Orientalmotor

FEATURES

Stepping Motor and Driver Package αSTEP

High-Efficiency AR Series AC Input

NEUGART

CONTENT

AR Series AC Input with newly released Built-In Controller Type

Features of the AR Series

- Adopting Oriental Motor's Original Closed Loop Control
- Lower Heat Generation
- High Precision Positioning with Compact High-Torque Motors

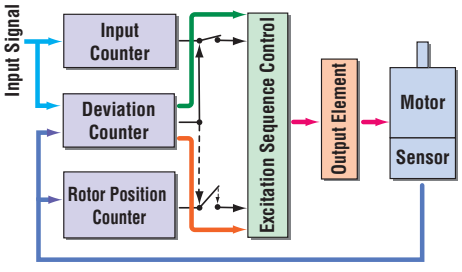
NEW Features of the Built-In Controller Type

- Necessary Operation Information is Built into the Driver
  - Return-to-Home Operation
  - Positioning Operation
  - Continuous Operation
  - JOG Operation, Automatic Return Operation
- Connection to Superior System
  - I/O Control
  - Modbus (RTU) Control

Adopting Oriental Motor's Original Closed Loop Control

◇Maintains Operation Even During Abrupt Load Fluctuations and Accelerations.

The **AR** Series uses our closed loop control to maintain positioning operation even during abrupt load fluctuations and accelerations. The rotor position detection sensor monitors the rotation.
When an overload condition is detected, the **AR** Series will instantaneously regain control using the closed loop mode.



●Alarm Signal Output in Case of Abnormality

If an overload is applied continuously, an alarm signal is output. When the positioning is complete, an END signal is output. This ensures the same level of reliability achieved by a servo motor.

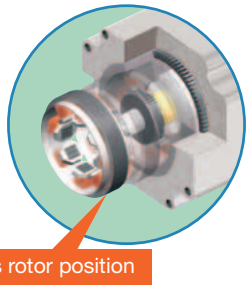
Normal (Positioning deviation is less than ±1.8°)
Motor runs in open loop mode like a stepping motor.

During Overload Condition (Positioning deviation is ±1.8° or more)
The closed loop mode is engaged to maintain the positioning operation.

◇Rotor Position Detection Sensor

The rotor position detection sensor uses the change in inductance caused by change in the distance between the stator teeth and the teeth on the sensor rotor to detect rotor position.

- This structure can be made small and thin, so the overall size of the motor can be reduced.
- High resolution
- This structure does not use electronic parts, so it is not affected by heat or vibration.

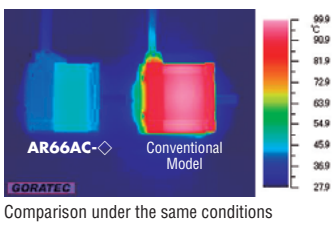


Continuous Operation is Achieved Due to the Reduction of Motor Heat Generation by Utilizing High-Efficiency Technology

◇Lower Heat Generation

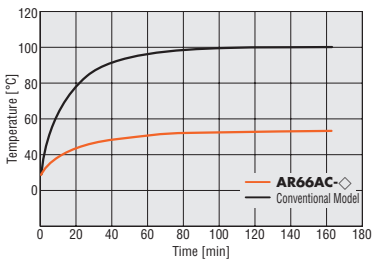
The **AR** Series utilizes high-efficiency technology to achieve a significant reduction in the amount of heat generated from the motor.

●Temperature Distribution by Thermography



Comparison under the same conditions

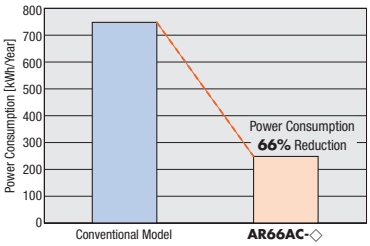
●Motor Case Temperature under Same Operating Conditions



◇Energy-Saving

Power consumption: up to **66**% less than a conventional model

●Power Consumption



CO_2 emission: up to **66**% less* than a conventional model

* Operating Condition
Speed: 1000 r/min, Load Factor: 50%
Operating Time: 24 hours of operation (70% operating, 25% standing by, 5% standstill), 365 days/year

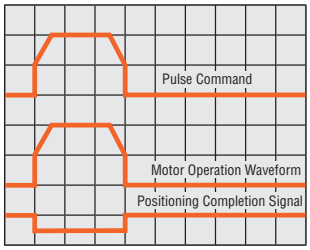
Beneficial Features of a Stepping Motor

◇User-Friendly and Easy, Highly Accurate Positioning

Stepping motors provide convenient means to ensure highly accurate positioning because they synchronize themselves with commands without requiring feedback.

◇High Response

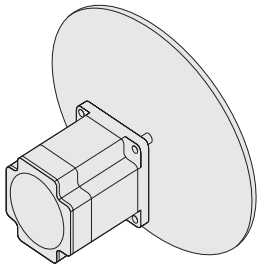
The motor operates synchronously with pulse commands to achieve high response. There's no delay in operation following a pulse command.



●Capable of Driving Large Inertial Loads

Stepping motors can drive larger inertial loads than servo motors of equivalent frame sizes.

