

**FLEXIBLE DEVICE**  
**ENDURANCE TEST**

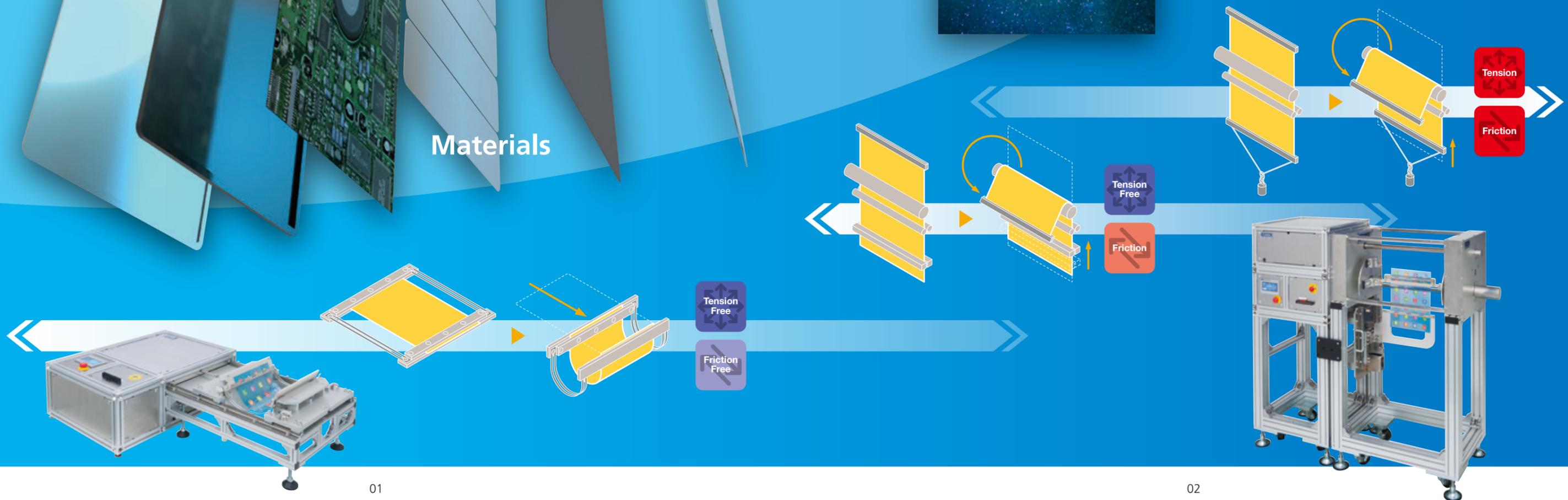
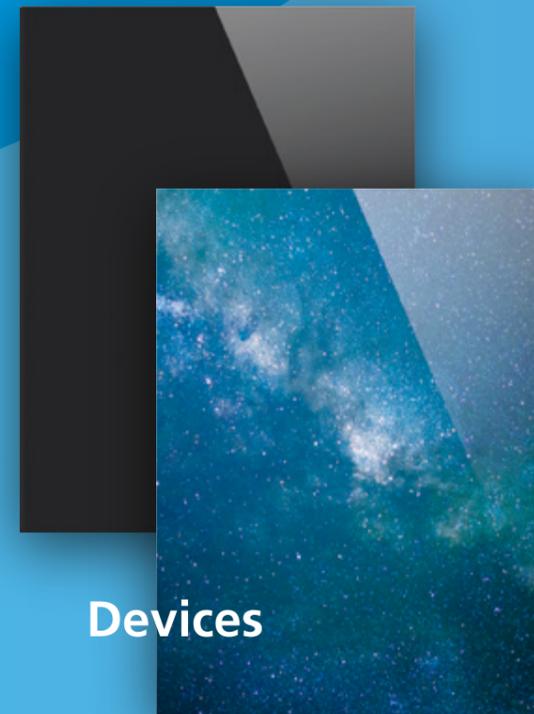
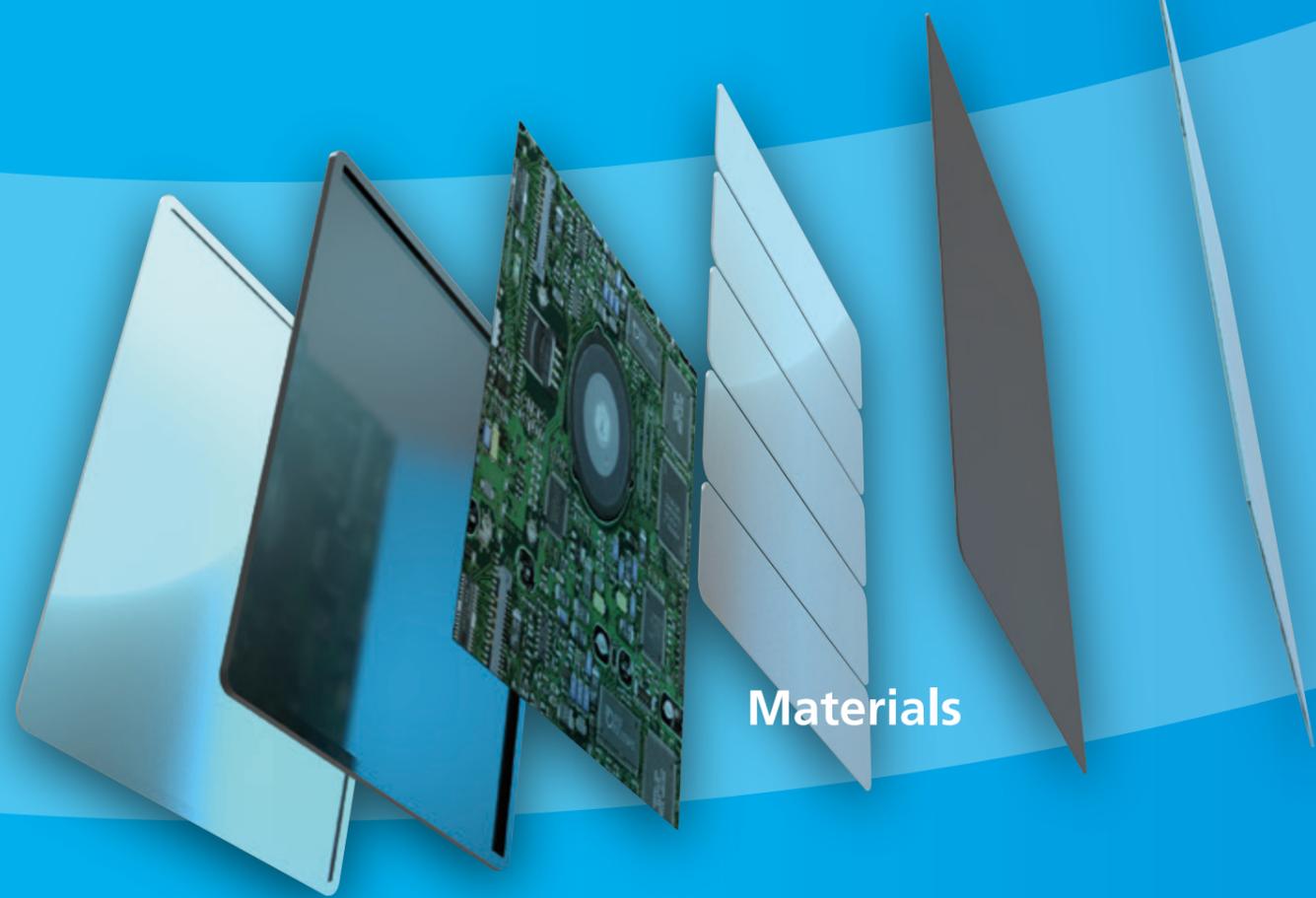


