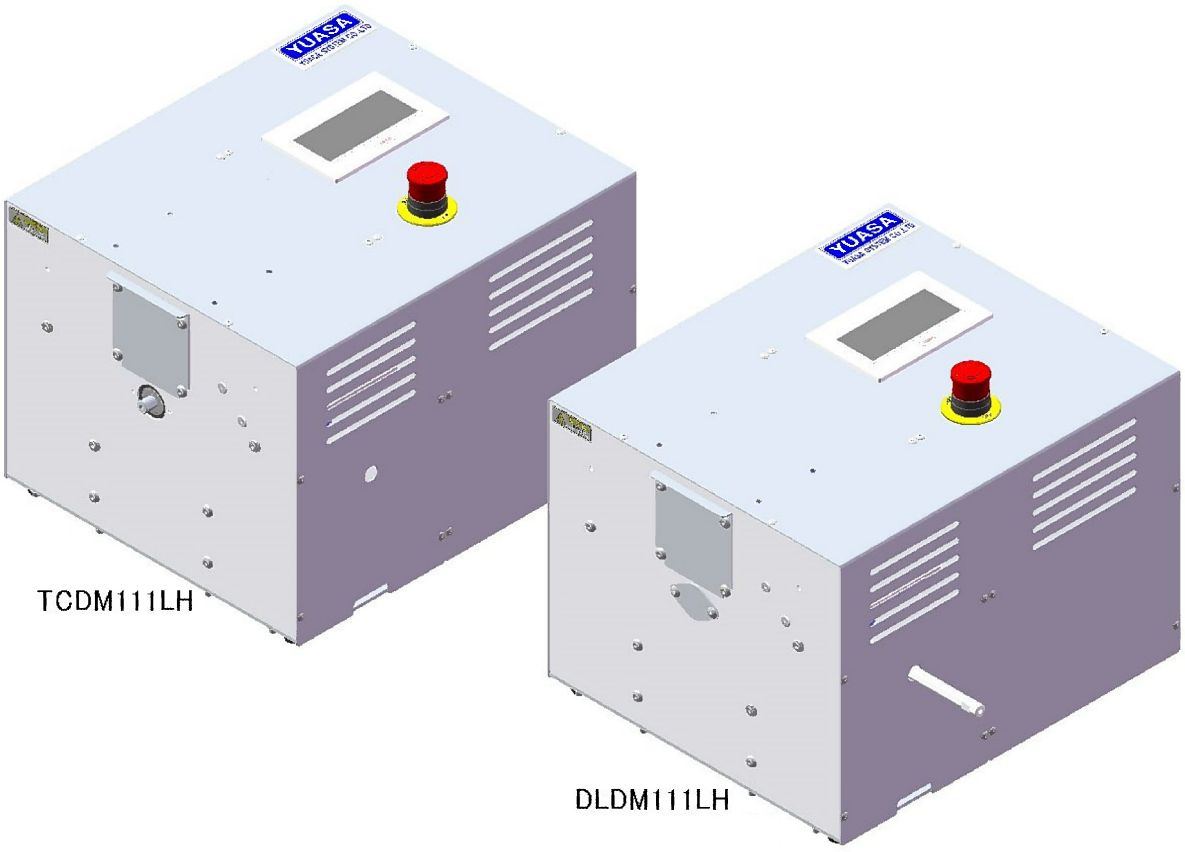
INSTRUCTION MANUAL

Desktop Model Endurance Testing Machine

TCDM111LH / DLDM111LH



YUASA SYSTEM CO., LTD.

Safety precaution are classified into five categories

WARNING : Death or serious injury may result from misusing the product wihtout following the instructions.

CAUTION : Minor injury, as well as damage to the product may result from misusing the product without following the instructions.

NOTICE : Bad influence on test result may result from misusing the product without following the instructions.

NOTE : General knowledge.

INTERLOCK : Effect of the interlock system for safety.

INTERLOCK : Install a personal safety cover and prevent access to any moving parts.

WARNING : Installing, operating, maintaining or inspecting must be carried out by skilled and professional engineers.

WARNING : Make sure to tighten each screws as described in this manual.

WARNING : Make sure the Emergency Stop Button is maked work, and the machine is completely stopped before adjust the examination condition and change the part.

WARNING : Make sure the power is switched off, and the machine is completely stopped before carrying out maintenance and inspection.

WARNING : Do not use products beyond its capacity as specified in the specification.

WARNING : Do not remodel.

CAUTION : Do not change installation environment (temperature and humidity) rapidly.

CAUTION : Isolate the machine from sunlight.

CAUTION : Isolate the machine from any noise.

CAUTION : Isolate the machine from any dust.

CAUTION : Isolate the machine from large vibration.

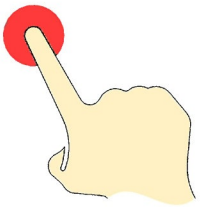
CAUTION : Immediately stop the machine upon any sign of abnormal operation.

NOTICE : Make sure to tighten the screws as described in the manual.

NOTE : The scraps should be disposed as general waste by skilled professionals.

Icons on this manual.

◇Tap the touch panel display ◇Press the touch panel display



- CONTENTS -

[- NOTICE -]

We make absolutely sure about the contents of this user manual.
However, if you have some questions or find some incorrect, please contact us.

