

Harmonic Drive®

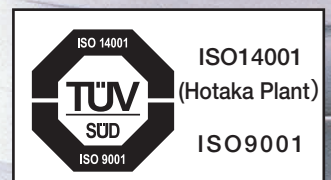
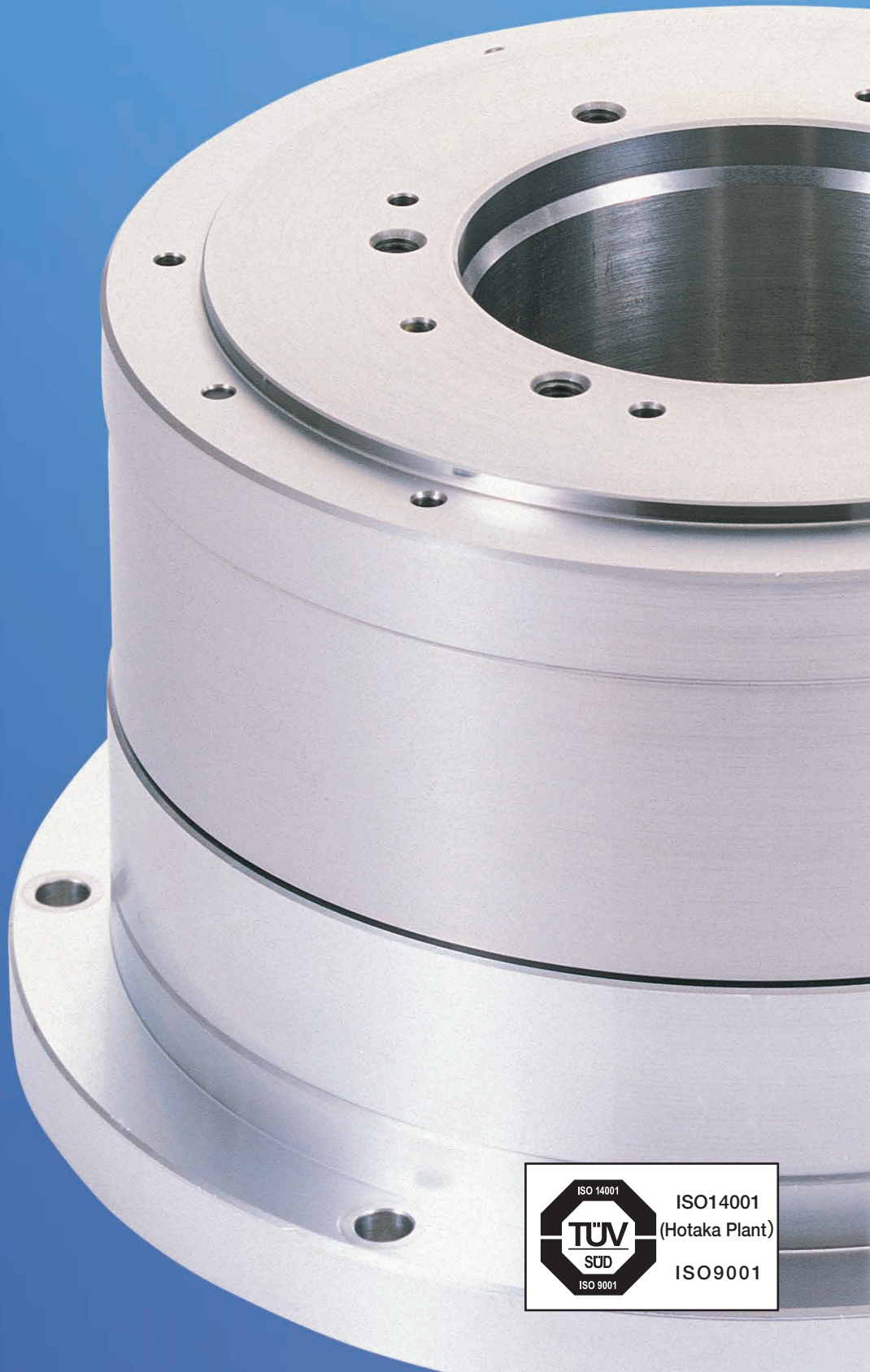
MECHATRONICS

FINE MECHANICS & TOTAL *motion* CONTROL

NEW PRODUCTS

High Precision Direct Drive Motor Series

KDU Series



Persistence to achieve super high resolution Direct Drive Motor

KDU Series

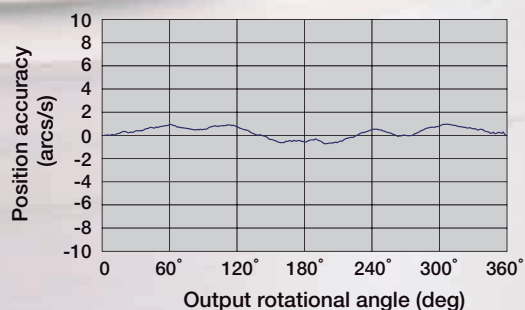
Resolution: **8.38** million divisions/revolution

High precision

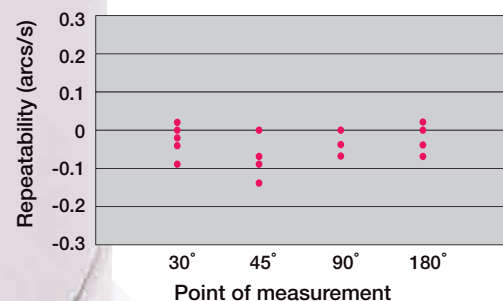
Absolute position accuracy: 10arcs/s

Repeatability: ± 0.5 arcs/s

Absolute positioning accuracy (Sample)

