This internal Geneva type micro index unit is characterized by the compact size and little time loss.
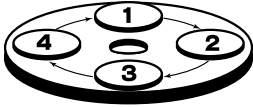

The table index motion allows intermittent feed of workpieces at a constant time interval and angle from (1) to (2) and from (2) to (3) as shown in the figure simply by mounting the turntable on top. The drive unit can be applied to pitch feed of belts. Two numbers of indexes are available: 4 (90°) and 6 (60°). The control is simple. The rotation control sensor of the input shaft can be used for the purpose. Changing the direction of rotation is also easy. Simply change the direction of rotation of the motor.
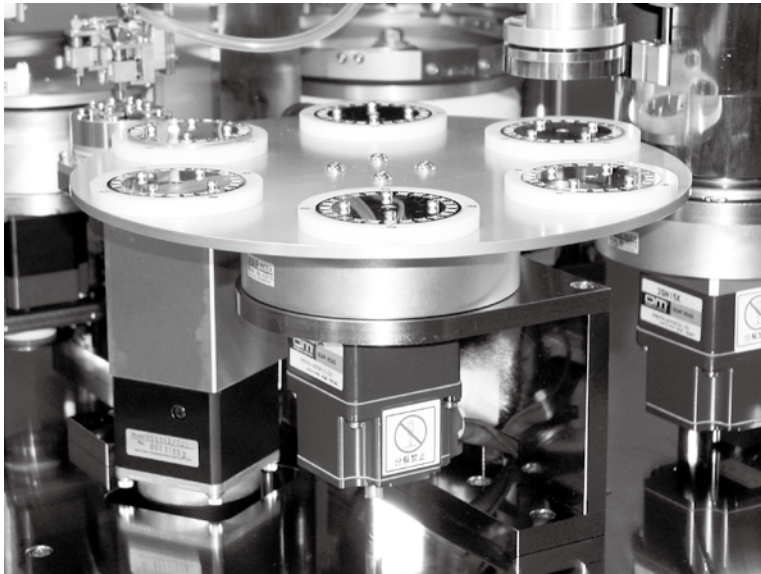
Intermittent indexing devices used in automated assembly systems are required to have high reliability as main driving sources of conveyance and sorting.

As a manufacturer, we regard elemental technologies for "correct feeding and correct positioning" as the most important technologies for automated assembly and have independently worked on the research and development. INDEX uses an internal Geneva mechanism for larger indexing angles to provide smooth and high-speed drive and, in addition, any extra mechanism has been eliminated to realize the integrated product with a simple indexing and locking mechanism. The small device for indexing drives incorporates a number of ideas.
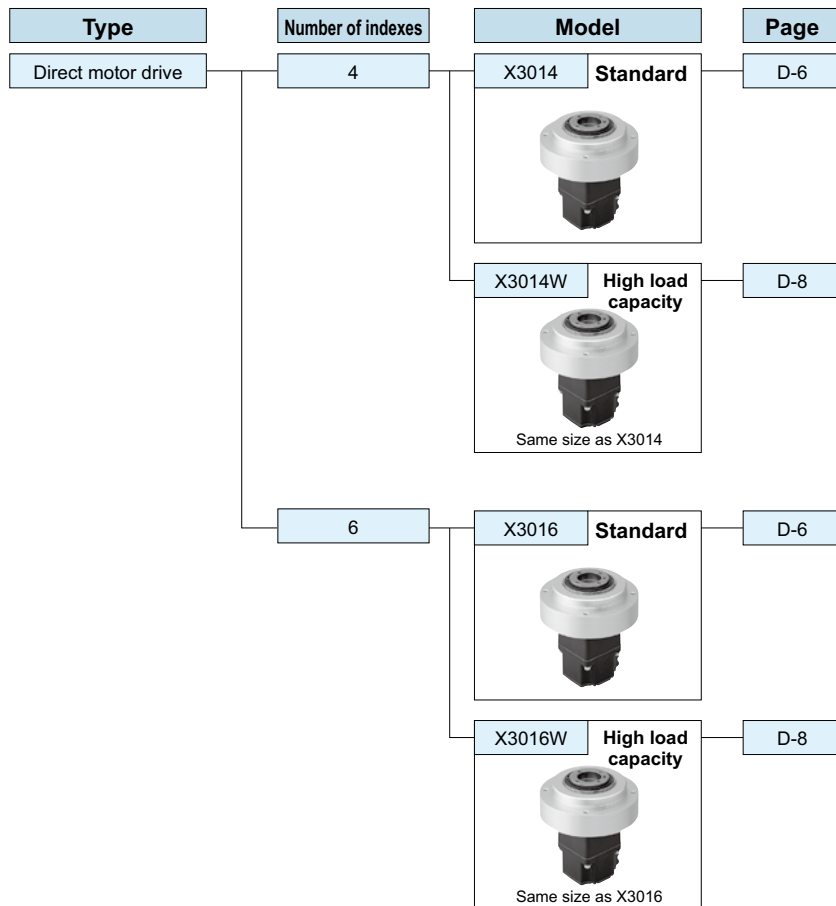
Thin-type index unit & controller

High load capacity type

Geneva gear turning index

INDEX
Thin-type index

INDEX (Thin-type index unit)

Model selection

■ **Model list**

Type	Number of indexes	Model		Page
Direct motor drive	4	X3014	**Standard**	D-6
		X3014W	**High load capacity**	D-8
			Same size as X3014	
	6	X3016	**Standard**	D-6
		X3016W	**High load capacity**	D-8
			Same size as X3016	

* For detailed specifications, see D-6 and the following pages.
* For the capacity, calculate based on Technical sheet 1 and 2 (D-16 and D-17) or input data on the Index unit page of our Website for selection.

