

MFR-M350



MELT FLOW INDEX TESTER OPERATION MANUAL



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IMPORTANT SAFETY INSTRUCTIONS

1. Save these instructions for future reference. Read of these instructions carefully before operating the instrument.
2. Follow all warnings and instructions that are marked on the instrument.
3. Unplug the instrument from the wall outlet before cleaning. Wipe the outside surfaces with a damp cloth only.
4. Do not use this instrument near water.
5. Do not place the instrument on an unstable cart, stand or table.
6. Only operate the instrument from the type of power source indicated on the label.
7. For safety, this product is equipped with a three-wire grounding type plug. This plug will only fit into a grounding type power outlet. If you are unable to insert the plug into the outlet, contact your electrician to replace the outlet with the proper type. Do not defeat the purpose of the grounding-type plug.
8. Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
9. If an extension cord is used with this product, make sure that the total ampere ratings of the product(s) plugged into the extension cord do not exceed the extension cord ampere rating.
10. Do not remove any panels from the tester. Never push objects of any kinds into any openings in the instrument's covers. Failure to heed this warning could result in fire or electric shock. Never spill liquid of any kind on the instrument.
11. Do not attempt to service this product yourself. Opening or removing covers may expose you to dangerous high voltages.
12. Unplug the unit from wall outlet and refer servicing to qualified service personnel under the following conditions:
 - ◆ When the power cord or plug is damaged or frayed.

- ◆ If liquid has been spilled into the product.
- ◆ If the product has been exposed to rain or water.

13. Please place the instrument and accessories in dry environment.

14. After usage, to daub anti-rust grease on accessories, and remove the anti-grease before test.

15. Turn off the instrument after usage.

16. Do not use sharp objects click on the touch screen.



1. General Instruction

1.1 Application

This instrument meets all dimensional temperature control and performance specifications of ISO 1133:2005, ASTM D 1238. This instrument can be used for testing MFR and MVR of polycarbonate, fluoroplastics, as well as polyethylene, polypropylene, ABS, POM, etc, but is not applicable to thermoplastics for which the rheological behaviour is affected by phenomena such as hydrolysis, condensation or crosslinking. Please read the installation and operation manual before using this instrument.

CAUTION: This instrument has been designed to determine the melt flow index property of thermoplastics. It is not intended for any other use. Any other attempt to use this instrument in any fashion other than its intended use may expose the instrument or the operator to dangerous.

1.2 Principle

Melt mass-flow rate (MFR): rate of extrusion of a molten resin through a die of specified length and diameter under prescribed conditions of temperature, load and piston position in the barrel of an extrusion plastometer, the rate being determined as the mass extruded over a specified time.

Melt volume-flow rate (MVR): rate of extrusion of a molten resin through a die of specified length and diameter under prescribed conditions of temperature, load and piston position in the barrel of an extrusion plastometer, the rate being determined as the volume extruded over a specified time.

The melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) are determined by extruding molten material from the barrel of a plastometer under preset conditions of temperature and load. For Melt mass-flow rate, timed segments of the extrudate are weighted and the extrudate rate is calculated in g/10 min and recorded. For melt volume-flow rate, the distance that the piston moves in a specified time or the time required for the piston to move a specified distance is measured to generate data in

cm³/10 min. Melt volume-flow rate may be converted to melt mass-flow rate, or vice-versa, if the density of the material is known under the conditions of the test.

1.3 Main Parameters

Temperature range: 100°C~450°C;
Temperature display error: $\leq\pm 0.2^{\circ}\text{C}$;
Temperature fluctuation: $\pm 0.5^{\circ}\text{C}$;
Time accuracy: 0.01s ;
Time recovery time: $\leq 4\text{min}$;
Piston distance display error: $\pm 0.1\text{mm}$

1.4 Working condition

1.4.1 Room temperature: 10°C~40°C
1.4.2 Relative humidity: 30%~80%
1.4.3 Without corrosive medium in working environment
1.4.4 Fixed on firm base without vibration
1.4.5 Working without strong electromagnetic interference, strong air blow or convection.

1.5 Electrical Requirement

Power: $220\times(1-15\%)\text{VAC}\sim 220\times(1+10\%)\text{VAC}$, 50Hz, 500W(single phase, three wires)

1.6 External Dimension

L×W×H: 400mm×260mm ×620mm

1.7 Weight

Net weight: 25kg

2. Installation

2.1 Opening inspection

Before opening inspect packaging for transit damage. Check that pack is not distorted and contents appear to be secured. If the transit damage results in the damage of the instrument, please contact with the shipping company and inform our company at once.

Do not cope with it yourself.

When moving the instrument, avoid intense oscillation and mechanical damage.

2.2 Installation

The instrument should be located on firm table approximately 900 mm in height. The following procedures shall be done before a new test.

2.2.1 Cut-off Knife Installation

CAUTION: When doing the operation A to E, do not turn on the power switch.

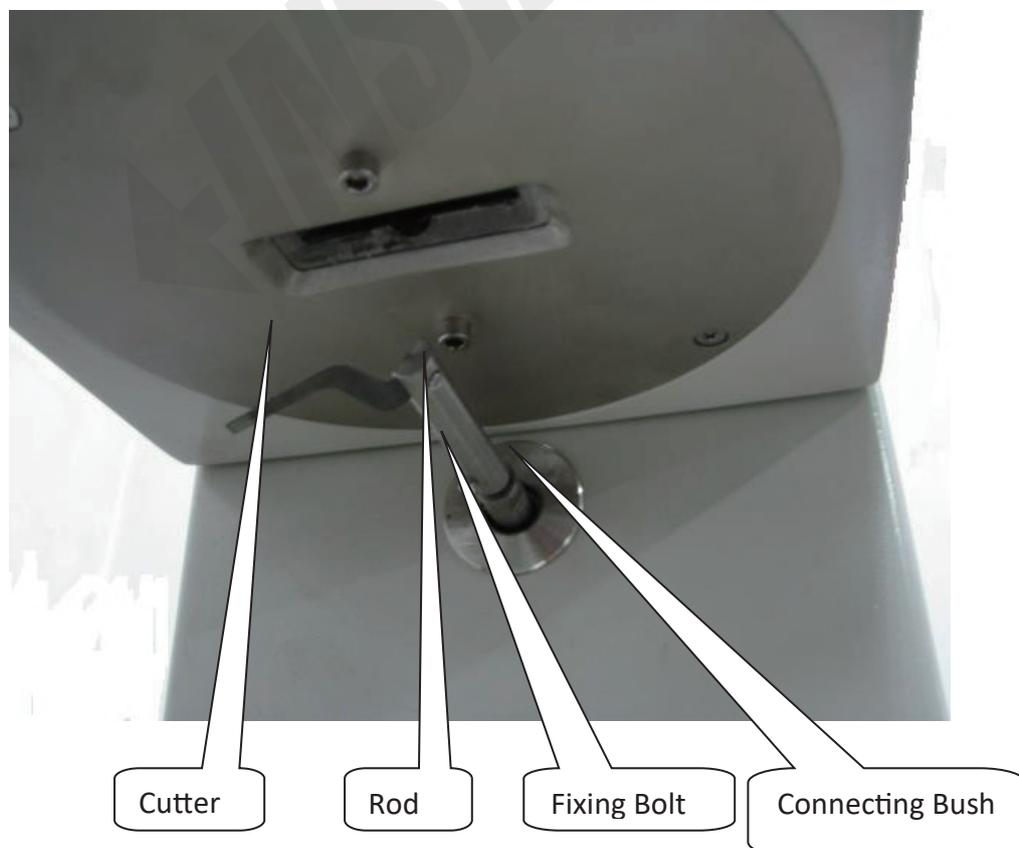


Fig. 1

A, Put the Tungsten Carbide Die into the bottom of the cylinder with the Charging Tool, do not take the Charging Tool out.

B. Loosen the adjusting bolt, which is fixing the rod of Cut-off Knife and the connective cover; take out the rod of the Cut-off Knife.

C, Adjust the Cut-off Knife and the rod of it in verticality (may bend the crook of the Cut-off Knife in advance), and then fix the Cut-off Knife with the adjusting bolt on the rod of Cut-off Knife.

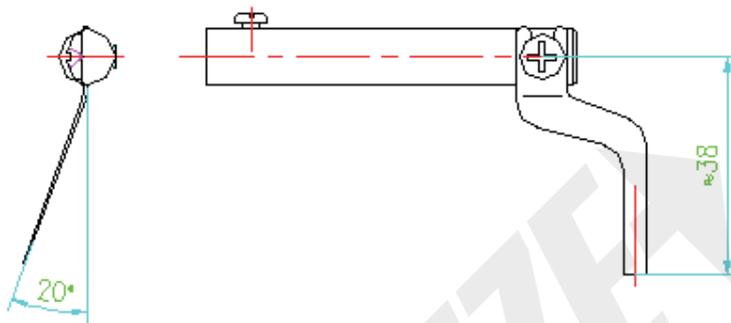


Fig 2

D, Insert the rod of Cut-off Knife along the hole of the permanent seat into the hole in the connective cover. Do not tighten the adjusting bolt. Then nip the rod of Cut-off Knife with fingers and rotate it clockwise, if you feel there is friction, move the rod Cut-off Knife outside and inside to make the Cut-off Knife in the center of the extrusion area, or re-adjust the angle position of the Cut-off Knife and the rod of Cut-off Knife. The blade of the Cut-off Knife should be in the condition of being tangent with the underside of the Die, if not, adjust the crook of the Cut-off Knife a little.

E, The Cut-off Knife should be in the left side below the Oven, and shape about 45° with the underside of the Oven. The plane of the Cut-off Knife rod tailed zeros in the adjusting bolt, and then tightens the bolt in order to press the Cut-off Knife rod. Next, clamp the flat-concave of the connective cover with spanner; rotate the connective cover clockwise (do not contra rotate).