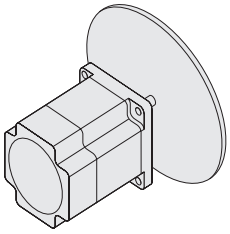
•Comparison at 30 times of the rotor inertia



AR Series

Load Inertia 22.4×10^{-4} kg·m^2
(30 times the rotor inertial moment)

Load Inertia: Diameter: 169 mm,
Thickness: 10 mm,
Material: Aluminum
Motor: Frame size 60 mm
Length 90 mm



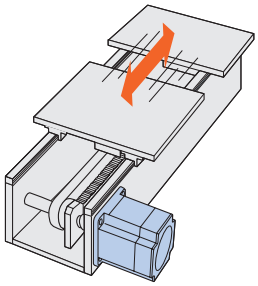
Conventional Servo Motor

Load Inertia 4.0×10^{-4} kg·m^2
(30 times the rotor inertia)

Load Inertia: Diameter: 110 mm,
Thickness: 10 mm,
Material: Aluminum
Motor: Frame size 60 mm
Length 96.5 mm

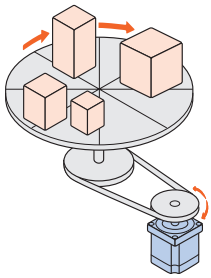
◇No Tuning

With the **AR** Series, you can perform positioning quickly after a load change, etc., without adjusting any gains.



◇No Hunting

Because it uses a stepping motor, the **AR** Series does not hunt when stopped. Accordingly, the **AR** Series is ideal for applications where the equipment uses a belt-drive mechanism or otherwise has low rigidity and you don't want it to vibrate when stopping.

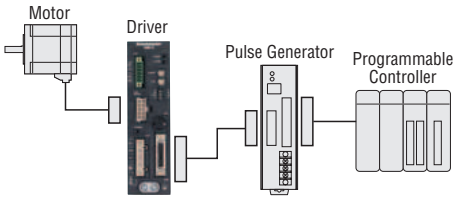


Types of Operation Systems

Stepping motor and driver packages combine a stepping motor selected from various types with a dedicated driver. In addition to the pulse input type, drivers with a built-in controller type is also available. You can select a desired combination product according to the required operation system. Different drivers are explained below by using the **AR** Series as an example.

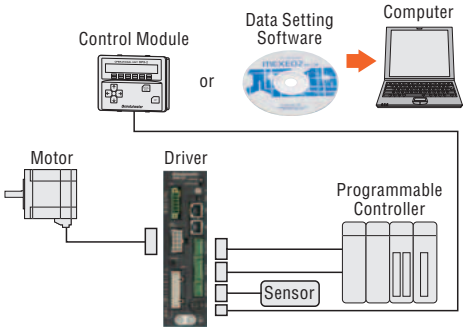
Pulse Input Packages

The motor can be controlled using a pulse generator provided by the customer. Operating data is input to the pulse generator beforehand, and you select the operating data on the programmable controller, then input the operation command.



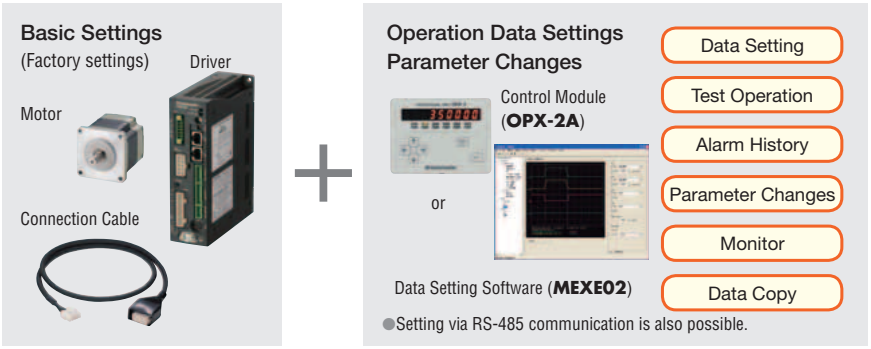
Built-In Controller Packages

A built-in pulse generator allows the motor to be driven via a directly connected programmable controller. Since no separate pulse generator is required, the drivers of this type save space.
RS-485 communication (Modbus RTU) is also available.



Built-In Controller Package

The burden on the programmable PLC is reduced because the information necessary for motor operations is built into the driver. This simplifies the system configuration for multi-axis control.
Set with control module (sold separately), data setting software, or RS-485 communication.



●Operation type

With built-in controller packages, the motor's operating speed and traveling amount are set with operating data and operations performed based on the selected operating data. The operation type is 4-pattern.

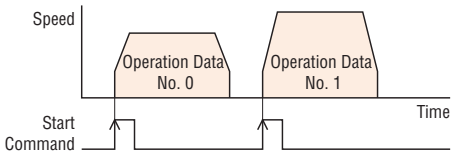
Item		Content	
Common	Control Method	I/O Control	
		RS-485 communication	Modbus RTU Protocol Connection
	Position Command Input	Set with operating data number Command range per point: −8388608～8388607 [steps] (setting unit: 1 [step])	
	Speed Command Input	Set with operating data number Command range: 0～1000000 [Hz] (setting unit: 1 [Hz])	
	Acceleration/ Deceleration Command Input	Set with operating data number or parameters. Acceleration/deceleration rate [ms/kHz] or acceleration/deceleration time [s] can be selected. Command range: 0.001～1000.000 [ms/kHz] (setting unit: 0.001 [ms/kHz]) 0.001～1000.000 [s] (setting unit: 0.001 [s])	
	Acceleration/ Deceleration Control	Velocity filter, moving average filter	
Return-To-Home Operation	Return-To-Home Method	2-sensor mode	This is the return-to-home operation using limit sensors (+LS, −LS).
		3-sensor mode	This is the return-to-home operation using limit sensors and HOME sensor.
		Pushing mode*	This is the return-to-home operation for pushing to the mechanical end of a linear slide, etc.
		Position preset	This function allows a home position to be confirmed by inputting P-PRESET using an arbitrary position.
			An arbitrary value can be set for the home position.
Positioning Operation	Number of Positioning Points	64 points (No. 0～63)	
	Operation Mode	Incremental mode (Relative positioning)	
		Absolute mode (Absolute positioning)	
	Operation Functions	One-shot operation	This is a PTP (Point to Point) positioning operation.
		Linked operation	This is a multistep speed-change positioning operation linked to operating data.
		Linked operation 2	This is a positioning operation with timer linked to operating data. The timer (dwell time) can be set in the range of 0～50.000 [s]. (Setting unit: 0.001 [s])
		Push-motion operation*	Continuous pressurizing position operations are performed with respect to load. The operating speed is maximum 30 [r/min] with the motor shaft.
	Starting Methods	Operating data selection mode	The positioning operation starts when START is input after M0～M5 has been selected.
		Direct mode (direct positioning)	The positioning operation starts with the operating data number that was set with the parameters when MS0～MS5 has been input.
		Sequential mode (sequential positioning)	The positioning operation starts in order from operating data No. 0 every time SSTART is input.
Continuous Operation	Number of Speed Points	64 points (No. 0～63)	
	Speed-Change Method	This switches the operating data number.	
Other Operations	JOG Operation	+JOG or −JOG is input, and regular feeding is performed.	
	Automatic Return Operation	This automatically returns to the original stopped position when the motor has become misaligned due to an external force during non-excitation.	