■ Basic specifications

Number of indexes	Model No.	Indexing time (sec)	Power supply voltage	Speed control	Overload limit	Instantaneous stop	CW/CCW switching	Origin sensor
4	X3014	At least 0.5	100 VAC 200 VAC	×	×	×	×	×
4	X3014W	At least 0.5	Single phase/ three phase	×	×	×	×	×
6	X3016	At least 0.5	100 VAC 200 VAC	×	×	×	×	×
6	X3016W	At least 0.5	Single phase/ three phase	×	×	×	×	×
Remarks		*1		*1	*2			

■ Remark description

*1.   Available with speed controller (volume).

*2.   By overload protection circuit during indexing.

INDEX (Thin-type index unit)

X3014, X3016

High load capacity
X3014W, X3016W

Realizing a small footprint, energy conservation and simple control
All-in-one index unit

■ High-speed indexing

The cycle time is 0.5 to 9 sec. Accommodates high-speed automated machines. The volume of the controller allows simple speed control. A constant torque is maintained even if the speed is changed. Low-speed operation does not cause torque decrease.

■ Smooth start and stop

The internal Geneva mechanism is adopted for smooth speed shift. The shock of start and stop is minimal even in high-speed operation.

■ Limiter function

The safe design incorporates an overload protection function to prevent damage to the product even if external load is applied during indexing operation.

■ Backlashless lock

A mechanism is adopted in which locking is applied in the precompressed state at the same time as the completion of indexing. This eliminates backlash and maintains a reliable stoppage with high rigidity.

■ Compactness

The main body is thin and features a small footprint. No driving part projects beyond the main body and a small table allows tooling.
The size has been reduced in terms of the length as well by using a small and high-output motor, which contributes to size reduction of the equipment.

■ Energy conservation

Use of a brushless DC motor provides a higher efficiency than that of the inverter drive of a three-phase motor, which realizes a significant decrease in power consumption. This greatly contributes to energy conservation of the equipment.
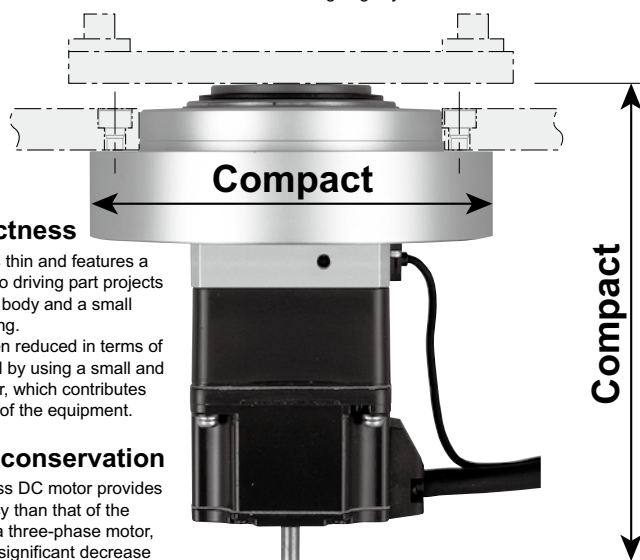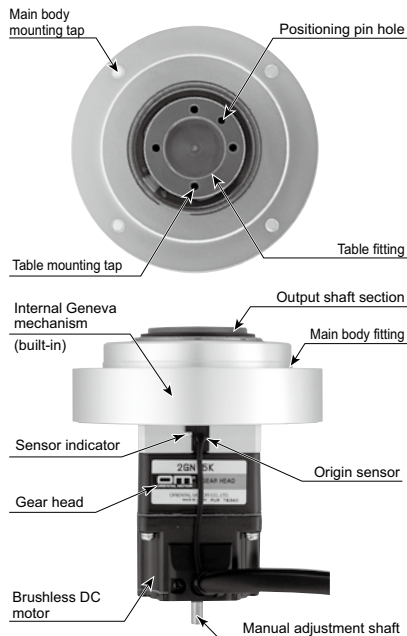
■ Easy control

The origin sensor of the input shaft allows easy control.
Change of the direction of rotation and instantaneous stop are also simple with controller signal switching.
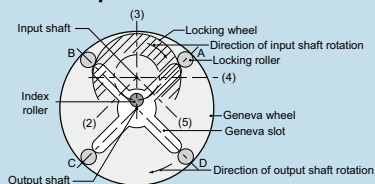
■ Manual adjustment

The shaft of the motor rear section can be rotated, which allows easy setup and maintenance.
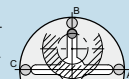
Main body mounting tap

Positioning pin hole

Table mounting tap

Table fitting

Internal Geneva mechanism
(built-in)

Output shaft section

Main body fitting

Sensor indicator

Origin sensor

Gear head

2GN5K
GEAR HEAD
ORIENTAL

Brushless DC motor

Manual adjustment shaft

Variation	
Number of indexes	Model No.
4	X3014, X3014W
6	X3016, X3016W

■ Basic operation

(3)
Input shaft
Locking wheel
Direction of input shaft rotation
Locking roller
B
A
(4)
Index roller
(2)
(5)
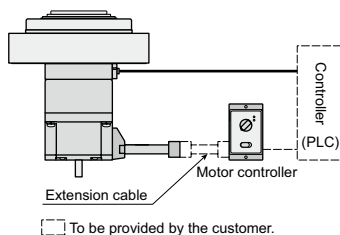Geneva wheel
Geneva slot
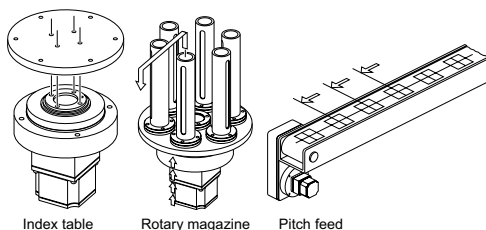C
D
Output shaft
Direction of output shaft rotation

1 The locking wheel is pinched between two locking rollers (A-B) of the Geneva wheel and the Geneva wheel is locked. This is the original position.

