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Operation notes

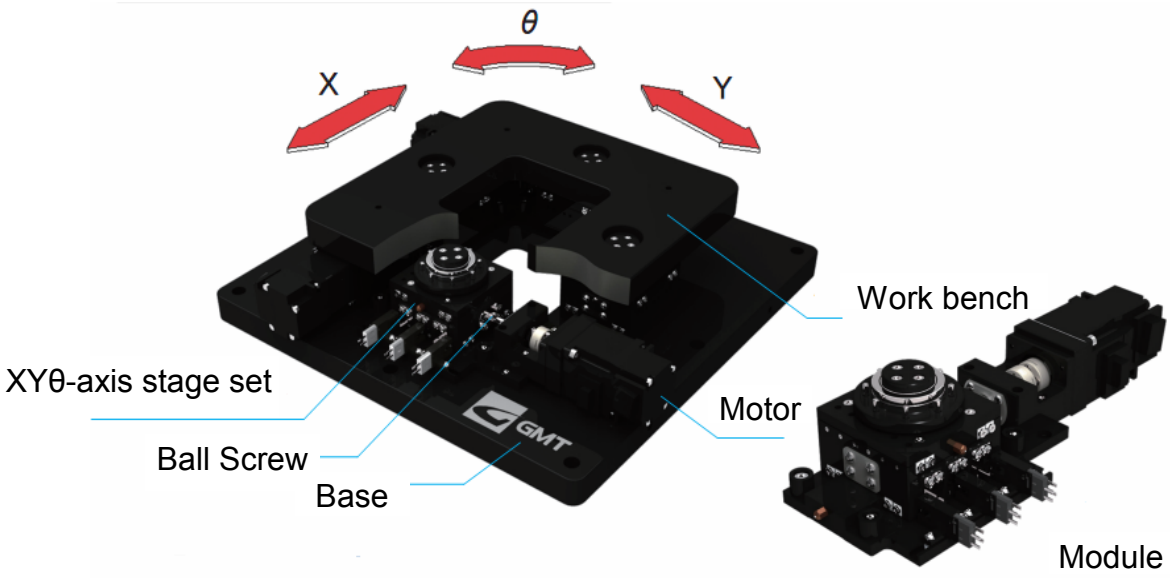
※ Abnormal status judgment made within the warranty period (one year after shipment); any problem caused from overload or improper installation or similar one is beyond the warranty scope.

※ Please contact us first for the export of our products in a single-piece, or export-purpose sales of our products & technologies, the basic policy is to comply with the respective foreign exchanges, trade acts and other related enactments.

※ We produce this catalog in a very serious manner; yet, we cannot be responsible to any possible error or missing texts in it.

◎ Due to the consistent upgrading in providing the best quality & services to clients, GMT hereby declare that we hold the engineering-change right of our products. For any change on our catalog, we won't make exceptional notice to customers.

GAS Series Mechanical Structure Introduction



GAS Series Design Advantages

Apply the innovative extra-thin stage module

The unique module structure of equipping the MINI STAGE XYθ sliding units and special cross-roller bearing four ends located between the base and bench.

Many sizes for selection

Size from 100x100mm to 1500x1500mm.

Light-weight and extra-thi

It creates the wing-free thin & lighter by applying the XYθ module.

Hollow structure

Used for the optical inspection devices or conduction tester.

High rigidity & precision

Pre-load to the special cross-roller bearing.

GAS Series Coding Method

GAS01 - 80 C H - 2M G - P

Model No.
GAS0M
GAS00
GAS01
GAS02
GAS03

Bench size	
100	□100 mm
125	□125 mm
160	□160 mm
200	□200 mm
250	□250 mm
350	□350 mm
400	□400 mm
500	□500 mm
750	□750 mm
1000	□1000 mm
1300	□1300 mm
1500	□1500 mm

Loading capacity	
	Standard
H	Hi-loading

Transmission	
C	Central feeding
S	Side feeding

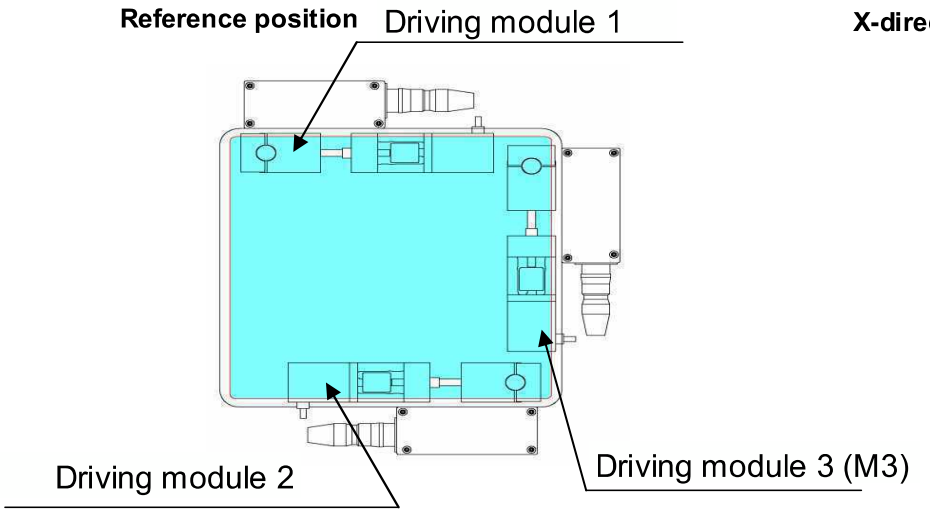
Accuracy	
P	Precision
N	Nomal

Motor brand	
G	GMT
50	50W (Servo)
100	100W (Servo)
200	200W (Servo)

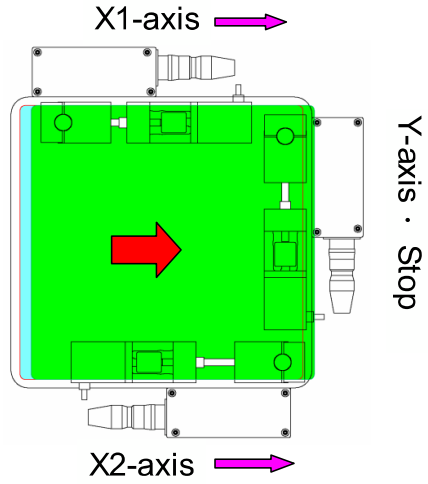
Motor	
2M	2-phase Stepping motor
M	Servo - Misu BiSH
Y	Servo - Yaskawa

The model GAS0M, 00 series alignment stage applies the combination of axle-X1, X2 & Y movements as graphically displayed in the following picture, which can perform various stage operations. (The green is the changed locations.)

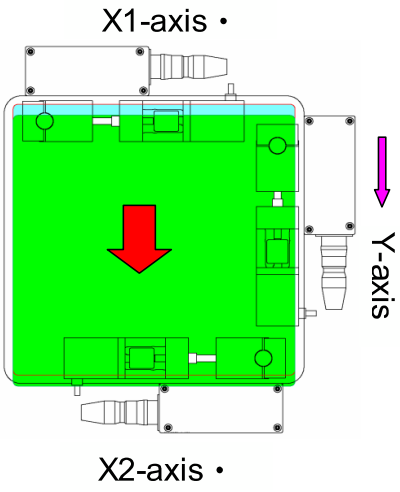
Reference position



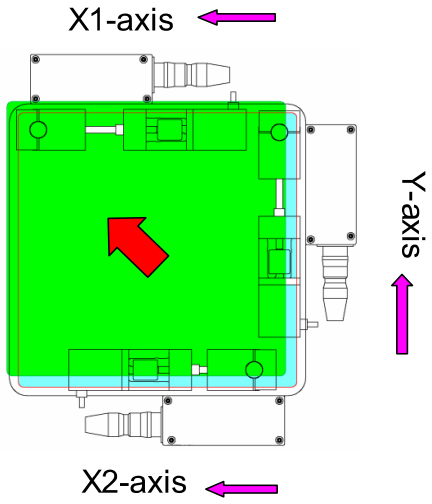
X-direction moving (M1 & M2 driving)