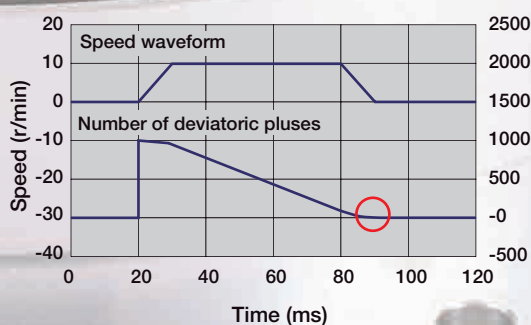


Repeated positioning accuracy (Sample)

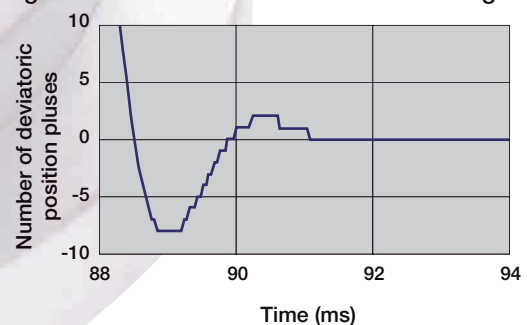


Stopping stability

Stopping stability in servo lock mode: Less than ± 2 pulses (± 0.31 arcs/s)



Enlargement of section circled in red in left diagram

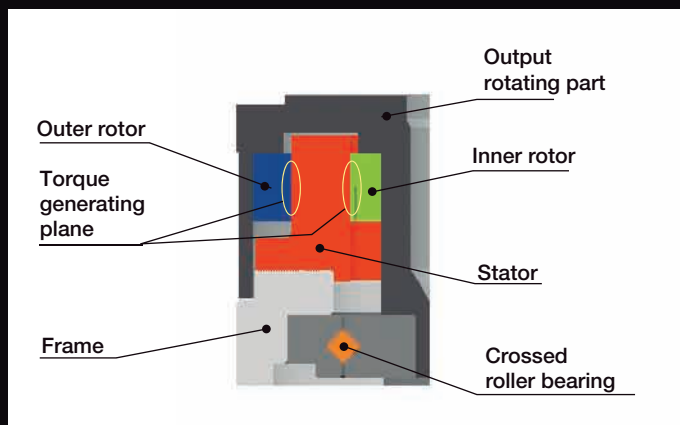


High torque

KDU-13S: 7Nm

KDU-13W: 15Nm

- Unique motor construction **Patent obtained**
- Two rotors sandwich the stator and torque is generated on two planes



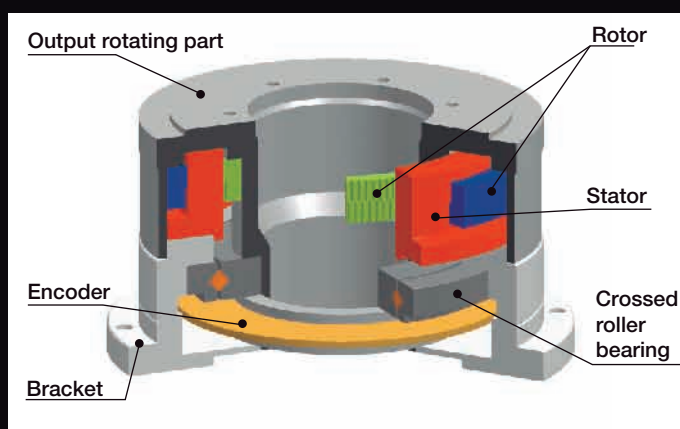
Large hollow opening diameter

Motor outside diameter: 130mm

Hollow opening diameter: 50mm

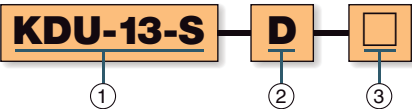
Mechanical accuracy

Runout on output side 2μm



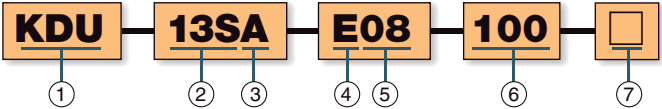
Models and symbols of KDU series

The direct drive motor **KDU** series is a system that functions in combination with an AC servo driver **HA-720**. The following table gives guidance how to find a system model name and symbol. When ordering, specify the following model names.