2 The locking wheel is rotated by 45° from the original position. Locking roller (B) is separated from the locking wheel and the Geneva wheel is released from the lock in the direction of indexing. The index roller reaches into the Geneva slot and indexing of the Geneva wheel begins.

B A

3 The locking wheel is rotated by 180°. The index roller reaches into the Geneva slot and indexing of the Geneva wheel progresses.

B
C A

4 The locking wheel is rotated by 270°. Indexing of the Geneva wheel further progresses following 3.

C B

5 The locking wheel is rotated by 315°. The index roller comes out of the Geneva slot and indexing of the Geneva wheel is completed. The locking wheel touches locking roller (B) and is pinched between two locking rollers (B-C) and locking of the Geneva wheel begins. The locking wheel further rotates to reach a point 360° from the original position, is stopped in the state described in 1 by a sensor signal and completes operation.

C B

■ Configuration

Controller
(PLC)

Extension cable

Motor controller

To be provided by the customer.

■ How to utilize

Index table

Rotary magazine

Pitch feed

INDEX (Thin-type index unit)

X3014, X3016

- This product combines a motor and index detection sensor. The combination eliminates the need for designing and building the drive and detection sections, allowing simplification of the system and cost reduction.

- A mechanism is adopted in which locking is applied in the precompressed state at the same time as the completion of indexing and the stoppage is maintained as it is.

- The internal Geneva mechanism is adopted for smooth speed shift. The shock of start and stop is minimal even in high-speed operation, offering stable indexing.

- A speed controller is supplied with the product, which allows speed control according to the specifications and conditions of the equipment.

- A simplified limiter function is provided, which protects the product from external interference during startup.

■ Variations

Model No.	Number of indexes	
	4	6
X3014	×	
X3016		×

Product number configuration

X301**4** - **A**

Model No.
4: Number of indexes 4
6: Number of indexes 6

A: 100 VAC
C: 200 VAC (single phase)
S: 200 VAC (three phase)

■ Basic specifications

Operating method	Internal Geneva type intermittent operation method
Driving method	Reduction brushless DC motor
Ambient temperature	5 to 50°C (controller: 5 to 40°C)
Lubricant	Grease filled　Non-lubrication use
Cycle time	0.5 to 9 sec (depending on load) *Note
Mass	2.5 kg
Frequency of use	Max. 120 cpm
Max. table diameter	φ270 mm

■ Power supply specifications (motor)

Model No.	X3014-A X3016-A	X3014-C X3016-C	X3014-S X3016-S
Power supply voltage	Single phase 100 to 115 VAC ±10%	Single phase 200 to 230 VAC ±10%	Three phase 200 to 230 VAC ±10%
Rated input current	0.7 A	0.4 A	0.25 A
Max. input current	1.2 A	0.8 A	0.6 A
Frequency	50/60 Hz		

2 m power cable supplied

*Note) Instantaneous stop may be necessary depending on the cycle time.
　　　For details, see "Motor connection and precautions."

*The extension cable between the motor and controller must be provided by the customer as required. (Details: D-14)
(Reference: Oriental Motor model CC01AXU 1 m)

For dimensional drawings, see D-10 and 11.

■ Input/output shaft specifications
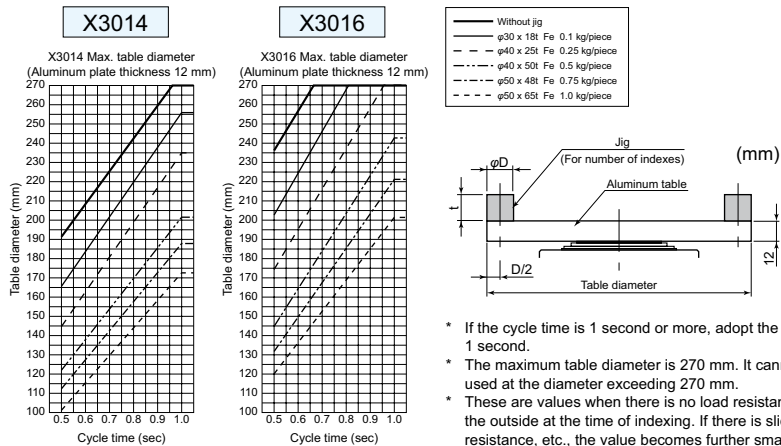
Unit of torque: N•m (kgf•cm)

Model No.	Input shaft specifications				Output shaft specifications	
	Motor	Gear head	Allowable rotating speed	Origin angle	Output shaft allowable torque	Locking torque
X3014	AXU210C-GN-K2	2GN-15K	120 rpm	80°	0.98 (10)	1.96 (20)
X3016	(Oriental Motor)				1.17 (12)	2.94 (30)
Remarks	*1			*2	*3	*4

*1. Double shaft motor (custom-made): For the motor, this model is used for all of the power supply specifications A, C and S.
*2. Origin dog angle
*3. The output shaft allowable torque is the allowable torque for indexing and is related to inertia moment and sliding torque.
*4. The locking torque is the allowable torque at the completion of indexing and a torque larger than this may cause internal damage.

■ Accuracy

Indexing accuracy (positioning accuracy)	The displacement of the angle of the output shaft angle relative to the specified angle	Within ±7 minutes
Backlash (looseness)	The difference in the forward and reverse directions when a force of 1 to 2 kg•cm is applied in the forward and reverse directions respectively and then the force is removed	Within 3 minutes
Repeat accuracy	The largest variation in the indexing accuracy of each index	Within 3 minutes
Lost motion	Deflection angle with locking torque applied	Within 15 minutes
Output shaft surface runout	Output shaft end	Within 0.02 mm

■ Cycle time and table size

X3014		X3016

X3014 Max. table diameter
(Aluminum plate thickness 12 mm)

X3016 Max. table diameter
(Aluminum plate thickness 12 mm)

Without jig
φ30 x 18t Fe 0.1 kg/piece
φ40 x 25t Fe 0.25 kg/piece
φ40 x 50t Fe 0.5 kg/piece
φ50 x 48t Fe 0.75 kg/piece
φ50 x 65t Fe 1.0 kg/piece