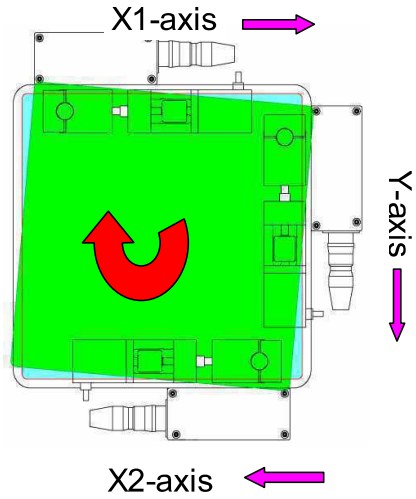
Y-direction moving (M3 driving)



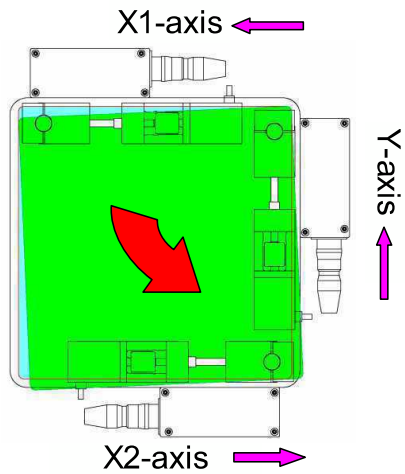
Diagonal moving (M1, M2 & M3 driving)



Bench center spinning (M1, M2 & M3 driving)

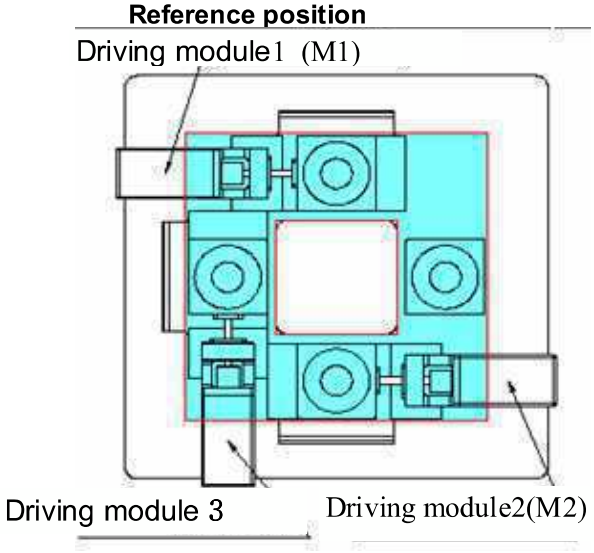


Spinning movement (M1, M2 & M3 driving)

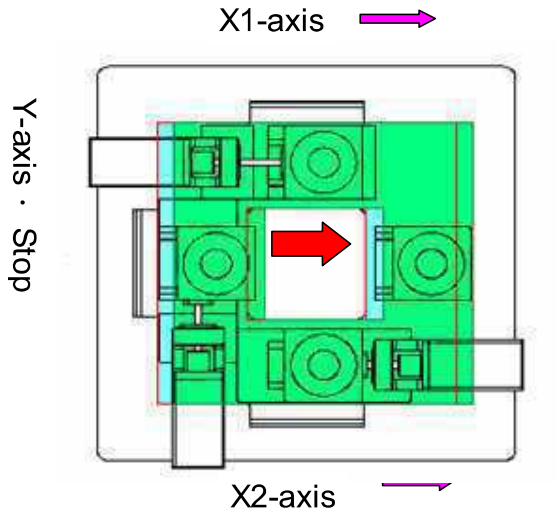


The model GAS01, 02, 03 series alignment stage applies the combination of axle-X1, X2 & Y movements as graphically displayed in the following picture, which can perform various stage operations. (The green is the changed locations.)

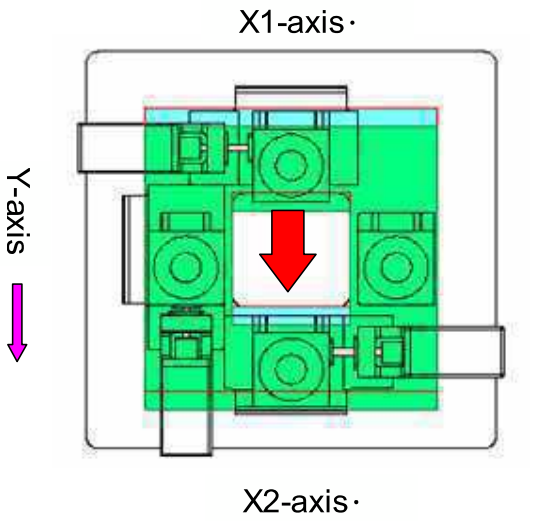
Reference position



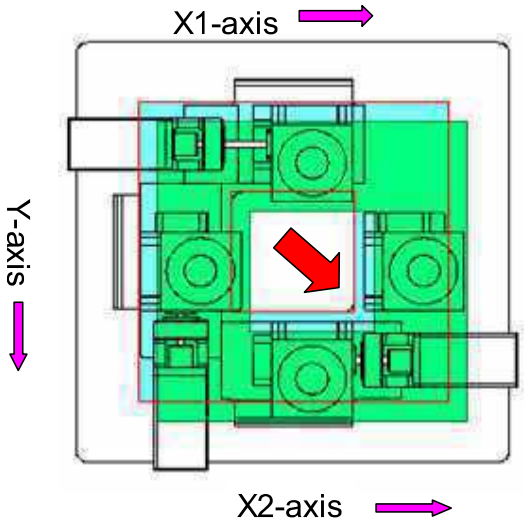
X-direction moving (M1 & M2 driving)



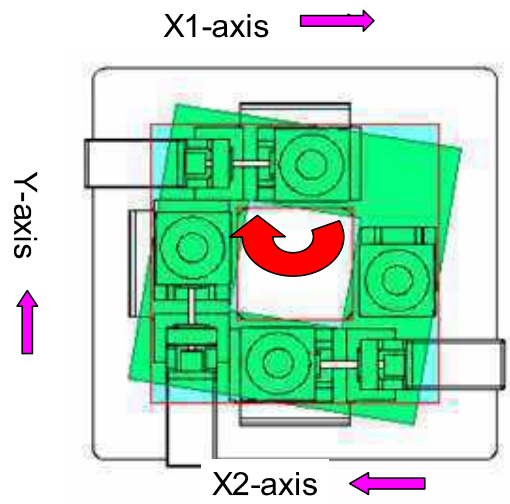
Y-direction moving (M3 driving)



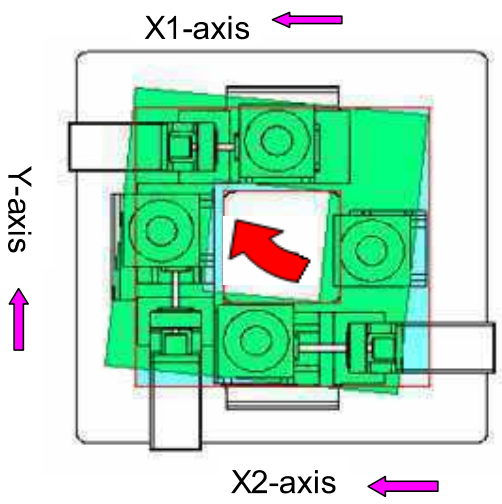
Diagonal moving (M1, M2 & M3 driving)



Bench-center spinning (M1, M2 & M3 driving)

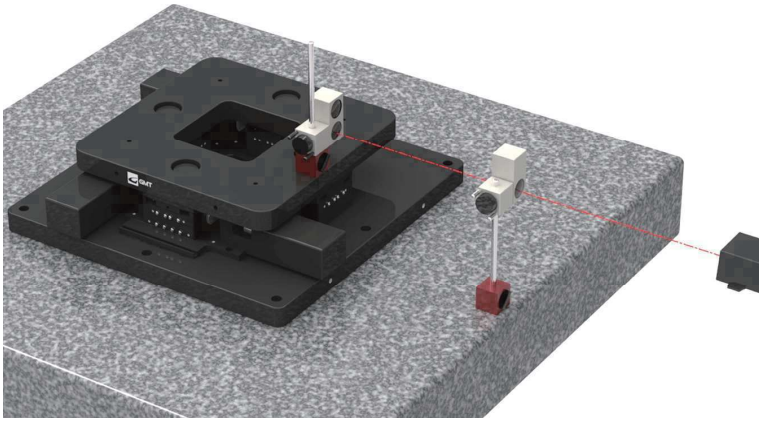


Spinning movement (M1, M2 & M3 driving)



GAS Series Positioning repeatabilily accuracy Precision Measurement

◆ Repetitive positioning precision



Position 7 times of any one point in the same direction; measure the offsets of ceased positions; calculate 1/2 of the maximum offset. Measure at center point and both ends; use the calculated maximum value as the repeated positioning precision. ◦

◆ Parallelization

Fix the s;ide on the datum plane;psition the working bench at the middle stroke location and position the working start measuring by completely sliding the insection indicator measurements by sliding the test indicator. use the maximum difference measured from the working bench area as the measured value.