**ENVIRONMENTAL TEST**

**YUASA**  
YUASA SYSTEM CO., LTD.

# Further Improve Reliability

## FLEXIBLE DEVICE ENDURANCE TEST SYSTEM



# New Standard

**ENDURANCE  
TEST**

**ENVIRONMENTAL  
TEST**



New Standard

**ENDURANCE  
TEST**

**ENVIRONMENTAL  
TEST**

# ENDURANCE TEST SYSTEM

Flexible Device Endurance Test

## Tension-Free U-shape Folding Test

Folding Test Without Tension and Friction.

The bending load is applied by having one side of the sample move straight towards the other side. The sample only receives bending load so there are no applied tension or friction.

**FLEXI  
A W A R D**

YUASA SYSTEM won the FLEXI Award in the Product Innovation category for Tension-Free U-shape Folding Test Jig. The FLEXI Award is presented by FlexiTech, a SEMI Strategic Association Partner.



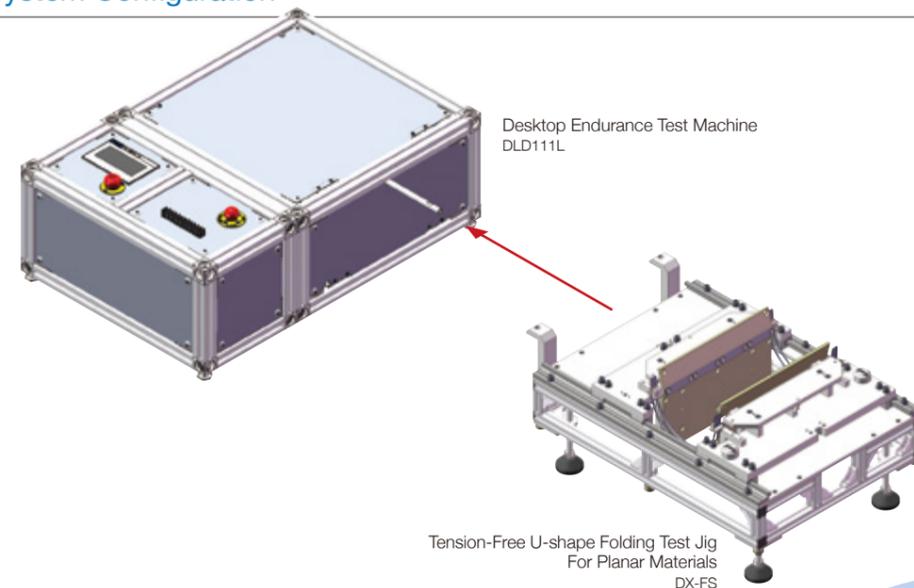
The Endurance Test System Which Realizes Tension-Free U-shape Folding Test

DLD-FS

Desktop Endurance Test Machine

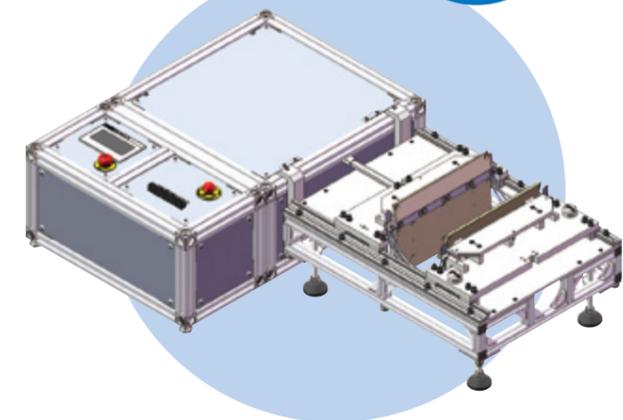
Tension-Free U-shape Folding Test For Planar Materials

System Configuration

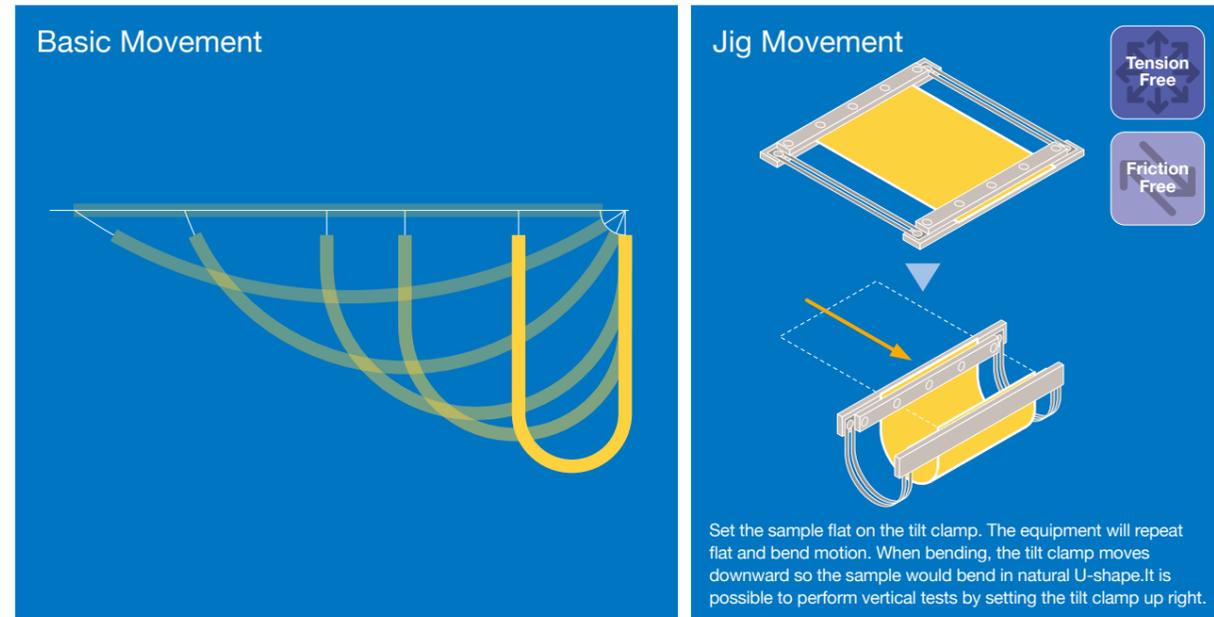


Folding test without tension and friction on the sample. Folding test without tension and friction on planar samples such as film or FPC can be performed.