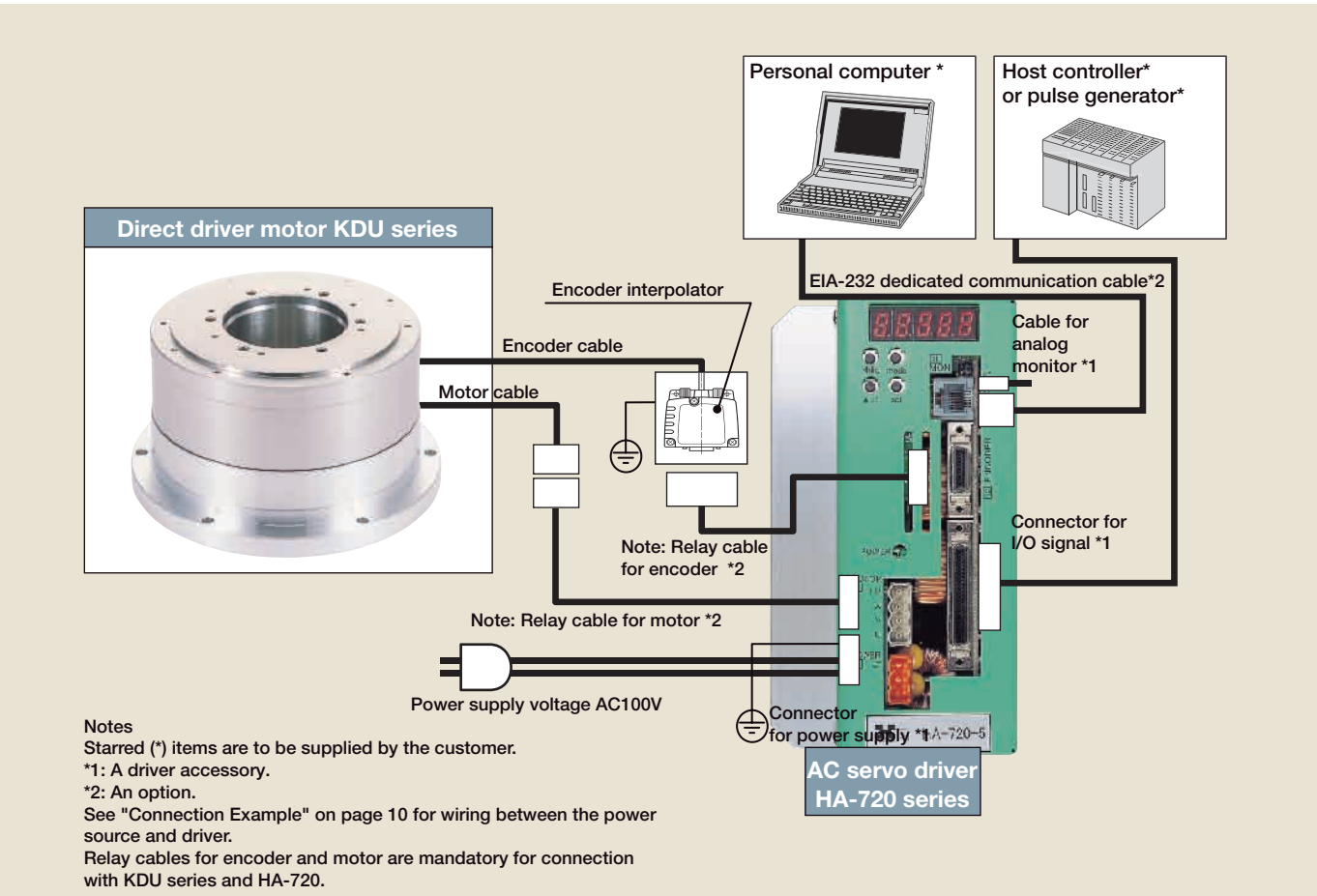
No.	Description of symbol	Details of symbol
①	Motor type	Direct driver motor KDU series KDU-13-S:KDU-13SA-E08-100 KDU-13-W:KDU-13WA-E08-100
②	System	Combination with AC servo driver HA-720-5-100
③	Specification symbol	No mark: Standard item SP: Special specification

The following table gives guidance how to find a model name and symbol for the direct drive motor **KDU** series.



No.	Description of symbol	Details of symbol
①	Model	Direct driver motor KDU series
②	Type	13S, 13W
③	Version symbol	A: Version symbol
④	Encoder type	E: Incremental encoder
⑤	Encoder resolution	08: 2 ³³ (8,388,608) p/rev
⑥	Power supply voltage	100: AC100V
⑦	Specification symbol	No mark: Standard item SP: Special specification

System configuration example



Specification of KDU series

The specification of KDU series described as follows.

Item		Model	KDU	
			-13SA	-13WA
Maximum torque *2		Nm	7.0	15.0
		kgfm	0.7	1.5
Maximum rotational speed		r/min	180	160
Torque constant		Nm/A	3.1	6.5
		kgfm/A	0.32	0.66
Input power supply voltage		V	AC100	
Induced voltage constant		V/ (r/min)	0.33	0.68
Line resistance		Ω (20°C)	9.1	14.0
Line inductance		mH	19	35
Moment of inertia GD ² /4 J		kgm ²	0.0047	0.0065
		kgfms ²	0.048	0.066
Moment of rigidity		Nm/rad	2.4×10^5	
		kgfm/rad	0.2×10^4	
Motor position sensor		pulse/rev	Incremental encoder Rectangular wave of Phases A and B: 2 ²³ (8,388,608) Pulse signal of Phase Z	
Repeatability *3		arc sec	± 0.5	
Absolute positioning accuracy *3		arc sec	10 (Angular position corrected) *4	
Mass		kg	4.0	5.0
Protective structure			Totally-enclosed self-cooled type (IP40 or equivalent)	
Ambient conditions			Operating temperature: 10 ~ 30°C Storage temperature: -10 ~ 60°C (*3) Operating humidity/storage humidity: 20 ~ 80% RH or less (no condensation) Resistance to vibration during delivery/installation: 25m/s ² (frequency: 10 to 400Hz) Resistance to impact during delivery/installation: 300m/s ² No powder or dust, metal powder, corrosive gases, flammable gases, or oil mist, etc. To be used indoors. No direct sunlight. Altitude: 1000m or lower	
Motor insulation			Insulation resistance: 100m ohm or more (DC 500V) Dielectric strength: AC 1500V/1min Insulation class: Class B	
Mounting direction			Output shaft to face upward	

*1: The table above shows output values of output shaft.