Then observe the rotating condition of the Cut-off Knife in the extrusion area:

The Cut-off Knife does not fractionate with the flank, and the blade of the Cut-off Knife is in the condition of being tangent with the underside of the Die.

If can't achieve the above condition, need re-adjustment.

F, Power on the tester, then press precut to rotate the cut-off rod clockwise. The knife shall work smoothly without any friction with the side-face of the oven, also the blade of the knife shall be tangent with the bottom of the die.

CAUTION: if the tester is idle for some time or frequently used, pls. do the above procedures regularly, so as to keep the knife at a good condition.

2.2.2 Basic weight assembly

Basic Weight Operation

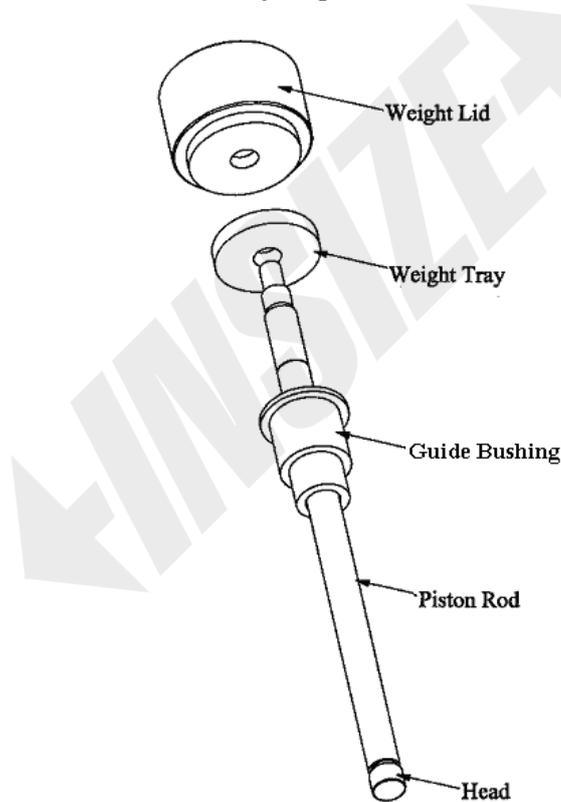


Fig 3

Basic Weight – consists of Weight Lid, Weight Tray, Guide Bushing and the Piston Rod, totally 325g (excluding the Guide Bushing). Assembly it as follow:

- A. Insert the Guide bushing into the Piston Rod
- B. Insert the weight tray onto the Piston Rod
- C. Screw the Weight Lid in the Piston Rod tightly.

2.2.3 Tungsten Carbide Die Operation

Push the handle to the end rightward. Then place the Tungsten Carbide Die on the cylinder, and use the Die Cleaning Tool to help the Tungsten Carbide Die falls into the bottom of the oven. If we pull the handle to the left, the Tungsten Carbide Die can fall off from the extrusion area of the oven smoothly (the Charging Tool can be the auxiliary mean).

2.2.4 Level meter operation

Place the level meter onto the cylinder, adjust those four feet screws till the bubble in the center of the meter.

CAUTION: the bubble moves to the position, means that position is higher, shall low down that foot screw. When the tester is moved, the tester must be leveled before test. During leveling, the tester shall be out of power, and the temperature in the cylinder shall be less than 50°C.

2.3 Composition

It consists of main frame and accessories.

Main frame: the core of it is extrusion system, consists of temperature measuring device, temperature controlling system, auto-cutting system, displacement measuring system, control panel.

2.3.1.1 Temperature measuring system: Built-in sensor is used to measure the temperature on time, accuracy is 0.1°C. Temperature controlling system: 100°C~450°C, display error is $\pm 0.2^\circ\text{C}$, fluctuation is $\pm 0.5^\circ\text{C}$.

2.3.1.2 Auto-cutting system: cut the extrusion automatically on set time interval and cutting times.

2.3.1.3 Displacement measuring system: is used to measure the MVR. The accuracy is $\pm 0.1\text{mm}$, time accuracy is 0.01s.

2.3.1.4 Test data export device, print test data with built-in printer.

2.3.1.5 Control the test with touch screen.

Function: MFR & MVR, and MVR include method a, the displacement of piston during a certain time, and method b, the time of the piston move a certain distance.

2.3.1.5.1 MAIN INTERFACE

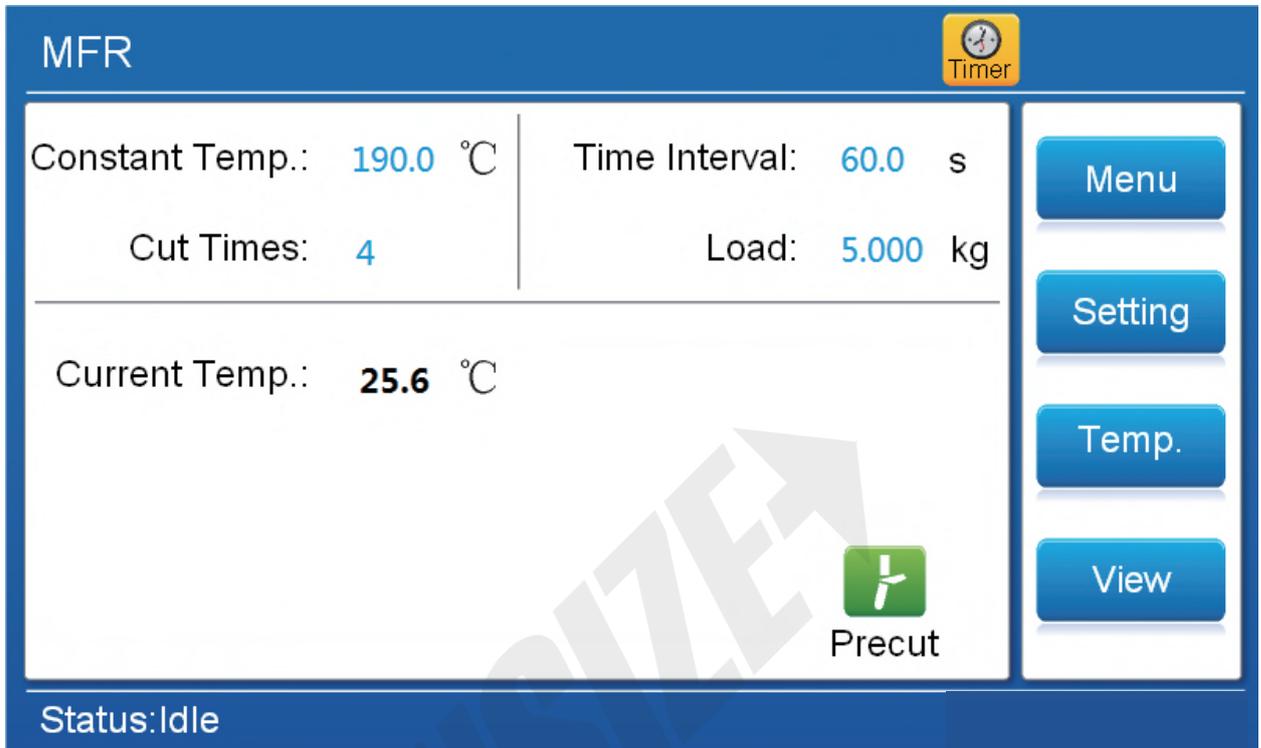


Fig 4

REMARKS: click the number in blue to set parameter.

Constant temp.: click the blue number of constant temp., and input the test temp., and click enter. The temp. range 100°C—450°C.

Cut times: click the blue number of cut times., and input number needed, and click enter.

Max. no. for MVR is 10, and Max. no. for MFR is 20.

Time interval: click the blue number of time interval, and input time between each cut, and click enter. Max. is 999s.

REMARKS: MVR include the time of the piston move a certain distance, Max. value for the distance is 30mm.

Load: click the blue number of load, and input time load for test, and click enter. Max. value is 50



Click , include Setting, Language, Sys. Setup and measure



Click button , cut the extruded sample. Test with method MVR, if you do not choose automatic cut, use this to cut the sample during test.



Click , to set test parameter.



Click  to temperature control interface, there is control time at lower left conner, and heating efficiency at upper left conner.



Click , check test report and parameter after test.



Click  after place specimen, system will countdown according to setting time. The timer will stop when reach the setting time, and remind the operator with a sound.



The time is set in setting menu. Click  during test, the timer will stop.