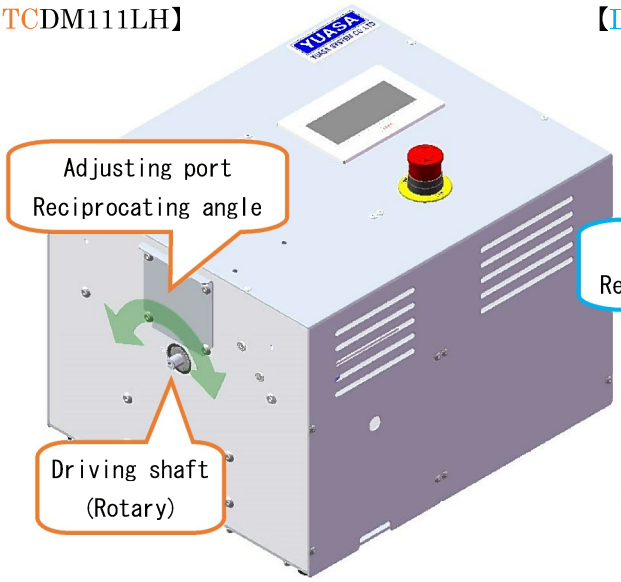
1. GENERAL DESCRIPTION

1.1 UTILITY INFORMATION

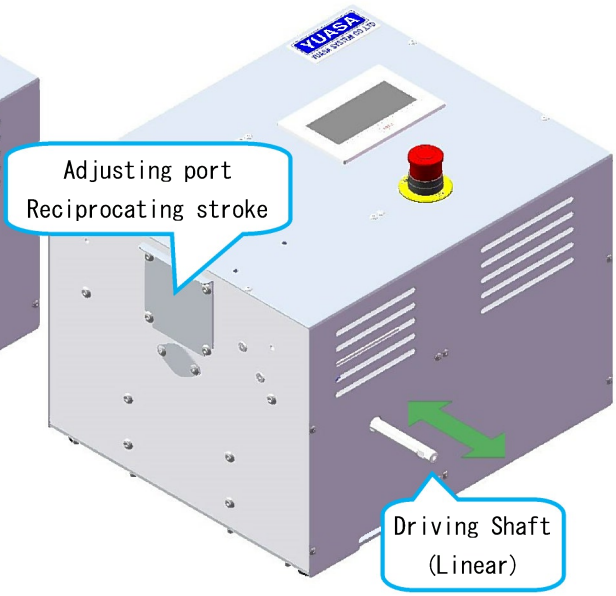
Electrical Information	100～240 V / 50 or 60 Hz / 1 Phase / 100 VA
Ambient Environment	Temperture : +5～+40 ° C (41～104 ° F) Humidity : 15～85 %RH (No Condensation)
Sound Level	Max. 80 dB

1.2 OVERVIEW

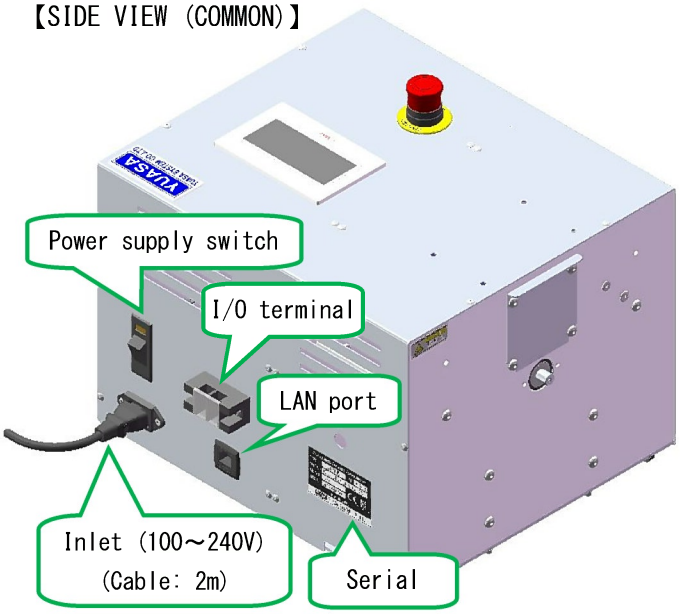
【TCDM111LH】

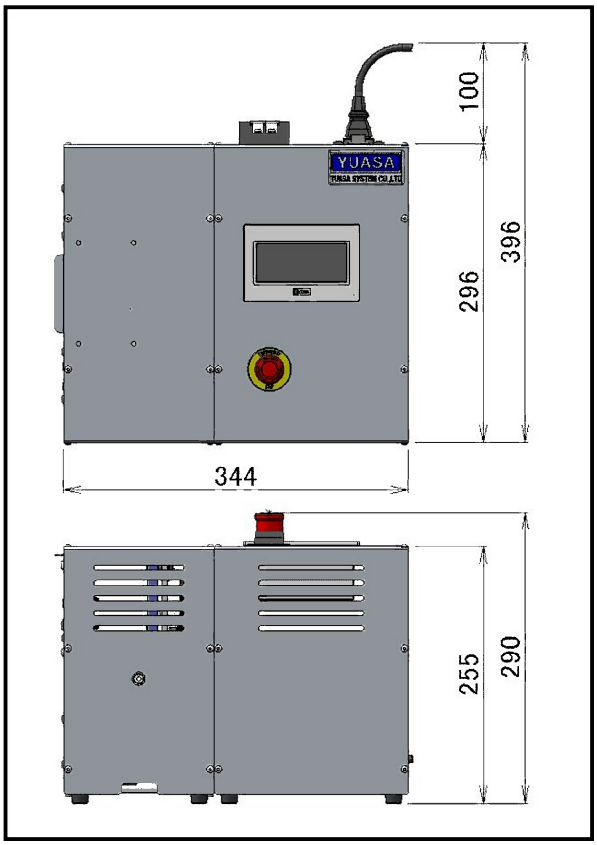


【DLDM111LH】



【SIDE VIEW (COMMON)】





1.3 SPECIFICATIONS <TCDM111LH> (refer to P.3-3 for detail of operating conditions)

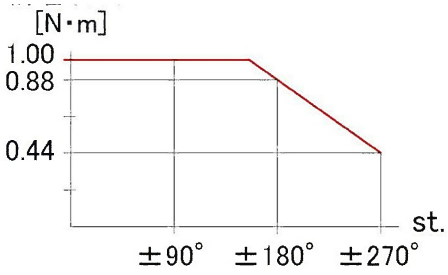
Choose and conduct various test modes and conditions.

TCDM111LH output rotary reciprocating motion for test jig as below.

CAUTION Function may be limited by kind of test jig or sample.

Counter	8-digits display (with Pre-set)
Motor Unit	DC Brushless Motor [DC24V, 3.5A(MAX), 30W] Gear Box [1/20]
Reciprocating Speed	10～120r/min (adjust with volume switch)
Reciprocating Angle	0～±270°(adjust with component position)
Driving Shaft	φ10h9, L= 11 mm
Permissible Torque	* Refer to the chart on the margin, below.
Static Rated Moment	1.5 N･m * Refer to the drawing [M], below.
Permissible Moment of Inertia	* Refer to the formula on the margin, below.

Permissible Torque



Permissible Moment of Inertia: Imax.