Table diameter (mm)
270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100
0.5 0.6 0.7 0.8 0.9 1.0
Cycle time (sec)

Table diameter (mm)
270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100
0.5 0.6 0.7 0.8 0.9 1.0
Cycle time (sec)

(mm)
φD
Jig
(For number of indexes)
Aluminum table
t
D/2
Table diameter
12

* If the cycle time is 1 second or more, adopt the value of 1 second.
* The maximum table diameter is 270 mm. It cannot be used at the diameter exceeding 270 mm.
* These are values when there is no load resistance from the outside at the time of indexing. If there is sliding resistance, etc., the value becomes further smaller.
* These are values in the case of horizontal operation (table top facing upward).
* When the iron table is used, the cycle time is selected for the plate thickness 4 mm.

INDEX (Thin-type index unit)

X3014W, X3016W *High load capacity type*

- This model has the conveying performance improved from X3014 and X3016 by revising their internal structures.
  A higher speed and higher load capacity have been realized with the characteristics and dimensions of the existing models maintained.

	Output shaft allowable torque
X3014	0.98N•m
X3014W	⬇ 1.96N•m
X3016	1.17N•m
X3016W	⬇ 2.35N•m

■ Variations

Model No.	Number of indexes	
	4	6
X3014W	×	
X3016W		×

Product number configuration

$$X3014\ W - A$$

Model No.

4: Number of indexes 4
6: Number of indexes 6

A: 100 VAC
C: 200 VAC (single phase)
S: 200 VAC (three phase)

■ Basic specifications

Operating method	Internal Geneva type intermittent operation method
Driving method	Reduction brushless DC motor
Ambient temperature	5 to 50°C (controller: 5 to 40°C)
Lubricant	Grease filled Non-lubrication use
Cycle time	0.5 to 9 sec (depending on load) *Note
Mass	2.5 kg
Frequency of use	Max. 120 cpm
Max. table diameter	ϕ500 mm

■ Power supply specifications (motor)

Model No.	X3014W-A X3016W-A	X3014W-C X3016W-C	X3014W-S X3016W-S
Power supply voltage	Single phase 100 to 115 VAC ±10%	Single phase 200 to 230 VAC ±10%	Three phase 200 to 230 VAC ±10%
Rated input current	0.7 A	0.4 A	0.25 A
Max. input current	1.2 A	0.8 A	0.6 A
Frequency	50/60 Hz		

2 m power cable supplied

*Note) Instantaneous stop may be necessary depending on the cycle time.
For details, see "Motor connection and precautions."

*The extension cable between the motor and controller must be provided by the customer as required. (Details: D-14)
(Reference: Oriental Motor model CC01AXU 1 m)

For dimensional drawings, see D-10 and 11.

■ Input/output shaft specifications

Unit of torque: N•m (kgf•cm)

Model No.	Input shaft specifications				Output shaft specifications	
	Motor	Gear head	Allowable rotating speed	Origin angle	Output shaft allowable torque	Locking torque
X3014W	AXU210C-GN-K2	2GN-15K	120 rpm	80°	1.96 (20)	3.675 (37.5)
X3016W	(Oriental Motor)				2.35 (24)	4.7 (48)
Remarks	*1			*2	*3	*4

*1. Double shaft motor (custom-made): For the motor, this model is used for all of the power supply specifications A, C and S.
*2. Origin dog angle
*3. The output shaft allowable torque is the allowable torque for indexing and is related to inertia moment and sliding torque.
*4. The locking torque is the allowable torque at the completion of indexing and a torque larger than this may cause internal damage.

■ Accuracy

Indexing accuracy (positioning accuracy)	The displacement of the angle of the output shaft angle relative to the specified angle	Within ±7 minutes
Backlash (looseness)	The difference in the forward and reverse directions when a force of 1 to 2 kg•cm is applied in the forward and reverse directions respectively and then the force is removed	Within 3 minutes
Repeat accuracy	The largest variation in the indexing accuracy of each index	Within 3 minutes
Lost motion	Deflection angle with locking torque applied	Within 15 minutes
Output shaft surface runout	Output shaft end	Within 0.02 mm

■ Cycle time and table size

X3014W

X3016W

X3014W Max. table diameter
(Aluminum plate thickness 12 mm)

X3016W Max. table diameter
(Aluminum plate thickness 12 mm)

Without jig
φ30 x 18t Fe 0.1 kg/piece
φ40 x 25t Fe 0.25 kg/piece
φ40 x 50t Fe 0.5 kg/piece
φ50 x 48t Fe 0.75 kg/piece
φ50 x 65t Fe 1.0 kg/piece

(mm)

Jig
(For number of indexes)

Aluminum table

φD

D/2

Table diameter

12

*   The maximum table diameter is 500 mm. It cannot be used at the diameter exceeding 500 mm.
*   These are values when there is no load resistance from the outside at the time of indexing. If there is sliding resistance, etc., the value becomes further smaller.
*   These are values in the case of horizontal operation (table top facing upward).
*   When the iron table is used, the cycle time is selected for the plate thickness 4 mm.

X3014, X3016   X3014W, X3016W

■ Allowable load and moment

F1

F1: Overhung
F2: Thrust load

M1 F2
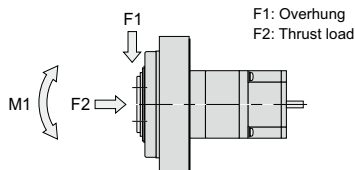
Max. allowable load (N)		Allowable moment load (N•m)
F1	F2	M1
147	245	5

■ Sensor specifications NPN Type

Sensor specifications	Photomicrosensor
Sensor type	PM-R24
Manufacturer	SUNX
Power supply voltage	5 to 24 VDC ±10% [Ripple (P-P) 10% or less]
Power consumption	15 mA or smaller

* The sensor must be connected to a controller such as a PLC provided by the customer. The controller supplied with the product is exclusively for the motor and no sensor can be connected.