2.3.1.5.2 interface Temp. as below

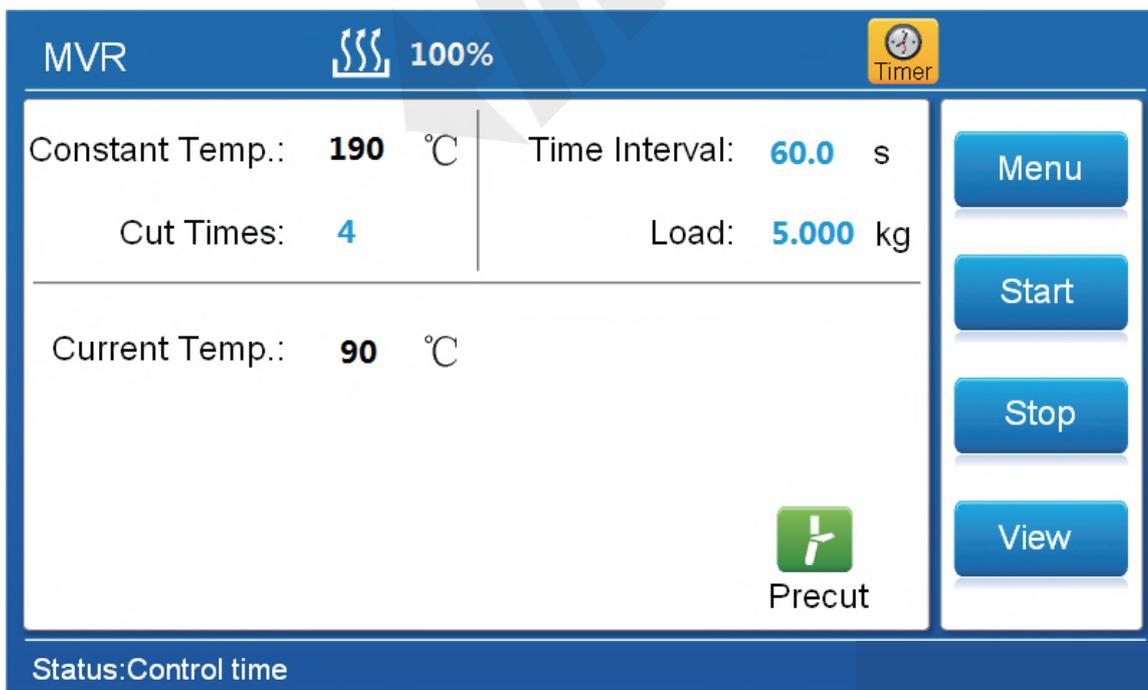


Fig 5

REMARKS: click the number in blue to set parameter.

Constant Temp.: Temperature can not be set on this interface.

Cut times: click the blue number of cut times., and input number needed, and click enter.

Max. no. for MVR is 10, and Max. no. for MFR is 20.

Time interval: click the blue number of time interval, and input time between each cut, and click enter. Max. is 999s.

REMARKS: MVR include the time of the piston move a certain distance, Max. value for the distance is 30mm.

Load: click the blue number of load, and input time load for test, and click enter. Max. value is 50

Click , include Setting, Language, Sys. Setup and measure

Click button , cut the extruded sample. Test with method MVR, if you do not choose automatic cut, use this to cut the sample during test.

Click  to start test.

Click , temperature control stop, click yes to main interface, and click no. to temperature control interface.

Click , check test report and parameter after test

Click  after place specimen, system will countdown according to setting time. The timer will stop when reach the setting time, and remind the operator with a sound.

The time is set in setting menu. Click  during test, the timer will stop.

2.3.1.5.3 Interface start as below

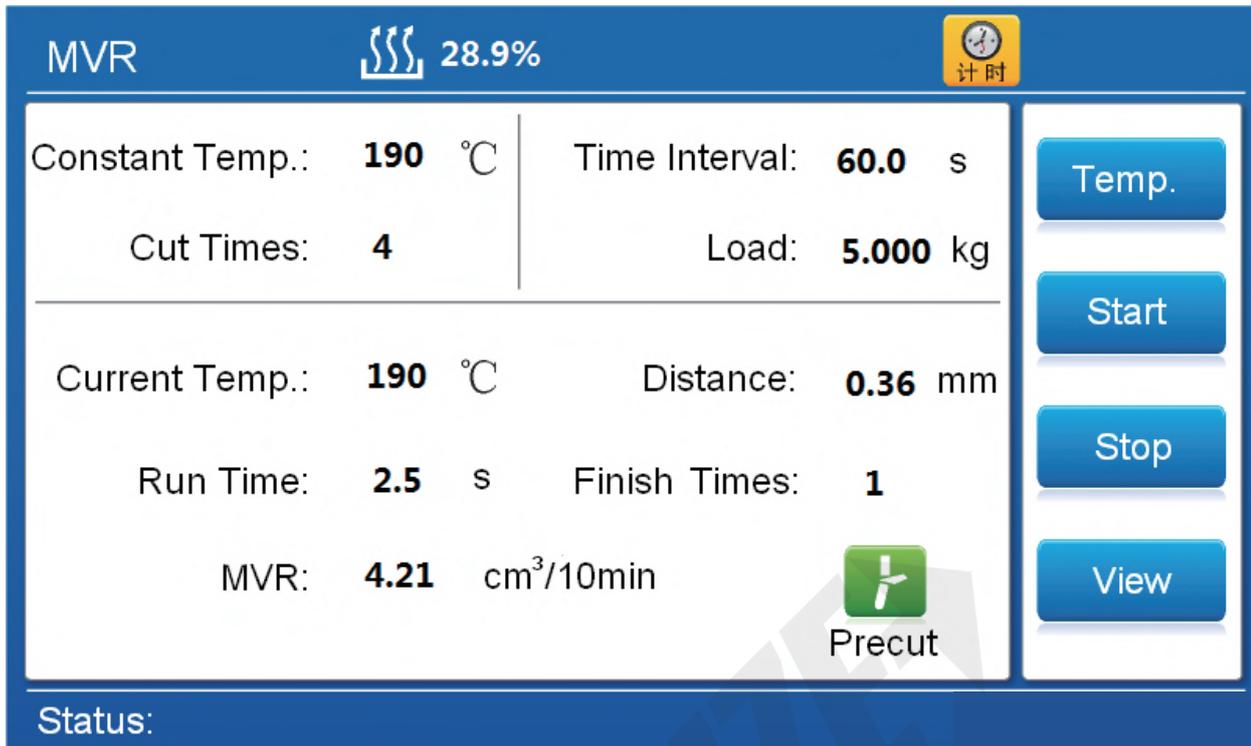


Fig 6

Click : back to interface Temp.

Click button , cut the extruded sample. Test with method MVR, if you do not choose automatic cut, use this to cut the sample during test.

Click  to start test

Click  to stop test.

Click , check test report and parameter after test

Click  after place specimen, system will countdown according to setting time. The timer will stop when reach the setting time, and remind the operator with a sound.

The time is set in setting menu. Click  during test, the timer will stop.

2.3.1.5.4 interface Menu:

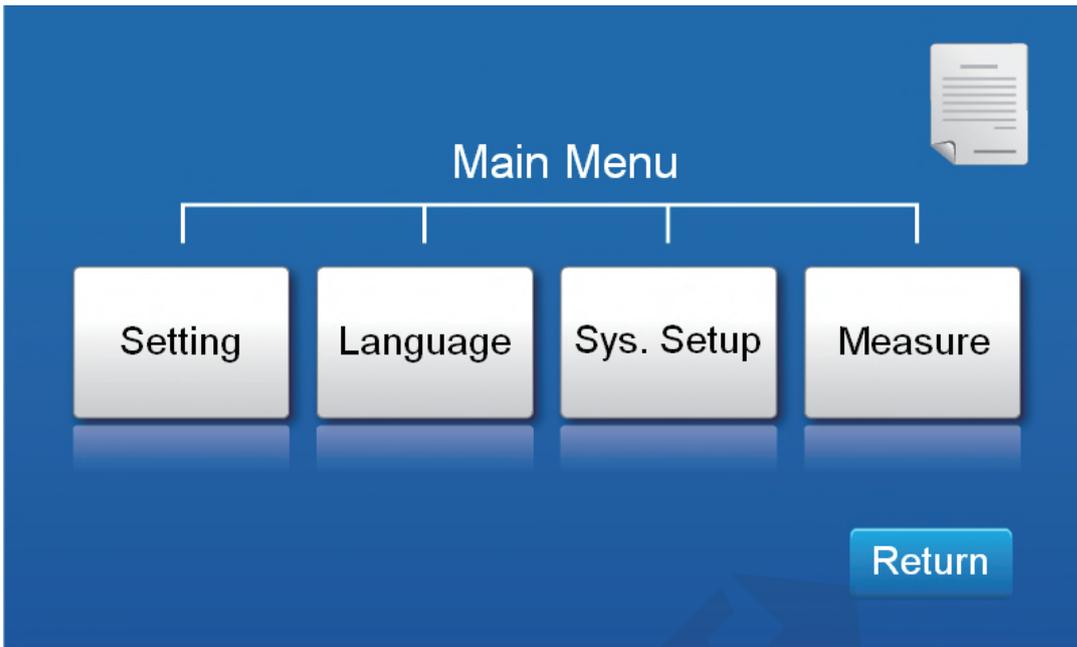


Fig 7

Click setting to set test parameters.

Click Language to choose language

Click Sys. Setup, input password 123456 to interface Sys.Setup.

Click Measure, input password 123456 to interface Measure

2.3.1.5.5 MVR parameters setup, see below picture

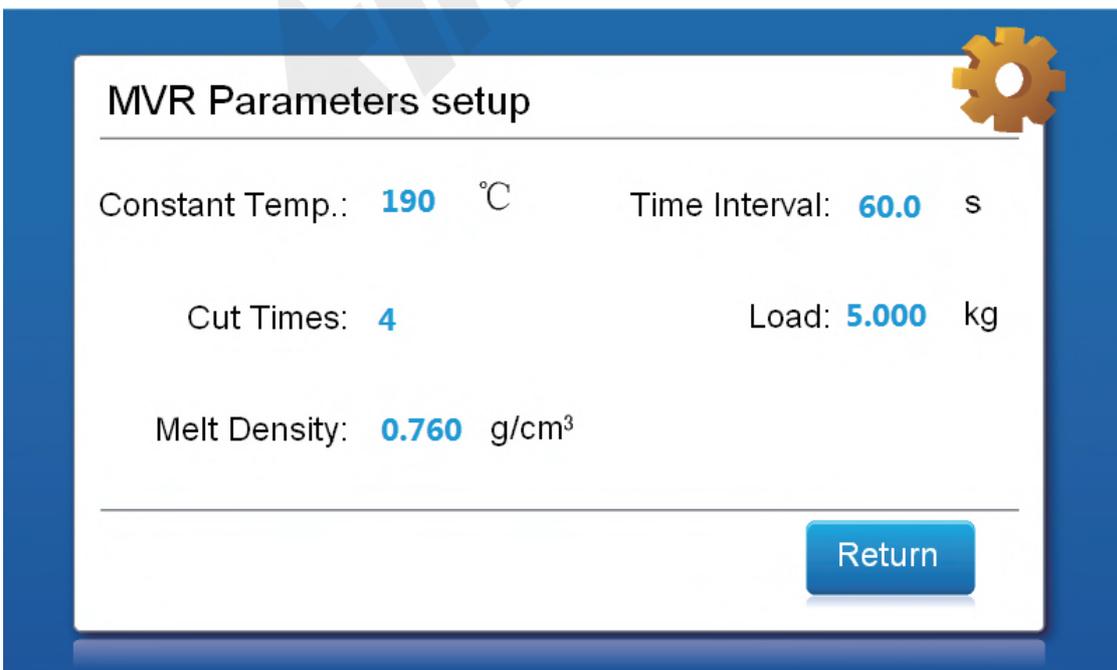


Fig 8

REMARKS: click the number in blue to set parameter.