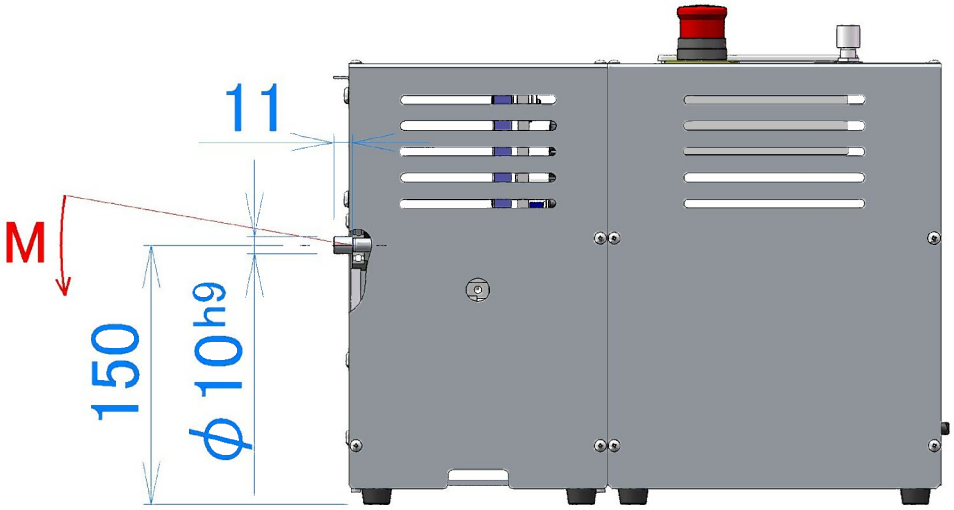
Reciprocating speed : v [r/min]

Reciprocating angle : ±θ [deg.]

Moment of inertia

(add up jigs and samples) : Is [kg･m²]

$Imax. = 215000 \div v^2 \div \theta^2 > Is$



1.4 SPECIFICATIONS <DLDM111LH> (refer to P.3-4 for detail of operating conditions)

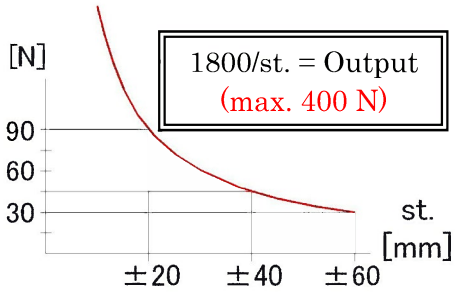
Choose and conduct various test modes and conditions.

DLDM111LH output linear reciprocating motion for test jig as below.

CAUTION Function may be limited by kind of test jig or sample.

Counter	8-digits display (with Pre-set)
Motor Unit	DC Brushless Motor [DC24V, 3.5A(MAX), 30W] Gear Box [1/20]
Reciprocating Speed	10～120r/min (adjust with volume switch)
Reciprocating Distance	0～±60 mm (adjust with component position)
Driving Shaft	φ10 mm (internal thread M5 depth 10)
Output	* Refer to the chart on the margin, below.
Static Rated Moment	1.3 N･m * Refer to drawing [M], below
Maximum Acceleration	* Refer to the formula on the margin, below.

Output (center of st.)



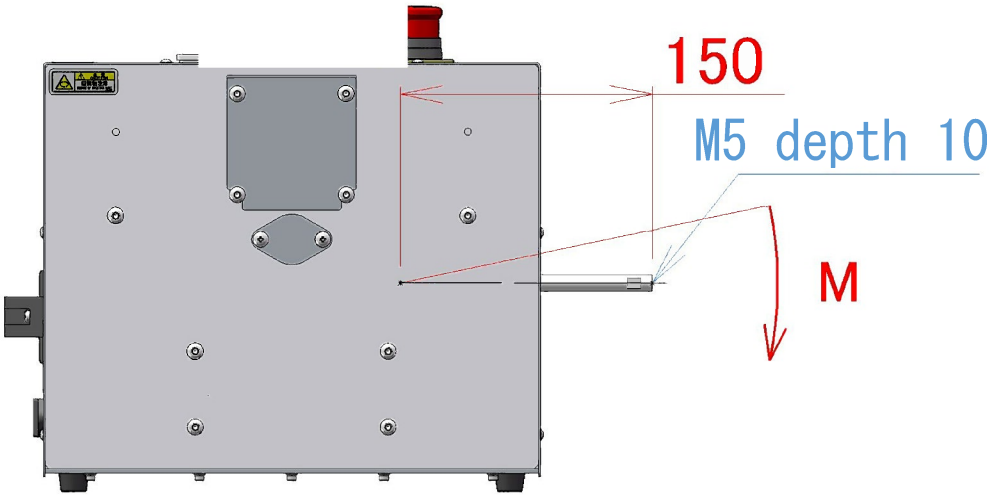
Maximum Acceleration αmax. (both end of st.)

Reciprocating speed : v [r/min]

Reciprocating Distance : ±L [mm]

$\alpha max. = 2 \times L \times v^2 \times \pi^2 \div 1.8 \times 10^{-6}$

$= L \times v^2 \times 1.1 \times 10^{-5}$



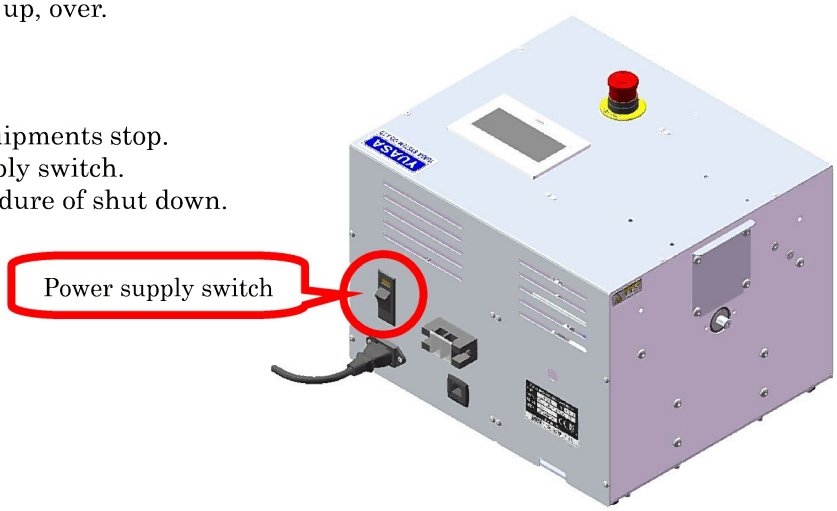
2. OPERATING INSTRUCTION

2.1 BOOT UP

1) Connect power cable (inlet) to outlet.
   WARNING Ground an earth wire for safety.
2) Turn On the power supply switch.
   NOTE The endurance testing machine boot up automatically when electricith supplied.
3) The “HOME” screen boot up, over.