*2: The values in the table above are obtained when connected to HA-720 servo driver.

*3: The repeatability and absolute repeatability are the values measured in an environment of 23 ±0.3°C in temperature, 50% RH in humidity and with output shaft facing upward in mounting direction.
Please operate the product after checking "Precautions for maintaining accuracy" below.

*4: Value after angular position of the HA-720 servo driver is corrected.

Precautions for maintaining accuracy

Strictly follow the precautions written below in the use of the product to obtain years of built-in accuracy.

Checking the operating environment:

Harmonic Drive Systems Inc. measures accuracy at 23 ±0.3°C in temperature and 50% RH in humidity. When operating in a system that requires a high repeatability, operate after carefully examining the mechanism stiffness, expansion coefficients of the components, external vibration and other factors within temperature variations of less than ±3°C.

Periodically rotate the output shaft 90° or more.

Where the system operating environment requires fine motions, periodically rotate the output shaft more than 90° to maintain the accuracy in order to prevent uneven wear of the crossed roller bearing due to depletion of grease.

Checking mounting direction:

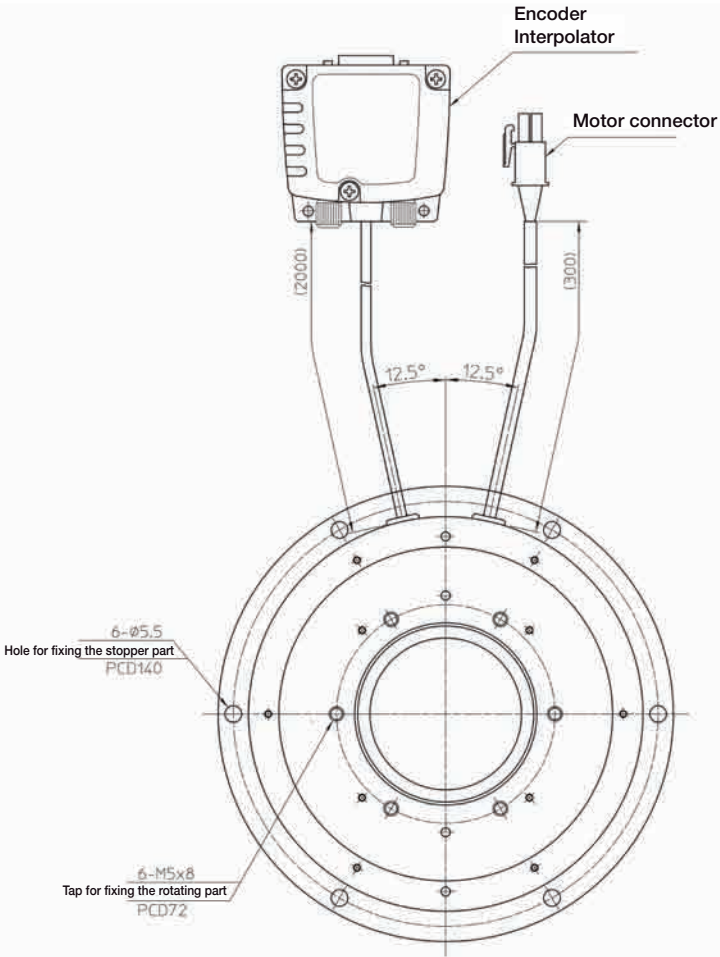
The condition of Harmonic Drive Systems Inc. for measurement of accuracies is that the output shaft is facing upward. Please contact Harmonic Drive Systems Inc. if you would like to install the output shaft other than facing upward.

Accuracy cannot be guaranteed if the installation environment is subjected to vibration or shocks.

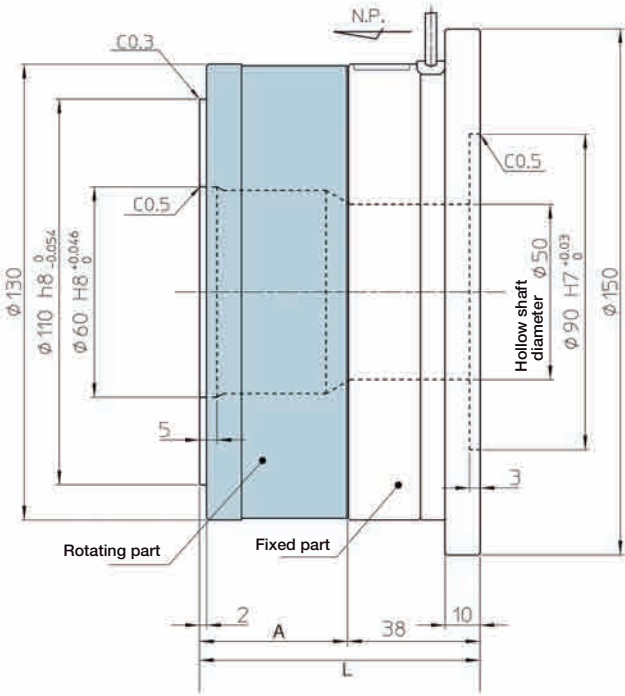
The resistance to vibration and shocks specified in the specification are the values anticipating carrying and mounting. Be cautious and prevent applying vibration or shocks to the product while carrying or mounting it. Operate the product in an environment that is free of vibration and shocks to ensure a high accuracy of the product.

