

PATENT PENDING

IKO

Piezo Stage

SP



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CAT-57161

IKO Piezo Stage SP

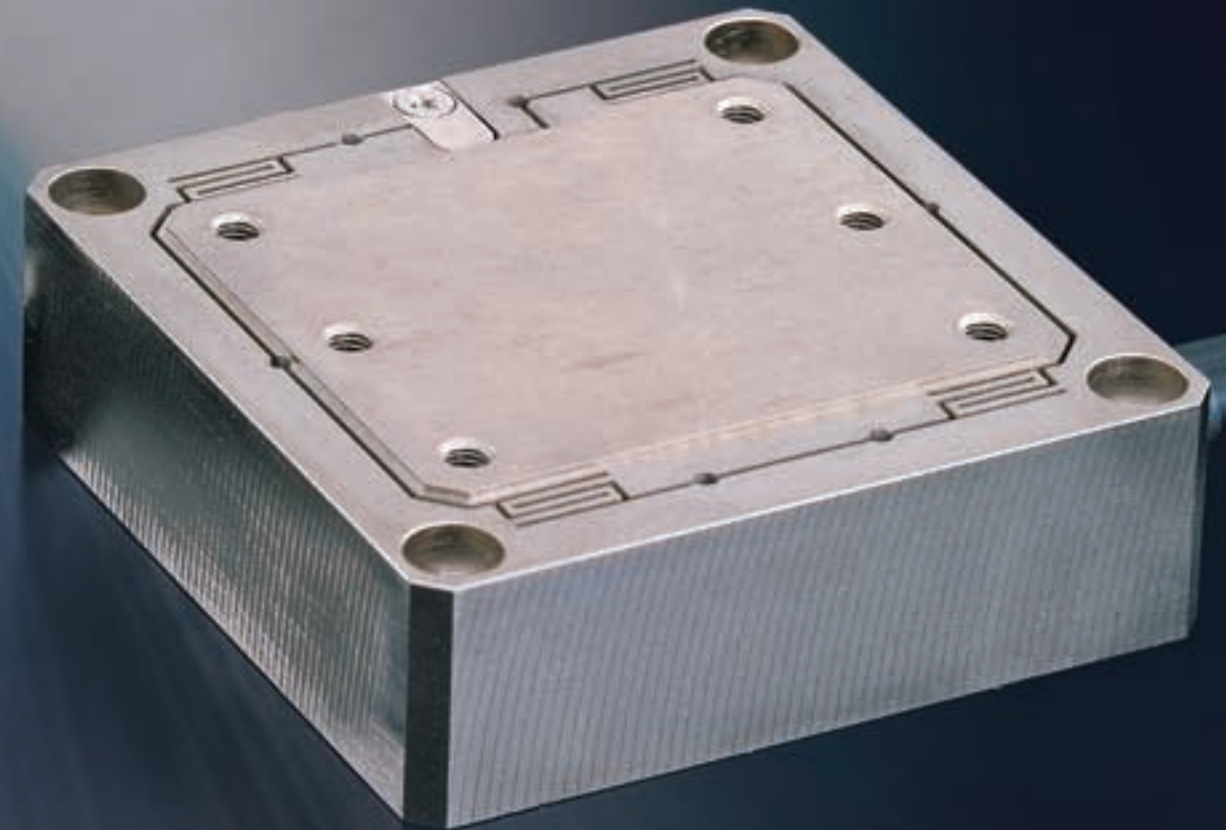
SP



IKO Piezo Stage SP is a super micromotion stage having a displacement detection mechanism made of a piezoelectric element and a strain gauge in a compact steel stage.