Perform natural folding test. This machine allows the sample to fold in natural form by utilizing the elasticity of the sample itself. Or it can create a folding with tiny radius using the guide plate. (Patent Pending)

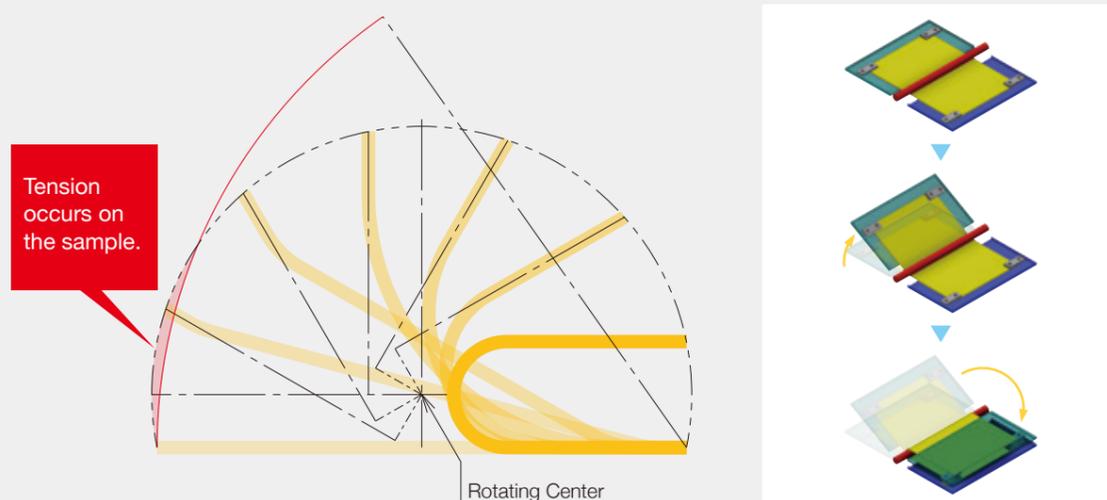


A safety cover is available to protect the moving section.



### Issues During General Folding Test

When conducting tests with equipments shown in the right diagram, a large tension occurs on the sample when the test starts. The cause of this is clear when drawing a circle with radius the same length as the sample on the movement track of the test machine, shown on left. As shown in red in the diagram, the length of the sample is too short against the movement track of the clamp. If one uses a rod, this becomes more apparent. This causes the unexpected breaks and disperse in the test results in actual tests.



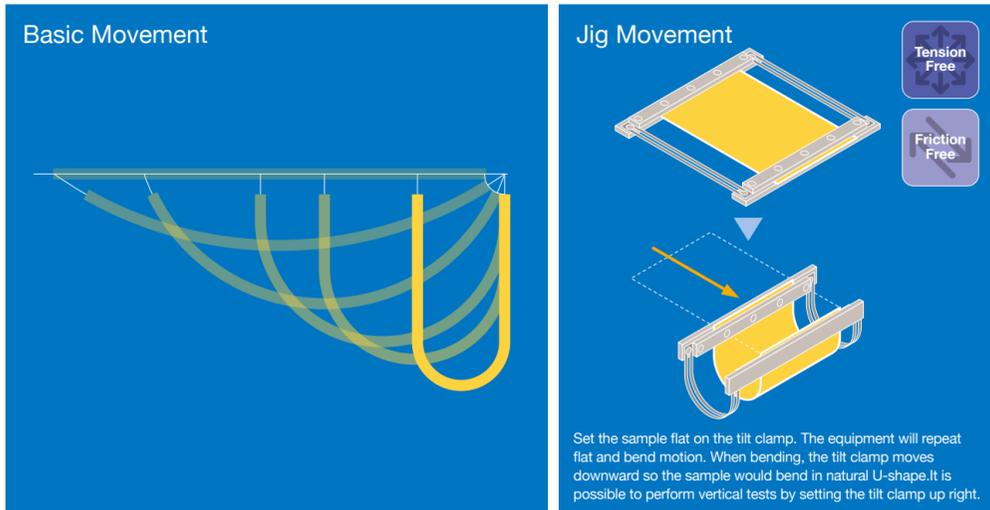
# ENDURANCE TEST

Flexible Device Endurance Test

## Tension-Free U-shape Folding Test

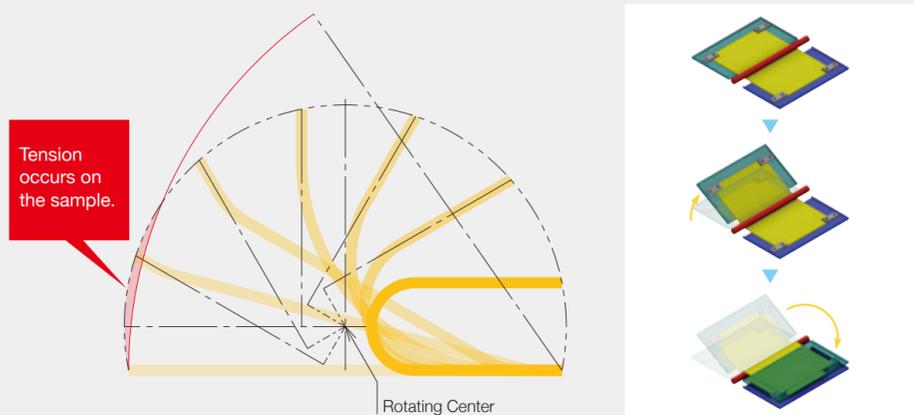
Folding Test Without Tension and Friction.

The bending load is applied by having one side of the sample move straight towards the other side. The sample only receives bending load so there are no applied tension or friction.



### Issues During General Folding Test

When conducting tests with equipments shown in the right diagram, a large tension occurs on the sample when the test starts. The cause of this is clear when drawing a circle with radius the same length as the sample on the movement track of the test machine, shown on left. As shown in red in the diagram, the length of the sample is too short against the movement track of the clamp. If one uses a rod, this becomes more apparent. This causes the unexpected breaks and disperse in the test results in actual tests.