External dimensions of KDU series (unit: mm)

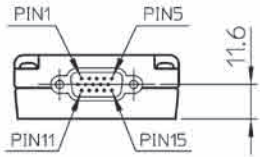
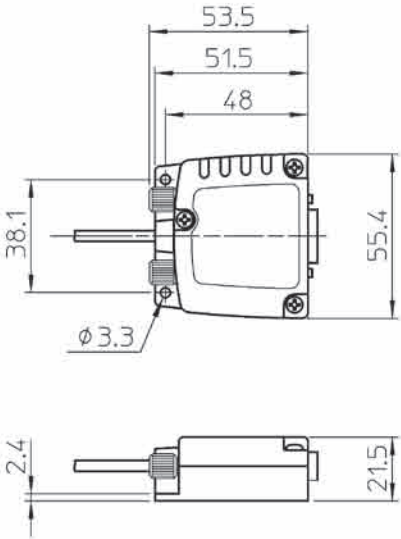
KDU-13SA-E08-100・KDU-13WA-E08-100



	KDU-13SA	KDU-13WA
A	42	56
L	80	94



Encoder interpolator (mass: 130g)



Note: Confirm the dimensions with specification drawing issued by us for details.

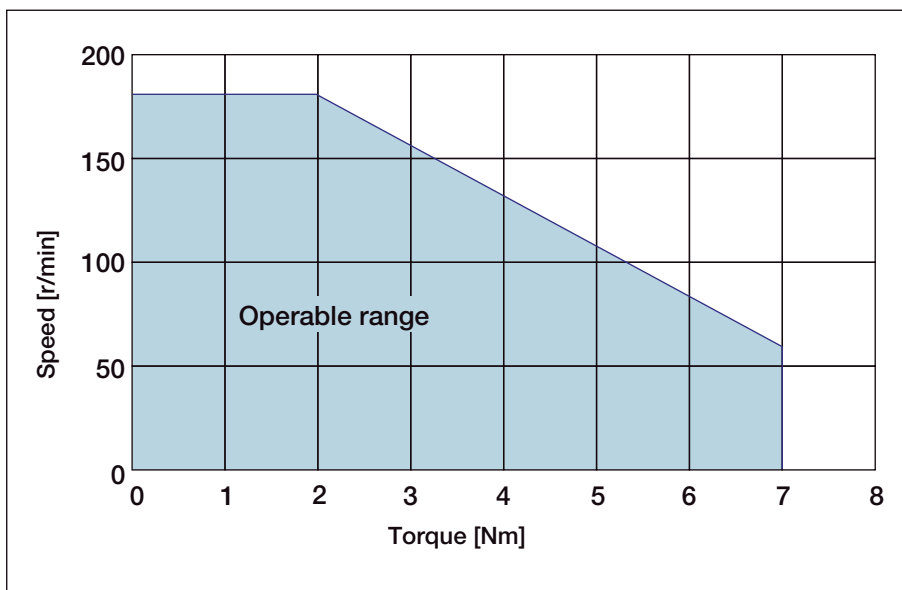
Operable range

The operable region for a combination of the **KDU** series and **HA-720** driver is illustrated in the following graph.

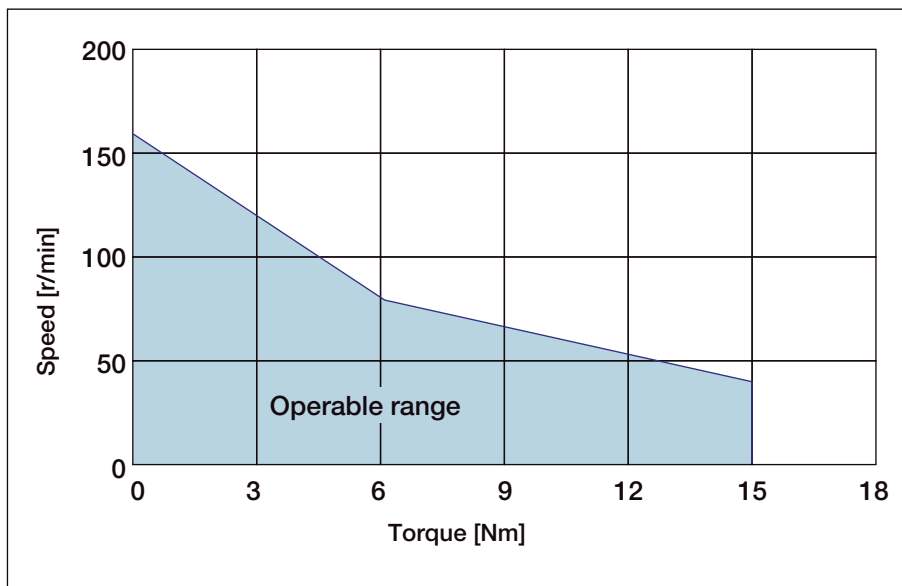
Operable range

The maximum rotating speed and maximum torque are the areas that allow operation only momentarily. Operate position indexing at normal acceleration and deceleration within the operable area.