Operation notes

Avoid equipping this alignment stage at the following environments:

※ The ambient temperature is lower than 0°C or over 40°C range, the RH is above 85%, or there is any condensate, corrosive gas or inflammable/combustible gas generated.

※ The area with Fe or other medium powders, dust, oil mist, cutting fluid, water, salt or organic-solvent-splashing condition.

※ The place under direct sunbeam or radiation heat.

※ The place with intense E/M field.

※ The place under vibration or shocks.

GAS0M, GAS00 Feeding Calculation Formula

The equation of calculating the respective feeding at any X-, Y-, or θ-axis.

X1-axis: $\delta x1 = \tan\theta \times (Y-X1y) + X1x \times (-1 + 1/\cos\theta) + X$

X2-axis: $\delta x2 = \tan\theta \times (Y-X2y) + X2x \times (-1 + 1/\cos\theta) + X$

Y-axis: $\delta Y = \tan\theta \times (Y-X1y) + X1x \times (-1 + 1/\cos\theta) + X$

δx1: X1-axle relative feeding 【mm】
δx2: X2-axle relative feeding 【mm】
δY: Y-axle relative feeding 【mm】
} Feeding of ball-screw

X1x、X1y: The center-coordinate drives crossed rolling spindle turning round for X1-axis. (refer to the parameter table)

X2x、X2y: The center-coordinate drives crossed rolling spindle turning round for X2-axis (refer to the parameter table)

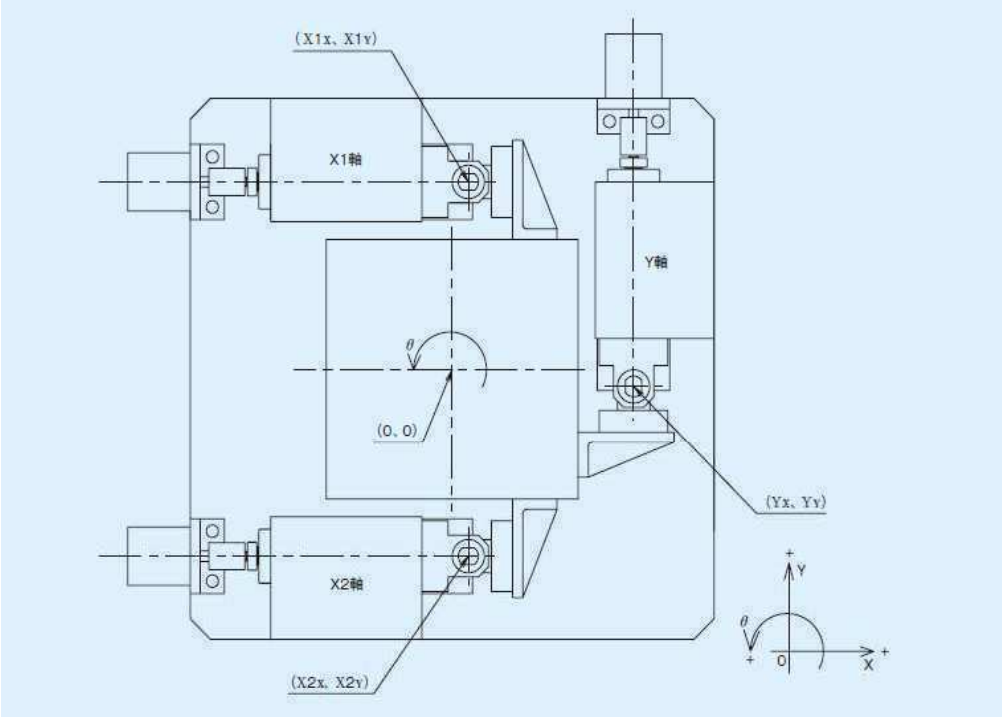
Yx、Yy: The center-coordinate drives crossed rolling spindle turning round for Y-axis (refer to the parameter table)

X: X-direction movement amount

Y: Y-direction movement amount

θ: θ-direction movement amount

Symbol interpreting diagram for the formula



Parameter table

Type		R	θY	θX1	θX2
GAS0M	125	$\sqrt{90.5^2 + \sqrt{50^2}}$	151.08°	118.92	241.08
GAS00	160	$66\sqrt{2}$	221.53	131.53	311.53
	200	$\sqrt{82^2+\sqrt{136^2}}$	148.91	121.09	238.91

GAS01, GAS02, GAS03 Feeding Calculation Formula

The calculating equation of the respective feeding at any axis of any working bench.
in order to figure out the rotary angle δ θ

X1-axis: δx1 =R cos(δθ +θX1+θ0)-R cos(θX1+θ0)

X2-axis: δx2 = R cos(δθ +θX2+θ0)-R cos(θX2+θ0)

Y-axis: δY =R sin(δθ +θY+θ0)-R sin(θY+θ0)

δx1: X1-axle relative feeding amount 【mm】
δx2: X2-axle relative feeding amount【mm】
δY: Y-axle relative feeding amount【mm】
} Feeding of ball-screw

X1x、X1y: The angle position links to center of crossed-roller bearing on X1-axis.
[°] (refer to the parameter table)

X2x、X2y: The angle position links to center of crossed-roller bearing on X2-axis.
[°] (refer to the parameter table)

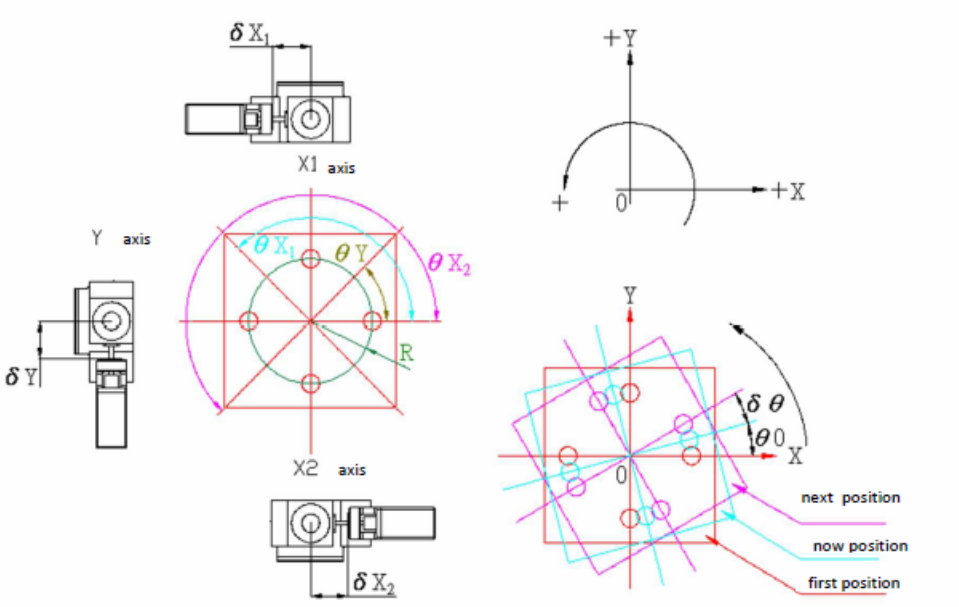
Yx、YY: The angle position links to center of crossed-roller bearing on Y-axis.
[°] (refer to the parameter table)

θ 0: The working bench angle calculated before movement.

δ θ : Rotary angle of any working bench

R:The radius produced from the supposed circle connected axis.
by the bearing center of crossed-roller on each .