2.3.1.5.6 System setup

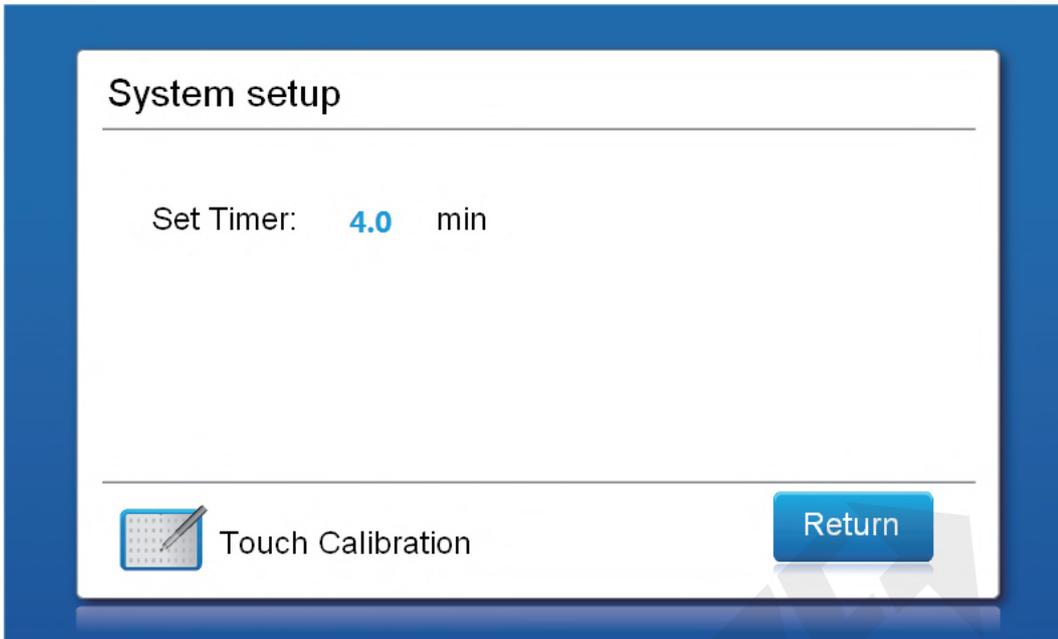


Fig 9

REMARKS: click the number in blue to set parameter.

Click  Touch Calibration to calibration touch screen.

2.3.1.5.7 Measure

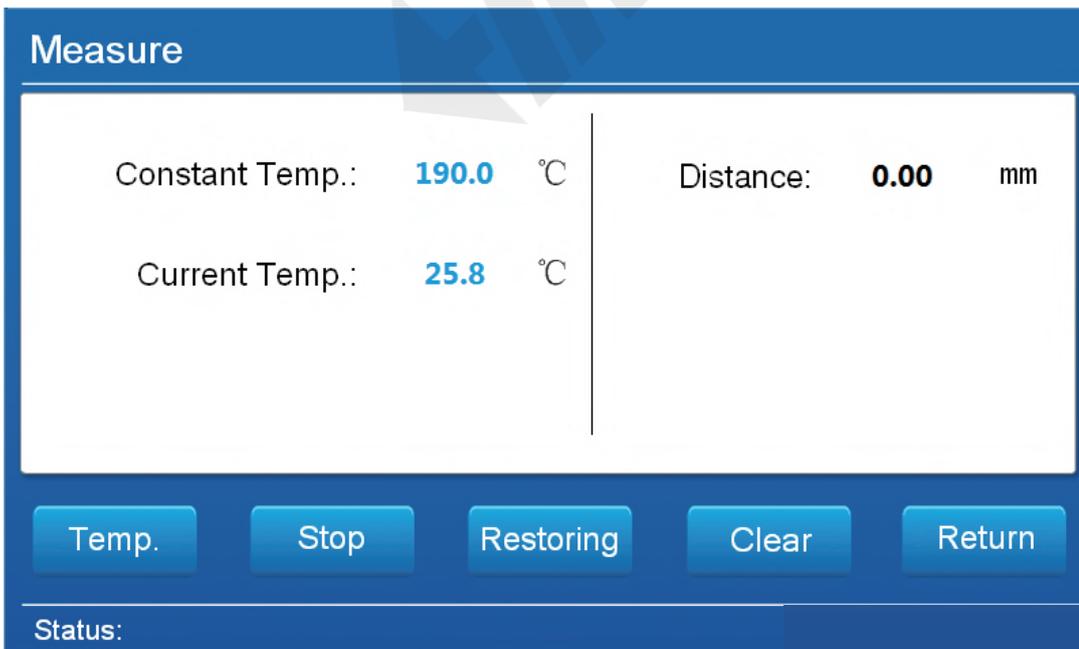


Fig 10

Click temp. to temperature control interface, there is control time at lower left conner, and heating efficiency at upper left conner.

Click Stop, the system prompts temperature stop interface, click "Yes" button to return to the main screen; click on the "No" button to return to temperature control interface.

Click Restoring, input password 123456, all the parameters to factory default.

Click Clear to zero displacement.

Click Reture to go back.

2.3.1.5.8 View

MVR Results			MVR (cm ³ /10min) 、 l (mm)		
No.	l	MVR	No.	l	MVR
1	6.30	4.48	6		
2	6.32	4.50	7		
3	6.35	4.52	8		
4	6.34	4.51	9		
5			10		

Next Print Return

Fig 11

Click Next to Test Result 2.

Click Print to print test result. If not, the data will be covered by new data.

Click Return to go back.

2.3.1.5.9 "Test result2",

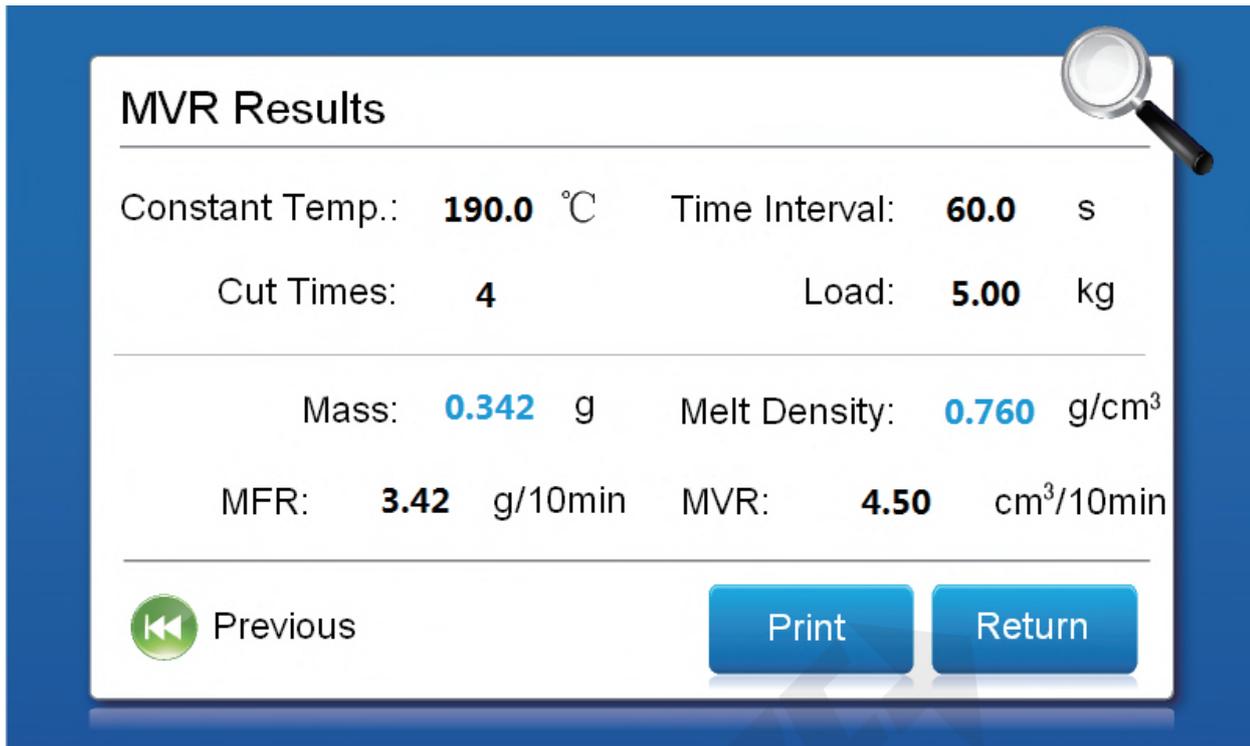


Fig 11

REMARKS: click the number in blue to set parameter.