■ KDU-13SA-E08-100



■ KDU-13WA-E08-100

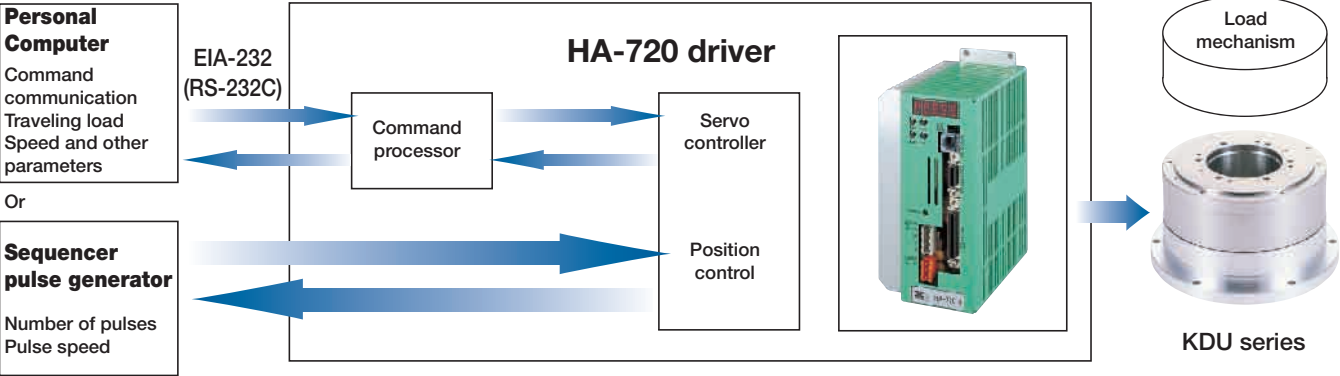


Overview of HA-720 driver

The HA-720 driver is a dedicated driver for driving a direct drive motor in the KDU series featuring a super high resolution and precision control.
HA-720 driver has many advantages to maximize the features of the direct drive motor KDU series.

Main features Control function by command communication system or pulse input system.

The driver with a position control function by the command communication system or pulse input system for servo control.



Easy selection of input system

Command communication system or pulse input system can be selected by parameter setting.

High resolution in current detection and enhanced control by high-speed processing

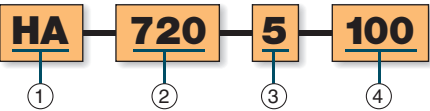
High resolution in current detection by a 16bit A/D converter and 32Mpps encoder pulse frequency promise positioning control in super high resolution.

Analog monitoring function

Two channels of analog monitor output circuits are provided for status monitoring of current speed and current torque command value.

Model of HA-720

The following table gives guidance how to find a model name and symbol for HA-720 drivers.



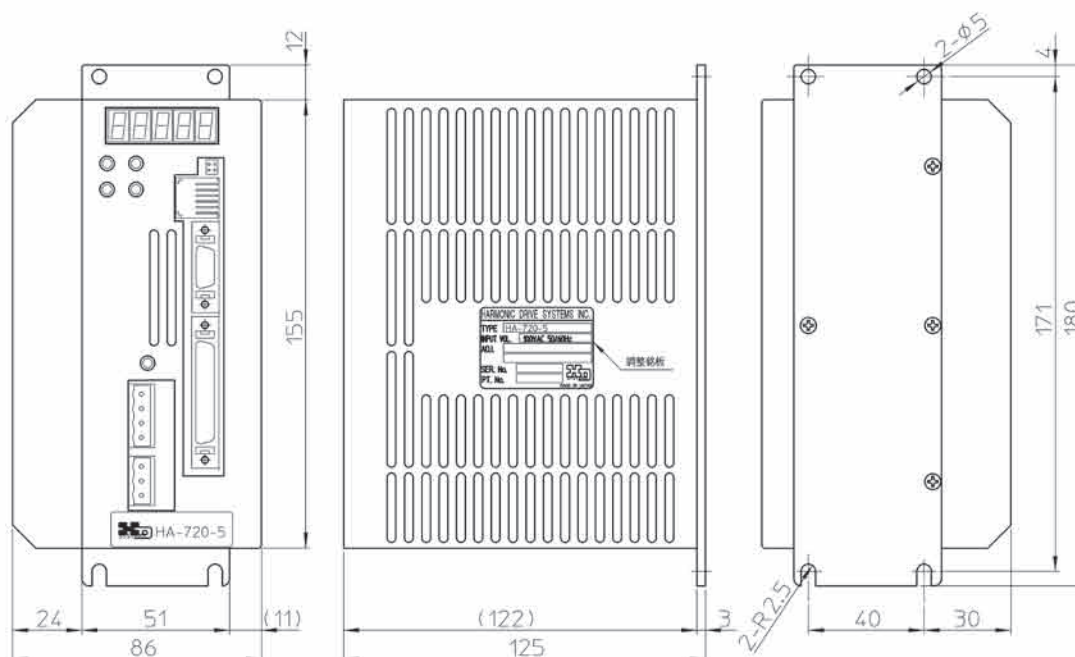
No.	Description of symbol	Details of symbol
①	Model	AC servo driver
②	Series	720 series
③	Rated output current	Rated output current 5: 5A
④	Power supply voltage	Power supply voltage 100: AC100V