Symbol interpreting diagram for the formula



Parameter table

Type		R	θY	θX1	θX2
GAS01	250	90	0°	90°	270°
	350	135			
GAS02	400	145√2	45°	135°	225°
	500	195√2			
	750	320√2			
GAS03	1000	400√2			
	1500	650√2			

GAS Series Feeding Calculation Example

Type: GAS02-400

Moving mode: take the axle stroke-center as the original point; find the feeding amount of each axis by letting the upper sliding stage follow moving sequences as below:

(1): Parallel moving by X-direction: +1mm, Y-direction: +0.5mm

↓

(2): +2° spin around the working bench center

↓

(3): Perform -0.3° spin from state (2) above

Steps

First, not to calculate the movement in X or Y direction; use the existed values as the axis-feeding values. Next, calculate the +2° rotary

We can get the parameter values of GAS01-400 from the parameter table

$R = 145\sqrt{2}$ $\theta Y = 45°$ $\theta X_1 = 135°$

$\theta X_2 = 225°$

Or follow the moving mode condition to get that

$\theta 0 = 0°$ (Since the current position is the initial o ne.)

$\delta\theta = 2°$

Feed the aforesaid data into Formula 1, 2 & 3, we thus can calculate the data regarding axle-X1 as

$\delta X_1 = 145\sqrt{2}\cos(2 + 135 + 0) - 145\sqrt{2}\cos(135 + 0) = -4.97210$ (mm)

And calculate the axle X2 and axle-Y in the same way, the result is shown in below.

$\delta X_2 = +5.14876$ (mm)

$\delta Y = +4.97210$ (mm)

Finally, find the feedings of each axis after rotating -0.3° from the current status:

Per the condition of action mode we get that

$\theta 0 = 2°$

$\delta\theta = -0.3°$

$= +0.73431$ (mm)

And calculate the axis X2 and axis-Y in the same way, the result is shown in below.

$\delta X_2 = -0.78333$ (mm)

$\delta Y = -0.73431$ (mm)

Calculation result

( ) means the absolute feeding value relative to the original point. Unit: mm

Axis	Relative feeding			
	X direction+ 1mm	Y direction+ 0.5mm	Spin + 2°	Spin - 0.3°
X1	+ 1	0	− 4.97210	+ 0.73431
	(+ 1)	(0)	(− 3.97210)	(− 3.23779)
X2	+ 1	0	+ 5.14876	− 0.78333
	(+ 1)	(0)	(+ 6.14876)	(+ 5.36543)
Y	0	+ 0.5	+ 4.97210	− 0.73431
	(0)	(+ 0.5)	(+ 5.47210)	(+ 4.73779)

Cryogenic Treatment

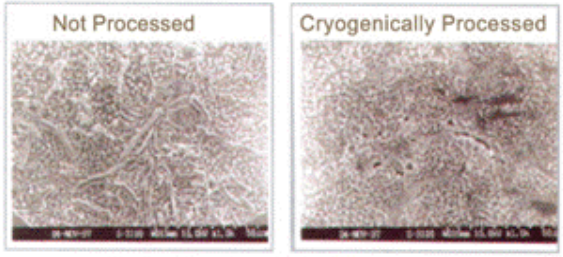
All of GMT series of products are Cryogenic Treatment

The Cryogenic Treatment is a technology that freezes parts in a subzero temperature at -196°C, which will change material's physic properties under certain processes. The study reports show that the cryogenic treatment not only can significantly upgrade the toughness and operation lifetime of non-ferrite metals, plastics and ceramic materials, it also will improve the dimension stability of materials The cryogenic treatment thus builds a great vision and enormous economic effect in the aviation &space, optic, biological, chemical, mechanical, electronic and light industries.

◆ Purpose of cryogenic treatment:

Apply the subzero-temperature cooling process to improve the physic (mechanical) properties of metals or other materials; it can effectively improve the operation lifetime, quality and efficiency of work pieces or parts

Example: aluminum alloy – metallographic phase comparis



1.Metallographic-phase chart analysis before cryogenic treatment
2.Metallographic-phase chart analysis after cryogenic treatment

◆Effectiveness analysis of aluminum alloy after cryogenic treatment:

After the cryogenic treatment it can improve:

(1) the deforming issue of structural stress made from the shape design of parts during or after machining process;

(2) and effectively restrains the aging deformation made later;

(3) The mechanical property test result shows that the mechanical strength is apparently improved, which perfectly demonstrates the mechanical properties of material as per the designed ones.

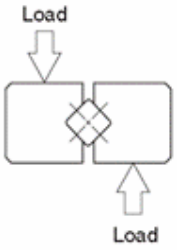
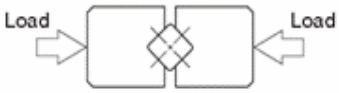
Practical application: after solution zing the aluminum alloy AL7075 (Duralumin), if we perform the cryogenic treatment and fast thaw the aluminum alloy; except boosting the aging ef it will improve the material's mechanical properties in return.

Experiment data shows that after performing the cryogenic treatment, aluminum casting will improve its machine-ability in response.

Objective parts	Hardness	Wear ability	Cutting lifetime	Dimension is stable	Other
Drill, Cutting tool, Cutter	+	+	+	+	One tempering cycle is sufficient
Shear-cut mold, Press mold, Shear-cutter, Rolling	+	+	+	+	Grind-crack prevention
Aluminum-extruding mold	+	+			
Slide, Roller	+	+		+	
Axis, Gear, Sleeve, Cam	+	+		+	Grind-crack prevention
Austenitic organization (Series 300)	+	+		+	Improve the anti-corrosion capability
Martens tic organization (420J2,440)	+	+	+	+	Improve the anti-corrosion capability
Precipitated organization (630,631)	+	+		+	Improve the anti-erosion capability
Type 18%Ni	+	+		+	Boost the aging effect
Type 25%Ni	+	+		+	Boost the aging effect
Cutting tool, Rolling, Vehicle parts		+	+	+	Remove the residual stress
Electrode, Flame nozzle		+		+	
Automatic mechanical parts, Precise machining, Mold production, Precise electronic instrument, SMT, PCB soldering carrier		+		+	Improve the cut force

Cross-Roller Loading Ability

Table 8.1 Calculation formulae for load ratings and allowable loads of **GRV**

Load condition	Upward/downward load (1)	Lateral load
		
Basic dynamic load rating C N	$Cr=\left\{\left(\frac{Z}{2}-1\right)2p\right\}^{1/36}\left(\frac{Z}{2}\right)^{3/4}Cu\cdots(1)$	$Ca=\left\{\left(\frac{Z}{2}-1\right)2p\right\}^{1/36}\left(\frac{Z}{2}\right)^{3/4}2^{7/9}Cu\cdots(4)$
Basic static load rating C_0 N	$C0r=\left(\frac{Z}{2}\right)C0u\cdots(2)$	$C0a=2\left(\frac{Z}{2}\right)C0u\cdots(5)$
Allowable load *F* N	$Fr=\left(\frac{Z}{2}\right)Fu\cdots(3)$	$Fa=2\left(\frac{Z}{2}\right)Fu\cdots(6)$

Quick Menu

Type

Stage-distance	Module drives		Central loading		Module drives		Module loading				
	GAS0M		GAS00		GAS01		GAS02			GAS03	
Module \ Table mm	100	125	160	200	250	350	400	500	750	1000	1500
GAU-0M	GAS0M -100										
GAU-03-125		GAS0M -125									
GAU-03-160			GAS00 -160								
GAU-03-200				GAS00 -200							
GAU-05DH					GAS01 -250CH						
GAU-05H											
GAU-05D1					GAS01 -250C						
GAU-05S											
GAU-06D1						GAS01 -350C					
GAU-06S											
GAU-10D1							GAS02 -400C	GAS02 -500C	GAS03 -750C		
GAU-10S											
GAU-12D1										GAS03 -1000C	GAS03 -1500C
GAU-12S											
GAU-C01											
GAU-C02											
Other	GAS0M -100S				GAS01 -250S	GAS01 -350S	GAS02 -400S	GAS02 -500S	GAS02 -750S	GAS03 -1000S	GAS03 -1500S
Instruction											