Click Previous to Test result 1.

Click Print to print test result. If not, the data will be covered by new data.

Click Return to go back.

2.3.2 Accessory

2.3.2.1 Barrel-- The Barrel is fixed in a vertical position in the oven. It is made of alloy steel. It has high hardness and corrosive resistance. The dimension is shown as follow:

Inside diameter: (9.550±0.025) mm

Length: 160mm

2.3.2.2 Charging Tool –used to tamp the test material into the Barrel, and also helps to remove some of the entrapped air when charging material.

Piston

Piston made of corrosion-resistant steel, hardness slightly lower than the hardness of the inner wall of the barrel. Piston full length 193mm, the effective length of 175mm, a piston rod having a diameter of 9mm, the bending axis is not more than 0.02%. Piston

head length (6.35 ± 0.10) mm, (0.075 ± 0.010) mm smaller than the inner diameter of barrel, a surface roughness is less than $0.25\mu\text{m}$. The lower edge of the piston head chamfer radius 0.4mm.

Mark engraved on the piston rod has five lines, The upper and lower lines are according to ISO1133 regulations, the remaining three are ASTM D 1238 test method.

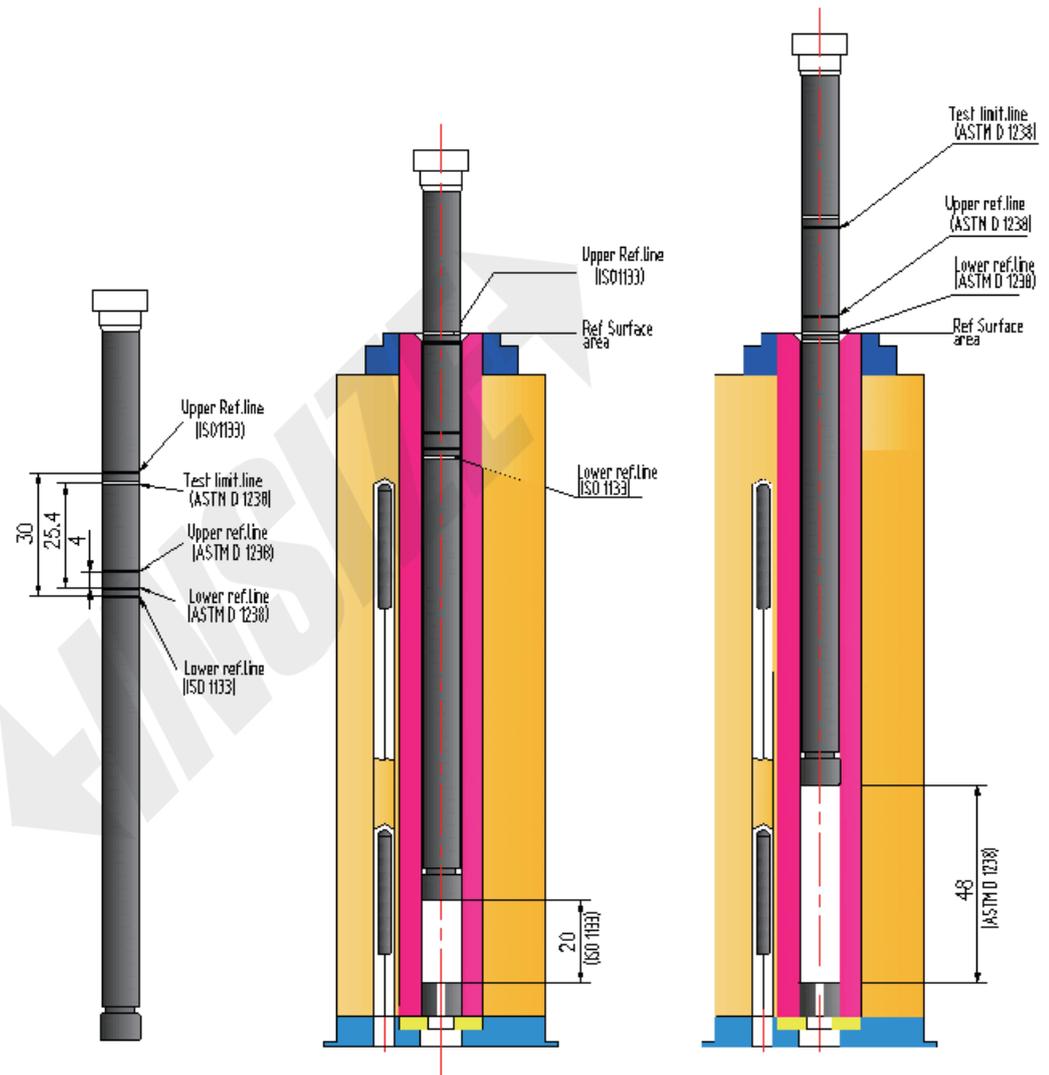


Fig 12

2.3.2.3 Die--Tungsten Carbide

INNER DIAMETER (2.095 ± 0.005) mm, wall roughness less than $0.25\mu\text{m}$, Height (8.000 ± 0.025) mm.

Options Inner diameter (1.050 ± 0.005) mm, Height (4.000 ± 0.025) mm

2.3.2.4 Removable load

The removable load consists of a set of weights and the Basic Weight. This set of weights consist of the following weights: one weight of 0.600kg, one weight of 0.875kg, one weight of 0.960kg, one weight of 1.000kg, one weight of 1.200kg, one weight of 1.640kg, two weights of 2.500kg, two weight of 5.000g, one weight of 30g (only used when do MVR test). The accuracy of the load is 0.5%.

Some of the Weights may be combined to give a required load according to the following

Table 1.

Load	0.325kg	1.200kg	2.160kg	3.800kg	5.000kg	10.000kg	21.600kg
Weight combinati on	Piston rod	0.325	0.325	0.325	0.325	0.325	0.325
	Weight lid	0.875	0.875	0.875	0.875	0.960	0.875
	Weight tray		0.960	0.960	0.960	0.875	0.960
				1.640	1.640	1.640	1.200
					1.200	1.200	1.640
						5.000	1.000
							0.600
						2.5×2	
						5.0×2	

Table 1

Caution: According to the requirement of the sample standard, prepare the needed weights. First, insert the Basic weight into the Cylinder. Then add the prepared weights to it one by one. And make sure that the round bulge of the previous one fasten the groove of the latter, otherwise the weight may glide down and may expose the operator to danger.

2.3.2.5

Funnel—is used to help introduce the sample of materials into cylinder.

Charging tool: Put the specimen through funnel, and press the specimen with charging tool.

3. Operating procedure

3.1 Specimen Preparation

3.1.1 In order to make the testing result exactly, prepare for the sample according to the relative specification (some sample may need dry) before the testing. When the temperature goes up to the set value, put the sample into the cylinder.

The test sample may be in the form of powder, granules, strips of film or other small pieces. Sample may be chosen according to Table 2.

Table 2

MFR	Mass of test sample in cylinder (g)	Extrudate cutoff time interval(s)
≥ 0.1 but ≤ 0.5	3 to 5	240
> 0.5 but ≤ 1	4 to 6	120
> 1 but ≤ 3.5	4 to 6	60
> 3.5 but ≤ 10	4 to 8	30
> 10	4 to 8	5 to 15

Note:

A, For some samples tending to degrade, use nitrogen gas to blow the cylinder before charging it.

B, It is recommended that MFR should not be measured if the value obtained in this test is less than 0.1g/10min or greater than 100g/10min.

C, When the density of the sample is greater than 1.0g/10cm³, it may be necessary to increase the mass of the test portion.

3.1.2 Level adjustment: if the equipment is not moved, jump over this procedure. If needed, turn to 2.2.4.

3.1.3 Die operation: if the die is already inside the cylinder, jump over this procedure. If not, turn to 2.2.3.

3.1.4 Cut-off knife operation: if the knife is well mounted, jump over this procedure. If not, turn to 2.2.

Note: The cut-off knife shall be spread some olefin, so that the extrudate will not stick to the knife.

3.1.5 Prepared spare parts: A. Heat insulation gloves; B. Die cleaning tool; C. Funnel; D. Charging tool; E. Pledget for cleaning die, piston rod and cylinder.