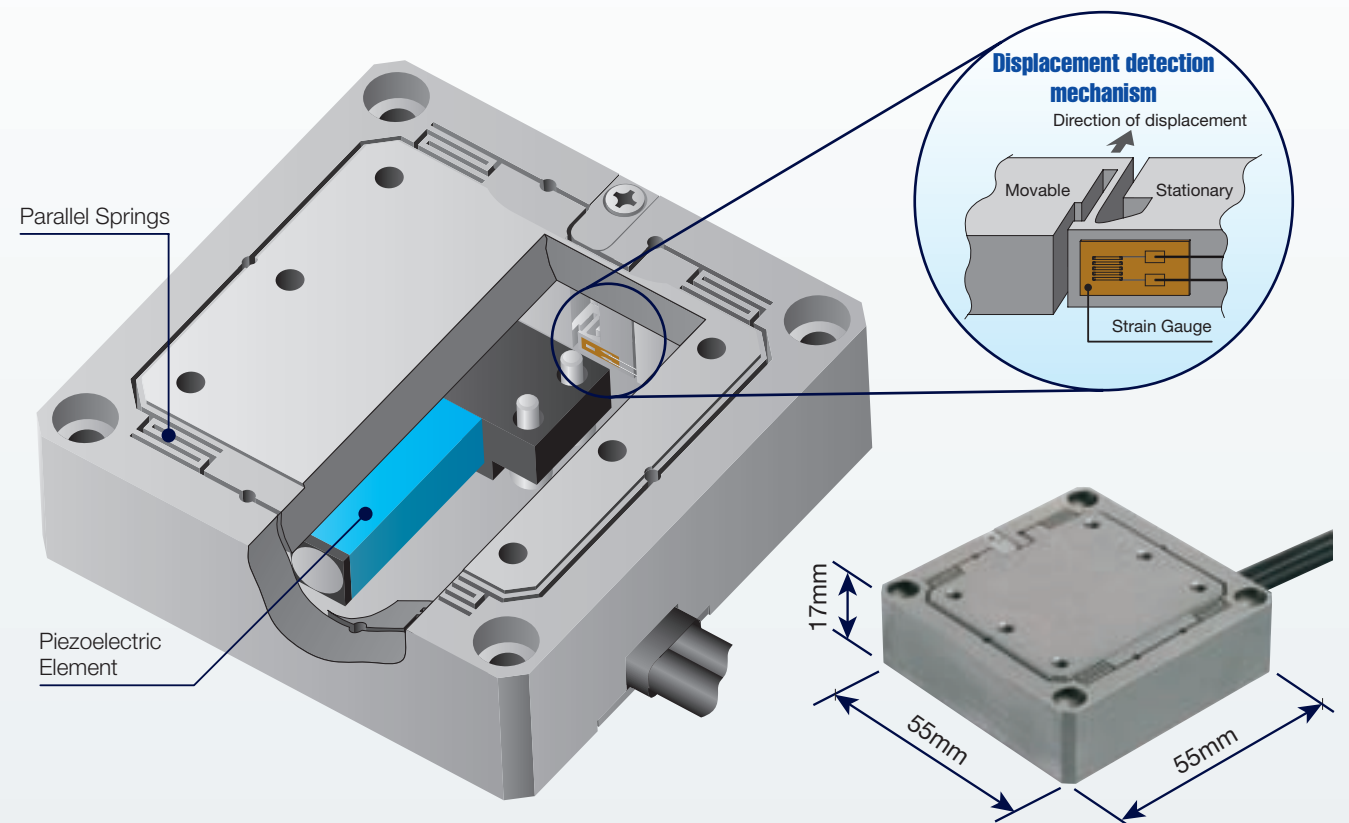
IKO Piezo Stage SP realizes a high resolution of "10nm" and a high positioning accuracy that can build up a high accuracy compact rough-motion / micromotion mechanism when combined with Precision Positioning Table.

IKO Piezo Stage SP is best suited for laser optical apparatus, semiconductor, LCD manufacturing equipment, and other control mechanisms that require complicated positioning operations.

