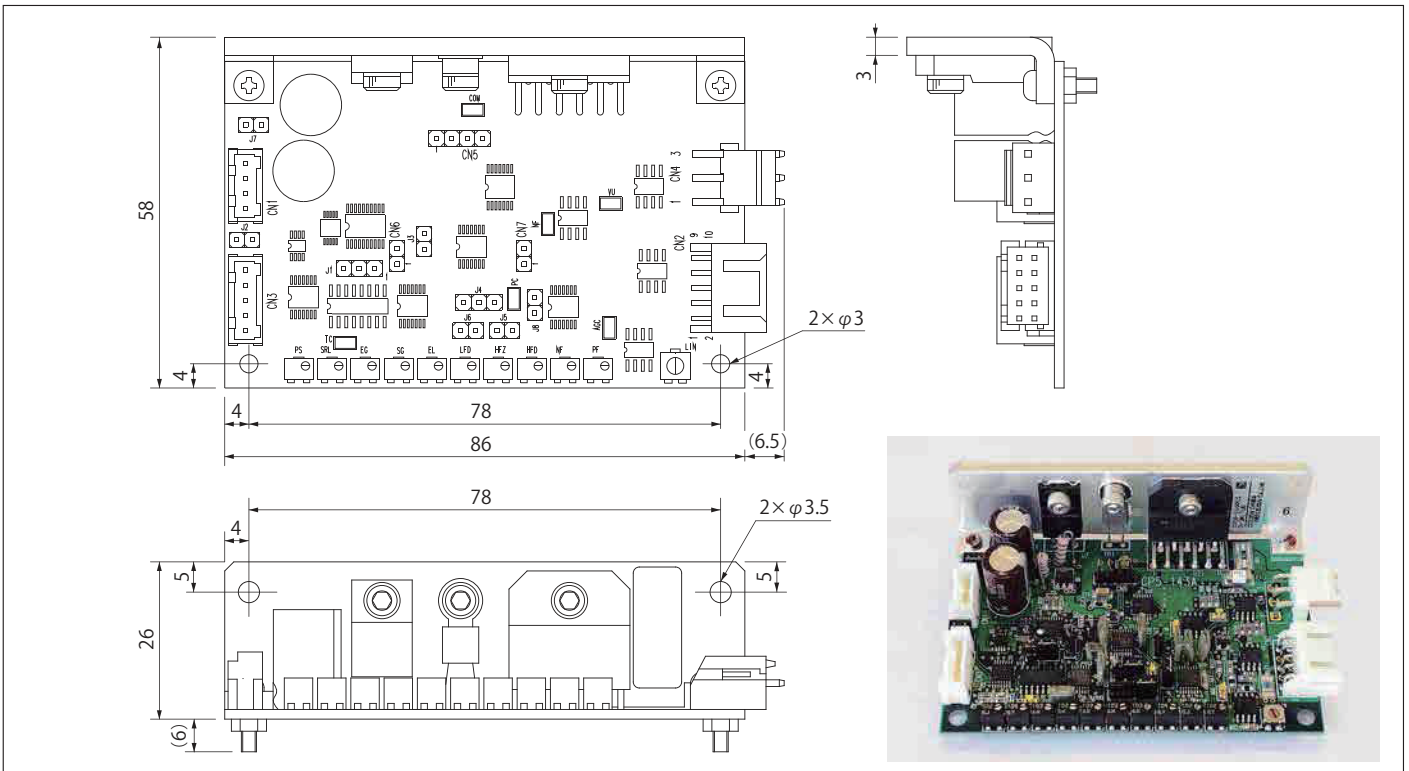
Mirror Angle Against Cable

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 Shaft

GVD0

External Layout Drawing

(Unit : mm)



Specifications

Model		GVD0 - * - * - * - * - *
Power	Power Voltage	$\pm 15V$ or $\pm 24V$
	Maximum Operating Current	2.5A RMS
	Peak Current	10A
Command Signal Input	Voltage (Differential)	$\pm 3V / \pm 5V / \pm 10V$
	Input Impedance	20k Ω (At differential input)
Monitor Output	Position Output	$\pm 1.5V / \pm 2.5V / \pm 5V$
Function	Input Signal	Servo ON
	Output Signal	Ready
	Protection	Over heating
		Over positioning
Ambient Temperature Range	0°C to +50°C	
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 the application.

P Control :

This control will output signal which is proportional to the differential 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 will output signal which is proportional to the differential by comparing position feedback and command signal, and integrate the time of differential. 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.