*Do not perform push-motion operations with geared types. Doing so will damage the motor and gearhead.

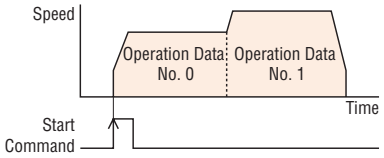
Positioning Operation

Operation Function

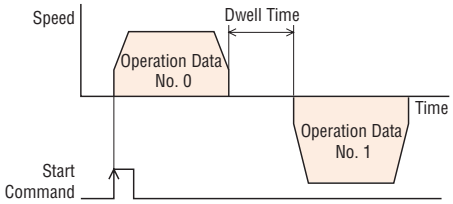
●One-Shot Operation



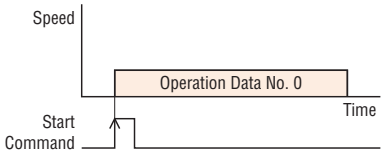
●Linked Operation



●Linked Operation 2



●Push-Motion Operation



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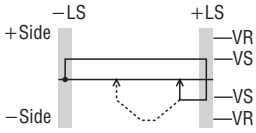
Start Method

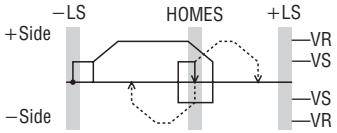
●Data-Select Positioning
●Direct Positioning
●Sequential Positioning

Return-To-Home Operation

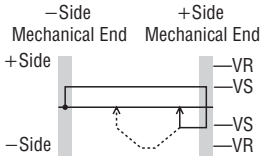
●2-Sensor Mode



●3-Sensor Mode

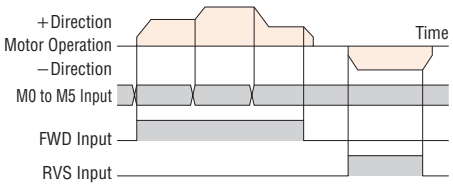


●Push-Motion Mode



●Position Preset

Continuous Operation



Other Operations

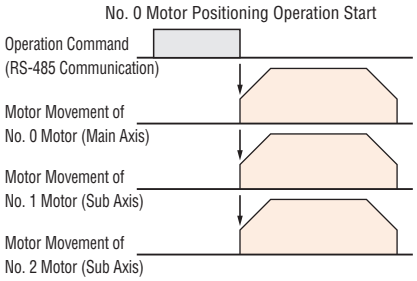
●JOG Operation (Test Operation)

●Automatic Return

●This comes with the return-to-home operation sequence installed, so the burden on the programmable master is reduced and there is no need to create a ladder.

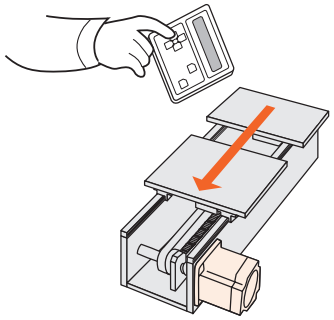
Group Sending Function (Via RS-485 communication)

Groups can be configured with multiple axes connected via RS-485 communication, and commands sent for each group. Multi-axis simultaneous starting and identical operations are also possible.



Teaching Function

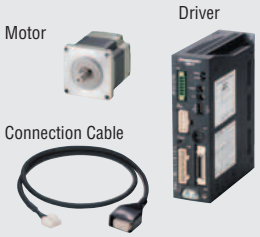
Teaching can be done using the control module **OPX-2A** (sold separately) or data setting software **MEXE02**. The table is moved to the desired position, and the position data at that time stored as the positioning data.



Pulse Input Package

By using the data setting software and control module, sold separately, parameters can be changed, the alarm history displayed, and each monitor handled according to your demands.