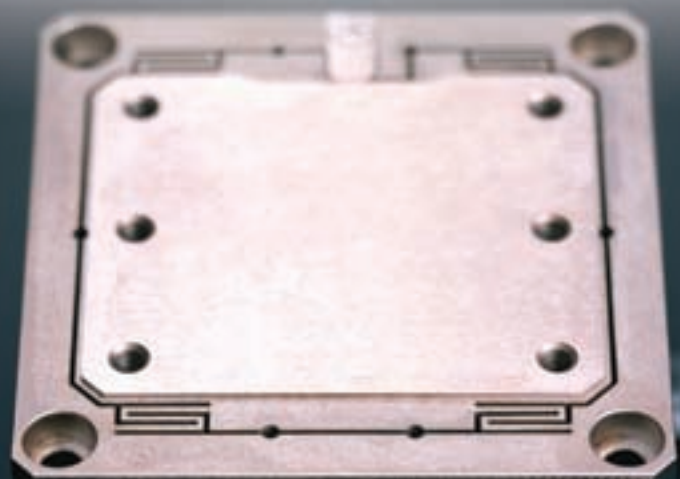


**10 nanometer of resolution for
your advanced micro machines**

Structure of Piezo Stage SP



Model code		
SP	55	DR
	/	/
Stage width 55mm	Stage length 55mm	With driver dedicated



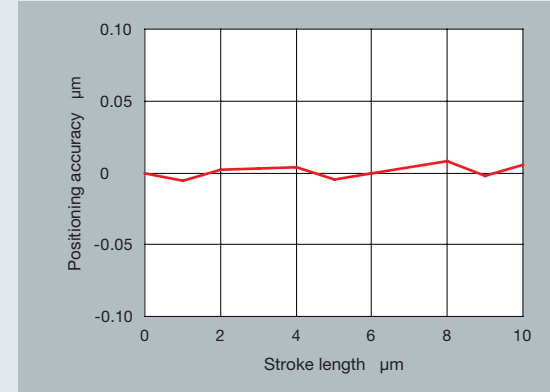
IKO Piezo Stage SP uses the piezoelectric element as a driving source. The piezoelectric element has a laminated structure which sandwiches a piezoelectric material with electrodes and expands when a voltage is applied between the electrodes (which is called "inversed piezoelectric effect"). In this case, a hysteresis generates between the applied voltage and the quantity of expansion. Piezo Stage SP performs high-accuracy super micromotion positioning by disposing a strain gauge in an optimum point obtained by a structural analysis and controlling the hysteresis by a closed control mechanism.

Features of Piezo Stage SP

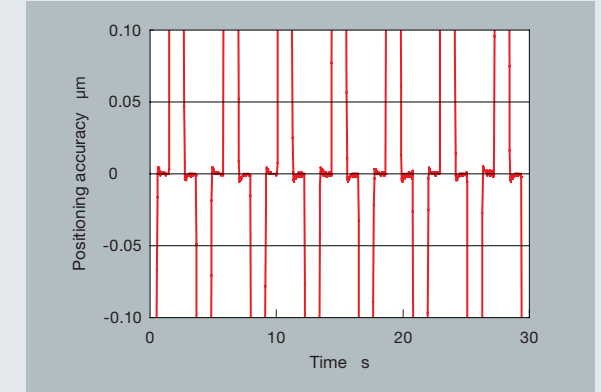
High resolution and high positioning accuracy

Piezo Stage SP realizes high resolution of "10 nm" and high positioning accuracy.

Positioning accuracy



Repeatability



Smooth micromotion

Parallel springs are provided as a mechanism to support the moving part. The springs can give a constant preload to the piezoelectric element and realize a frictionless stable micromotion feeding.

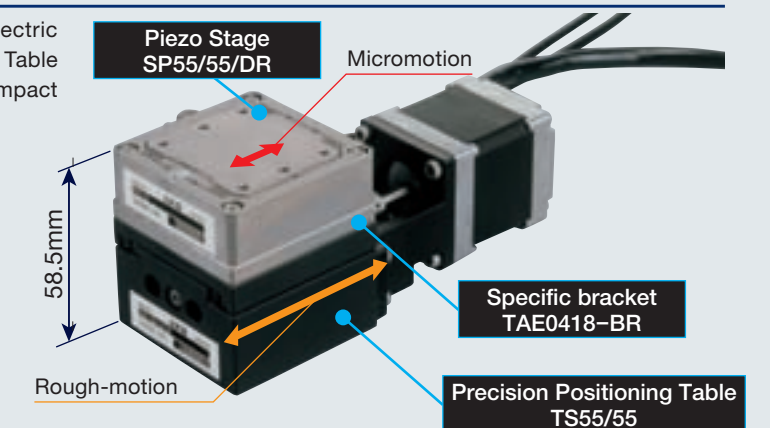
Dedicated driver having a versatile function also capable of handling pulse commands