■ Dimensional drawing   (mm)

X3014, X3014W
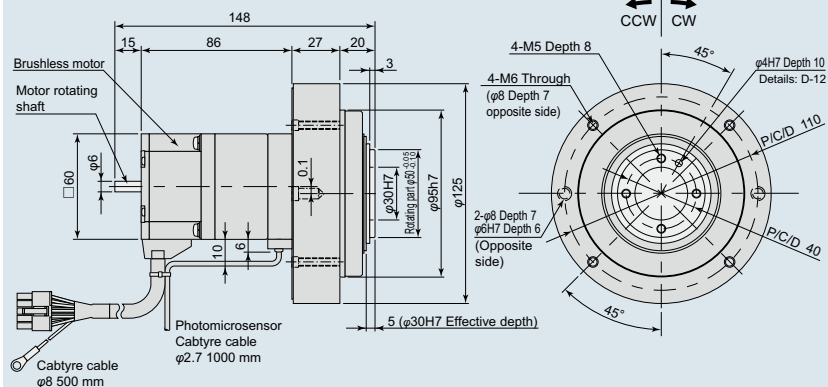
■ Dimensional drawing (mm)

X3016, X3016W

	e1
X3016	4
X3016W	2.5

CCW **CW**

Brushless motor
Motor rotating shaft

4-M5 Depth 8
4-M6 Through (φ8 Depth 7 opposite side)
φ4H7 Depth 10 Details: D-12
2-φ8 Depth 7 φ6H7 Depth 6 (Opposite side)

P/C/D 110
P/C/D 40

Photomicrosensor Cabtyre cable φ2.7 1000 mm
Cabtyre cable φ8 500 mm

φ30H7 Rotating part φ50 φ95h7 φ125

5 (φ30H7 Effective depth)

(mm)

Motor controller

113.5 max.
102.5

Speed controller
RUN/STAND-BY Switch
2-φ4.5 hole

Angle hole
81 90
2-M4 or 2-φ4.5
53

Controller mounting panel machining drawing

*The extension cable between the motor and controller (Oriental Motor) must be provided by the customer.
(See description of motor on D-14 for details.)

INDEX (Thin-type index unit)

X3014, X3016   X3014W, X3016W

■ Mounting precautions

● Since the part D is finished to h7, install the main body by mating the spigot and socket fittings with the part F as the location face and by using four tapped holes. If it is difficult to install the main body in this direction, secure it from the motor side. The tap and pin holes are opened at the position 7 mm inside on the motor side. So take care of the length. When the pin holes are used, use the diamond pin for one of these holes.

(mm)
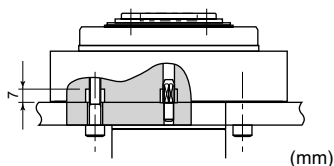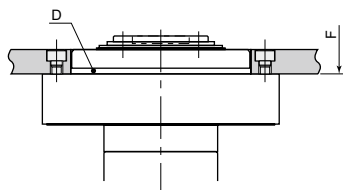
* The positional relation between the main body positioning hole (φ6H7) and the output shaft positioning hole may have a variation for the indexing accuracy.
Give consideration to the peripheral design to allow position adjustment with the table or the surrounding units.

● Secure the table onto the end of the output shaft using the screw. The fitting part of 30 mm diameter is chamfered to C0.5. Install the table side at R0.3 or less. For positioning in the direction of rotation, use the knock pin (h7) and insert it through the output shaft into the slotted hole opened in the table.
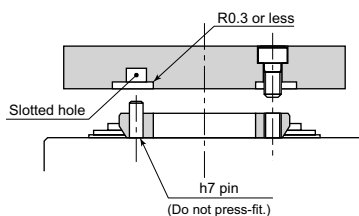
● When mounting the product by using the motor mounting face, use sufficient caution because the origin sensor projects out of the motor.

(mm)
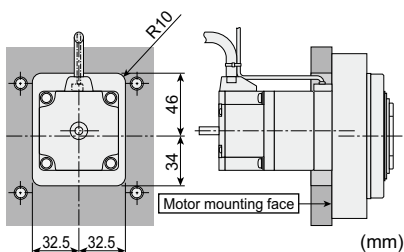
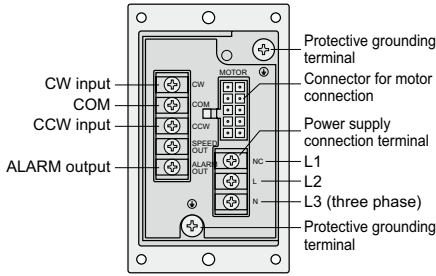● The sensor indicator light is located as shown in the drawing below.
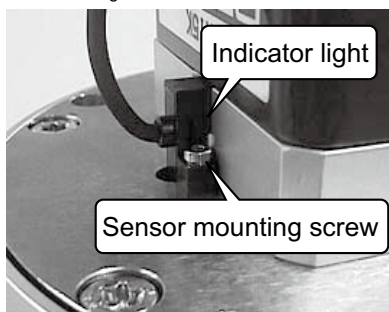
■ Handling precautions

- The output shaft backlash is eliminated by precompression at the time of motor assembly. Never remove the motor and housing mounting screws.

- The mechanism performs indexing. Avoid sudden stop during rotation of the output shaft except when it is unavoidable in emergency.

- Make sure that the load capacity of the output shaft mounting part is within the output shaft allowable torque.

- The overhung load and thrust load may have a significant impact on the bearing life and shaft strength. Make sure that they do not exceed the allowable values.

- Use caution so that the rotational load applied from the outside does not exceed the locking torque. Failure to do so may lead to internal damage because no limiter function after completion of indexing is provided.

- Ensure interlock with other devices to prevent interference.