Basic Settings
(Factory settings)



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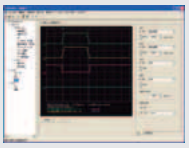
Extended Settings

Control Module (**OPX-2A**)

or



Data Setting Software (**MEXE02**)

- Push-Motion Operation
- Test Operation
- Alarm History
- Parameter Changes
- Monitor
- Data Copy

Main Additional Functions from Extended Settings

Item	Overview	Basic Settings	Extended Settings
Pulse Input Mode Selection	1-pulse input mode or 2-pulse input mode (negative logic) can be selected.	●	●
	Beyond the normal settings, the phase difference input can also be set. • 1-pulse mode (positive logic/negative logic) • 2-pulse mode (positive logic/negative logic) • Phase difference input (1×/2×/4×)	–	●
Resolution Setting	The resolution can be selected with a function switch (D0, D1, CS0, CS1).	●	●
	The value of the electronic gears corresponding to each function switch (D0, D1, CS0, CS1) can be changed.	–	●
Running Current Setting	The running current setting can be changed with the current setting switch (CURRENT).	●	●
	The value corresponding to each stage of the current setting switch (CURRENT), 0～F (16 stages), can be changed.	–	●
Standstill Current Ratio Setting	The ratio of the standstill current with respect to the running current can be set.	–	●
Motor Rotation Coordinate Setting	The motor's rotation coordinate can be set.	–	●
All Windings On Signal (C-ON input)	This is the input signal for exciting the motor.	●	●
	The logic of the C-ON input during power supply input can be set.	–	●
Excitation Position Return-To-Home Operation when All Windings are On Enabled/Disabled	Whether or not an operation to return to the excitation position (deviation 0 position) is performed when all windings are on can be set.	–	●
I/O Input Signal Mode Selection	Input when a push-motion operation is performed.	–	●
Alarm Code Signal Enabled/Disabled	Set when code output is desired when an alarm has occurred.	–	●
END Signal Output Width Setting	The END signal output width can be changed.	–	●
END Signal Output Offset	The END signal output value can be offset.	–	●
A/B Phase Output	This can be used to confirm the position of the motor.	●	●
Timing Signal Output	This is output every time the motor rotates 7.2°.	●	●
Velocity Filter Setting	This places a filter on the operation command and suppresses motor behavior.	●	●
	The value corresponding to each stage of the setting switch, 0～F (16 stages), can be changed.	–	●
Vibration Suppression Function for Normal Mode	This can be set to suppress resonance vibration during rotation.	–	●
	This can be set to suppress vibration during acceleration and deceleration, and when stopped.	–	●
Gain Adjustment for Current Control Mode*	This adjusts the position/speed loop gain.	–	●
	This adjusts the constant during velocity integration.	–	●
	This sets the damping control vibration frequency.	–	●
	This sets the damping control as enabled/disabled.	–	●
Motor Excitation Position Selection When Power is On	The motor excitation position when the power is on can be selected.	–	●
Control Module Settings	Whether the speed display of the control module is signed or an absolute value can be selected.	–	●
	The geared motor gear ratio for the speed monitor can be set.	–	●

*Oriental Motor recommends using normal mode unless you want to further reduce heat generation and noise.

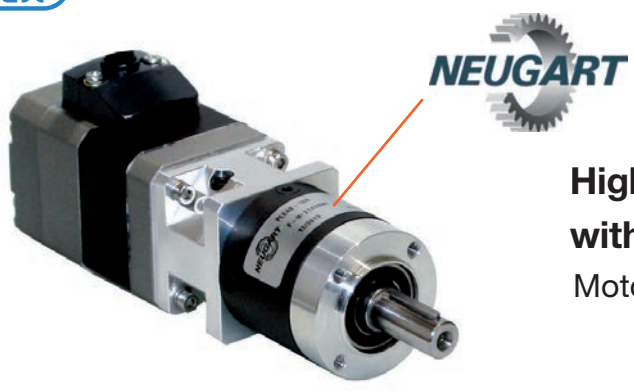
Oriental motor

NEW PRODUCTS

Stepper Motor and Driver Package αSTEP

AR Series

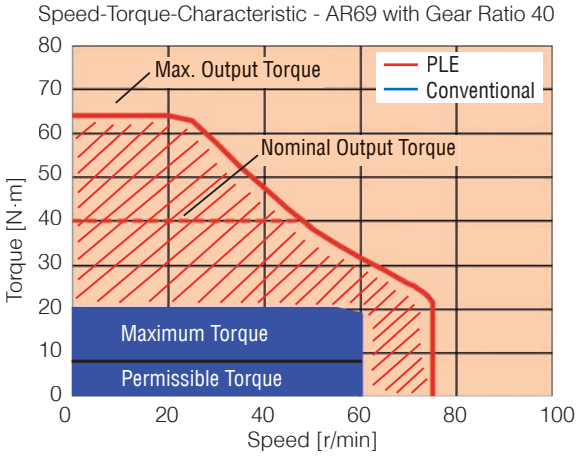
FLEX



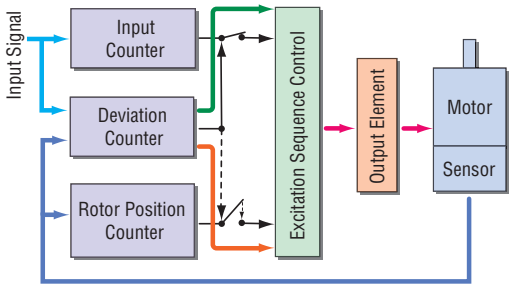
High-Efficiency Closed Loop Combination with Neugart PLE Planetary Gearhead

Motor and gearhead are delivered pre-assembled.

● High output torque



● Closed Loop Control



Normal (Positioning deviation is less than ± 1.8°)

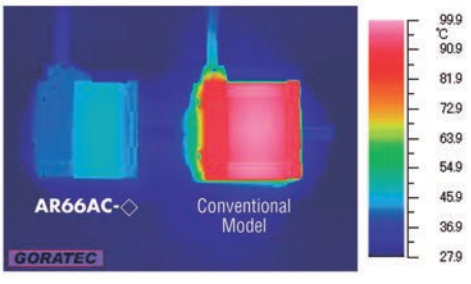
Motor runs in open loop mode like a stepper motor.