IKO provides Piezo Stage SP together with dedicated driver that can receive pulse commands and USB commands in addition to general analog voltage commands. You can build up an optimum control system according to your system requirements.

Combination with precision positioning table

Capable of building up a rough-motion/micromotion system

A specific bracket (TAE0418-BR) enables the piezoelectric stage to be mounted on IKO Precision Positioning Table TS55/55 · CT55/55T · CT55/55. You can build up a compact rough-motion / micromotion system.



Specifications and Performance

Table 1 shows specifications and performance of Piezo Stage SP.

Table 1 Specifications and performance

Item	Type	SP55/55/DR
Position sensor		Strain gauge
Stroke	μm	10
Resolution	nm	10
Positioning accuracy	μm	0.1
Repeatability	μm	± 0.05
Lost motion	μm	0.05
Maximum load mass ⁽¹⁾	N	10
Total mass ⁽²⁾	kg	0.3

Note⁽¹⁾ This is a maximum load that can be carried without affecting the function and performance of Piezo Stage SP.
⁽²⁾ The mass of cord is not included.

Operation Specification

Piezo Stage SP works when commands are given to the dedicated driver by any of the following methods: In any of the following commanding methods, when the stage exceeds the stroke range of $10\mu\text{m}$, a limit signal is output to stop the stage immediately.

① Pulse command

The stage moves by 10nm per pulse when "+" or "-" direction pulse command is applied. When a Return-to-Origin signal is applied, the stage moves to the center of the stroke range ($10\mu\text{m}$).

② Voltage command

The stage moves at $1\mu\text{m}/\text{V}$ by an analog voltage command. In the operation by a voltage command, it is possible to offset the zero point in the stroke range ($10\mu\text{m}$) by the BIAS control on the front panel of the driver.

③ USB command

The stage moves in the unit of 10nm by a command from the USB port.