GAS	
C	Center drives
S	Side drives
H	Heavy-load type

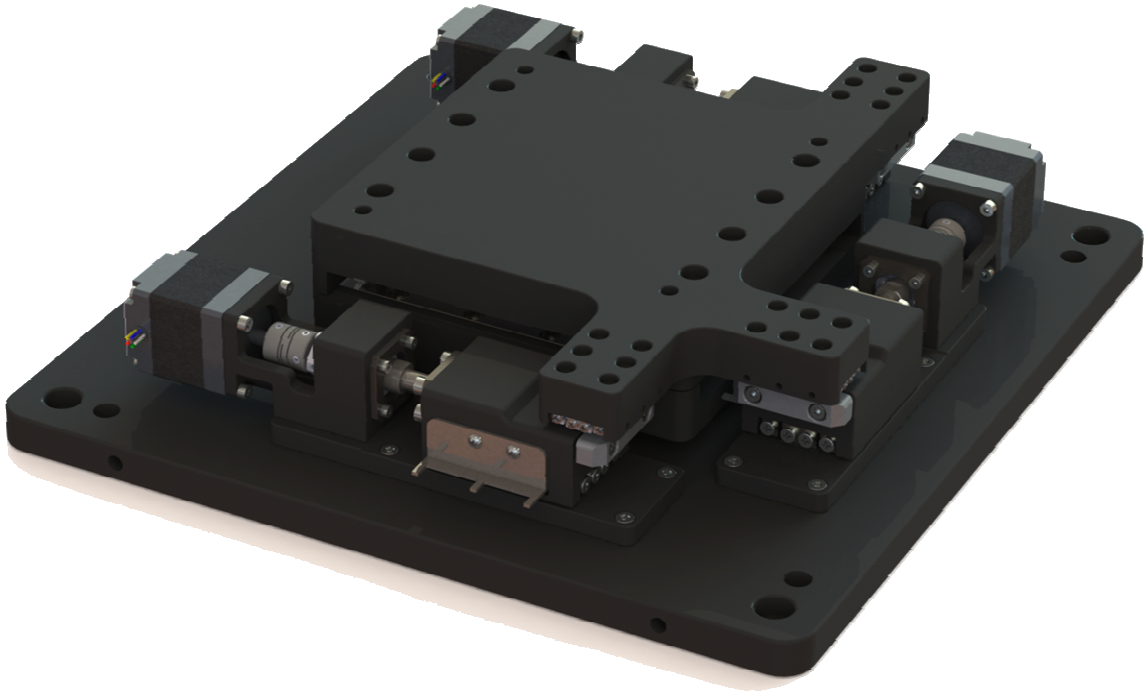
GAS Material	
Aluminum alloy 6061	250~400 anode
Aluminum alloy 7075	500~750 anode
Steel S-45	Low-temp black-Chrome (foggy surface)/chemical nickel plating

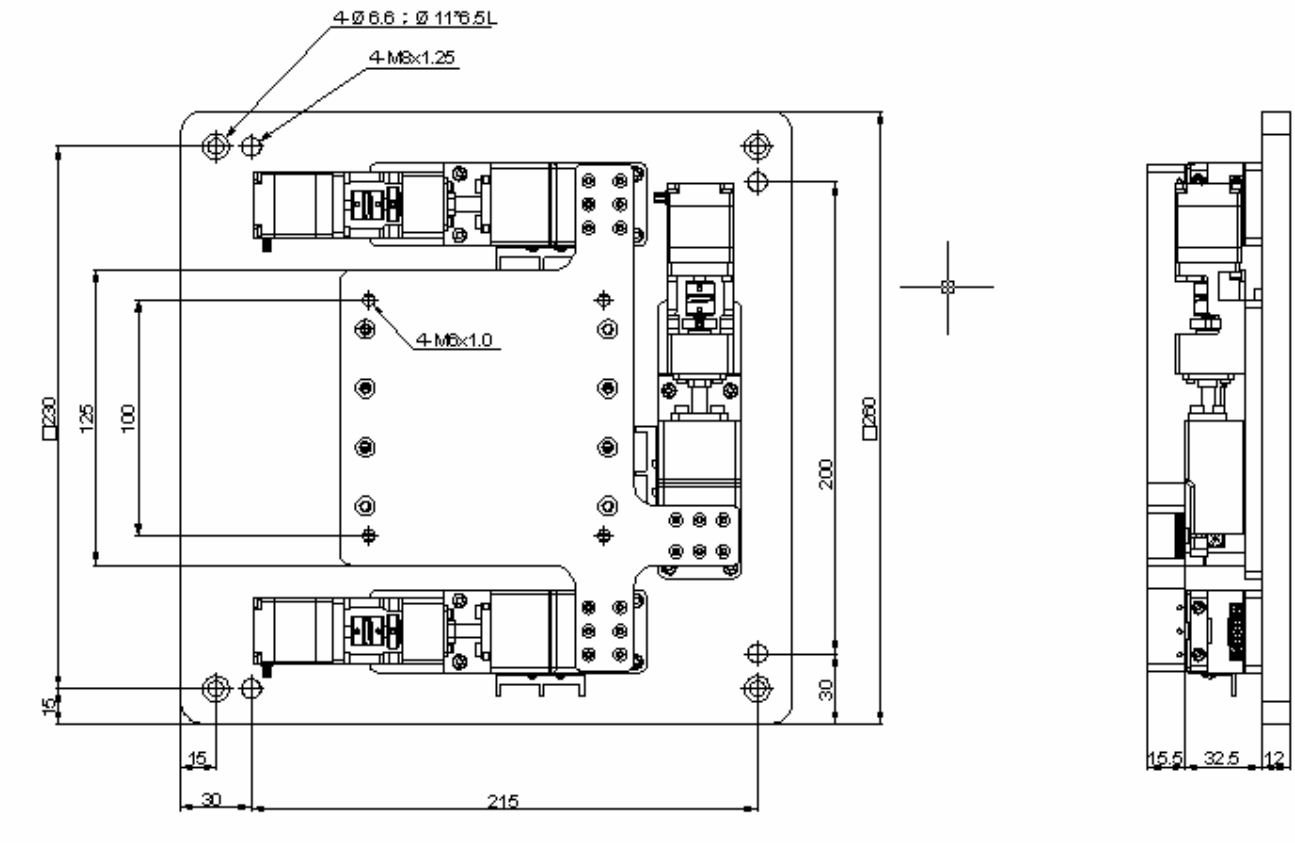
GAU	
D	Old-type support unit
D1	Improved support unit
S	Driven module
H	Heavy-load type