During Overload Condition (Positioning deviation is ± 1.8° or more)

The closed loop mode is engaged to maintain the positioning operation.

● Lower Heat Generation

Temperature Distribution by Thermography



Comparison under the same conditions

● No Tuning

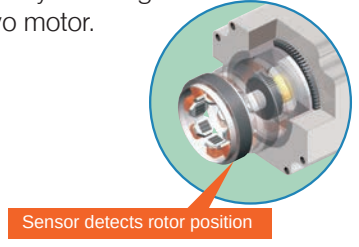
You can perform positioning quickly after a load change, etc., without adjusting any gains.

● No Hunting

Because it uses a stepper motor, the AR Series does not hunt when stopped.

● Rotor Position Detection Sensor

The reliability is as high as a servo motor.



● Driver Type: - Built-In Controller Type FLEX
- Pulse Input Type

FLEX What is FLEX?

FLEX is a collective name for products that support Industrial Network control via I/O control, Modbus (RTU) control, and network converters. These products enable simple connection and simple control, shortening the total lead time for system configuration.

Product Number Code

AR 69 A C D -1- PLE 60 -10

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①	Series Name	**AR**: **AR** Series
②	Motor Frame Size	**46**: □42 mm **69**: □60 mm **911**: □85 mm
③	Motor Type	**A**: Standard (Single shaft)
④	Power Supply Voltage	**C**: Single-Phase 200-240 VAC
⑤	Driver Type	**D**: Built-In Controller Package Blank: Pulse Input Package
⑥	Cable length (Included)	**1**: 1 m **2**: 2 m **3**: 3 m
⑦	Gear Series Name	**PLE**: **PLE** Series
⑧	Gear Size	**40**: Ø40 mm **60**: Ø60 mm **80**: Ø80 mm
⑨	Gear Ratio	5, 10, 20, 40

AR46

AR69

AR911

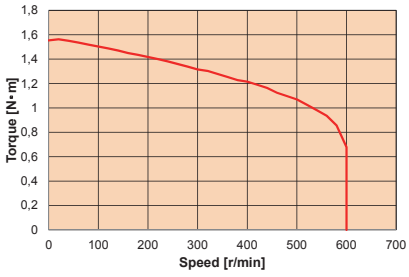
Specifications of the PLE Gearhead

Type	PLE40 (1)				PLE60 (1)				PLE80 (1)			
Stage	1		2		1		2		1		2	
Reduction ratio	5	10	20	40	5	10	20	40	5	10	20	40
Backlash [arc min]	15		19		10		12		7		9	
Nominal output torque [Nm] (2)(3)	14	5	20	18	40	15	44	40	110	38	120	110
Max. output torque [Nm] (2)(3)(4)	22	8	32	29	64	24	70	64	176	61	192	176
Emergency stop torque [Nm] (5)	36	27	40	36	80	80	88	80	220	200	240	220
Max. input speed [r/min] (6)	18,000				13,000				7,000			
Running noise [dB (A)] (7)	58				58				60			
Permitted radial load for 30,000h (Fa=0) [N] (2)(8)	160				340				650			
Permitted axial load for 30,000h (Fr=0) [N] (2)(8)	160				450				900			
Permitted radial load for 20,000h (Fa=0) [N] (2)(8)	200				400				750			
Permitted axial load for 30,000h (Fr=0) [N] (2)(8)	200				500				1,000			
Operating temp [°C] (9)	-25/90											
Degree of protection	IP54											
Lifetime [h]	30,000											

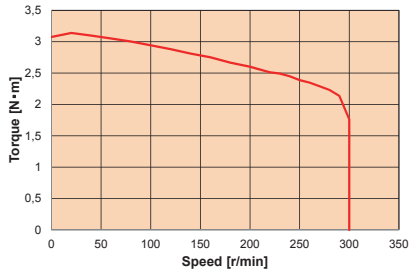
(1) These values refer only to the PLE Gearhead. The actual value depends on the motor combination.
(2) These values refer to a speed of the output shaft of n2=100 r/min on duty cycle KA=1 and S1-mode for electrical machines and T=30°C
(3) With key, at tumescent load
(4) Allowable for 30,000 revolutions at the output shaft.
(5) Allowed 1,000 times
(6) Allowed operating temperature must be kept; other input speeds on inquiry
(7) Sound pressure level; distance 1 m; measured on idle running with an input speed of n1=3000 r/min, ratio=5
(8) Half way along the output shaft
(9) Refering to the middle of the body surface