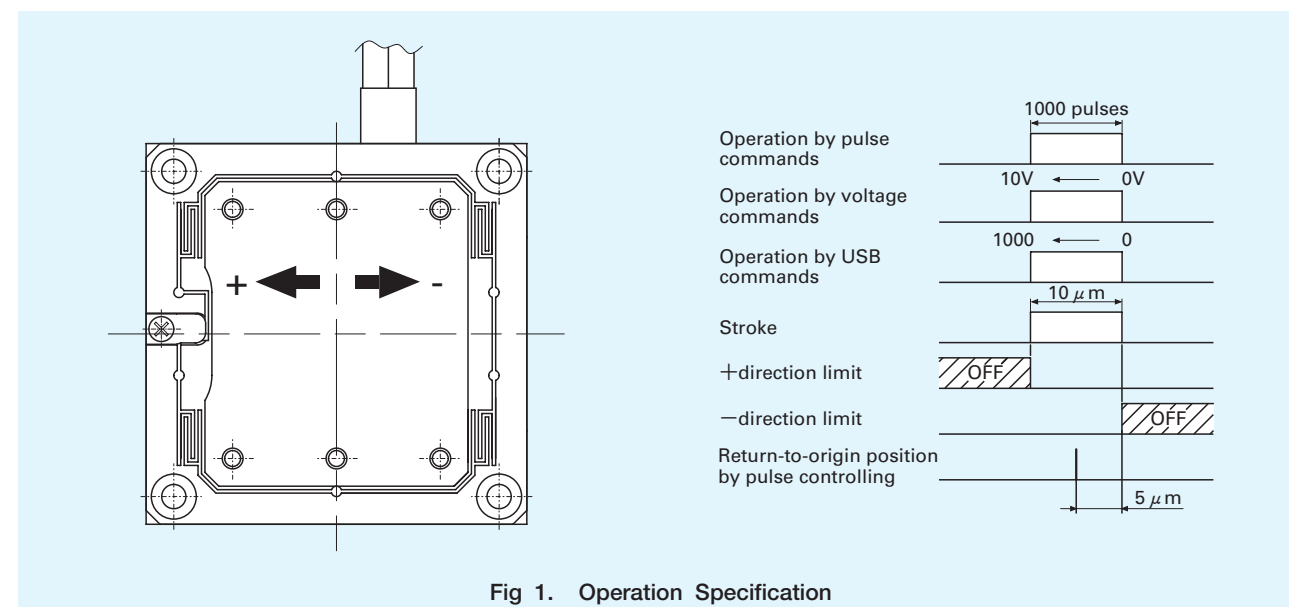


Fig 1. Operation Specification

System Configuration

Dedicated Driver

The system configuration of Piezo Stage SP is shown by Figure 2 and Table 2. The specification of the dedicated driver is shown in Table 3. The accessories of the dedicated driver are listed in Table 4.

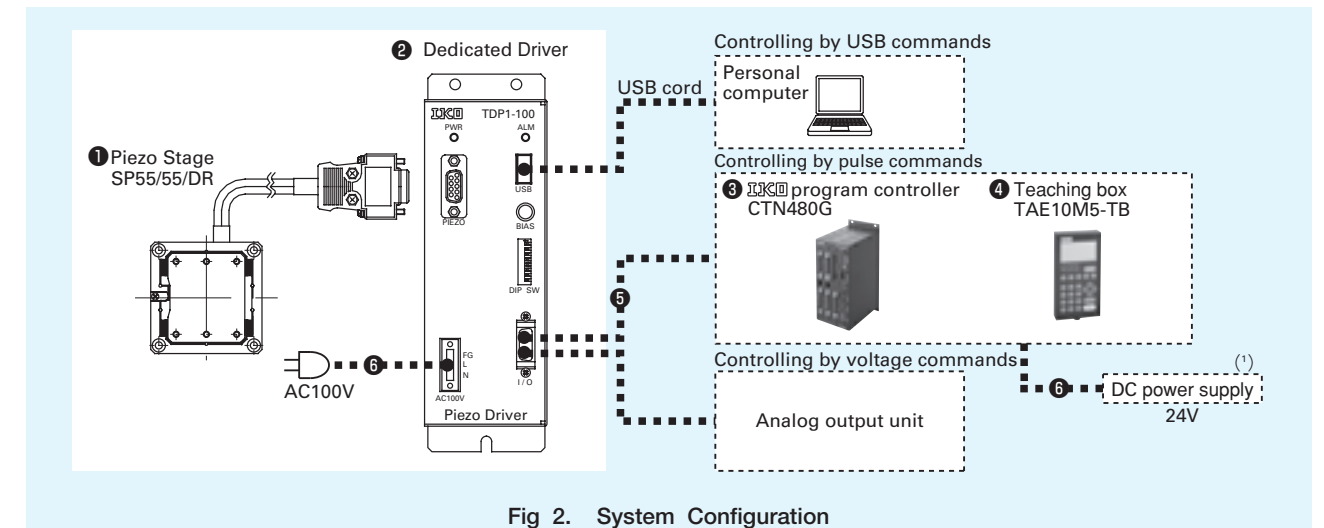


Fig 2. System Configuration

Note⁽¹⁾ DC24V power supply is prepared by customer.
 Remarks The cords for controlling by voltage and USB commands shall be prepared by customer.

Table 2 System configuration for controlling by pulse commands

No.	Item	Models
①	Piezo Stage SP	SP55/55/DR
②	Dedicated Driver	
③	Program controller	CTN480G
④	Teaching box	TAE10M5-TB
⑤	Pulse · Limit cord	TAE10V1-LD
⑥	Power cable	Prepared by customer

Remarks 1. The length of the cord between Piezo Stage SP and the dedicated driver is 3m.
 2. The length of Pulse · Limit cord 1.5m.