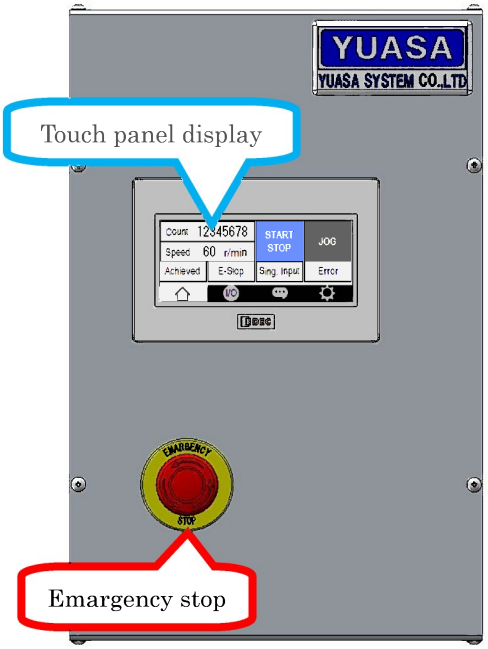
2.2 SHUT DOWN

1) Make sure that every equipments stop.
2) Turn OFF the power supply switch.
   NOTE There is no procedure of shut down.



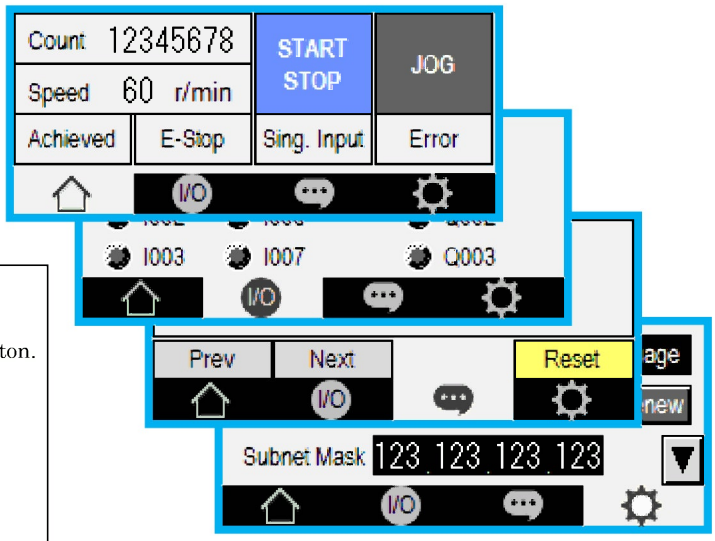
2.3 OPERATION PANEL

Operate the endurance testing machine with the touch panel display.

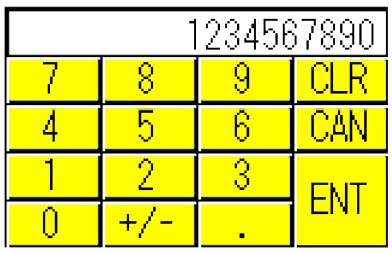


Tap each menu button to change the screen.
Refer to each instruction for detail, below.

- HOME screen:
  3. SETTING of TEST CONDITON
- I/O screen:
  4. MAINTENANCE and INSPECTION
- MESSAGE screen:
  4. MAINTENANCE and INSPECTION
- SETTING screen:
  3.5 STOP SIGNAL
  5. REMOTE CONTROL



Tap the numeric display for each setpoints.
The keypad will be shown on the screen.
Enter the setpoint value and tap the “ENT” button.



NOTE Tap the “Language” button, the “language selection” window will pop up.
Can select language from English, Japanese, Korean or Chinese.

3. SETTING and TEST CONDITION

Choose and conduct various test mode and conditions.

It count every 1 reciprocation in the movement number of times.

3.1 Test Jig

Choose and attach the test jig to linear or rotary reciprocating drive shaft as necessary.

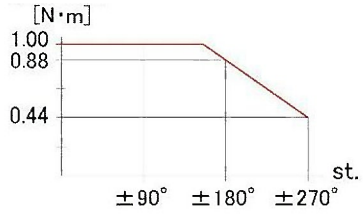
Refer to an attached sheet, instruction manuals and specifications of each test jig, for detail.

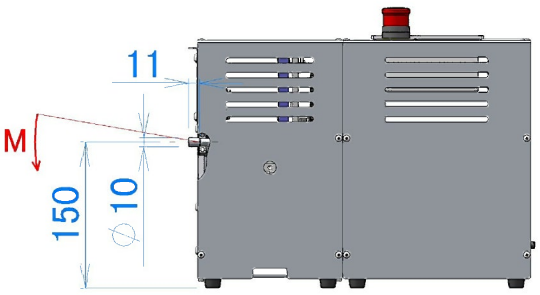
3.1.1 TCDM111LH

TCDM111LH supply rotary reciprocating motion for endurance test, bending or twisting or...

Driving shaft: Diameter is 10 mm and length is 11 mm.

Caution: Operate it under each specifications (limit) of TCDM111LH as below.

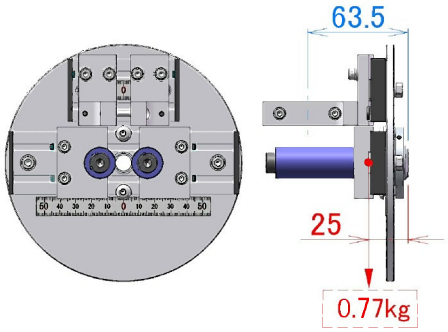
Permissible Torque	
Static Rated Moment	1.5 [N·m]
Permissible Moment of Inertia	Imax. = 215000÷v²÷θ² [kg·m²]



・Permissible Torque : It mean maximum power, the test jig transform samples.

・Static Rated Moment : It mean maximum mass (add up test jigs and samples) attachable to driving shaft.

⇒Calculate it from each mass and center of gravity positions.



Ex. Bending Jig + Bending Radius Jig (R10)

◇Test jigs

・Center of gravity position : 25 mm

・Mass : 0.77 kg

◇Samples

・Clamping position : 63.5 mm

・Mass : 1.0 kg

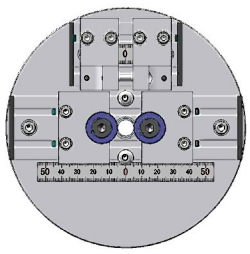
Static Rated Moment

= 0.77×9.81×0.025+1.0×9.81×0.0635

= 0.81 [N·m] < 1.5 [N·m]

・Permissible Moment of Inertia: It is index for checking relations of reciprocating speed and angle.

⇒ Refer to an attached sheet, instruction manuals and specifications, for detail of each moment of inertia.



Ex. Bending Jig + Bending Radius Jig (R10)

・Reciprocating speed : v [r/min]

・Reciprocating angle : ±θ [deg.]

・Moment of inertia (test jig) : 0.00138 [kg·m²]

・Moment of inertia (sample) : 0.00012 [kg·m²]

⇒ Maximum reciprocating speed when reciprocating angle is ±100 deg.