Characteristics

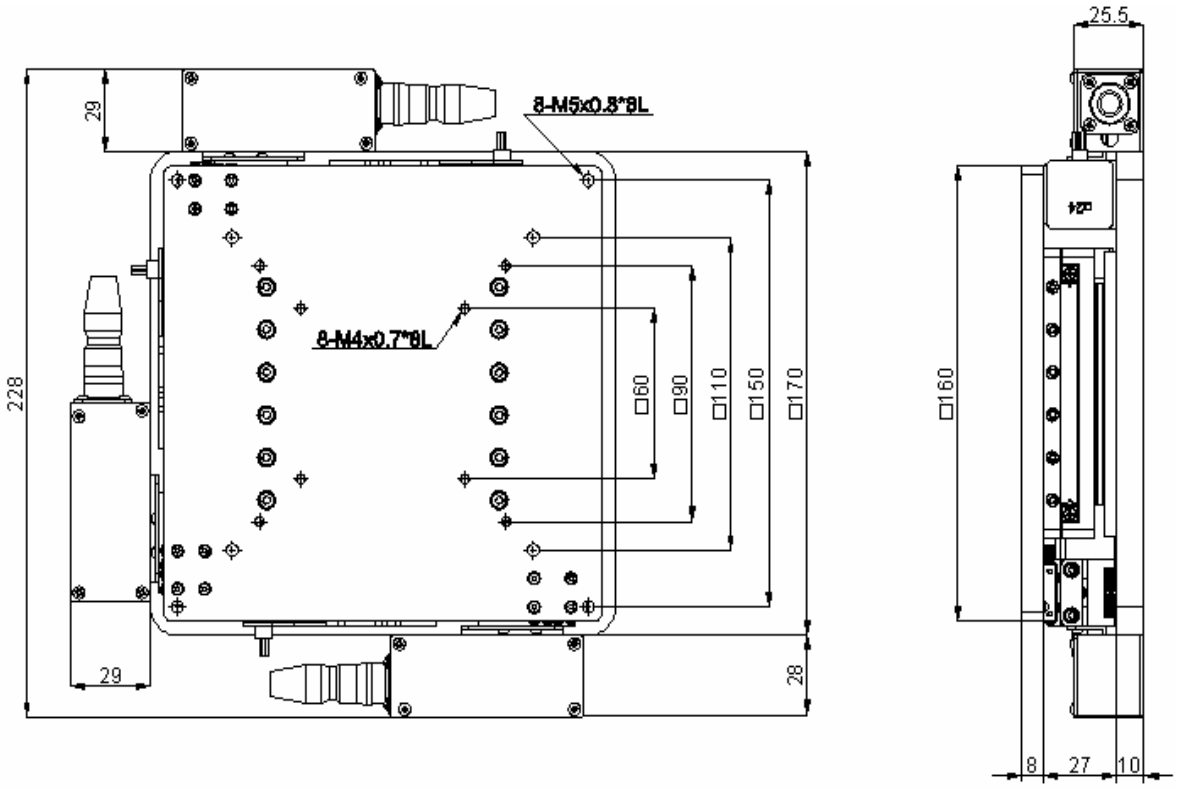
		GAS0M		GAS00		GAS01-C		GAS02-C			GAS03-C	
Module \ Table mm		100	125	160	200	250	350	400	500	750	1000	1500
Bench size	mm	100x100	125x125	160x160	200x200	250x250	350x350	400x400	500x500	750x750	1000x1000	1500x1500
Base size	mm	120x120	260x260	170x170	350x350	350x350	450x450	500x500	600x600	850x850	1200x1200	1700x1700
Travel	mm	±2×±2×±2°	±3×±3×±3°	±3×±3×±3°	±5×±5×±3°	±5×±5×±3°	±5×±5×±2°	±10×±10×±3.5°	±10×±10×±2.5°	±10×±10×±1.5°	±15×±15×±2°	±15×±15×±1°
Height	mm	35	60	45	60	90	90	110	110	110	160	160
Parallelism	um	15	30	30	30	30	40	50	80	180	300	700
Loading capacity F\	Kgf	4.8	40.6	18.6	56.8	50.9	50.9	97.5	97.5	97.5	219.5	439
Loading capacity Fs	Kgf	9.6	81.2	37.2	113.6	101.8	101.8	195	195	195	439	878
Material		S45C	S45C	S45C	S45C	6061T651	6061T651	7075T651	7075T651	7075T651	S50C	S50C
Surface treatment		Low-temp black-	Low-temp black-	Low-temp black-	Low-temp black-Chrome	Black anode	Black anode	Black anode	Black anode	Black anode	Cr-plated (black)	Cr-plated (black)
P-class	Ball screw lead	mm	1	1	1	1	1	1	2	2	2	4	4
	Positioning repeatability accuracy	um	±1	±0.7	±0.7	±0.7	±1	±1	±1	±1	±1	±1	±1
N-class	Ball screw lead	mm	1	1	1	1	1	1	2	2	2	4	4
	Positioning repeatability accuracy	um	±2.5	±1.75	±1.75	±1.75	±2.5	±2.5	±2.5	±2.5	±2.5	±2.5	±2.5
Motor	Motor		2MS-N20U33A	2MS-N20U33A	TS3664N16E2	2MS-N28U45A	2MS-N42U47A /Servo	2MS-N42U47A /Servo	2MS-N42U47A /Servo	2MS-N42U47A /Servo	Servo	Servo	Servo
	Driver		DS2-022A Micro-stepping driver	DS2-022A Micro-stepping driver	TAMAGAWA SEIKI	DS2-022A Micro-stepping driver	DS2-022A Micro-stepping driver	DS2-022A Micro-stepping driver	DS2-022A Micro-stepping driver	DS2-022A Micro-stepping driver	Driver	Driver	Driver
	Limit Sensor		SA0301	SA0301	2K127	2K127	EE-SX672	EE-SX672	EE-SX672	EE-SX672	EE-SX672	EE-SX672	EE-SX672
Body weight	Kg		2	15	6	35	18	23	37	44	63	600	1150