Environmental Endurance Test System Which Realizes Tension-Free U-shape Folding Test

CL09-typeD01-FSC90

Constant Temperature and Humidity Environment Endurance Test Machine

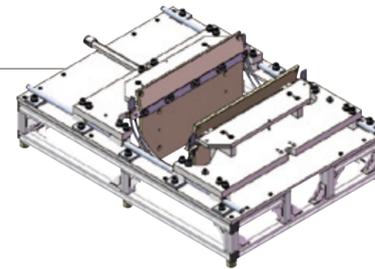
Tension-Free U-shape Folding Environment Test For Planar Materials



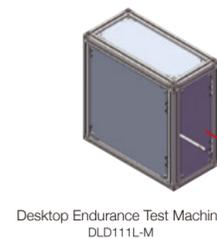
### Test Jig

Tension-Free U-shape Folding Test Jig For Planar Materials

DM-FSC90



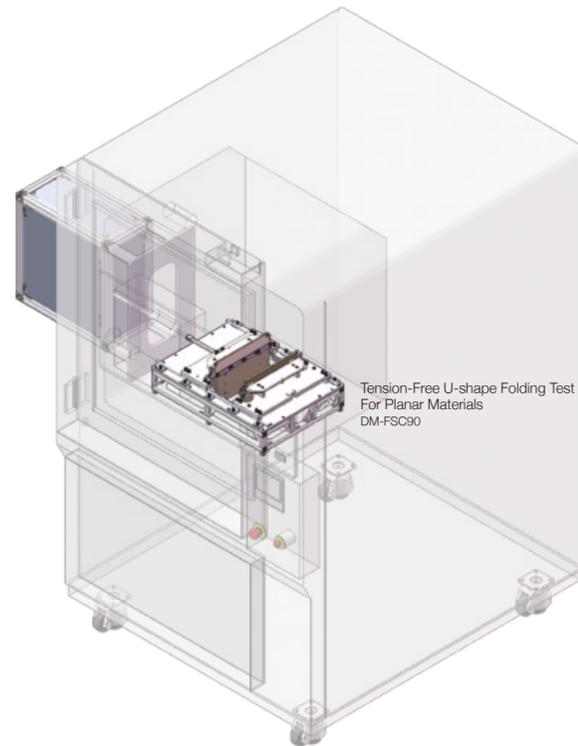
### System Configuration



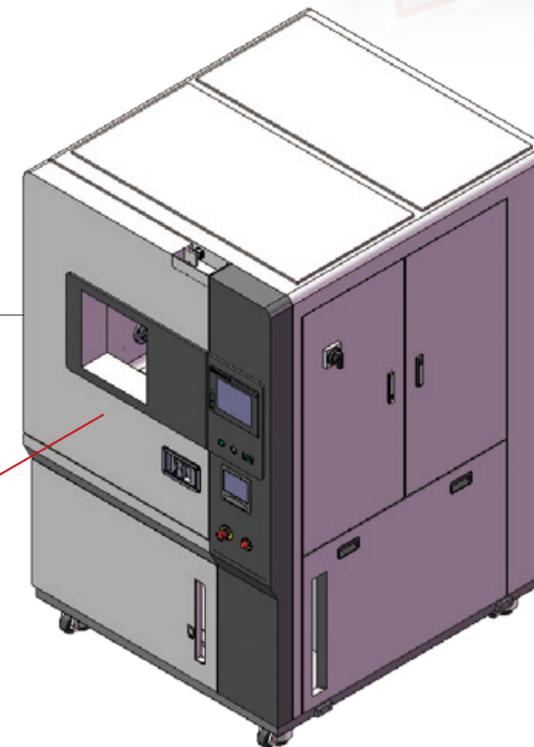
Desktop Endurance Test Machine DLD111L-M



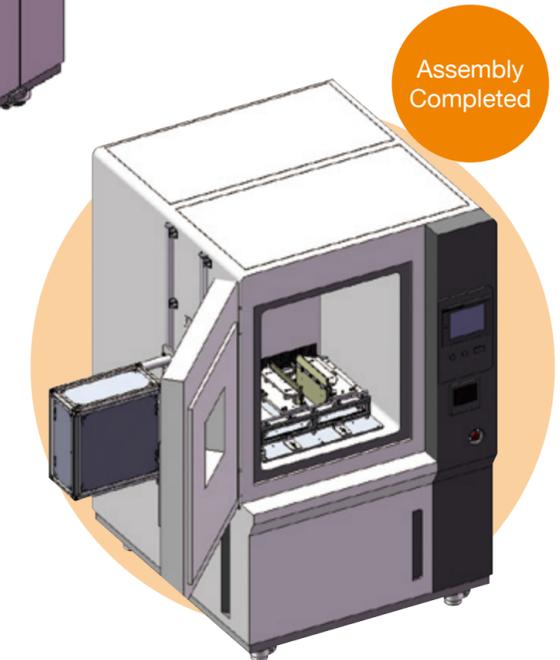
Jig to be attached to the Base Unit CL09-typeD01-CU



Tension-Free U-shape Folding Test Jig For Planar Materials DM-FSC90



Thermo-hygrostat typeD01



Folding test without tension and friction on the sample in constant temperature and humidity environment.

Folding test without tension and friction on planar samples such as film or FPC can be performed in constant temperature and humidity environment.

Perform natural folding test.

This machine allows the sample to fold in natural form by utilizing the elasticity of the sample itself. Or it can create a folding with tiny radius using the guide plate. (Patent Pending)