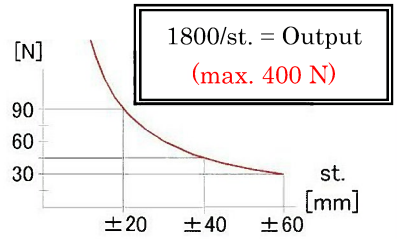
Imax. = 215000÷v²÷100² > 0.00138+0.00012

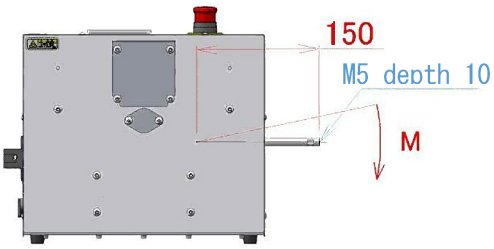
21.5÷v² > 0.0015

v < 119 r/min

3.1.2 DLDM111LH

DLDM111LH supply linear reciprocating motion for endurance test, Sliding Folding or Push or Pull or…
Driving shaft: Diameter is 10 mm and internal thread M5 depth 10, for attach test jig.
Caution: Operate it under each specifications (limit) of DLDM111LH as below.

Output	
Static Rated Moment	1.3 [N・m]
Maximum Acceleration	αmax. = L×v²×1.1×10⁻⁵ [m/s²]

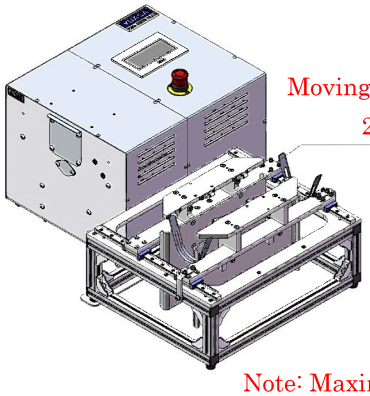


・Output : It mean maximum power (pushing power is same as pulling power).
It will be smallest at center of distance.
・Static Rated Moment : It mean maximum mass (add up test jigs and samples) attachable to driving shaft.
⇒Calculate it from each mass and center of gravity positions.
NOTE Do not include each mass of components supported by linear guide.

Ex. Floating joint
・Center of gravity position : 32 mm
・Mass : 0.056 kg

Static Rated Moment
= 0.056×(0.150+0.032)
= 0.01 [N・m] < 1.3 [N・m]

・Maximum Acceleration: It is index for checking relations of reciprocating speed and distance.
⇒ Refer to an attached sheet, instruction manuals and specifications,
for detail of each mass of components.



Ex. Tension-Free Folding (ET254A002-004)
・Reciprocating speed : v [r/min]
・Reciprocating distance : ±L [deg.]
・Mass of test jig : 2.5 [kg]
・Mass of sample : 0.1 [kg]

⇒ Maximum reciprocating speed when reciprocating distance is ±60 mm.
αmax. (= 60×v²×1.1×10⁻⁵)×(2.5+0.1) < 100
v²×1.42×10⁻³ < 100
v < 241 r/min

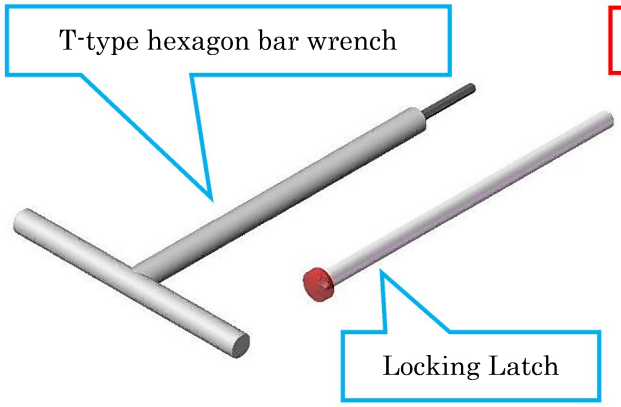
Note: Maximum speed of Tension-Free Folding is 90 r/min. on specification drawing.

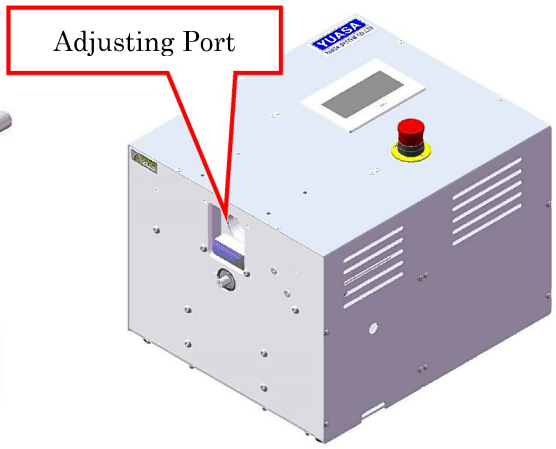
3.2 RECIPROCATING ANGLE or DISTANCE [Tool: 3 mm T-type hexagon bar wrench, Locking Latch]

- Adjust reciprocating angle and distance by the position of the cam follower.
- The way of adjusting reciprocating angle is same as the reciprocating distance.

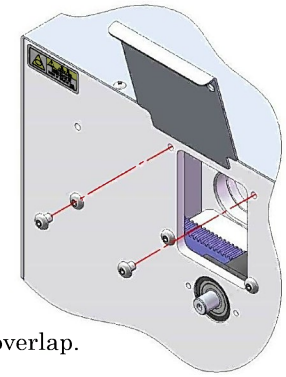
WARNING Make sure the Emergency Stop Button is maked work or power supply switch is turned OFF before adjust conditions.

NOTE T-type hexagon bar wrench and locking latch are machine accessorys.
Can use a hexagon bar wrench on the market (do not use the one whose tip is ball-shape).



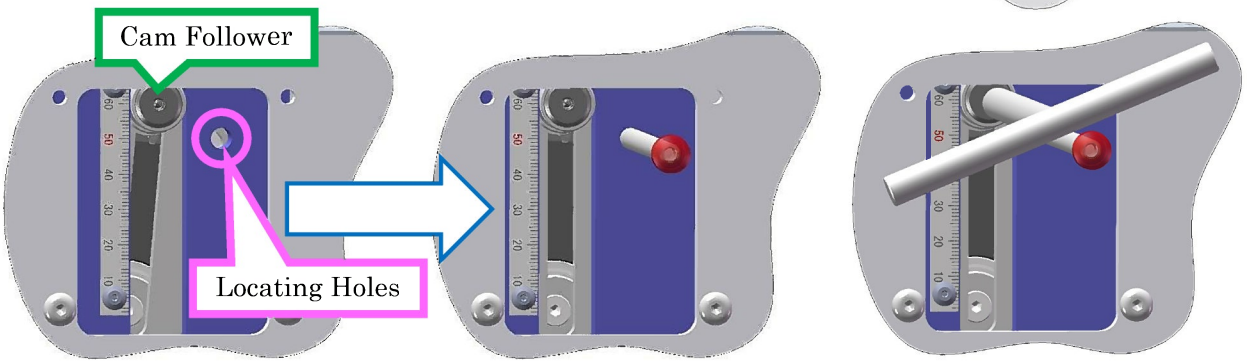


1) Operate the machine with low speed to the adjusting position.
   NOTE TCDM111LH: Center of stroke (came on counter-clockwise).
   NOTE DLDM111LH: Center of stroke (came from rear end).