Speed-Torque Characteristics

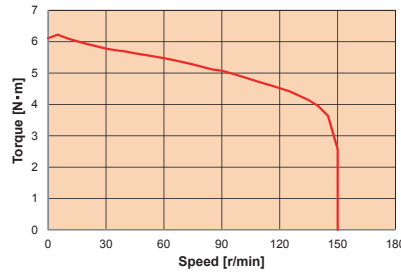
AR46 Gear Ratio **5**



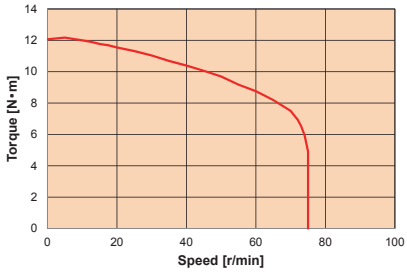
AR46 Gear Ratio **10**



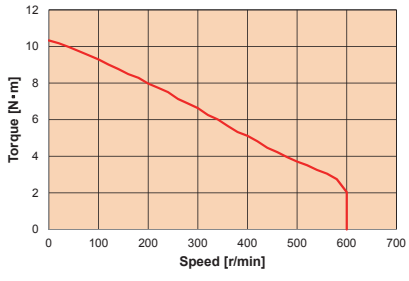
AR46 Gear Ratio **20**



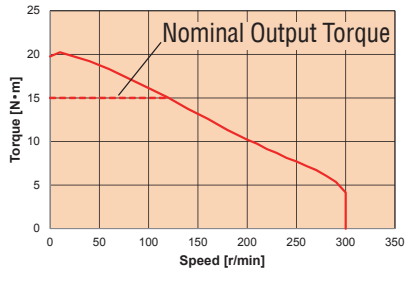
AR46 Gear Ratio **40**



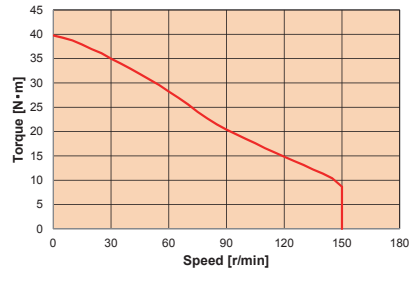
AR69 Gear Ratio **5**



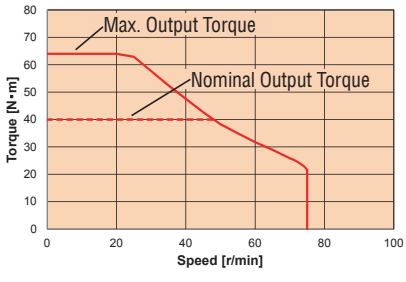
AR69 Gear Ratio **10**



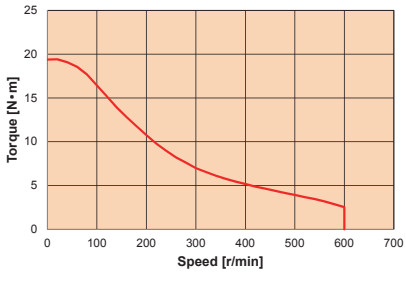
AR69 Gear Ratio **20**



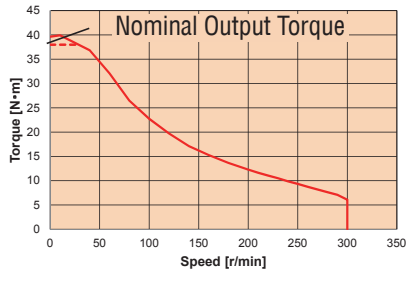
AR69 Gear Ratio **40**



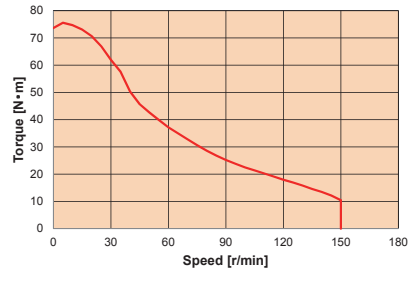
AR911 Gear Ratio **5**



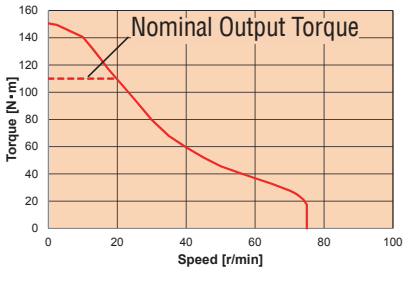
AR911 Gear Ratio **10**



AR911 Gear Ratio **20**



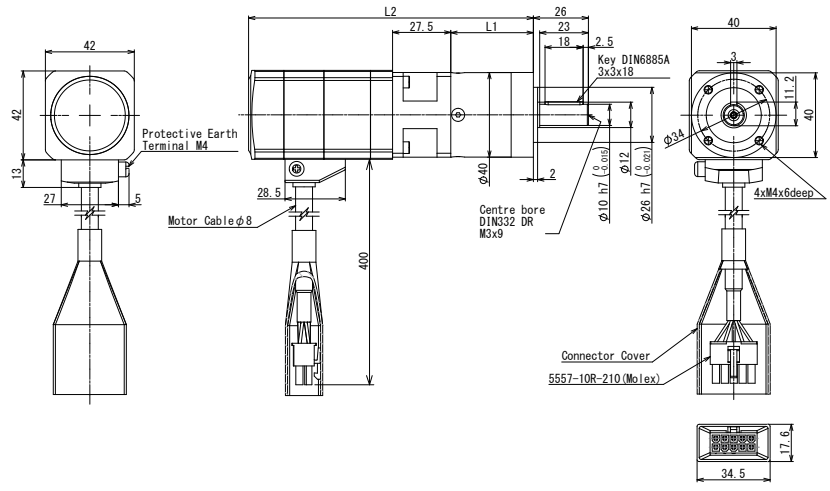
AR911 Gear Ratio **40**



Dimensions

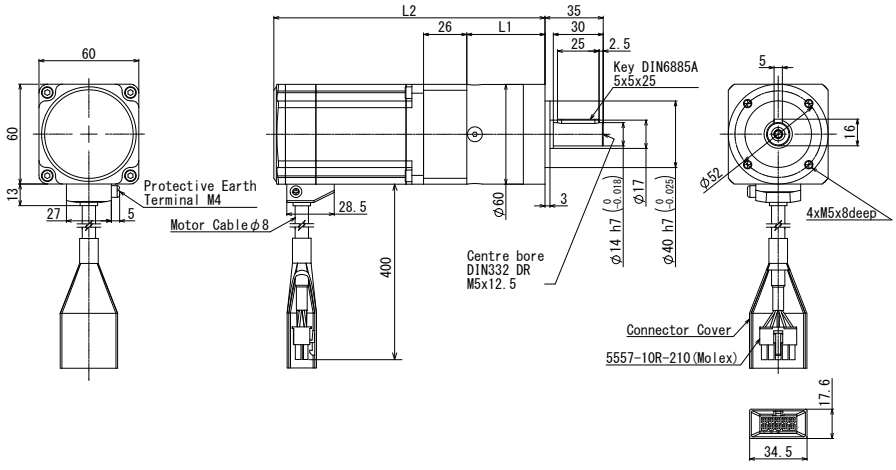