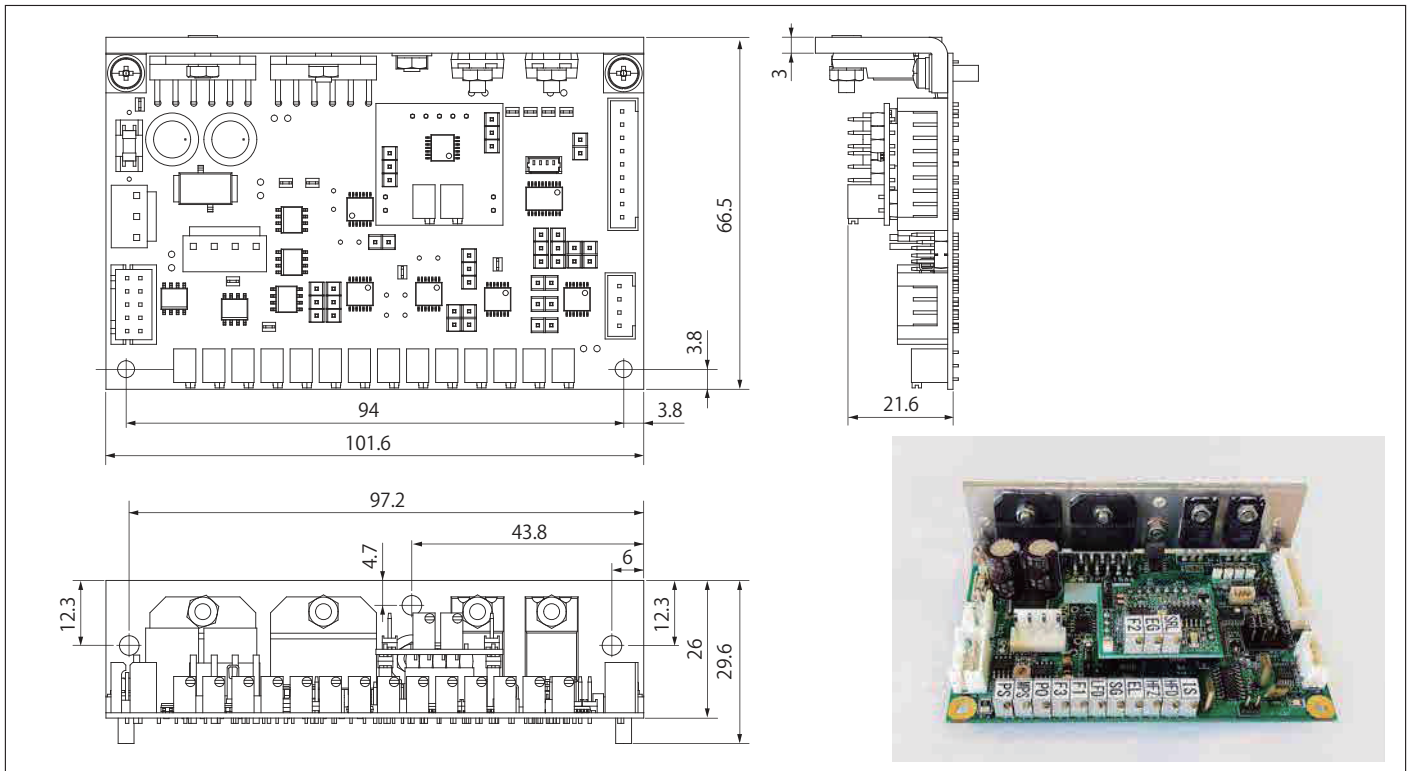
Please select P Control if you are focusing on high speed of settling time, or PI control for high position repeatability.

Galvanometer Optical Scanner Driver

■ GVD1

■ External Layout Drawing

(Unit : mm)



■ Specifications

Model		GVD1 - ***** - **	
Power	Power Voltage	$\pm 15V$ or $\pm 18V$ to $\pm 30V$	
	Maximum Operating Current	5.0A RMS	
	Peak Current	11.5A	
Command Signal Input	Voltage (Differential)	$\pm 3V$ / $\pm 5V$ / $\pm 10V$	
	Input Impedance	20k Ω (At differential input)	
Monitor Output	Position Output	$\pm 1.5V$ / $\pm 2.5V$ / $\pm 5V$	
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°C to + 50°C	
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 signal which is proportional to the differential 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 :