2) Remove the cover, adjusting port.
   Loosen lower 2 screws and remove upper 2 screws.
   NOTE Remove test jigs that cover adjusting port.

3) Insert the locking latch into locating hole, lock the machine.
   Make sure driving shaft will not move by hand.
   NOTE Move the driving shaft (rotary / linear), two locating holes will overlap.



4) Loosen the cam follower (rotate about 90 deg.).
   CAUTION Keep the cam follower with wrench, it will drop and break.
   CAUTION Do not loosen the cam follower more 90 deg., it will come apart.

5) Adjust the position ond the cam follower to the scale.
   NOTE Number of the scale "□" is mean linear reciprocating distance "±□".
   Ex. Driving shaft moves in "±60 mm (120 mm)" when number of the scale is "60"
   NOTE Refer to conversion table below when use TCDM111LH.

Scale [mm]	10	20	30	40	50	60
Angle [deg.]	±45	±90	±135	±180	±225	±270

6) Fix the cam follower (CAUTION tightening torque: 3.5～4.0 N).

7) Pull out the locking latch.

8) Close the adjusting port with the cover.

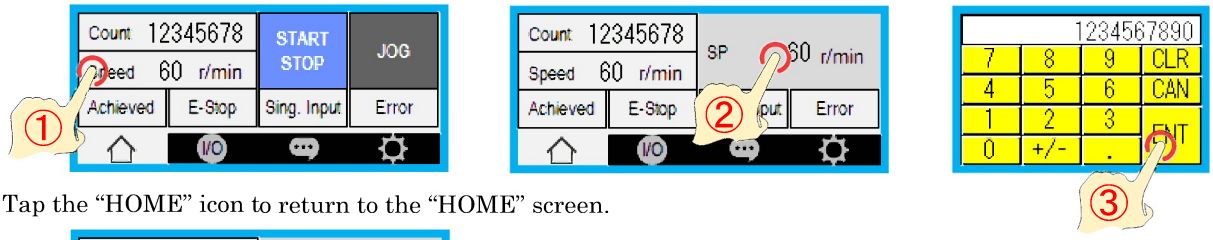
3.3 RECIPROCATING SPEED

1) Tap the “Speed” button, the “setting” window will pop up.
2) Tap the number, the keypad will pop up.
3) Input the speed (set point) and tap the “ENT” button.

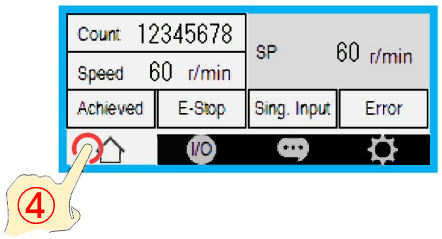
CAUTION Refer to each attach sheet, instruction manual and specification of each test jigs.

NOTICE Number shown on the screen is set value. Check present value with the stopwatch etc. because present value may change by load.

NOTICE The speed is in “r/min. (reciprocation per minute)”.



4) Tap the “HOME” icon to return to the “HOME” screen.

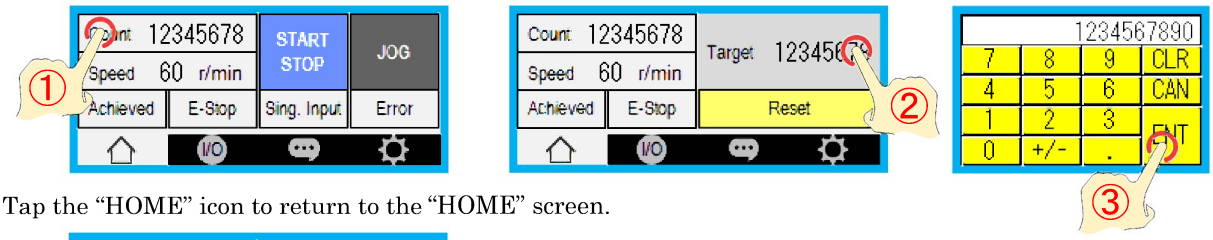


3.4 PRESET COUNTER

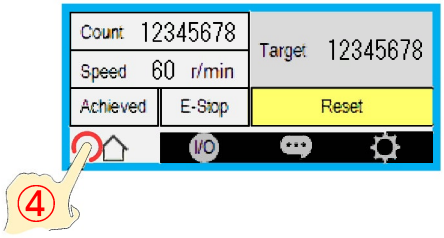
NOTE The endurance testing machine will stop when the value of reciprocation reach to preset value.

1) Tap the “Count” button, the “setting” window will pop up.
2) Tap the number, the keypad will pop up.
3) Input the preset number (target number) and tap the “ENT” button.

NOTE Input “zero”, the preset value, if you do not use preset counter (only count).



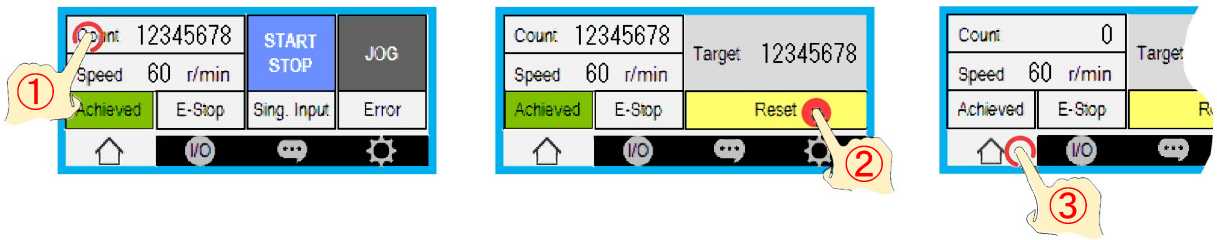
4) Tap the “HOME” icon to return to the “HOME” screen.



3.4.1 RESET COUNT

NOTE Change the preset count or reset the present count to continue operation.