- Use in oscillating motion reduces the guaranteed life by 1/2.

- The motor is provided with the following protection functions. When any of the protection functions is activated, an alarm signal is output and the motor is brought to a natural stop. To reset, turn off the power for 10 sec and eliminate the cause.

  · Overload protection function: when a load exceeding the rated torque has been applied to the motor for more than 5 sec
  · Overvoltage protection function: when the voltage applied to the controller has exceeded 115 VAC or 230 VAC by 20% or more
  · Open-phase protection function: when the sensor wire in the motor cable is broken during operation
  · Undervoltage protection function: when the voltage applied to the controller has fallen below 100 VAC or 200 VAC by 30% or more
  · Overspeed protection function: when the rotating speed has increased abnormally to significantly exceed the rated rotating speed of the motor

- The overload protection function of the motor is intended for preventing damage to the inside of the product in the event of interference during indexing. The torque cannot be adjusted.

- When the alarm function of the motor is activated, the motor runs free. During indexing, the output shaft may rotate due to the table balance or external load.

- When the protection function of the motor has been activated, turn off the power for 10 sec to reset.
  *The RUN/STAND-BY switch is not a power on/off switch.

- When the instantaneous stop circuit is used, a stop time of 0.5 sec is required.

- Do not operate at a shorter time than the designed cycle time. Excessive speed-up may lead to reduction of product life. Use within the specifications.

- Contact us for any questions about the motor specifications.

- Before indexing, be sure to secure the workpiece by putting it into a jig or other means. Failure to do so may lead to damage due to workpiece displacement or interference.

- Modifying the product may significantly affect the performance and life. Never modify the product.

- Before use, read and understand the instruction manual for correct use.

INDEX (Thin-type index unit)

X3014, X3016   X3014W, X3016W

■ Motor connection and precautions

CW input
COM
CCW input
ALARM output

MOTOR
CW
COM
CCW
SPEED OUT
ALARM OUT
NC
L
N

Protective grounding terminal
Connector for motor connection
Power supply connection terminal
L1
L2
L3 (three phase)
Protective grounding terminal

Controller rear side

● For extension between the motor and controller, a dedicated extension cable (Oriental Motor) must be provided by the customer.
→Reference: Oriental Motor model CC01AXU 1 m
CC02AXU 2 m
CC03AXU 3 m
CC05AXU 5 m
CC10AXU 10 m

● Contact us for any questions about the controller specifications.

● Connect the power cable supplied with the product to the power supply connection terminal of the controller.

● Input circuit input signal: photocoupler input
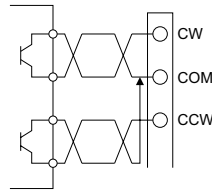Input resistance 2 kΩ   Driven by internal power supply

◇ Input circuit

CW
CCW

2 kΩ

COM

+12 V

Reinforced insulation photocoupler
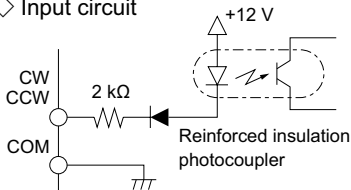
◇ Example of input circuit connection

•For small-capacity switch or relay

OFF ON   CW
COM
OFF ON   CCW
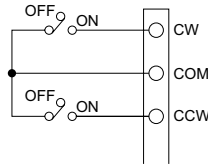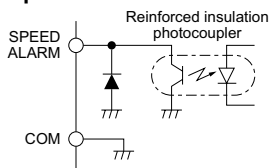
•For controller with transistor output

CW
COM
CCW

* For the relay, use a small-capacity contact type relay capable of switching 12 VDC 5 mA.

* The output shaft rotates clockwise when the CW input is turned on. The output shaft stops when the CW input is turned off. (Same for CCW)

* The motor is brought to an instantaneous stop when the CW input and CCW input are turned on simultaneously. (At least 0.5 sec is required before it can be started next time.)

* Do not use an SSR (solid-state relay) for turning the power on/off.
The motor controller may be damaged.

* When using a control device integrating a clamp diode, pay attention to the order of turning the power on/off. The motor may rotate temporarily.

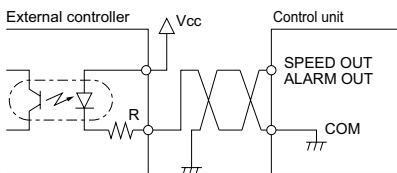* For CW and CCW signals, ensure a period of 20 ms or longer.

● Output circuit
Output signal: open collector output
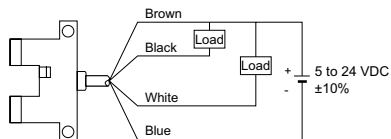External use conditions 26.4 VDC,
10 mA or smaller

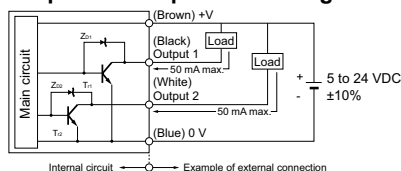◇ **Output circuit**

◇ **Example of output circuit connection**

■ Sensor connection and precautions

1. Input and output circuit diagram

Symbol ... Z_{D1}, Z_{D2}: Zener diode for absorption of surge voltage
T_{r1}, T_{r2}: NPN output transistor

Output operation

	Color of lead wire	Output operation
Output 1	Black	Turned on when light enters

*Light enters at the original position.
*Do not use the white lead.

2. Connection diagram

● The power supply reverse connection protection circuit and output short circuit protection circuit are not provided. So use added caution to make the wiring connection correctly.

● If a commercially available switching regulator is used for the power supply, be sure to ground the frame ground (F. G.) terminal.

● When a device (switching regulator, inverter motor, etc.) which could become a noise source is used near the sensor installation place, be sure to ground the frame ground (F. G.) terminal of the device.

● Avoid parallel arrangement and use of the same raceway with a high-voltage line and power line. Otherwise, malfunction may be caused due to induction.