Table 3 Specifications of driver

Item	Specification	
Control specification	Feedback	Strain gauge sensor
	Control range	$10\mu\text{m}$
	Resolution	10nm
Command specification	Pulse command	+/- direction pulse method (Photocoupler input)
	Voltage command	-10V to +10V ($1\text{V}=1\mu\text{m}$) (Bias function : 0 to +10V)
	USB command	By communication commands from the USB port
Input/Output specification	Input	Return to origin in pulse controlling
	Output	Alarm, Positioning Completed, +Direction Limit, -Direction Limit
Power supply	Analog monitor	Current position or deviation
	Main power supply	AC100V $\pm 10\%$, 50/60Hz
	Maximum current consumption	0.5A
	Piezo output voltage	0 to 150V
	Rated output current	10mA
Ambient operating temperature and humidity	0 to 50°C, 20 to 85%RH (No condensation)	
Mass (reference)	1.6kg	

Table 4 Driver accessories

Part name	Model	Remarks
Power connector	MSTB2.5/3-STF	PHOENIX CONTACT Co., Ltd.
DIN rail fitting	DRT-1	TAKACHI ELECTRIC INDUSTRIAL Co., Ltd.

1N=0.102kgf=0.2248lbs.
 1mm=0.03937inch

Cautions in Use

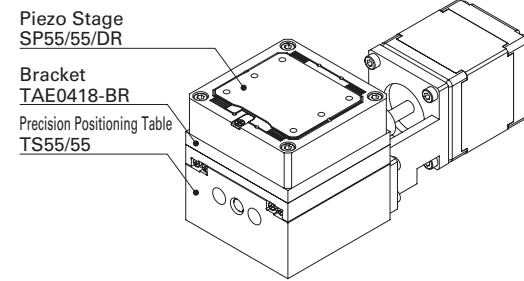
- ◆ IKO Piezo Stage SP is specially adjusted together with a dedicated driver, so that the combining of the stage and different general purpose driver is impossible.
- ◆ IKO Piezo Stage SP is a precision device. Therefore, handle it with great care and do not apply any excessive load or strong impact on it.
- ◆ Design the system that does not apply excessive force to cables.
- ◆ Use this product in a clean environment free from water, oil, dust and other foreign matters.
- ◆ Make sure that the mounting base is free from dirt and harmful protuberances.
- ◆ IKO Piezo Stage SP is machined, assembled and adjusted with high accuracy. Accordingly, never disassemble or remodel it in any case.

◎ The appearance, specifications and other details of the products are subject to change without prior notice for improvement.

Combination of IKO Precision Positioning Table

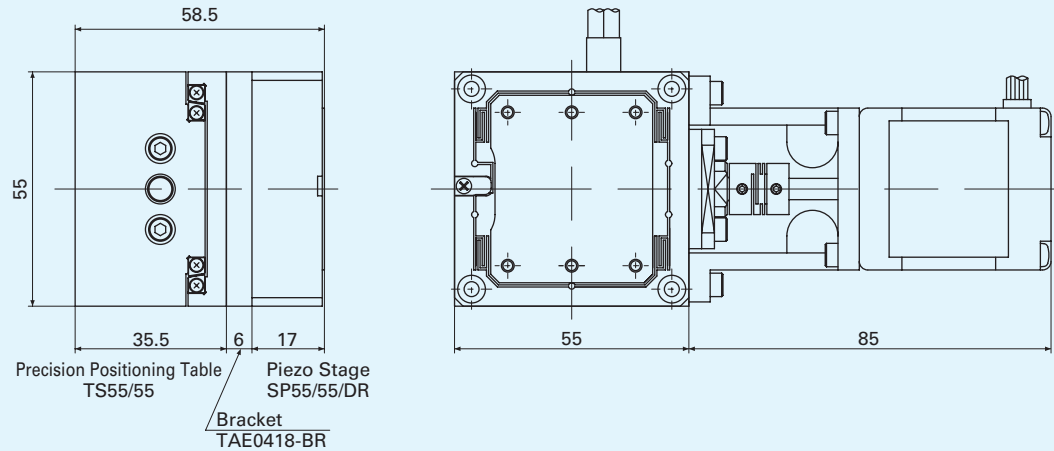
IKO Piezo Stage SP can be mounted on IKO Precision Positioning Table TS55/55 · CT55/55T · CT55/55 by using the dedicated attachment. This allows to build a compact rough-fine positioning mechanism.