1) Tap the “Count” button, the “setting” window will pop up.
2) Press the “Reset” button two seconds, counter (Test Count) will reset to zero.
3) Tap the “HOME” icon to return to the “HOME” screen.



3.5 STOP SIGNAL

Can stop the endurance testing machine automatically if input any signal to the I/O terminal.

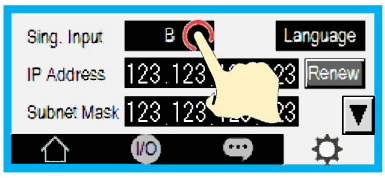
CAUTION Do not apply the voltage. Can connect only the dry contact.

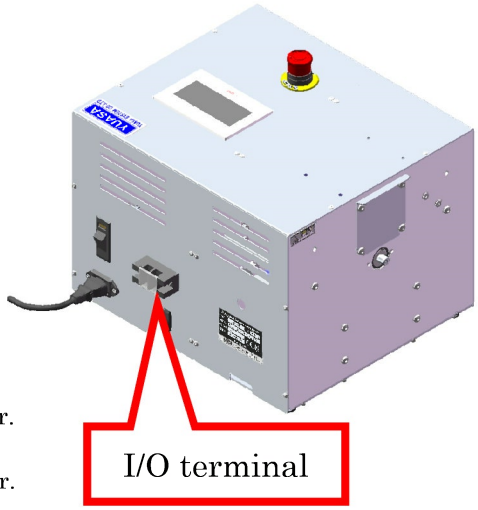
3.5.1 SELECT CONTACT

Select the type “A-contact” or “B-contact” according to the testing equipment, the signal.

NOTE Select the “A-contact” if do not use it.

1) Tap the “A” or “B” button, contact type will change to other.





ex. If the testing equipment input the signal with error.
⇒ “A”

ex. If the testing equipment shut off the signal with error.
⇒ “B”

ex. If connect the sample which turns on electricity with error.
⇒ “A”

ex. If connect the sample which turns off electricity with error.
⇒ “B”

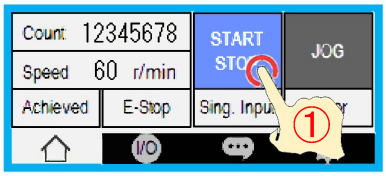
3.6 OPERATION

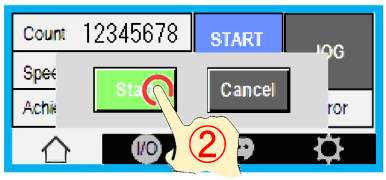
NOTICE All of set points can change anytime regardless of operation state.

INTERLOCK Cannot operate the endurance testing system without any cover for the test jig.

3.6.1 START

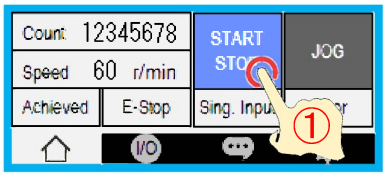
1) Tap the “START / STOP” button, the “confirmation” window will pop up.
2) Tap the “Start” button to start operation.





3.6.2 STOP

1) Tap the “START / STOP” button to stop operation.



3.6.3 JOG

1) Press the “JOG” button, the endurance testing machine will move slowly while keep pressing.

NOTE Cannot change the speed in JOG mode. [5 r/min.]

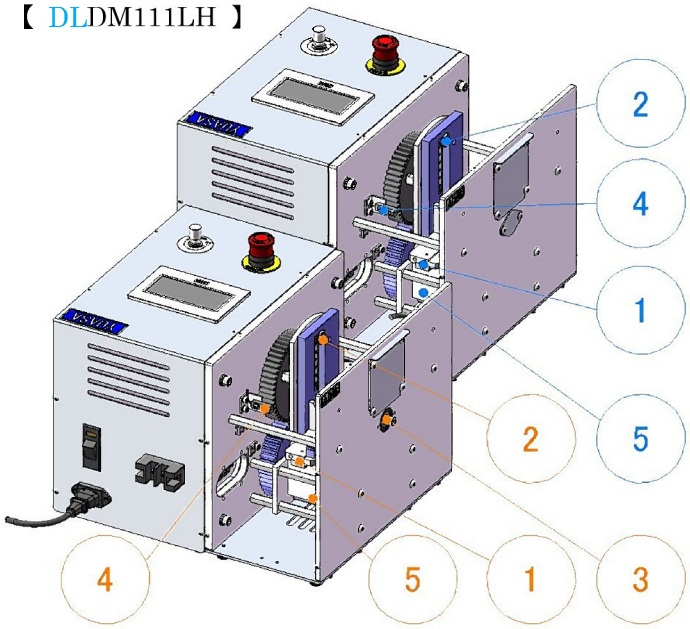
4. MAINTENANCE and INSPECTION

4.1 INSPECTION

This endurance testing machine is maintenance-free.

Change to the new one if some components will go break becouse of using consition or requirement.

【 TCDM111LH 】【 DLDM111LH 】



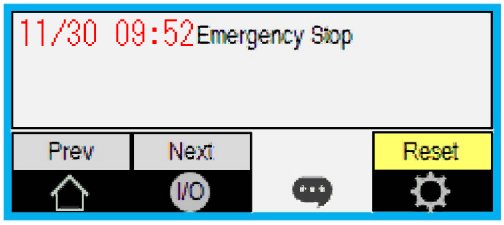
№	REGION	INSPECT	SCHEDULE
-	Exterior	Wipe or vacume out all debris.	Weekly
1	Linear Guide	Check it move smoothly, with hand or low speed operation. (without wobble, noise and dirt)	Monthly
2	Cam Follower	Check it move smoothly, with hand or low speed operation. (without wobble, noise and dirt)	Monthly
3	Driving Shaft	Check it move smoothly, with hand or low speed operation. (without wobble, noise and dirt)	Monthly
4	Proximity Switch	Check the reciprocating count synchronize with motion at low speed.	Monthly
5	Magnetic Proximity Switch	Check the endurance testing machine are not operated without the cover for the test jig.	Monthly
6	Motor Unit	Check it without noise.	Monthly

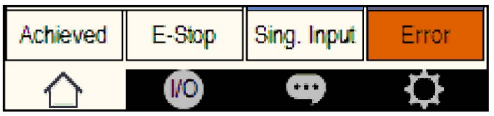
Notice: Check the all items after a long-termstop.