Central Loading GAS0M Series

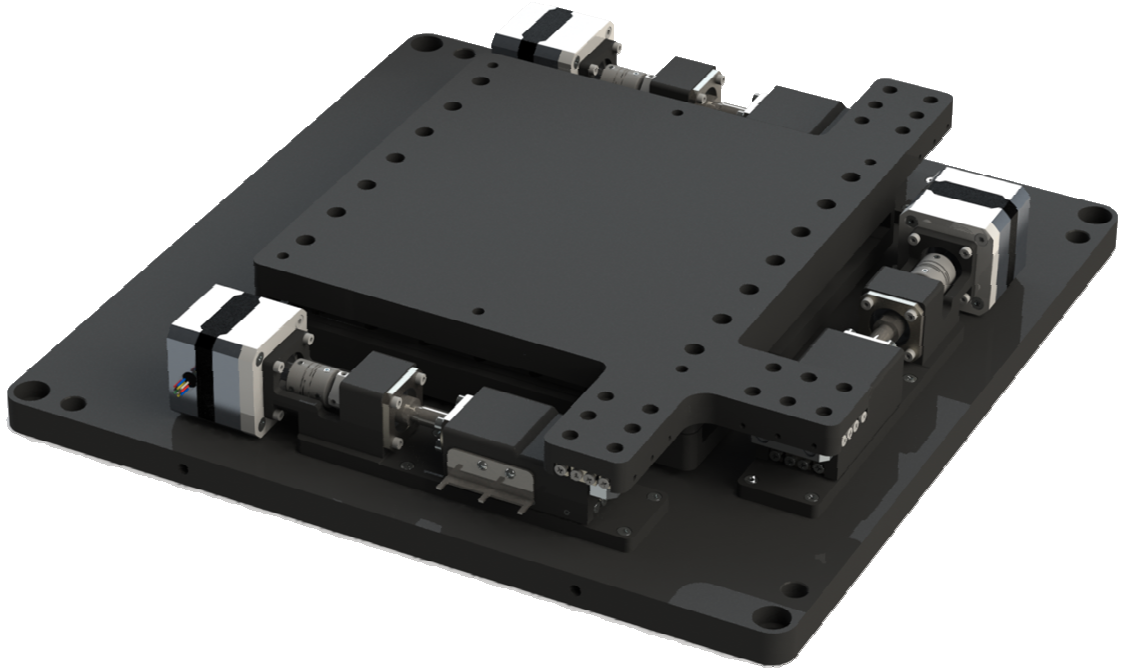


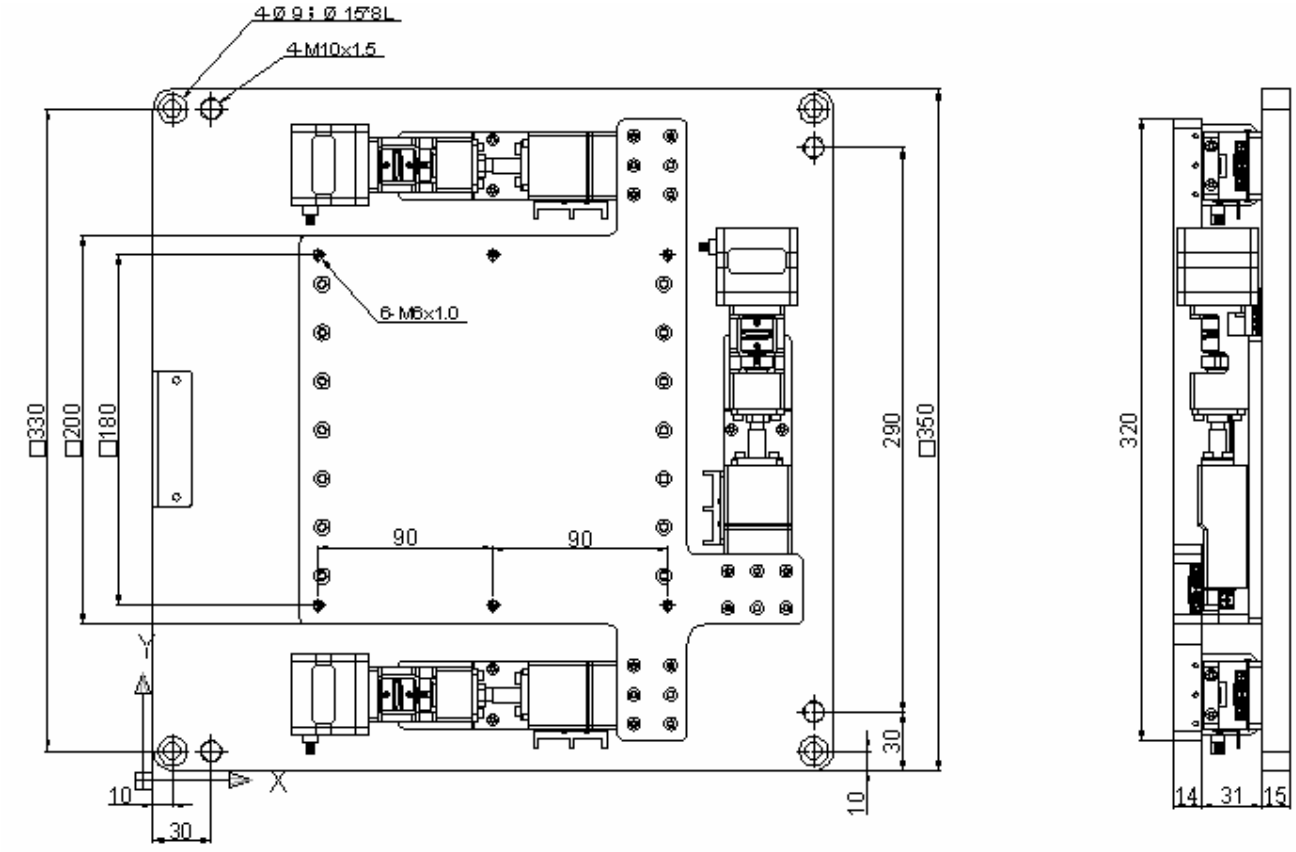


Central Loading GAS00 Series

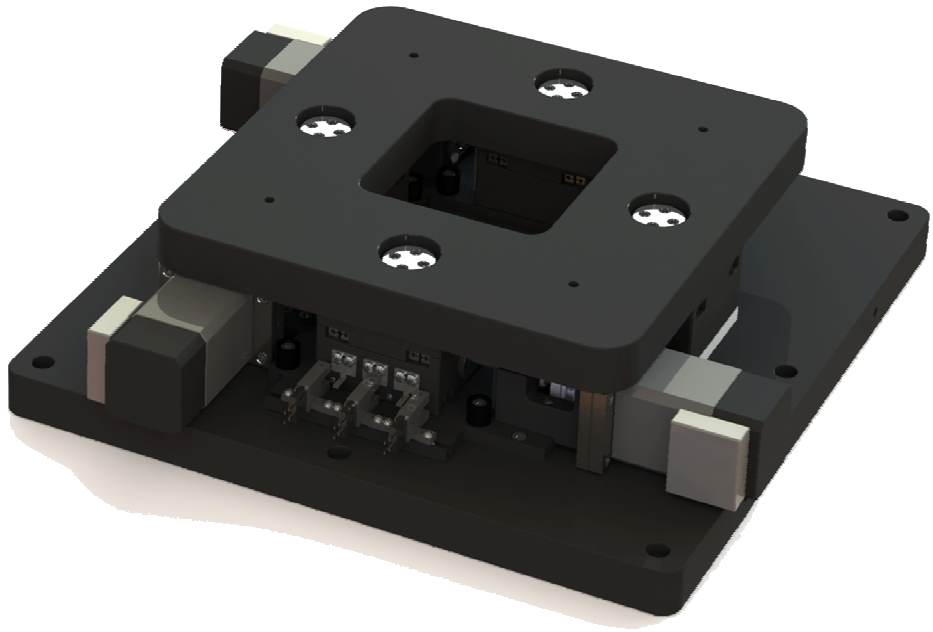


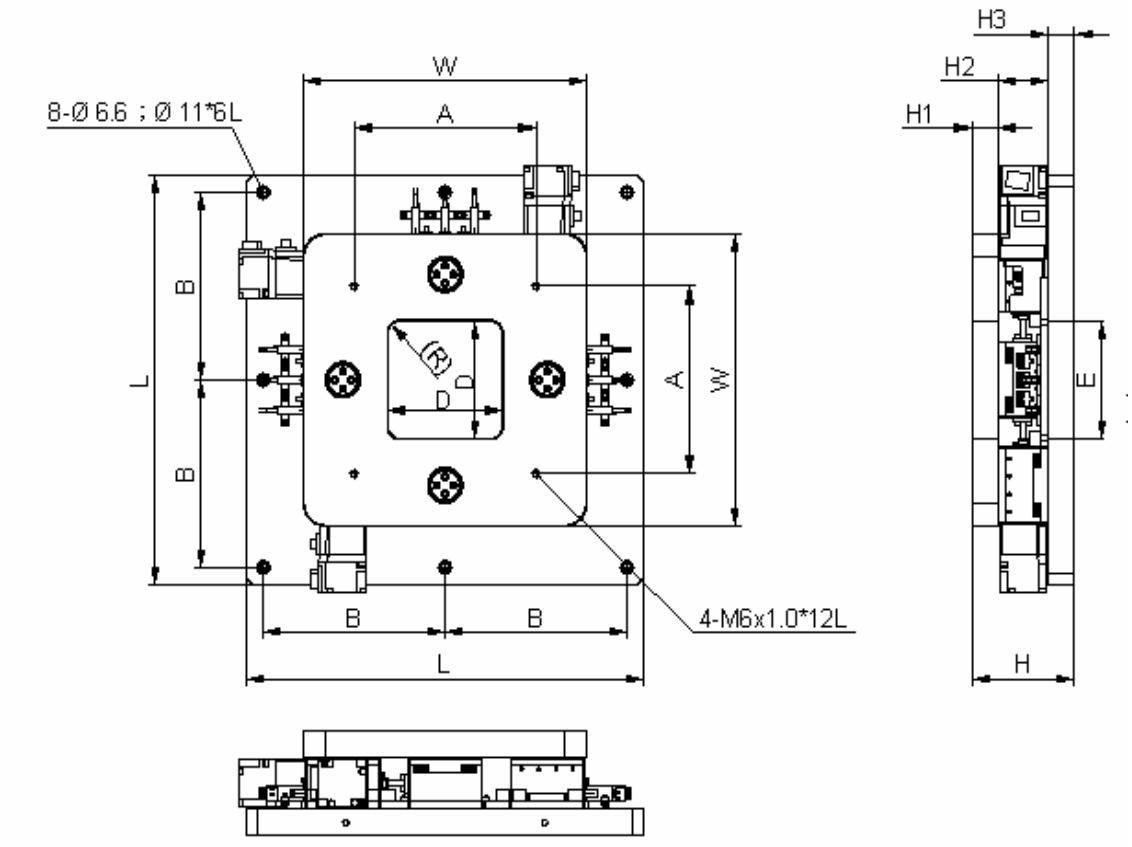
Central Loading GA S00 Series





Module Loading



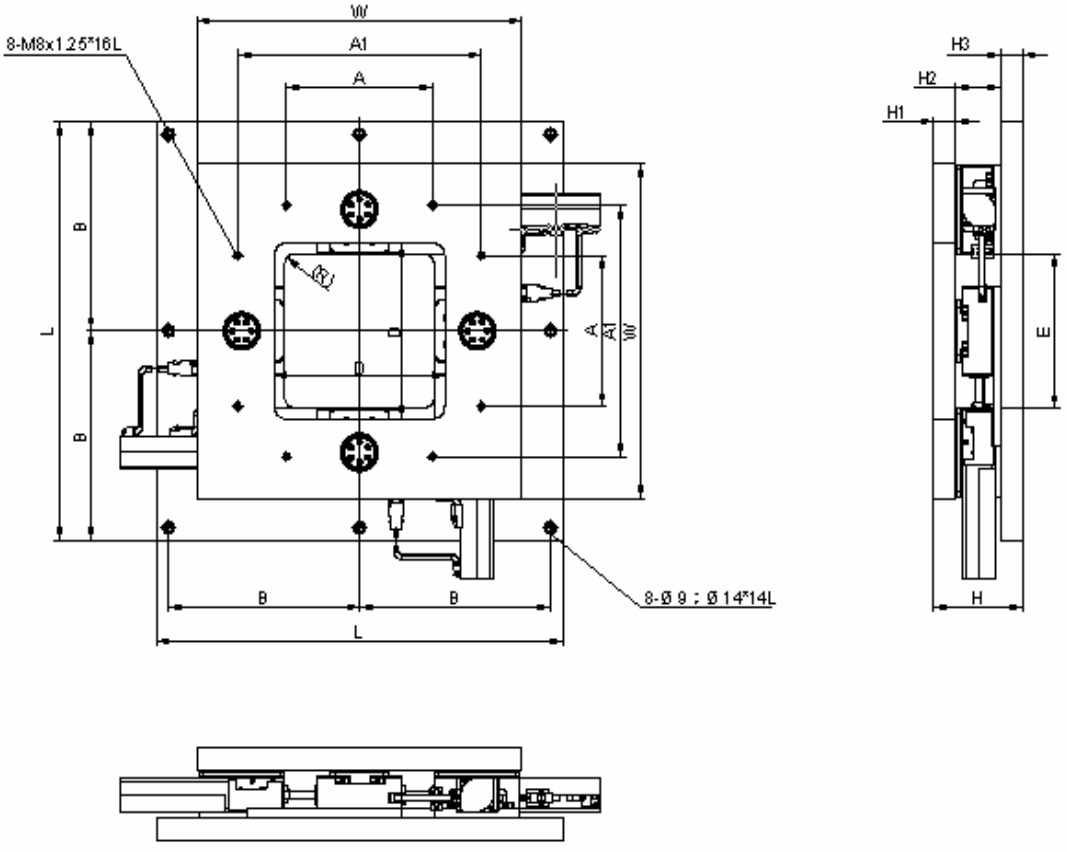


[General height] H = 90, H1 = 23, H2 = 44, H3 = 23

Unit: mm

Type	Maximum travel	Base			Working Bench			
		L	B	E	W	D	A	R
GAS01-250	±5×±5×±3°	350	160	80	250	80	160	10
GAS01-350	±5×±5×±2°	450	210	180	350	180	220	

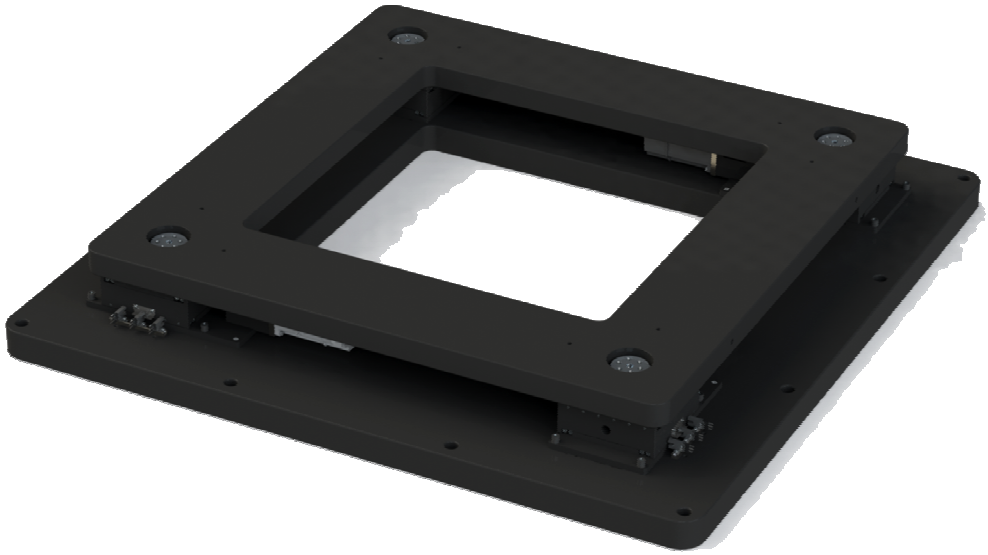
GAS02 Series