Specification of HA-720 driver

Item	Model		Driver	HA-720-5-100
			Motor	KDU-13SA, KDU-13WA
Driver rated voltage				5A
Driver maximum current				10A
Power supply voltage				AC100V $\pm 10\%$
Power supply frequency				50/60Hz
Control functions				Positioning control by pulse input or by command
Applicable encoder				Incremental: Phase A, B and Z Line driver output
Limit value for position specification				$\pm 2,100,000,000$ (32bit)
Control drive system				Sine wave PWM control 20kHz
Structure				Self-cooled type
Installation method				Base mount (wall installation)
Input and output signals	Command pulse	20Mpps Max. x4 differential input Input mode (1 pulse system, 2 pulse system or 2-phase pulse system)		
	Input signal	Servo-ON, FWD inhibit, REV inhibit, dynamic brake, alarm clear, inhibit Origin (Insulation by a photo coupler in all cases)		
	Output signal	Ready, in-position, alarm code output (Insulation by a photo coupler in all cases)		
Command communication	Communication system	EIA-232 (RS-232C)		
	Mode setting	Absolute position control, relative position control, jogging, at-origin		
	Command	Servo operation, input signal operation, position data value change, traveling operation designation, parameter confirmation and change, servo status monitoring and alarm status monitoring and clearing		
Data display				LED 7 segments 5 columns: Current monitor, parameters, error codes, etc.
Panel operation keys				4 keys (Parameter check, parameter change, display digit change, memory write and other functions)
Ambient conditions				Operating temperature: 0 ~ 50°C Storage temperature: -20 ~ 85°C Operating humidity/storage humidity: 90% RH or less (no condensation) Resistance to vibration: 4.9m/s ² (10~55Hz) Resistance to impact: 19.6m/s ² No metal powder, powder dust, oil mist, or corrosive gas, etc. No water or oil splashed. To be used indoors. No direct sunlight.
Mass				1.4kg
Safety standards				Not compliant to RoHS directive

Note: The HA-720 driver is stored with data for position correction of the KDU series product to be combined.
 The same No. is written as "SER No." on the nameplates of the HA-720 driver and KDU series product. The position accuracy of the KDU series product cannot be guaranteed if the "SER Nos." for the product and driver in the combination are different.

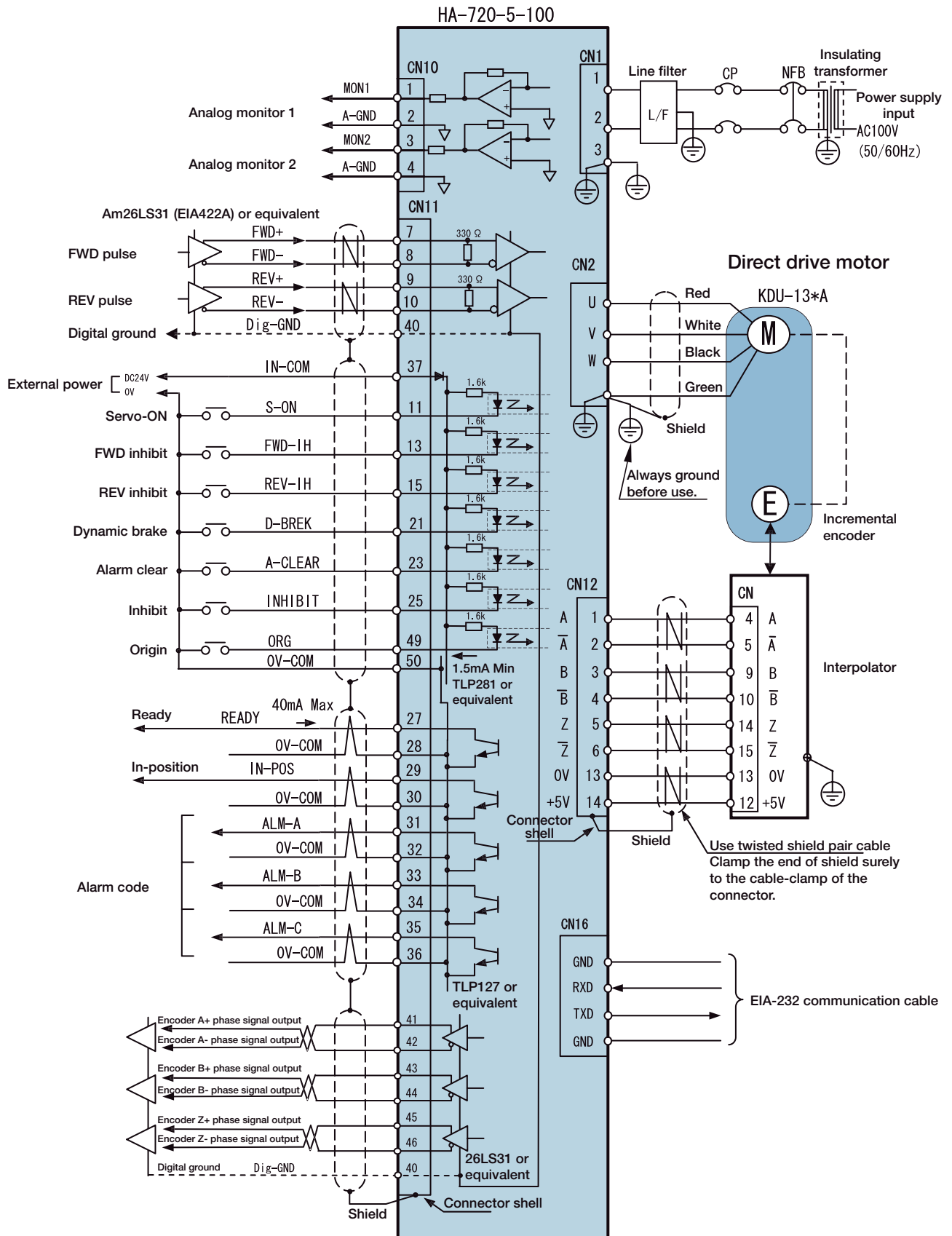
External dimensions of HA-720 (unit: mm)



Note: Confirm the dimensions with specification drawing issued by us for details.