3.2 Test condition

See Apendix A &B

3.3 Test procedure

3.3.1 Test procedure for MVR

Power on the tester,

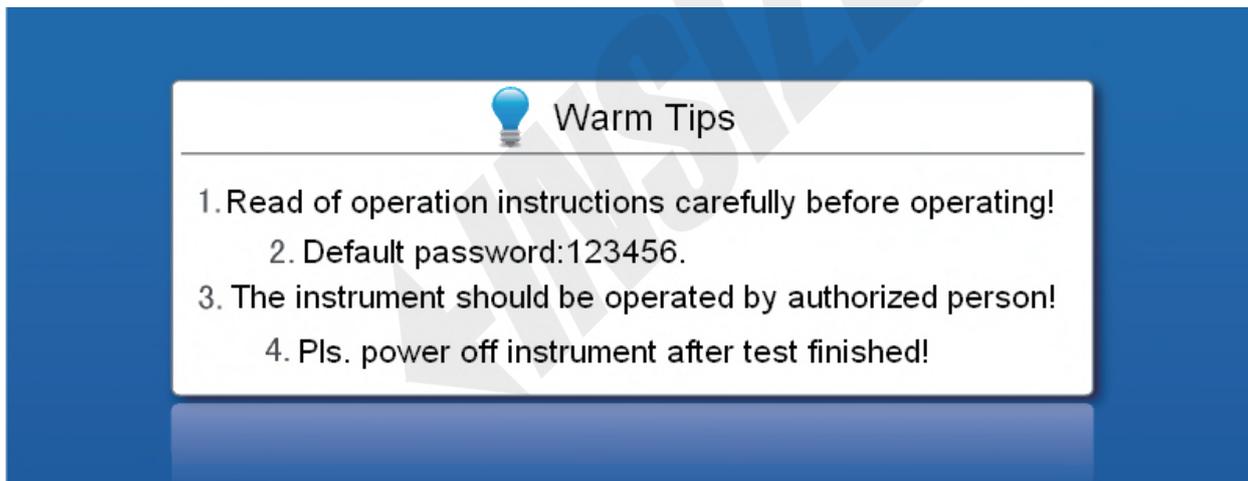


Fig 13

Click the screen to next interface,

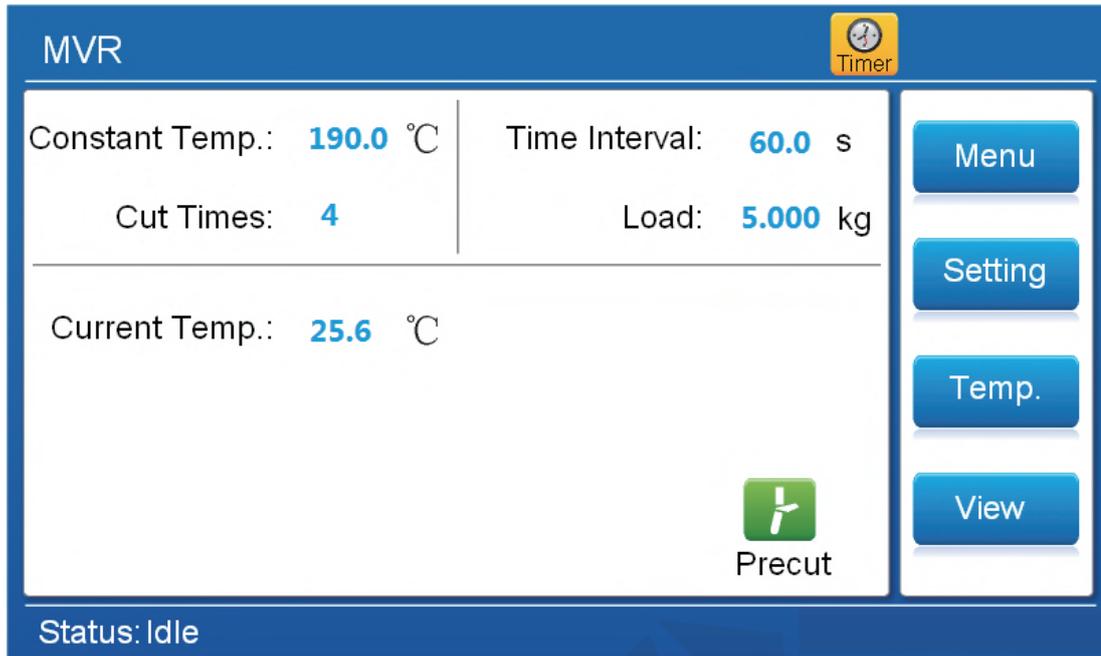


Fig 14

Parameter setting: click the value in blue to set constant temp., time interval, cut times and load, or Click Setting to choose MFR OR MVR, automatic cut for MVR, test parameters.

Start: Click Temp.to start temperature control, see below interface, heating efficiency at upper left corner, control time at lower left Corner.

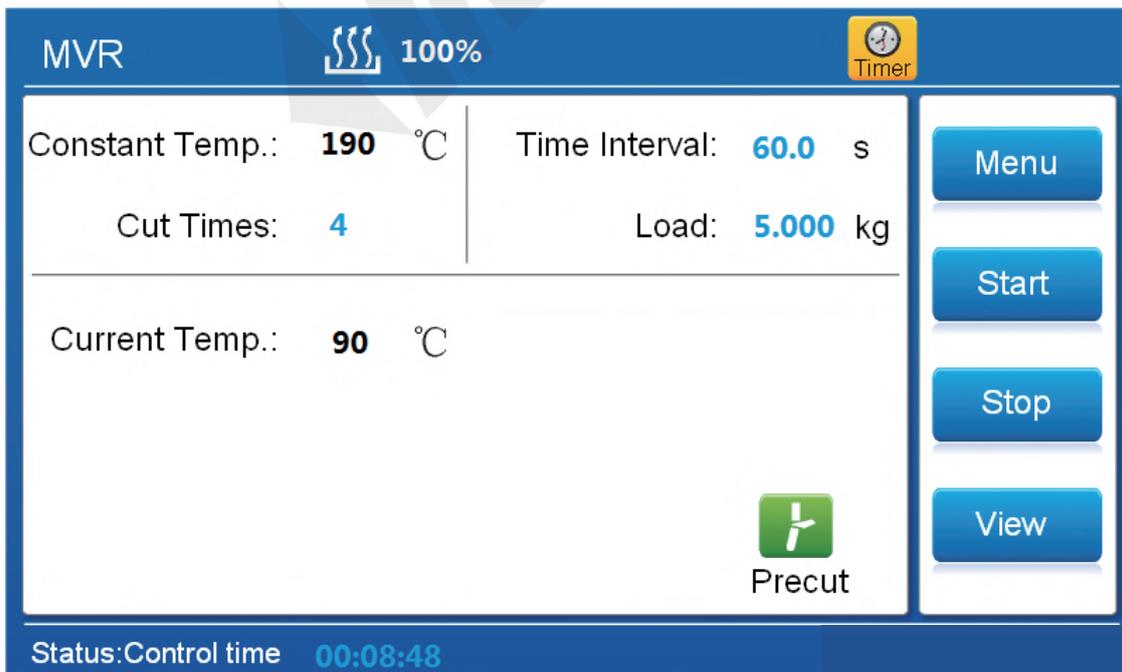


Fig 15

Click stop to stop temperature control if need. When the temperature reach the setting constant temp. (tolerance $\pm 0.2^{\circ}\text{C}$) 4 minutes, the control time start to time counting, and announce by sound, place the specimen after 15 minutes.

Feed specimen: Put the specimen in to barrel, and press with charging tool, put the piston into barrel, and place the signal rod at top position.

Click to start counting, the tester will announce till the setting time, then put the weight on,

click  to cut the extruded specimen., click start when reach the line on piston.

Click start to next interface, control time, distance, finish times, and value of MVR. When the test finish, extrude rest specimen, and take the weight away.



The screenshot displays the MVR control interface with the following data and controls:

MVR		 28.9%	 04:00:00
Constant Temp.:	190 °C	Time Interval:	60.0 s
Cut Times:	4	Load:	5.000 kg
Current Temp.:	190 °C	Distance:	0.36 mm
Run Time:	2.5 s	Finish Times:	1
MVR:	4.21 cm ³ /10min		View
Status: control time 00:28:12			

Additional controls on the right side include: Temp., Start, Stop, and View buttons.

Fig 16

Clean the tester.

Test result: Weight the extruded specimen, and take average value, input to system, and system will calculate the melt flow rate and density. Or input density, and system calculate the average weight and melt flow rate.