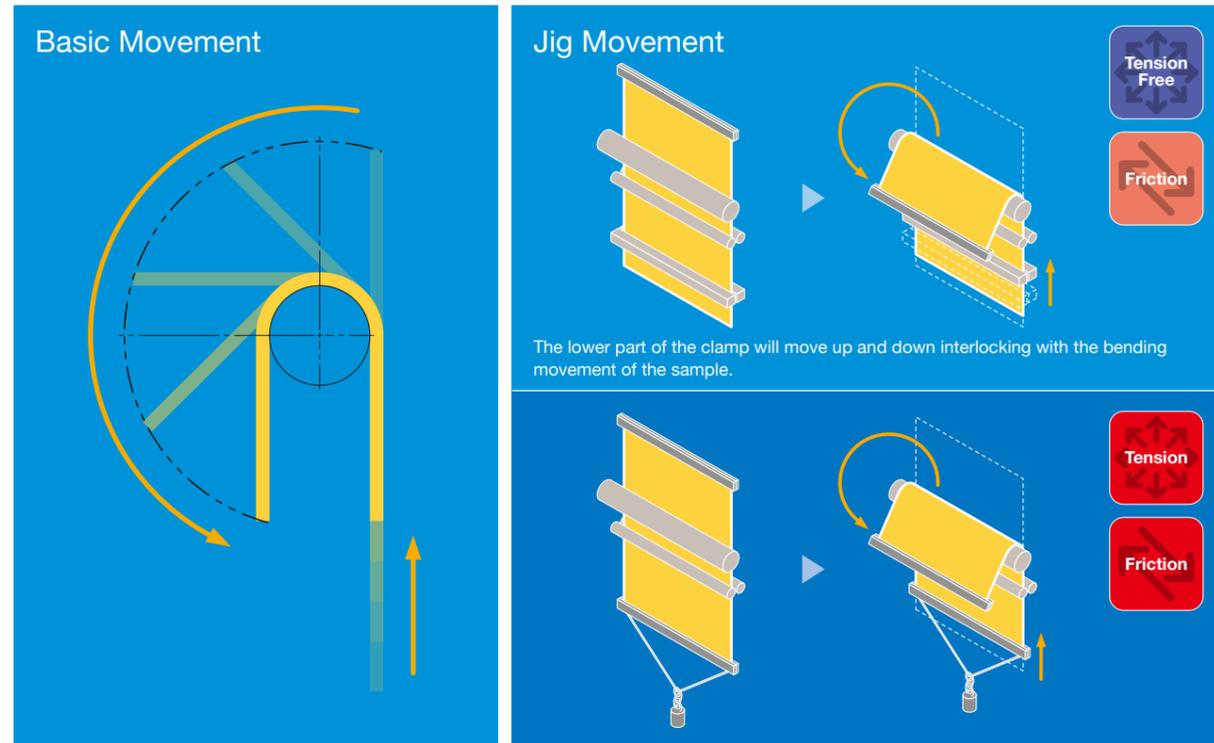
# ENDURANCE TEST SYSTEM

Flexible Device Endurance Test

## Tension-Free Bending Test

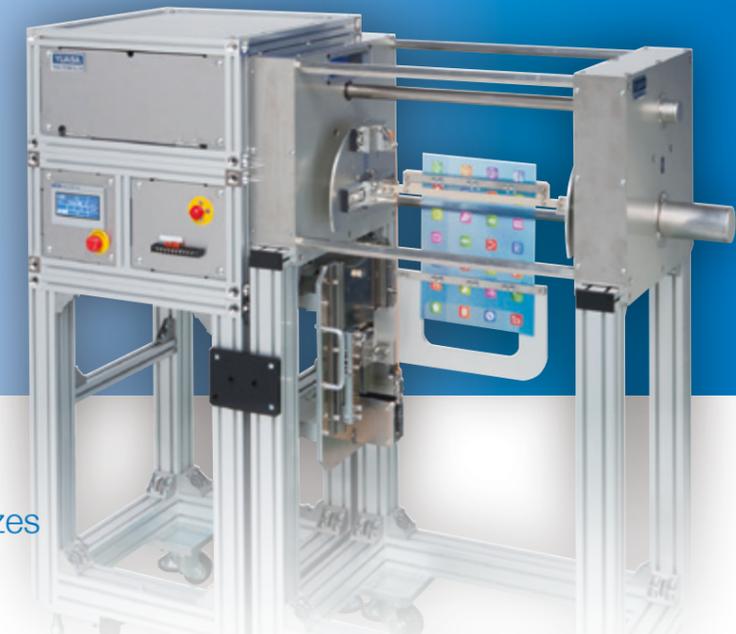
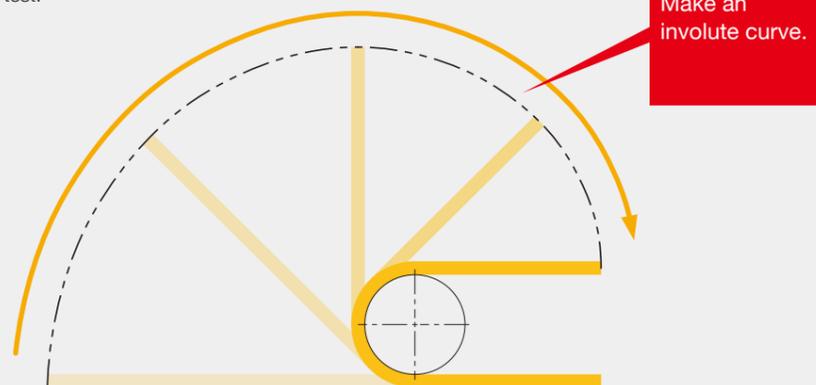
### Bending Test Without Tension (Constant Bending Radius)

This equipment uses a bending rod to keep the bending radius constant. The clamp moves in the circular motion having the same center point as the rod. The other end slides. There would be no tension applied to the sample.



### Issues During General Bending Test

If the sample is bent along the rod, the edge of the sample will make an involute curve, making it hard to grab the sample, which makes it difficult to successfully perform the test.



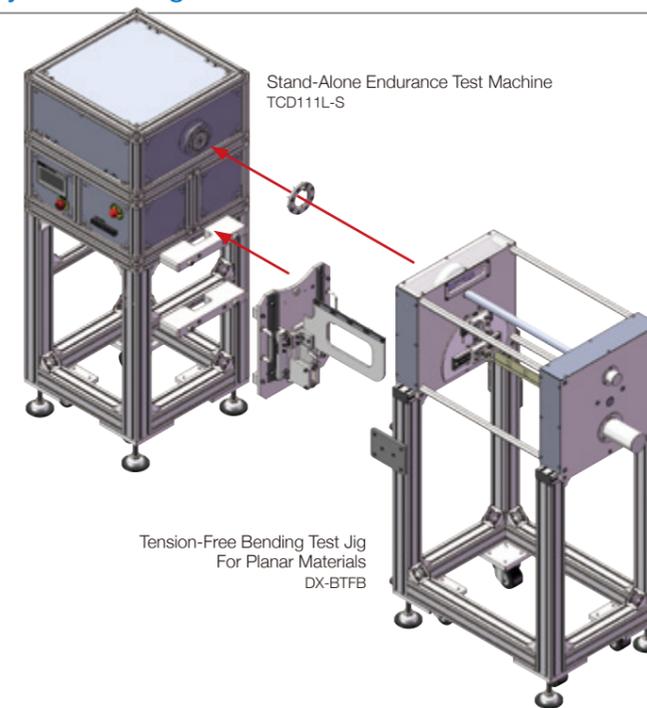
Endurance Test System Which Realizes Tension-Free Bending Test