● AR46-PLE40

Ratio	L1	L2	Mass kg
5, 10	39	134.5	0.82
20, 40	52	147.5	0.92



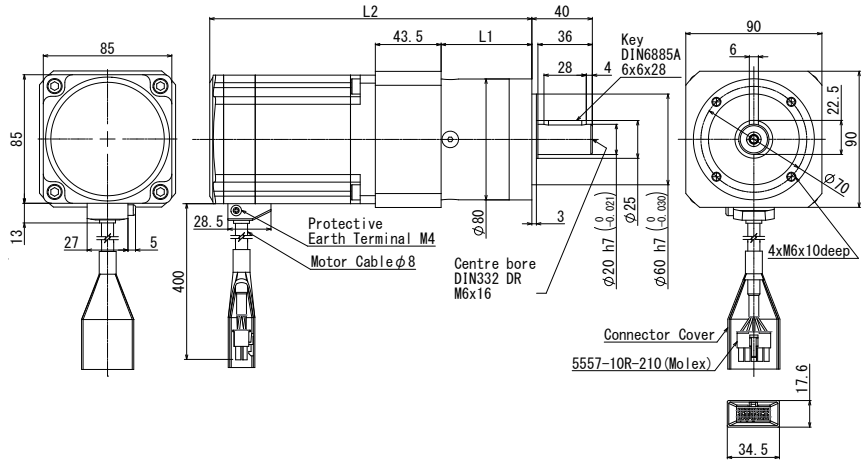
● AR69-PLE60

Ratio	L1	L2	Mass kg
5, 10	47	163	2.3
20, 40	59.5	175.5	2.5



● AR911-PLE80

Ratio	L1	L2	Mass kg
5, 10	60	213	5.1
20, 40	77.5	230.5	5.6



Product Line

● FLEX Built-In Controller Package

Product Name
AR46ACD-◇-PLE40-5
AR46ACD-◇-PLE40-10
AR46ACD-◇-PLE40-20
AR46ACD-◇-PLE40-40
AR69ACD-◇-PLE60-5
AR69ACD-◇-PLE60-10
AR69ACD-◇-PLE60-20
AR69ACD-◇-PLE60-40
AR911ACD-◇-PLE80-5
AR911ACD-◇-PLE80-10
AR911ACD-◇-PLE80-20
AR911ACD-◇-PLE80-40

● Pulse Input Package

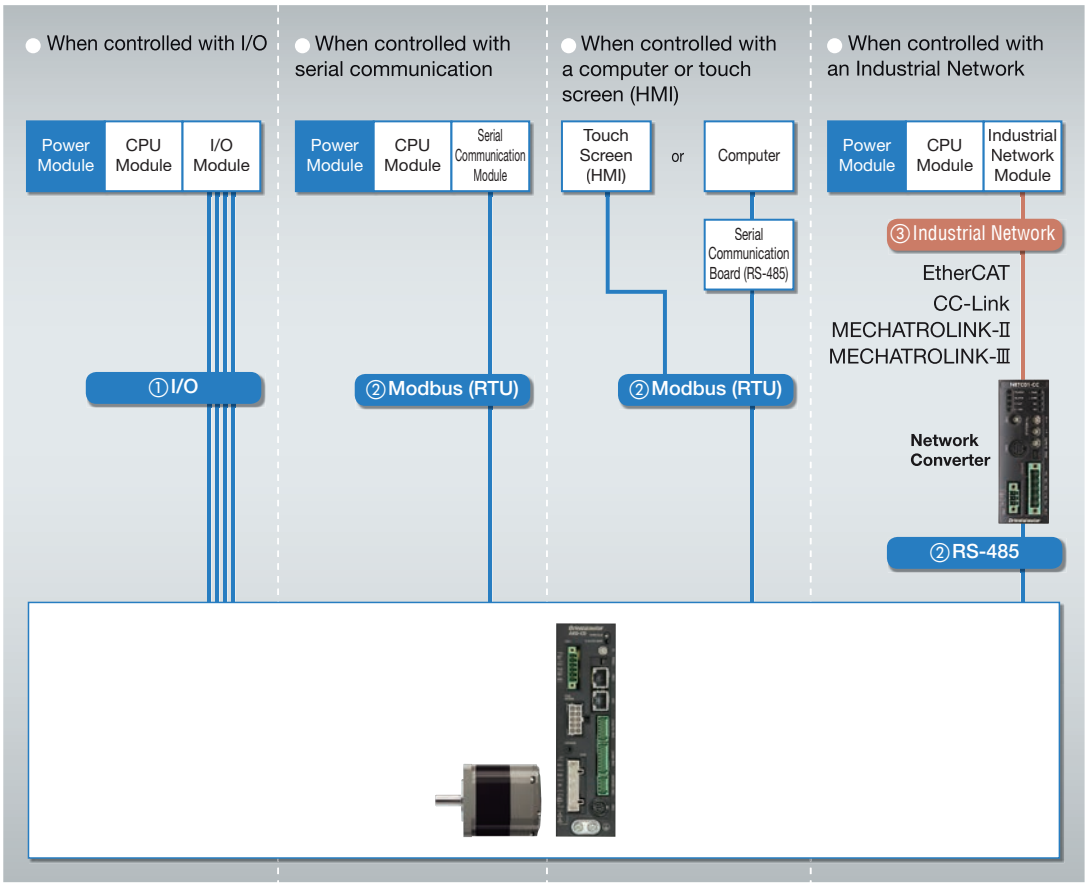
Product Name
AR46AC-◇-PLE40-5
AR46AC-◇-PLE40-10
AR46AC-◇-PLE40-20
AR46AC-◇-PLE40-40
AR69AC-◇-PLE60-5
AR69AC-◇-PLE60-10
AR69AC-◇-PLE60-20
AR69AC-◇-PLE60-40
AR911AC-◇-PLE80-5
AR911AC-◇-PLE80-10
AR911AC-◇-PLE80-20
AR911AC-◇-PLE80-40