● Avoid a transient state (50 ms) at the time of power-up.

● Take measures so that a load by bending and pulling is not applied to the sensor cord. Use caution to avoid a load to the base of the sensor cord, in particular, by securing the sensor cord or by other means.

● Keep space of at least 10 mm from the sensor end face to avoid interference between the base of the sensor cord and peripheral components.

● Be sure to insulate any unused output line.

● The controller supplied with the product is exclusively for driving the motor and is not capable of controlling any sensor. Control the sensor with your PLC or other device.

INDEX (Thin-type index unit)

Technical sheet

■ Selection of index unit

For attaining the performance of this product, read this section carefully.

First, calculate the load on the output shaft. Follow the order of steps in the description.

When the load has been determined, select a model within the output torque of the index unit to complete the selection.

《We can select a model for you. Contact us with Support sheet.》

《Assistance with calculation and selection is also provided on our Website: http://www.meg.co.jp/》

1. Find the load on the output shaft of the index unit.

The values to be calculated as the load are the accelerating torque required for indexing rotation acceleration and deceleration and load torque for friction load. For the calculation, use (kgf) for the load, (kg) for the weight and (cm) for the length as the units.

Calculation of accelerating torque (Ta)

In use with a large turntable or at a high speed, the accelerating torque may be larger than expected. For that reason, it must be calculated correctly. The accelerating torque can be determined by finding the inertia moment from the flywheel effect (GD^2) and multiplying it with the acceleration.

**Step 1**

Find the (GD^2) of the respective rotating object according to its shape. (GD^2 is simply a symbol and not a calculation expression. For the constant (density) required for weight calculation, use the following values.

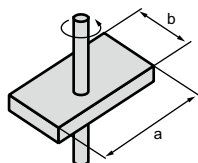|	
Iron	ρ = 7.9 x 10^{-3} (kg/cm^3)
Aluminum	ρ = 2.8 x 10^{-3} (kg/cm^3)
Brass	ρ = 8.5 x 10^{-3} (kg/cm^3)
Nylon	ρ = 1.1 x 10^{-3} (kg/cm^3)

► Center of load coaxial with axis of rotation
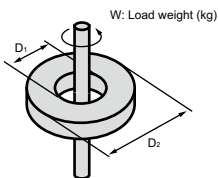
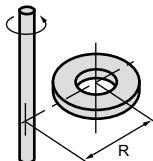W: Load weight (kg)

$$GD^2 = \frac{1}{2} W (D_1^2 + D_2^2)$$
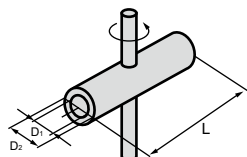
$$GD^2 = W \left[\frac{1}{4} (D_1^2 + D_2^2) + \frac{1}{3} L^2 \right]$$

$$GD^2 = \frac{1}{3} W (a^2 + b^2)$$

► Center of load not aligned with axis of rotation
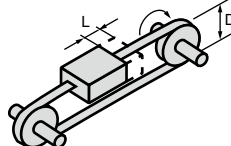The figure shows an example with a cylindrical shape.

$$GD^2 = [GD_0^2] + 4WR^2$$

GD_0^2: GD^2 with center of load coaxial with axis of rotation
W: Load weight (kg)
R: Distance between center of load and center of axis of rotation (cm)
► Linearly moving load
The value is GD_2 on the axis of rotation (equivalent GD_2).

$$GD^2 = WD^2 = W \left[\frac{L}{\pi} \right]^2$$
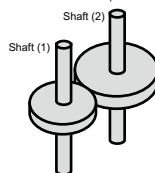
W: Load weight (kg)
For screw feed, substitute the screw pitch (cm/rev) for L.

Step 2

Add up the GD^2 for the coaxial axes of rotation to find the sum total.
If any relief is made due to the shape of the load, find GD^2 with the shape of the relief and subtract the value as the negative load.

Step 3

Convert to equivalent GD^2 on the drive shaft (output shaft of the index unit).

Shaft (2)

Shaft (1)

► To determine GD^2 of shaft (2) as equivalent GD^2 of shaft (1)

$$GD^2 = GD_2^2 \times \left[\frac{N_2}{N_1} \right]^2$$

GD_1^2: Equivalent GD^2 when GD_2^2 of shaft (2) is replaced with shaft (1)
GD_2^2: GD^2 of shaft (2)
N_1: Rotating speed (rpm) of shaft (1): For selecting a motor, replace N_1 value with the rotating speed of the motor shaft for calculation.
N_2: Rotating speed (rpm) of shaft (2)

The sum total of the GD^2 for all axes of rotation converted to equivalent GD^2 on the drive shaft is the GD value on the drive shaft. Also add GD^2 on the output shaft of the index unit.

Step 4

Find the inertia moment (I) from the GD^2 in the drive section.

$$I = \frac{GD^2}{4g}$$

I: Inertia moment (kgf•cm•sec^2)
g: Gravitational acceleration 980.7 (cm•sec^2)

Step 5

Determine the angular acceleration (ω) of the drive shaft.
For index unit standard products, determine from the values in the table. For X3014 and X3016, adopt the value of 1 sec if the cycle time is 1.0 sec or longer.

$$\omega = Am\left[\frac{\pi}{450}\frac{SN^2}{(S+2)^2}\right]$$

ω: Angular acceleration (Rad/sec^2)
Am: Acceleration coefficient by indexing
    Am = 14.137 (4 indexes)
    Am = 9.674 (6 indexes)
S: Number of indexes
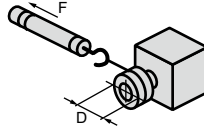N: Rotating speed of input shaft (rpm)

Step 6

Determine the accelerating torque (Ta) from the inertia moment (I) and angular acceleration (ω).