TCD-BTFB

Stand-Alone Endurance Test Machine

Tension-Free Bending Test For Planar Materials

### System Configuration



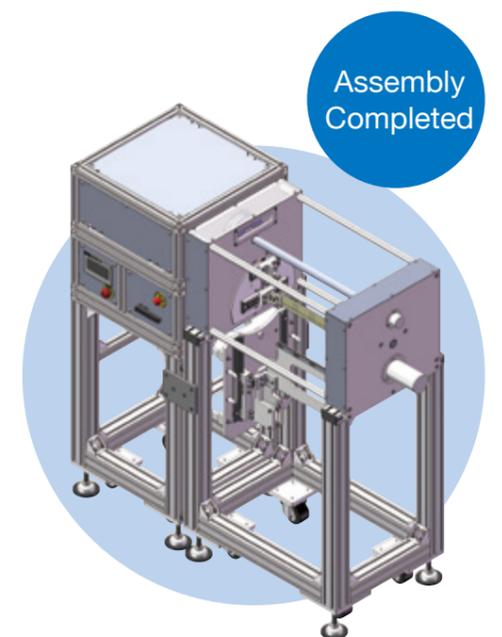
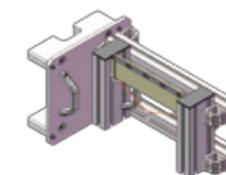
This machine makes it possible to perform tension-free bending test on a planar sample such as flexible device.

By changing the position of the clamp, one can perform tension-free bending test for planar materials that are card size to A4 size. Maximum bending angle is up to  $\pm 180^\circ$ . One can bend one side only or both right and left side.

One can also use a weight when performing the bending test.

By changing the tension-free test jig to the stabilizing jig, it will be possible to perform bending test using weights.

Bending Test Jig For Planar Materials  
DX-BFFB



The weight is not included.

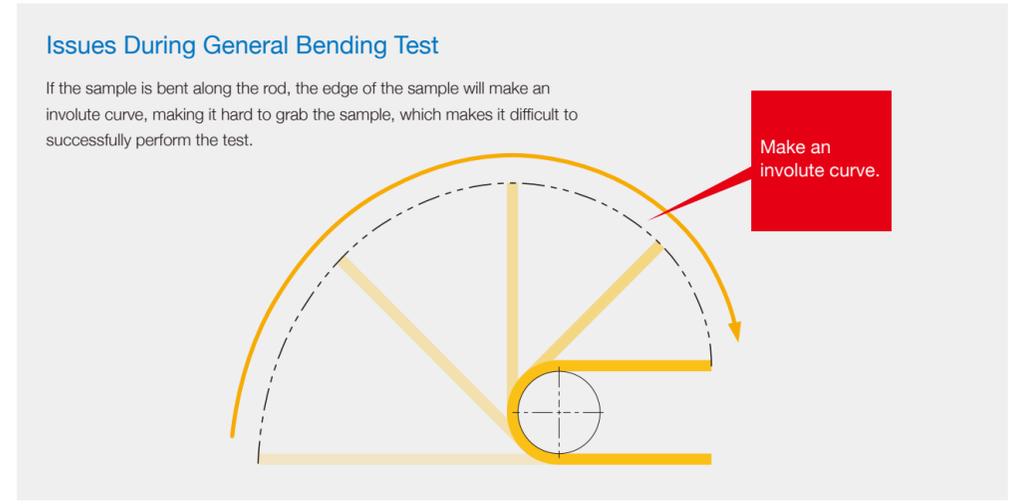
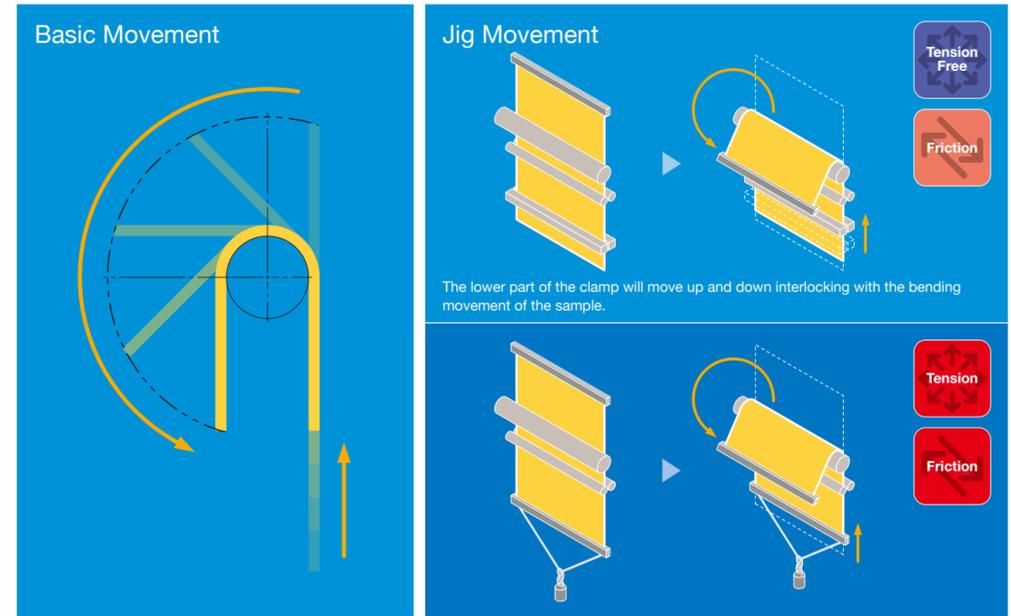
# ENDURANCE TEST

Flexible Device Endurance Test

## Tension-Free Bending Test

### Bending Test Without Tension (Constant Bending Radius)

This equipment uses a bending rod to keep the bending radius constant. The clamp moves in the circular motion having the same center point as the rod. The other end slides. There would be no tension applied to the sample.



# ENVIRONMENTAL TEST

Environmental Endurance Test System Which Realizes Tension-Free Bending Test

CR09-typeD01-BTFBC90

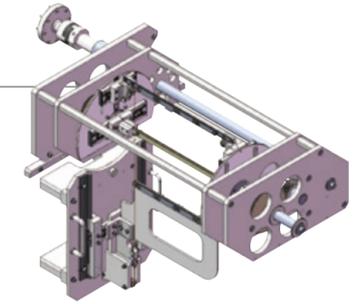
## Constant Temperature and Humidity Environment Endurance Test Machine