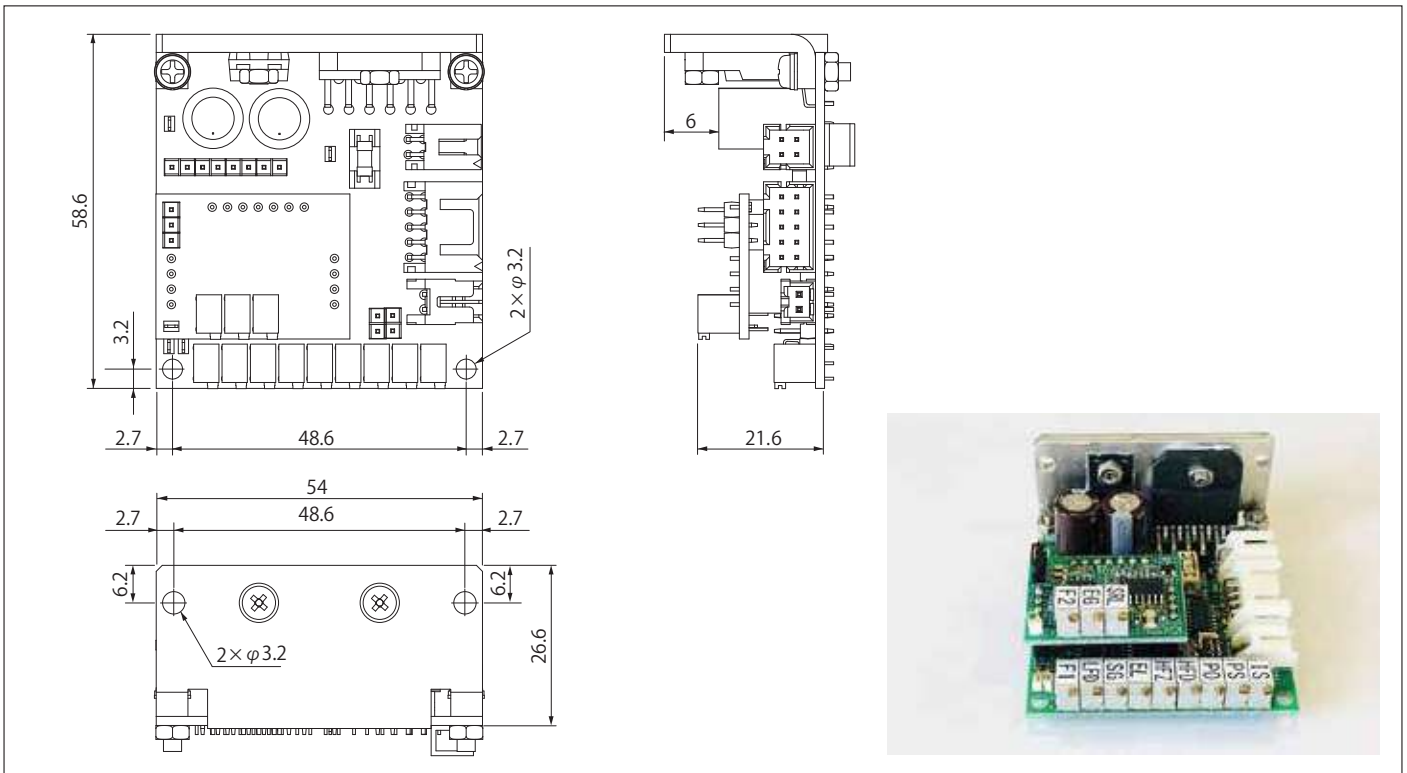
This control will output signal which is proportional to the differential by comparing position feedback and command signal, and integrate the time of differential. Therefore, it is possible to maintain a stationary state (a state with extremely small position error) regardless of distortion or friction. 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.

GVD2

External Layout Drawing

(Unit : mm)



Specifications

Model		GVD2 - ***** - **	
Power	Power Voltage	$\pm 15V$ to $\pm 30V$	
	Maximum Operating Current	2.5A RMS	
	Peak Current	1A	
Command Signal Input	Voltage (Differential)	$\pm 3V$ / $\pm 5V$ / $\pm 10V$	
	Input Impedance	20k Ω (At differential input)	
Monitor Output	Position Output	$\pm 1.5V$ / $\pm 2.5V$ / $\pm 5V$	
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°C to +50°C	
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 signal which is proportional to the differential 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 will output signal which is proportional to the differential by comparing position feedback and command signal, and integrate the time of differential. 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.

Galvanometer Optical Scanner

Driver

■ 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

Registered Custom Number

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

Beam Diameter(Mirror size)

0 : φ 3mm
1 : φ 5mm
2 : φ 7.5mm
3 : φ 10mm
4 : φ 12.5mm
5 : φ 15mm
6 : φ 20mm
7 : φ 30mm
C : Customized Size

Scanner Type

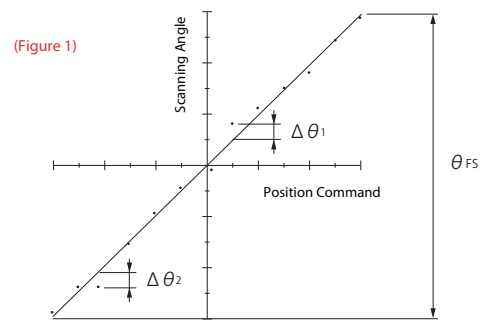
0 : 0930S
1 : 0930L
2 : 1445S
3 : 1445L
4 : 2260
5 : 2280
6 : 2510

- **Non-Linearity** (Figure 1)

This is a ratio of error against ideal scanning angle.