For details of specifications and performance of IKO Precision Positioning Table TS55/55 · CT55/55T · CT55/55, refer to the catalog of Precision Positioning Table Compact Series "CAT-57122" or "CAT-57134".

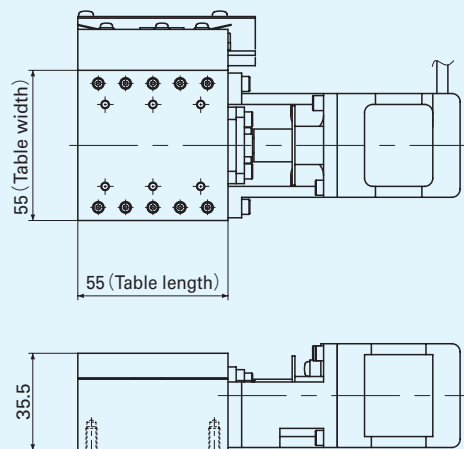


Combination with TS55/55

■ Combined dimension with TS55/55



■ Characteristics of the TS55/55

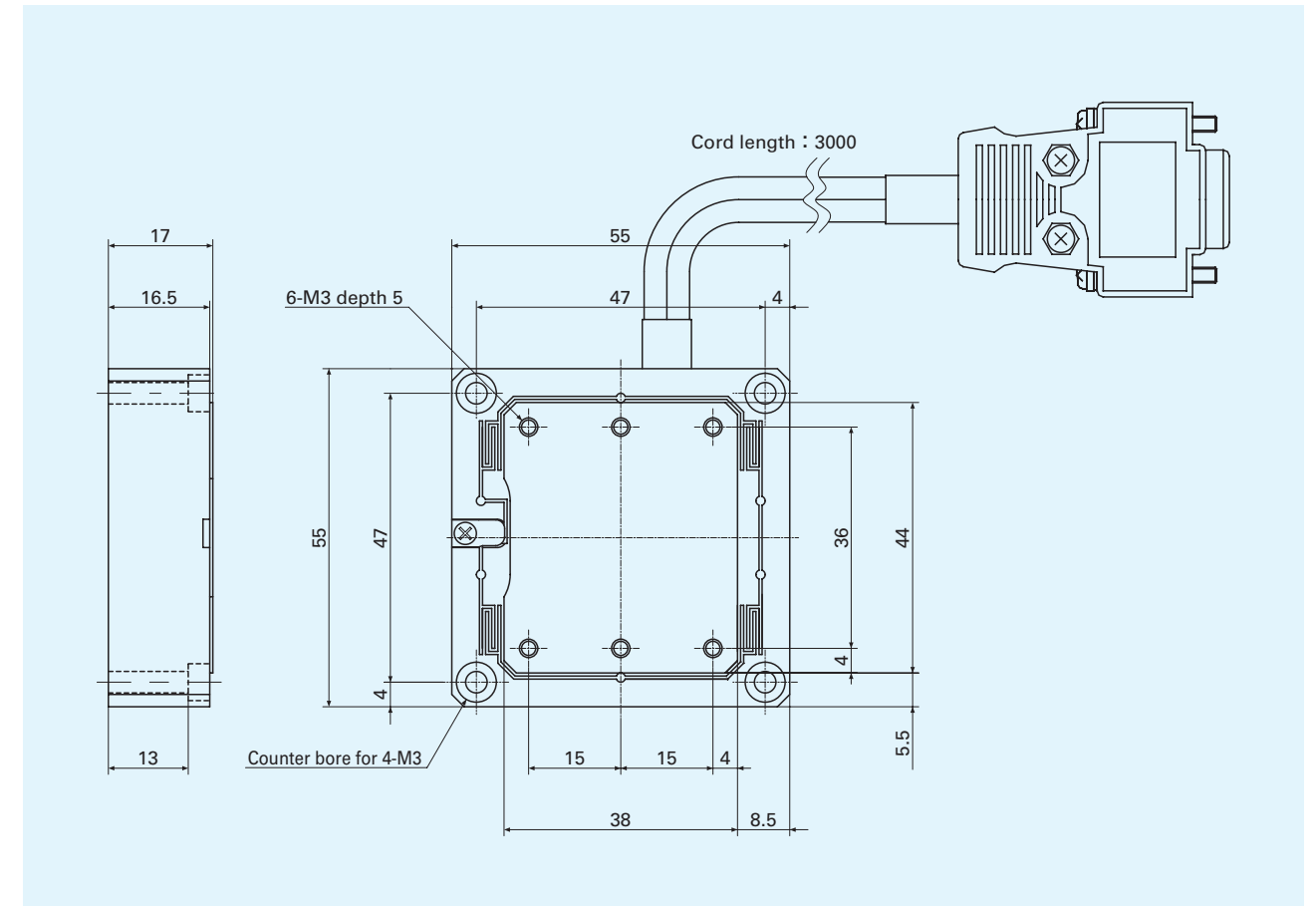


Accuracy

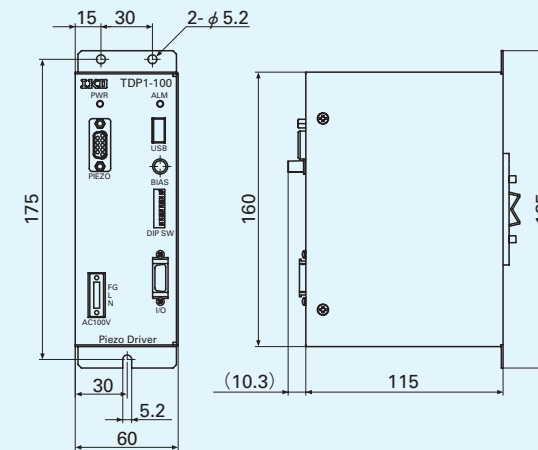
Item	Performance
Stroke length	mm ±7.5
Positioning accuracy	mm 0.005
Repeatability	mm ±0.002
Parallelism in operation A	mm 0.005
Parallelism in operation B	mm 0.015
Allowable load	N 20
Table inertia J_T	$\times 10^{-5} \text{kg} \cdot \text{m}^2$ 0.01