Connection example: HA-720 driver

A connection example for the pulse command input system.



Options

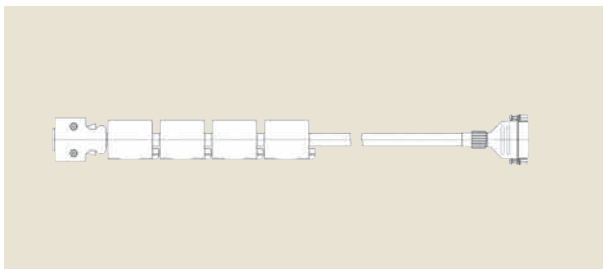
Relay cable for incremental encoder

Order code example: EWA-E**-J15-3M20

The cable to connect interpolator of incremental encoder and servo driver

**** in code indicates the cable length (01: 1m, 03: 3m).

Note: This cable is mandatory for the connection between incremental encoder and servo driver.



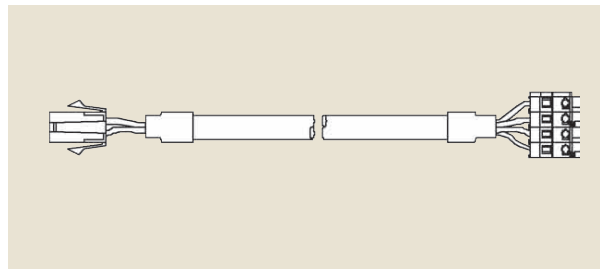
Relay cable for motor

Order code example: EWA-M**-A04-WG04

The cable to connect the motor and servo driver

**** in code indicates the cable length (03: 3m, 05: 5m).

Note: This cable is mandatory for the connection between motor and servo driver.

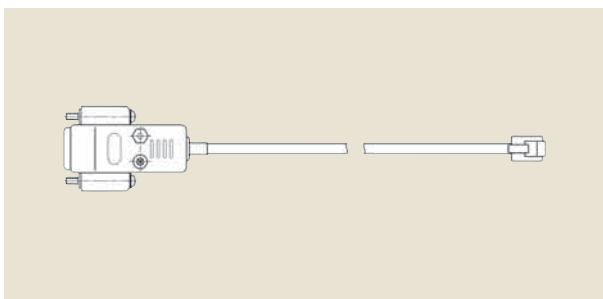


EIA0232 (RS-232C) Communication Cable

Order code example: HDM-RS232C-HA720

The cable to connect the personal computer and servo driver

Standard cable length is 2m.



Insulating Transformer

Order code Example: PT1-10005-100

Use this transformer in the power source of the servo driver for control of external noise and ground faults.

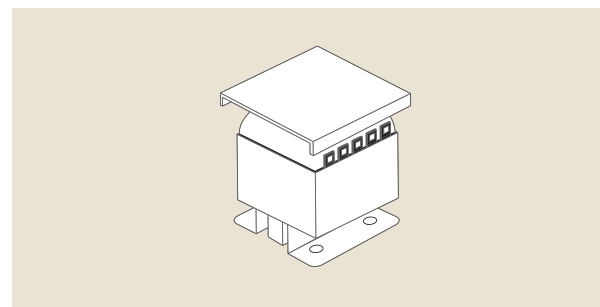


Chart for standard combinations

System model	Maximum torque	Motor model	Servo driver model	Model of relay cable for incremental encoder	Length of entire cable (Length for connector not included)
				Model of relay cable for motor	
KDU-13-S-D	7.0Nm	KDU-13SA-E08-100	HA-720-5-100	EWA-E01-J15-3M20	Encoder cable : 3m
				EWA-M03-A04-WG04	Motor cable : 3.3m
KDU-13-S-D	7.0Nm	KDU-13SA-E08-100	HA-720-5-100	EWA-E03-J15-3M20	Encoder cable : 5m
				EWA-M05-A04-WG04	Motor cable : 5.3m
KDU-13-W-D	15.0Nm	KDU-13WA-E08-100	HA-720-5-100	EWA-E01-J15-3M20	Encoder cable : 3m
				EWA-M03-A04-WG04	Motor cable : 3.3m
KDU-13-W-D	15.0Nm	KDU-13WA-E08-100	HA-720-5-100	EWA-E03-J15-3M20	Encoder cable : 5m
				EWA-M05-A04-WG04	Motor cable : 5.3m

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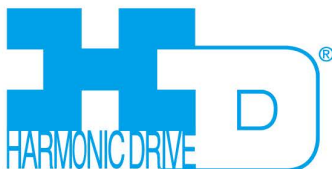
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The academic or general nomenclature of our products
HarmonicDrive® is strain wave gearing.

All specifications and dimensions in this manual subject to change
without notice. This manual is correct as of July 2026.

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