Measured the angle between each command to find approximated linearity. Then it is calculated by setting full-scale value of the approximate value as the denominator and the peak value of the difference from the approximate value as the numerator.

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



- **Offset drift** (Figure 2)

This is the amount of change in offset due to temperature.

Fixed the scanning angle at 0°. Then it is calculated by measuring the amount of position change when the ambient temperature is changed from 10 to 50 °C.

- **Gain drift** (Figure 3)

This is the amount of change in gain due to temperature.

It is calculated by measuring the amount of position change when the ambient temperature is changed from 10 to 50 °C at the maximum scanning angle of ± n °.

- **Thermal drift** (Figure 4)

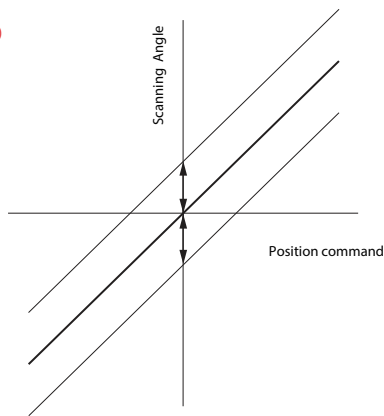
This is the amount of maximum position change by combining offset drift and gain drift.

- **Step response time** (Figure 5)

This is the amount of time from the start of scanning to the mirror is settled to the final position after the position command signal is input.

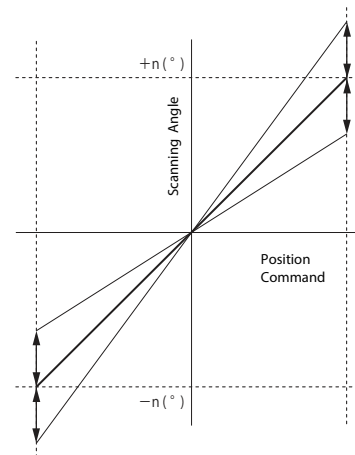
*The catalog value is stated as the response time until the scanning angle becomes ± 0.1 ° and the settling width becomes ± 0.01 °.

(Figure 2)



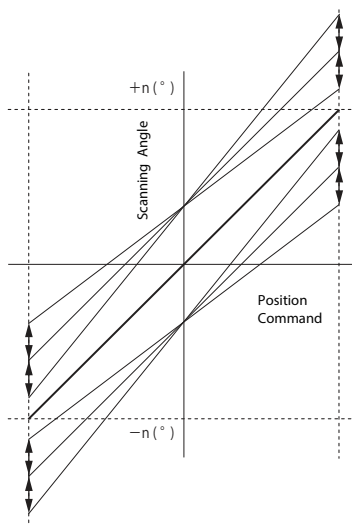
Offset Drift

(Figure 3)



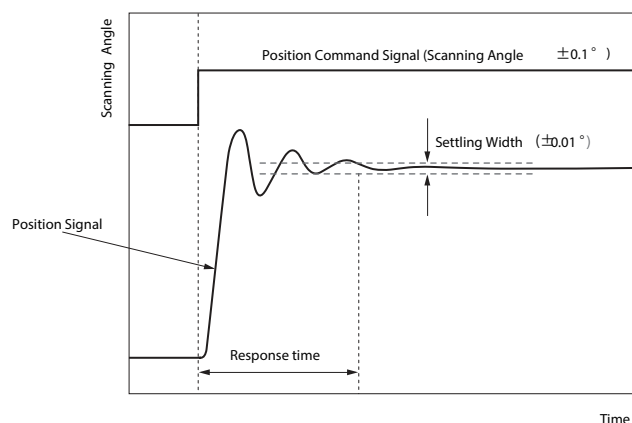
Gain Drift

(Figure 4)



Thermal Drift (Offset Drift + Gain Drift)

(Figure 5)



Step Response Time



Motor, Gearhead, Encoder, Driver, 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.

【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 caution may result in malfunction 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. Also please do not apply thrust load that exceeds the specified value. Failure to follow this caution may result in malfunction.
5. Hall sensor and encoder include semiconductor components. Please process the lead wire in an anti-static environment.
6. When installing the product, please use the specified number of screws by the torque specified in JIS. Please select the screws according to the dimensions shown in the external layout drawings. 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.

【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 only if the customer carry it in or return it to our company address by customer's expense.
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 carry it in to our company address or the customer is responsible to all shipping charges.
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】

- Information listed above is subject to change without notice.
For further information, please contact our sales representatives or our authorized distributors.

■ 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

CITIZEN CHIBA PRECISION CO., LTD.

1811-3, Yoshihashi, Yachiyo, Chiba 276-0047, Japan

Telephone : +81-47-458-7935 / Facsimile : +81-47-458-7962

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