3.3.2 Procedure for MFR

Click Menu to below interface

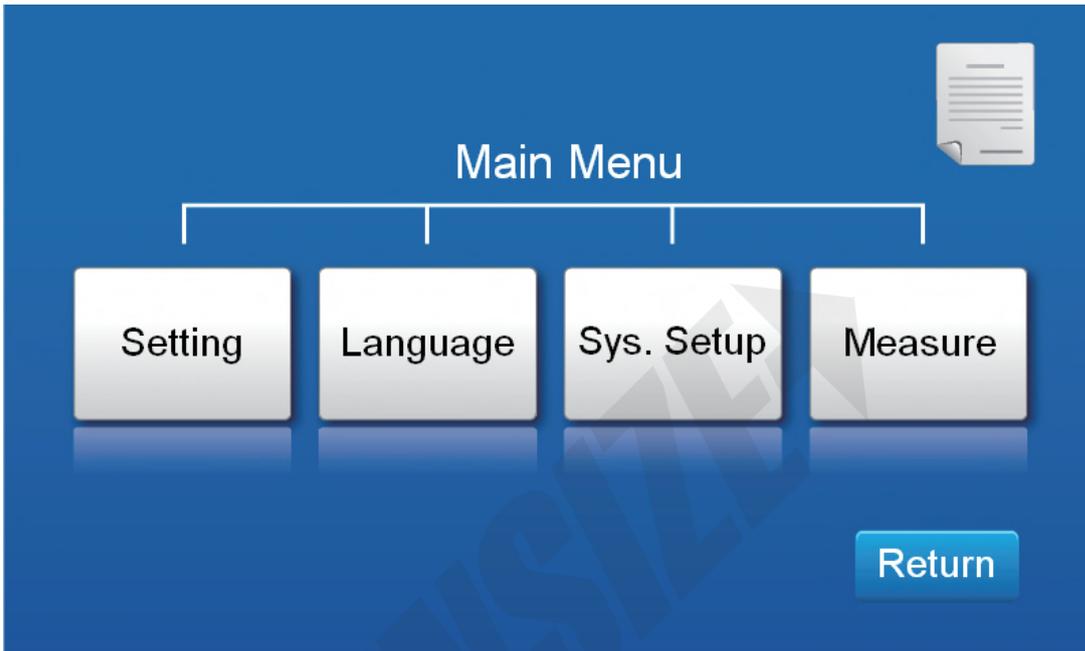


Fig 17

Click setting to choose test method,

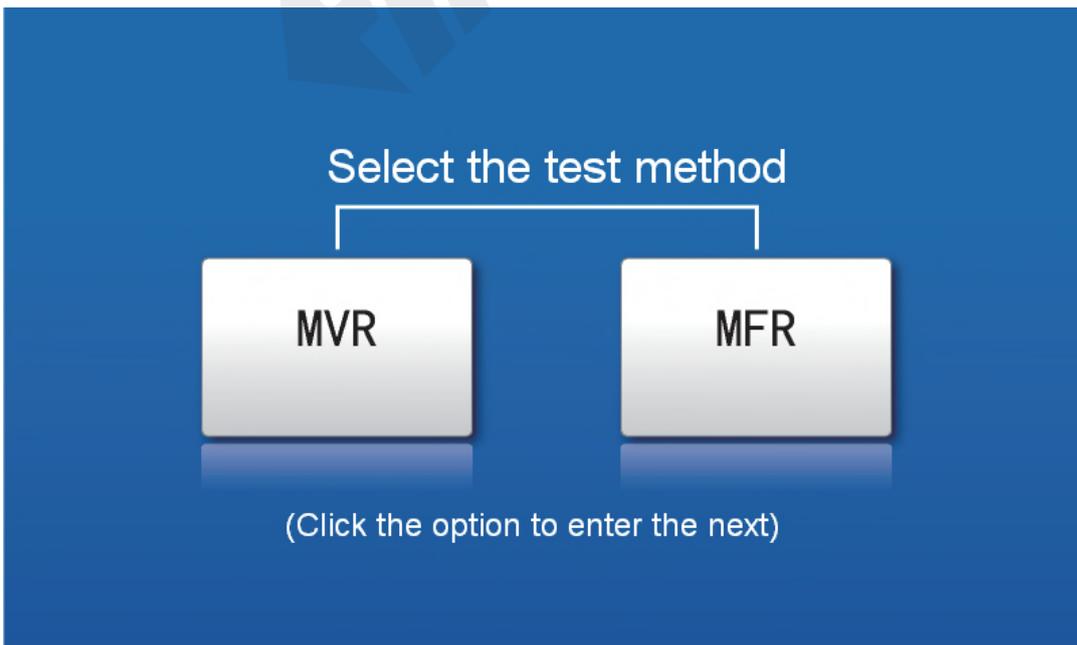


Fig 18

Click MFR to parameters setting interface,

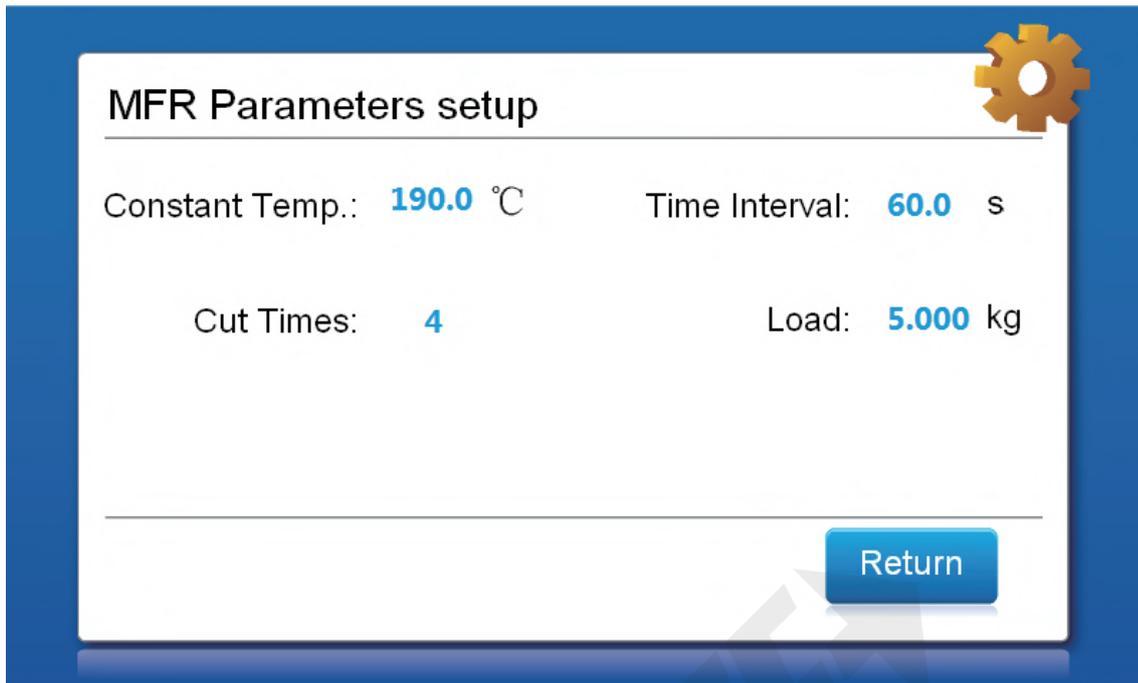


Fig 19

Click the number in blue to set parameters.

Temp. control: Click start to temperature control interface.

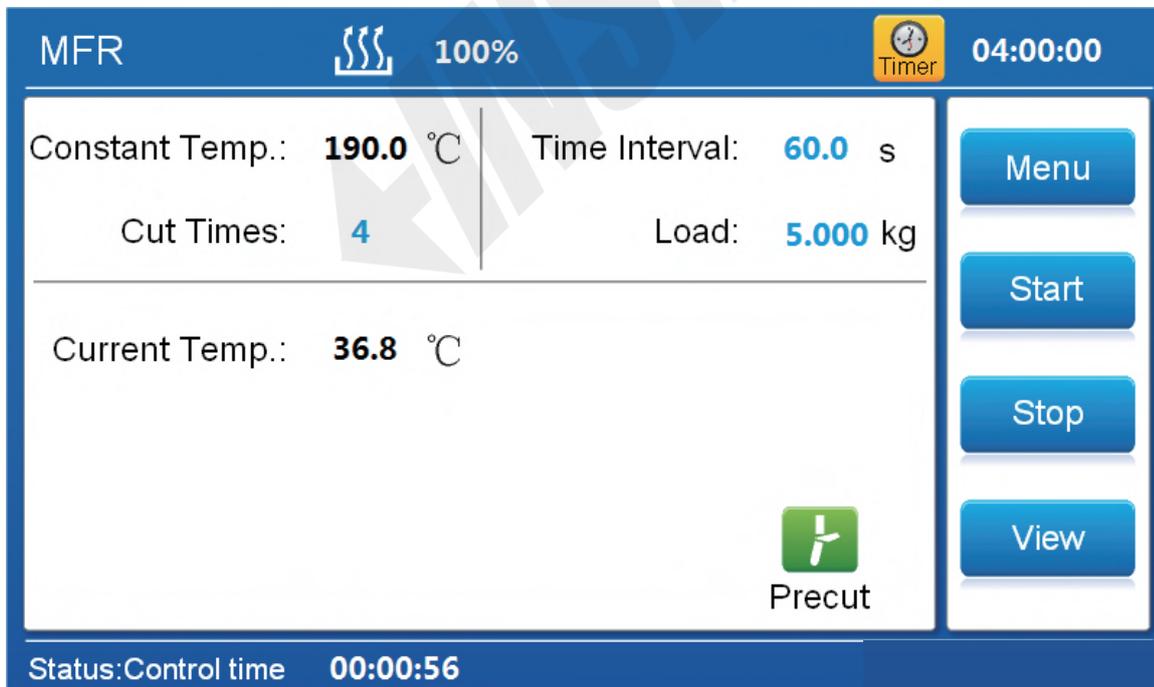


Fig 20

Click stop to stop temperature control if need. When the temperature reach the setting constant temp. (tolerance $\pm 0.2^{\circ}\text{C}$) 4 minutes, the control time start to time counting, and announce by sound, place the specimen after 15 minutes.

Feed specimen: Put the specimen in to barrel, and press with charging tool, put the piston into barrel, and place the signal rod at top position.

Click to start counting, the tester will announce till the setting time, then put the weight on,

click  to cut the extruded specimen., click start when reach the line on piston.

Click start to next interface, control time, distance, finish times, and value of MVR. When the test finish, extrude rest specimen, and take the weight away.