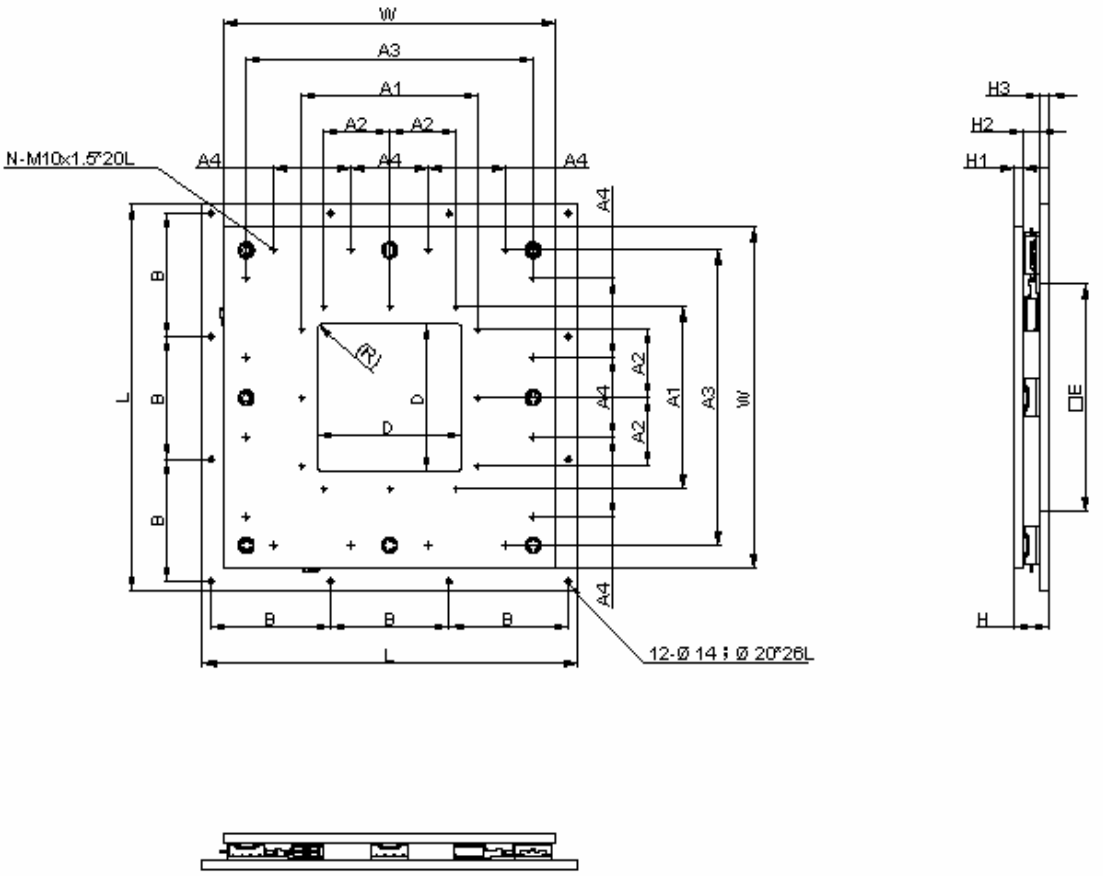


"Common size" height: H = 110, H1=27, H2=56, H3=27, Bench: (R) = 15 Unit: mm

Type	Maximum travel	Base seat			Bench			
		L	B	E	W	D	A	C
GAS02-400	±10×±10×±3.5°	500	235	210	400	210	180	300
GAS02-500	±10×±10×±2.5°	600	285	310	500	310	280	400
GAS02-750	±10×±10×±1.5°	850	410	560	750	560	530	650

GAS03 Series





"Common size" height: H = 160, H1 = 40, H2 = 72, H3

Unit: mm

Type	Maximum travel	Base seat			Bench							
		L	B	E	W	D	N	(R)	A1	A2	A3	A4
GAS03-1000	±15×±15×±2°	1200	380	650	1000	650	12	20	800	300	—	—
GAS03-1500	±15×±15×±1°	1700	540	1000	1500	1000	16		—	—	1300	350