A number indicating the desired length of **1** (1 m), **2** (2 m) or **3** (3 m) for the cable included with the product is entered where the box ◇ is located within the product name. Select a desired cable length from 1 m, 2 m and 3 m.

Handles a Variety of System Configurations

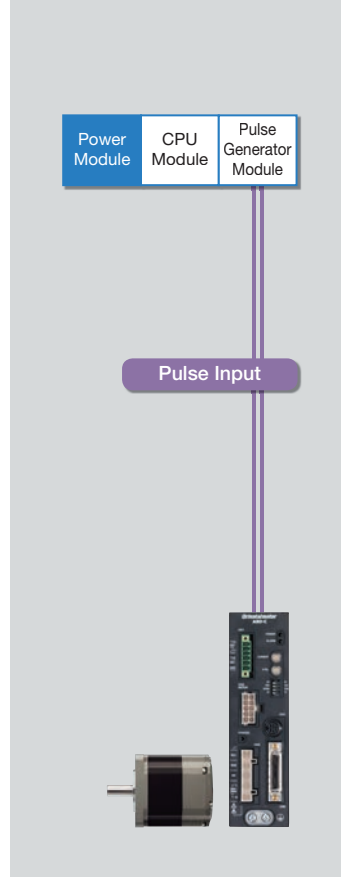
Built-in Controller (Stored Data) Type FLEX

Operating data is set in the driver and the operating data is selected and executed from the master controller. Connection and control with the master controller is done through either ① I/O, ②Modbus (RTU)/RS-485, or ③Industrial Network.



Pulse Input

Operations are executed by inputting the pulses into the driver. The motor can be controlled using a positioning module (pulse generator) provided by the customer.



① I/O

The functions of a positioning module (pulse generator) are built into the driver, allowing it to be connected directly to a controller or PLC to configure an operating system with I/O. Since no positioning module is required on the PLC side, space is saved and the system is simplified.

② Modbus (RTU)/RS-485

Operating data and parameters can be set and operation commands can be input using RS-485 communication. Up to 31 drivers can be connected to each serial communication module. Also, there is a function that enables the simultaneous start of multiple axes. The protocol supports Modbus (RTU), enabling connection with devices such as a touch screen (HMI) or PCs.

③ Industrial Network

Use of a network converter (sold separately) enables support with EtherCAT, CC-Link or MECHATROLINK communication. Operating data and parameters can be set and operation commands can be input using various communication methods.

Network Converter RoHS

The network converter is a transducer that converts from the host communication protocol to Oriental Motor's unique RS-485 communication protocol. You can use the network converter to control products supporting Oriental Motor's RS-485 in the host communication environment.

Product Line

Network Type	Product Name
EtherCAT-Compatible	**NETC01-ECT**
CC-Link-Compatible	**NETC01-CC**
MECHATROLINK-Ⅱ Compatible	**NETC01-M2**
MECHATROLINK-Ⅲ Compatible	**NETC01-M3**

NETC01-ECT NETC01-CC NETC01-M2 NETC01-M3

This product is manufactured at a plant certified with the international standards **ISO 9001** (for quality assurance) and **ISO 14001** (for systems of environmental management).

Oriental motor

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ORIENTAL MOTOR (EUROPA) GmbH
www.orientalmotor.de
European Headquarters and Düsseldorf Office
Schiessstraße 74
40549 Düsseldorf, Germany
Tel: 0211-5206700 Fax: 0211-52067099

For other countries – EU-Webshop:
www.orientalmotor.eu

ORIENTAL MOTOR (UK) LTD.
www.oriental-motor.co.uk
UK Headquarters
Unit 5, Faraday Office Park,
Rankine Road, Basingstoke,
Hampshire RG24 8AH U.K.
Tel: 01256-347090 Fax: 01256-347099

ORIENTAL MOTOR (FRANCE) SARL
www.orientalmotor.fr
France Headquarters
56, Rue des Hautes Pâtures
9200 Nanterre Cedex, France
Tel: 01 47 86 97 50 Fax: 01 47 82 45 16

ORIENTAL MOTOR ITALIA s.r.l.
www.orientalmotor.it
Italy Headquarters
Via A. De Gasperi, 85
20017 Mazzo di Rho (MI), Italy
Tel: 02-93906346 Fax: 02-93906348

ORIENTAL MOTOR CO., LTD.
www.orientalmotor.co.jp
Headquarters
4-8-1 Higashiueno
Taito-ku, Tokyo 110-8536, Japan
Tel: (03)6744-0361 Fax: (03)5826-2576

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