№	NAME	TYPE	Num.	MANUFACTURE (MATERIAL)	NOTE
1	C-Lube Linear Way	MLF18C1R170HS1	1	IKO	
2	C-Lube Cam Follower	CF6WBUUR/SG	1	IKO	
3	Driving Shaft	ET104A003-003	1	YUASA SYSTEM	Rotary type
4	Proximity Switch	GX-H8A-P	1	SUNX	
5	Magnetic Proximity Switch	RS-1NO	1	NA	
6	DC Brushless Motor	CBA-30CKF-SD	1	Shinano Kenshi	

4.2 ERROR MESSAGE and CORRECTIVE ACTION

Confirm the message that are shown on the “Message” view.
Correct each errors according to the instractions, below.



ERROR MESSAGE	CORRECTIVE ACTION	HOME SCREEN
Emergency Stop	Release the lock of emergency stop button (turn the button).	
Stop Signal A	Open the terminal, the circuit.	
Stop Signal B	Close the terminal, the circuit.	
Motor Error	Remove any error factors, debris or error of connector (Controller to Driving unit). NOTE Turn OFF the power supply switch, then turn ON after waiting 10 seconds.	
Lost Cover	Attach the cover (for the test jig) to unlock the safety interlock.	

4.3 TROUBLESHOOTING

If error is not shown on the "Message" view, refer to the troubleshooting as below.

WARNING Make sure the power is switched off, and the machine is completely stopped before open eace covers.

NOTE Confirm "I/O" screen as necessary.

PROBLEM	PROBLEM CAUSE	CORRECTIVE ACTION
Equipments will not boot up.	·The plug isn't sticking. ·It isn't the 1 phase.	·Cofirm the electricity circuit.
Equipments will not operate.	· Value of preset count is less than present value. ·Position of the cam follower is zero.	·Reset the preset value. ·Reset the counter, present value. ·Adjust the position of cam follower.
Counter will not count value of reciprocation.	·Proximity switch is dirty. ·Priximity switch is broken.	·Clean up the proximity switch. ·Change to the new one.
Strange motion or noise in operation.	·Movement soud echoes in the machine. ·Equipments are dirty. ·Equipments are bloken.	·Check the source of sound. ·Check positional relation, the machine and jigs. ·Clean up equipments. ·Please contact us.

NOTE The case except the above, please contact us.

4.3.1 I/O CHECK

NOTE Can confirm each signal status with the I/O screen.

We may ask for the confirmation of the I/O screen to improve the problem.

【MEMO】

5. REMOTE CONTROL

5.1 OUTLINE

Can control the endurance testing system with PC (Local Area Network).

NOTE Should design application software according to basic format, below.

NOTE Can download the simple referenc software from URL, below.

(URL:)

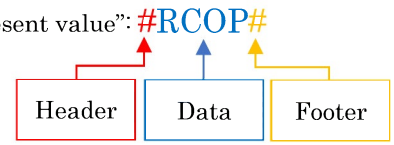
5.2 FORMAT

5.2.1 BASIC FORM

Every messages consists of Header, Data and Footer.

NOTE In this system, every Headers and Footers are "#".

ex. The message to read the "count, present value": #RCOP#



NOTE The endurance testing system communicates in decimal digit.

#RCOP# ↔ 35 82 67 79 80 35

5.2.2 REQUEST MESSAGES

Request Messages has the Read Messages and Write Messages.

Use each Read Messages to read each present value.

Use each Write Messages to write each set value.

・READ MESSAGES

There are seven kinds of Read Messages to read each information.

NAME	1	2	3	4	5	6
All Status	#	R	A	L	L	#
Count PV	#	R	C	0	P	#
Count SV	#	R	C	0	S	#
Speed PV	#	R	S	P	P	#
Speed SV	#	R	S	P	S	#
Operation Status	#	R	S	T	1	#
Error Status	#	R	S	T	2	#

NOTE PV: Present Value

NOTE SV: Set Value

NOTE All Status: Operation Status, Count PV and Speed PV

NOTE Operation Status: In-Operation or Non-Operation

・WRITE MESSAGES

There are three kinds of Write Messages to write each information.

NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Count SV	#	W	C	0	S	*	*	*	*	*	*	*	*	#
Speed SV	#	W	S	P	S	*	*	*	#					
Operation Status	#	W	S	T	1	*	#							

NOTE PV: Present Value

NOTE Input the number into "*".

・Count SV: 00000000 ~ 99999999

・Speed SV: 010 ~ 120

・Operation Status: "0: Stop" or "1: Start"

5.2.3 RESPONSE MESSAGES

The endurance testing machine will output Response Message automatically according to Request Message.

NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
All Status	#	R	A	L	L	*	*	*	*	*	*	*	*	*	*	*	*	#
Count PV	#	R	C	O	P	*	*	*	*	*	*	*	*	#				
Count SV	#	R	C	O	S	*	*	*	*	*	*	*	*	#				
Speed PV	#	R	S	P	P	*	*	*	#									
Speed SV	#	R	S	P	S	*	*	*	#									
Operation Status	#	R	S	T	1	*	#											
Error Status	#	R	S	T	2	*	*	*	*	#								
Count SV	#	W	C	O	S	*	*	*	*	*	*	*	*	#				
Speed SV	#	W	S	P	S	*	*	*	#									
Operation Status	#	W	S	T	1	*	#											

NOTE PV: Present Value

NOTE SV: Set Value

NOTE All Status: Operation Status, Count PV and Speed PV

ex. The Endurance testing machine is moving at 30 r/min. and reached the count to 999 reciprocations.

a) Request: #RALL# ⇒ Response: #RALL100000999030#

b) Request: #RST1# ⇒ Response: #RST11#

c) Request: #RCOP# ⇒ Response: #RCOP00000999#

d) Request: #RSPP# ⇒ Response: #RSPP030#

5.3 IP ADDRESS

Initial IP Address: 192.168.0.1

Initial Subnet Mask: 255.255.255.0

NOTE Can change IP Address and Subnet Mask freely.

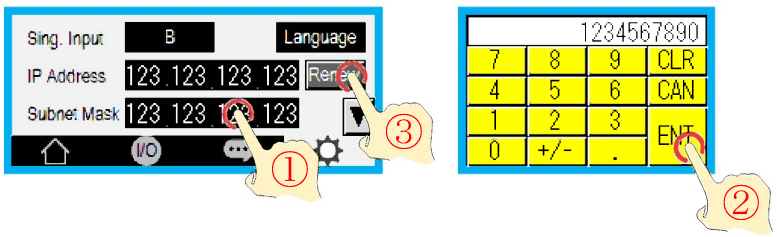
1) Select the “Setting” screen.

2) Tap the arrow “▼” button. IP Address and Subnet Mask will be shown on the screen.

3) Tap the numeric display. The keypad will pop up.

4) Input number and tap the “ENT”.

5) Tap the “Renew” button. The endurance testing machine will restart the touch panel display.



～ Further Improve Reliability

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