Starting torque T_0	$\text{N} \cdot \text{m}$ 0.03

Dimensions

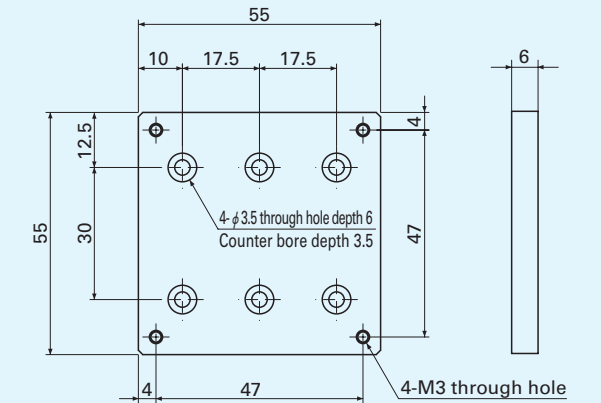
SP55/55/DR



● Dedicated Driver



● TAE0418-BR



Material : Carbon steel

Dedicated attachment for SP55/55

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

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Recognizing that conservation of the global environment is the top-priority challenge for the world's population, **IKO** will conduct its activities with consideration of the environment as a corporate social responsibility, reduce its negative impact on the environment, and help foster a rich global environment.

**ISO 9001 & 14001 Quality system
registration certificate**