### Tension-Free Bending Test For Planar Materials

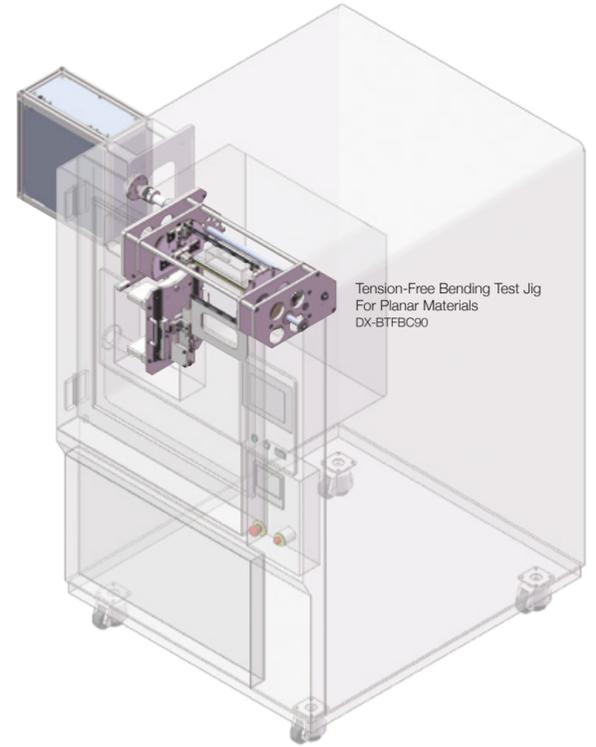
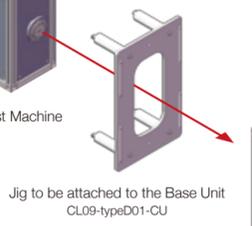
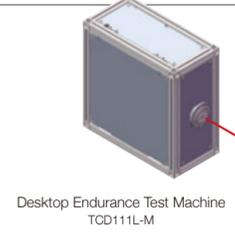


#### Test Jig

Tension-Free Bending Test Jig For Planar Materials  
DX-BTFBC90



#### System Configuration

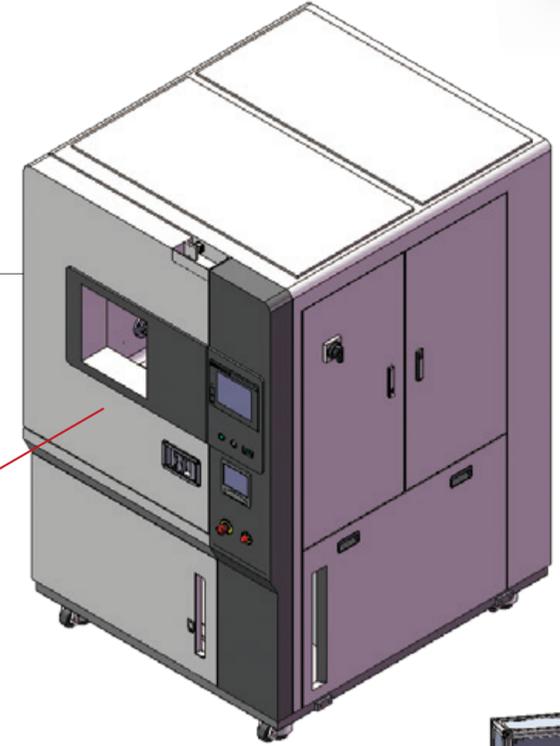


This machine makes it possible to perform tension-free bending test on a planar sample such as flexible device in constant temperature and humidity environment.

By changing the position of the clamp, in constant temperature and humidity environment, one can perform tension-free bending test for planar materials that are card size to A4 size. Maximum bending angle is up to  $\pm 180^\circ$ . One can bend one side only or both right and left side.

One can also use a weight when performing the bending test.

By changing the tension-free test jig to the stabilizing jig, it will be possible to perform bending test using weights



The weight is not included.

# ENDURANCE TEST × ENVIRONMENTAL TEST

Environment and Movement Interlocking Type Endurance Test System Which Realizes Various Endurance Tests In Constant Temperature and Humidity Environment.

PROGRAMMING (1/2) Mar/13/17 18:13 MENU

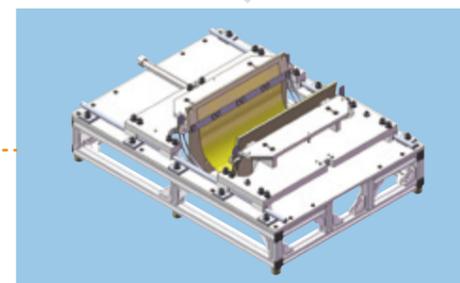
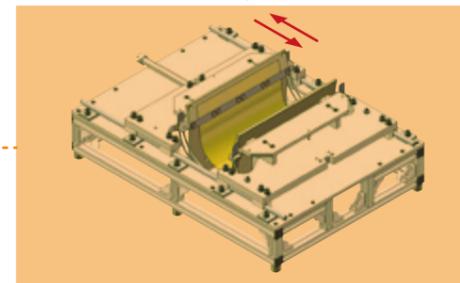
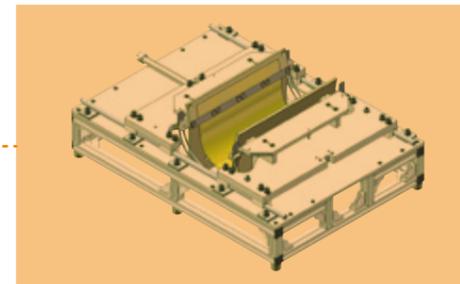
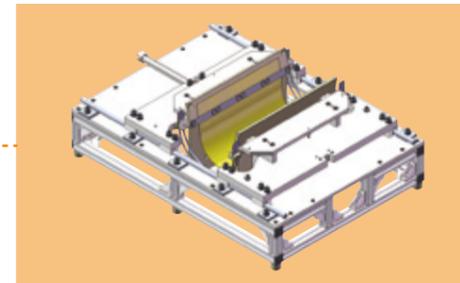
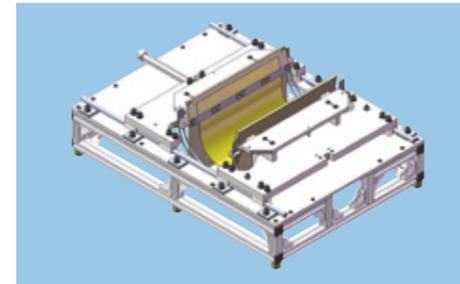
PROGRAM EDIT STEP INSERT STEP DELETE PROGRAM CLEAR PROGRAM OPERATION

STEP	DRIVE UNIT	TEST MODE	DYNAMIC		STATIC			CHAMBER	
			SPEED (rpm)	COUNT	REAR END	CENTER	FRONT END	TIME (HOUR)	TEMP. (°C)
1	DISABLE							85.0	90.0
2	ENABLE	STATIC					2.0	85.0	90.0
3	ENABLE	DYNAMIC	60	100000				85.0	90.0
4	END	DISABLE						24.0	30.0
7									
8									
9									
10									

CHAMBER STATUS ENABLE LOOP SETTING 1 LOOP END CHAMBER CONTROL STOP AFTER END TEMP. (°C) HUM. (%) 0.0 0.0



Example Using Program Operation  
(Tension-Free U-shape Folding Environment Test For Planar Materials)



## STEP 1

Set thermo-hygrostat to 85°C/90%Rh.