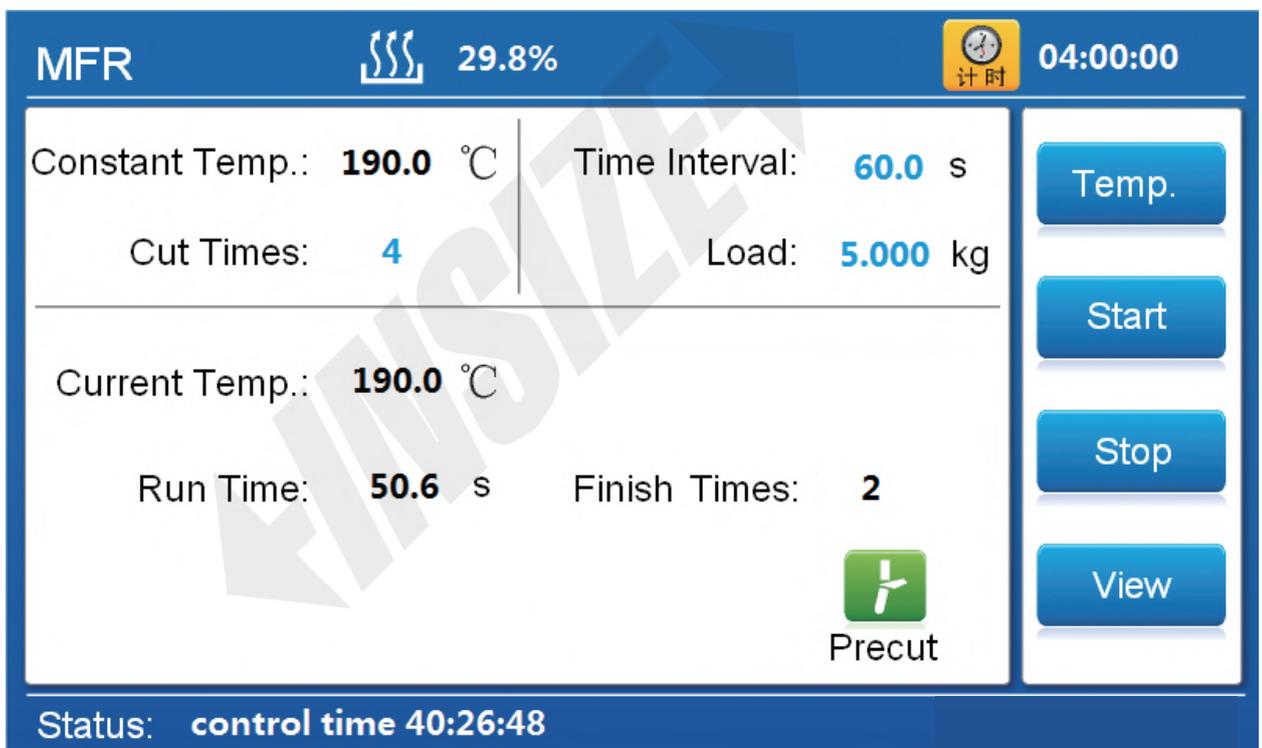


Fig 21

Clean the tester.

Test result: Weight the extruded specimen, take the average value. If the difference between max. value and min. value is more than 15% of average value, the test should do again.

Click view, input the average weight and melt flow rate will display on screen.

The melt flow rate (MFR), expressed in gram per 10min, is given by the equation as follow:

$$MFR(\theta, m_{nom}) = \frac{t_{ref} \cdot m}{t}$$

θ is the test temperature, in degrees Celsius

m_{nom} is the nominal load, in kilograms

m is the average weight of extrudate, in grams

t_{ref} is the reference time (10min), in seconds (600s)

t is the cutoff time interval, in seconds

Express the result to two significant figures.

3.4 Calibration

Click measure, input password “123456” see below interface.

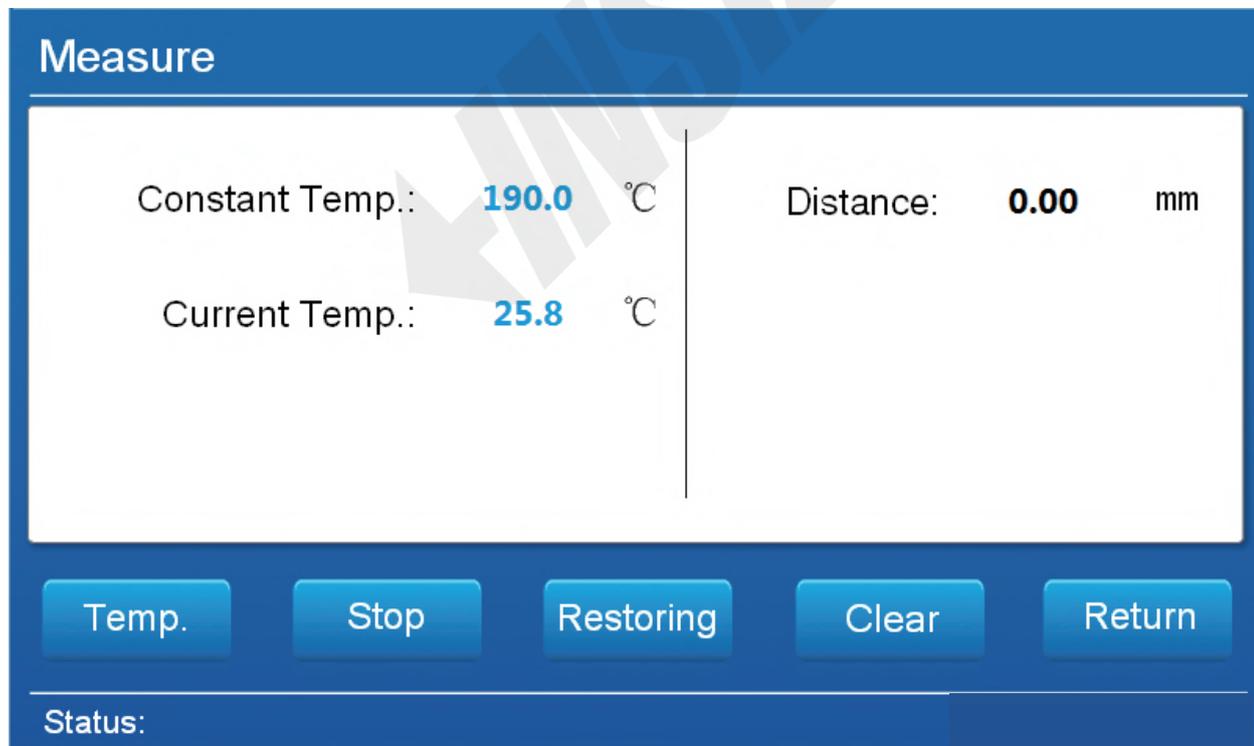


Fig 22

Temperature calibration:

For example, calibrate the temp. point 300°C, set the constant temp. as 300°C, click Temp. to control temperature, when the temperature stay at 300°C 15 minutes, measure the temperature at position 10mm above die, and input the value at current temp., click enter to confirm. If can not calibrate the temperature in one time, please do it again after the temperature stable.

Restoring: Click restoring, and input password “123456”, the temperature to factory default.

Clear: Click it to zero the distance.

3.5 Cleaning instruction

CAUTION: It is absolutely imperative that the Cylinder, Die and Piston are cleaned thoroughly after each test.

Insulated gloves should be used to avoid scalds or burns.

All these should be done before the instrument becoming cool.

A lubricant (such as silicon oil, paraffin and etc) can be used for cleaning.

Do not use cleaning things, which may have abrasion to the piston, the cylinder and the surface of the die.

3.5.1 Piston Cleaning:

Because there may be some melting specimen remained, when taking out the piston, the resistance may be great. So you can rotate the basic weight clockwise while lifting it up.

CAUTION: Do not rotate it anti-clockwise; otherwise it is possible that the piston will get out of the weight lid and the cylinder will get loose. When take out the piston rod, the cylinder will be taken out at the same time. It will add troubles to the cleaning work.

Wipe the piston rod thoroughly using a patch of cloth made from a natural fiber. The cloth must be clean and free from oil and grease of any type as they may affect future

test result. Place the piston on the tool rack or on a frictional surface that will prevent it from rolling.

3.5.2 Die cleaning

Pull out the handle to the left, use the Charging Tool to remove the die by pushing it out of the bottom of the cylinder. At the same time, use hand to hold the die (gloves should be worn). Clean the outside of the Die with the clean, natural fiber cloth. Clean the bore of the Die by using the Die Cleaning Tool promptly. There should be no residue on the orifice after cleaning.

3.5.3 Barrel cleaning

Insert the Cylinder Cleaning Tool with pledget winding around into the cylinder and clean it several times up and down until there is no visual evidence of material remaining on the cylinder wall.

Drop the Die in the cylinder. It should fall to the bottom of the bottom easily and there should be an audible click when it hits the bottom of the cylinder. If not, remove the Die and re-clean it and the cylinder.

4. Equipment storage, maintenance

4.1 The tester and accessory must be placed in dry environment.

4.2 The accessories must cover antirust grease after test, and remove the antirust grease before test.

4.3 Power off the tester after test.

Appendix A

(Normative)

Test conditions for Melt Flow Rate determination

The conditions used shall be as indicated in the appropriate material designation or specification. Table A indicates test conditions that have been found useful.

List A

Condition (letter symbol)	Testing temperature θ , °C	Load (combination), kg
A	250	2.16
B	150	2.16
D	190	2.16
E	190	0.325
F	190	10.00
G	190	21.6
H	200	5.00
M	230	2.16
N	230	3.80
S	280	2.16
T	190	5.00
U	220	10.00
W	300	1.20
Z	125	0.325

NOTE: If, in the future, conditions other than those listed in this table are necessary, e.g. for new thermoplastics, only the loads already in use shall be chosen. Temperatures shall also be selected from those already in the table. If absolutely necessary, new temperatures might have to be taken because of nature of the new thermoplastic.

Appendix B

(Suggestive appendix)

Testing condition for thermoplastics materials

Table B indicates test conditions that are currently specified in relevant international standards. Other test conditions not listed here may be used, if necessary, for particular material.

List B

Materials	Condition (code Letter)	Testing Temperature θ , °C	Nominal Load (combined) mnom, kg
PS	H	200	5.00
PE	D	190	2.16
PE	E	190	0.325
PE	G	190	21.60
PE	T	190	5.00
PP	M	230	2.16
ABS	U	220	10.00
PS-1	H	200	5.00
E/VAC	B	150	2.16
E/VAC	D	190	2.16
E/VAC	Z	125	0.325
SAN	U	220	10.00
ASA, ACS, AES	U	220	10.00
PC	W	300	1.20
PMMA	N	230	3.80
PB	D	190	2.16
PB	F	190	10.00
POM	D	190	2.16
MABS	U	220	10.00

Problem analysis and treatment method

Problem	Problem analysis and treatment method
No display or display disappears during heating	Check whether the power supply is well connected, whether power fuse burned, and ground wire is connected
Heating but not constant ,fluctuate around the constant point	Fluctuations in the power supply voltage is too large, the first stage must be connected to power supply
The handle can not move	The barrel are not clean enough, heat the barrel to a temperature, and move the handle. Make sure clean the barrel and die after each test.



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