$$Ta = I\omega$$

Ta: Accelerating torque on output shaft (kg•cm)
  I: Sum total of inertia moments on output shaft (kgf•cm•sec^2)
  ω: Max. angular acceleration of output shaft (Rad/sec^2)
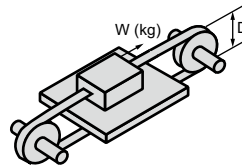
Calculation of load torque (TL)

► Rotating load

$$TL = \frac{FD}{2}\ \text{(kgf•cm)}$$

F: Force at start of shaft rotation (kgf)

► Linearly moving load

$$TL = \frac{\mu WD}{2}\ \text{(kgf•cm)}$$

W: Load weight (kg)
μ: Friction coefficient

Calculation of required torque (T) on output shaft

Calculate the required torque for rotating the output shaft based on the accelerating torque (Ta) and load torque (TL).

$$T = (Ta + TL) \times Sa\ \text{(kgf•cm)}$$

The factor (Sa) in the calculation expression is a safety factor given in view of the accuracy of load calculation and secular change.

Mounting direction	Sa
Horizontal	1.2
Vertical	1.5

2. Select the index unit.

See if the load capacity determined by the calculation is within the allowable torque range of the output shaft of the index unit to complete the selection.

Index unit output shaft GD^2, allowable torque and angular acceleration (ω)									
Model No.	Number of indexes	GD^2 (kg•cm^2)	Output shaft allowable torque (kg•cm)	Angular acceleration (ω)					
				Cycle time (sec)					
				0.5	0.6	0.7	0.8	0.9	1.0
X3014	4	18	10	157.9	109.7	85.7	61.7	48.8	39.5
X3014W	4	18	20	157.9	109.7	85.7	61.7	48.8	39.5
X3016	6	18	12	91.2	63.3	46.5	35.6	28.1	22.8
X3016W	6	18	24	91.2	63.3	46.5	35.6	28.1	22.8

Applications

1. Restriction of applications

This INDEX (thin-type index unit) is a motor-driven index unit with an internal Geneva indexing mechanism and intended to serve as a device for intermittent indexing.

2. Safety precautions

⚠ DANGER

- Do not use the product for the following applications.
  1. Medical devices related to the support and maintenance of human life and body
  2. Mechanisms and machinery used for the purpose of moving and transporting people
  3. Important security components of machinery
     This product is not developed or designed for applications that require a high degree of safety. Use of this product for such applications may cause death.

- Do not use the product in a place where hazardous substances such as combustible or flammable substances exist.
  There is a possibility of the product catching fire.

- Never modify the product. Doing so may cause injury due to abnormal operation, electric shock, fire, etc.

- Do not perform improper disassembly/ assembly that affects the product's basic structure, performance, or functions.

- Do not pour water on the product. Pouring water on the product, washing it or using it immersed in water may cause injury due to abnormal operation, electric shock, fire, etc.

⚠ WARNING

- Be sure to confirm the safety of the operating range of devices before supplying power to and operating the product. If the power is supplied improperly, there is a risk of electric shock and injury caused by contact with a movable part.

- Keep away from the operating range of machinery when a product is in operation or ready to operate. Failure to do so may result in injury due to unexpected operation of the product.

- Do not touch the terminal blocks or switches while the power is turned on. There is a risk of abnormal operation and electric shock.

- Do not damage any of the cables. Damaging, forcibly bending, pulling, winding or pinching cables, placing heavy objects on them may cause electric shock, abnormal operation, etc.

- Do not get on top of the product, use it as a foothold or put any object on it. It may cause an accidental fall, tumbling of the product, injury due to a fall, damage to the product or malfunction due to damage.

- Do not throw the product into the fire. The product may explode or poisonous gases may be discharged.

- Be sure to completely remove the supply of electricity before performing various tasks such as maintenance, inspection, service, or replacement.

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⚠ CAUTION

- When mounting the product, ensure reliable retention and securing. Otherwise, fall or abnormal operation of the product may cause injury.

- Do not use this product in places subjected to direct sunlight (ultraviolet light) or dust, iron, iron powder, or in an atmosphere containing organic solvent, phosphate-ester hydraulic oil, sulphurous acid gas, chlorine gas, acids, etc. The product may stop functioning in a short period of time, or the performance may be deteriorated and the lifetime of the product may be significantly reduced.

</div>

- Use protective covers to prevent the moving parts of machinery from coming in direct contact with human body.

- When working on the product, ensure safety by wearing protective gloves, safety glasses, safety shoes, etc. as required.

- When the product has become unserviceable or unnecessary, dispose of it properly as industrial waste.

- As you incorporate the products into your system, add all safety information to the instruction manual of your system and make sure the operators of the system follow the instructions.
  Be sure to add to the instruction manual all new safety information that needs to be provided as a result of the incorporation.

3. Design precautions

- The range for use as an index table is φ270 mm for X3014 and X3016. φ500 mm for X3014W and X3016W.

- Be sure to use the Technical sheet (D-16) for selection of the equipment.

* We can select a model for you. Fill in the Technical support sheet (H-8) with specifications required and send it to our sales representative.

- Use within the allowable torque range. Exceeding the specification limits may not only lead to reduced life but also damage to the internal mechanism.

- After an instantaneous stop, 0.5 sec is required before next start-up. Use caution for instantaneous forward and reverse operation, etc.

- Do not frequently stop during indexing.

- For putting a workpiece into the jig on the index by free fall, provide workpiece seating detection by using a sensor.

- For putting a workpiece into the jig on the index by feeder vibration alone, provide workpiece leading edge arrival detection by using a sensor.

- Allow a cycle time of at least 0.5 sec.

- In the press-fitting process, provide a buffer to prevent any load from being applied on the index table.

- Provide interlock with peripheral devices.

- When using as a magazine index, a tall magazine may cause unexpected load to be applied to the product because of moment load. Use sufficient caution.

- When the driven shaft is arrested in the radial direction, use an eccentric/deflection angle coupling or belt for linking.

- Do not use the product in a place subject to strong vibration or shock.