## STEP 2

Wait 2 hours maintaining thermo-hygrostat at 85°C/90%Rh.

## STEP 3

Conduct the test 100,000 times with thermo-hygrostat set at 60 rounds/minute.

## STEP 4

Adjust the thermo-hygrostat to room temperature (24°C/30%Rh) and finish the operation.

# Base Unit Specifications

## Constant Temperature and Humidity Environment Endurance Test Machine

CL09-typeD01 / CR09-typeD01  
 (Linear Reciprocation Specification) (Rotary Reciprocation Specification)

By combining the base endurance test machine and the test jig in the thermo-hygrostat, various endurance tests can be performed in constant temperature and humidity environment.

### Device Overview

#### Set Up Requirements

Electricity Supply	AC200V / 3 phase / 60A	Compressed Air	No
Cooling System	Cooler	Noise Level	Max.80dB
Water to Add Moisture	Purified Water	Maximum Amount of Heat Released	10,977 kcal/h
Ambient	Temperature: 21.1 - 29.4°C Humidity: 15.0 - 85.0%Rh (no condensation)		

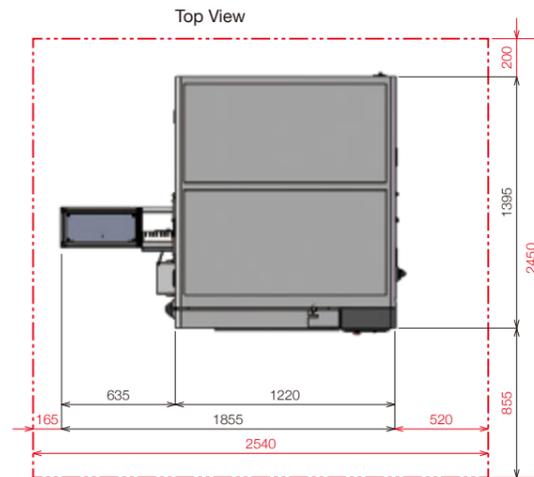
Mass approx.	800kg (Excluding test jig and sample)
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#### NOTE

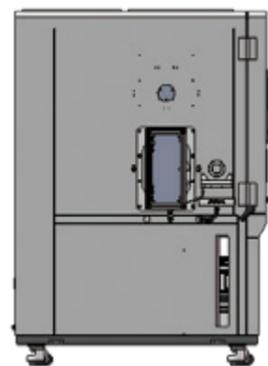
When conducting maintenance including exchanging of equipments, more than 500mm space surrounding the equipments is necessary.

#### WARNING

If the water which includes impurities are used, impurities precipitate in the humidity heater, which could cause malfunction or fire.



Side View



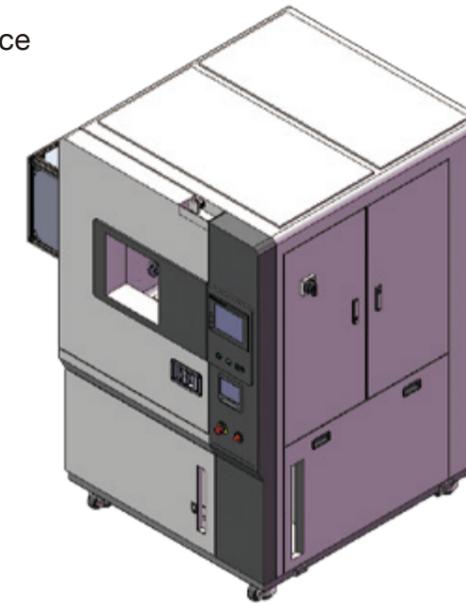
Front View



Drawing is CL09-typeD01.



### Appearance



#### Thermo-hygrostat

The device controls set up environment of the test jig under various conditions. When test jig is moving, or inside is too hot, the door cannot be opened.

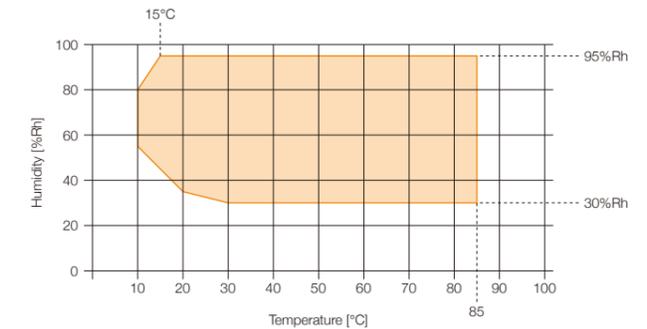
**Engine Unit (Linear Reciprocating Specifications)**  
 Set linear reciprocating movement within the thermo-hygrostat.

**Engine Unit (Rotary Reciprocation Specification)**  
 Set rotary reciprocating movement within the thermo-hygrostat.

### Specifications

#### Thermo-Hygrostat

Refrigerant	R404A, R23
Environment Control Range	Temperature: -40 - +150°C Humidity: 30.0 - 95.0%Rh



#### Engine Unit (Linear Reciprocating Specifications)

Reciprocating Times Count	8 digits (Comes with preset feature)	Reciprocating Speed	10 - 60 rounds/minutes.
Reciprocating Distance	0 - ±120mm	Driving Axis Output	Max. 400N 14000/st. [N] *Ex. st.=±60mm=120mm

#### Engine Unit (Rotary Reciprocation Specification)

Reciprocating Times Count	8 digits (Comes with preset feature)	Reciprocating Speed	10 - 60 rounds/minutes.
Reciprocating Angle	0 - ±180°	Engine Axis Output	Max. 10N·m 1620/st. [N·m] *Ex. st.=±60deg.=120deg.

# Further Improve Reliability

## YUASA SYSTEM ENDURANCE TEST SYSTEM



**Bending**



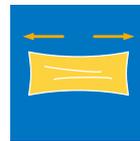
**Torsion**



**Folding**



**Rolling**



**Tension**



## YUASA SYSTEM CO., LTD.

Our product information is also available on <https://www.yuasa-system.jp/en>



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OSAKA OFFICE	8F, NLC SHIN-OSAKA EARTH-BLDG. 5-1-3 MIYAHARA, YODOGAWA-KU, OSAKA-CITY 532-0003 JAPAN PHONE : +81-6-6394-8175 FAX : +81-6-6397-2632

 **Safety Note** To ensure your safe and proper usage, please observe all the manuals before using these machines.