LCD screen will display English Initial Page (P_1) after you turn on the power or Press key 8,If you Press key 9 then LCD screen will display chinese Initial Page (P_1)

Ⅰ. Applications:

XNR-400b Melt Flow Rate Instrument is suitable for determination of flow properties of thermoplastic high polymer under high temperature according to test method of GB3682-2000.It is used to determine the melt flow rate of high polymer such as PE ,PP ,POM ,ABS resin ,poly carbonic acid ester and nylon FI plastic ,etc. It is widely supplied to the manufacture and research of factories and science and research instiiute .

Ⅱ. Main Specifications :

1. **Extrusion section :**

Die diameter:Φ2.095±0.005mm
Die length : 8.000±0.025mm
Cylinder diameter : Φ9.550±0.025mm
Cylinder length : 152±0.1 mm
Diameter of piston head: 9.475±0.015 mm
Length of piston head : 6.350±0.100mm

2 . Standard test load (kg ,8 grades)

1st grade :0.325kg = (piston stem +weight tray +heat insulation sheath +weight # 1)
2nd grade :1.200kg = (0.325+weight # 2 0.875)
3rd grade :2.160kg = (0.325+weight # 3 1.835)
4th grade :3.800kg = ((0.325+weight #4 3.475)
5th grade :5.000kg = (0.325+weight #5 4.675)
6th grade :10.000kg = (0.325+weight #5 4.675+weight #6 5.000)
7th grade :12.500kg = (0.325+ weight #5 4.675+weight #6 5.000+ weight #7 2.500)
8th grade :21.600kg = (0.325+ weight #2 0.875+ weight #3 1.835+ weight #4 3.475+ weight #5 4.675+weight #6 5.000+ weight #7 2.500+weight #8 2.915)

The test load relative error shall not be more than 0.5% .

3.Temperature range :room temperature to 400℃

4. Temperature constant accuracy : ±0.2℃

5. Power voltage :220V±10% 50Hz

6. Working Condition :

The ambient temperature shall be 10-40℃ and the relative humidity shall be 30%~80% .There shall be no corrosive media ,strong air convection ,virbaration and strong magnetic field disturbance in ambient .

Ⅲ. Theory and Structure

Melt Flow Rate Instrument is a kind of Extrusion Plastometer .It

can make the sample melt through high temperature oven in specified temperature conditions .The melt sample can be extruded from a die under specified load from the weights .The Melt (Mass) Flow Rate is usually used to express the physical properties such as fluidity and viscosity of macromolecule materials under melt condition in factory plastic manufacture and research of science and research institutes . Melt Flow Rate is the mass that the melt sample of the thermoplastics passes through standard die every 10min under definite temperature and pressure .

The melt mass-flow rate (MFR) ,expressed in grams per 10min ,is given by the equation :

$MFR(\theta、m_{nom})= t_{ref}\times m/t=600\times m/t(g/10min)$

Where :

θ ---- test temperature ,in degrees Celsius ;

m_{nom} ---- nominal load ,in kilograms ;

m ---- the average mass of the cut-offs in grams ;

t_{ref} ---- the reference time (10min) ,in seconds (600S) ;

t ---- the predetermined time of measurement ,in seconds .

For example :There is one group plastic sample .The machine is Ent to cut off one section every 30S .The mass of every section is 0.081 g ,0.086g ,0.081g ,0.089g ,0.082g and seperately .

The average value m =(0.081+0.086+0.081+0.089+0.082) ÷5 = 0.0838(g) .Put the value into the equation and get the MFR .

MFR =600×0.084/30 =1.680 (g/10min).

Ⅳ. Keyboard operation

(Ⅰ) Figure buttons , “.” button and “-” button .

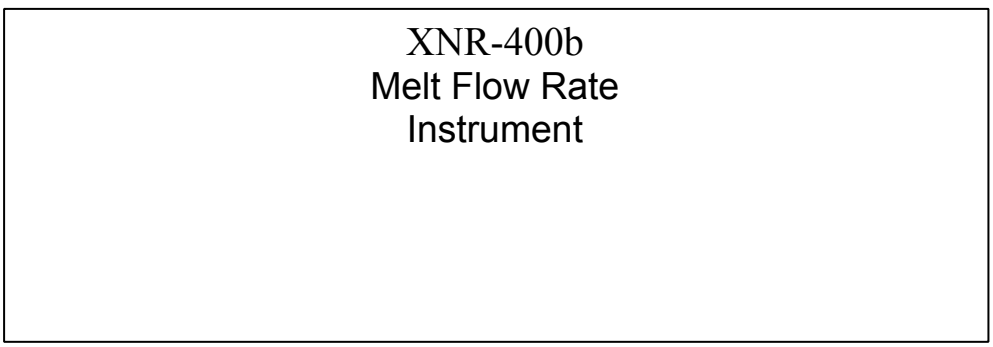
The operation panel consists of 10 figure buttons from 0 to 9 ,“**.**” button and “**-**” button for inputting figures .

(Ⅱ) The operation of the function buttons :

(1) **“Menu”, “EnT”** and **“Esc ”** buttons :

(a) The following is the instruction of the LCD screen display :

The LCD screen display includes 8 page layouts ,they are initial page ,menu page ,Parameters Set page,Test Display page ,Calibration page,Temp Calibration page ,Time Set page ,PID Set page as shown in the following figures (The sketch map of LCD screen interfaces).



Initial Page (P_1)

1. Parameters Set
2. Test Display
3.Calibration
Press key 1~3 select

Temp. Correction Controlling Parameters Set

menu Page (P_2)

1. θ: 190℃
2. t : 15s
3. d : 5
4. m : 2.16kg
5. f : Auto

Press key1~5 select .

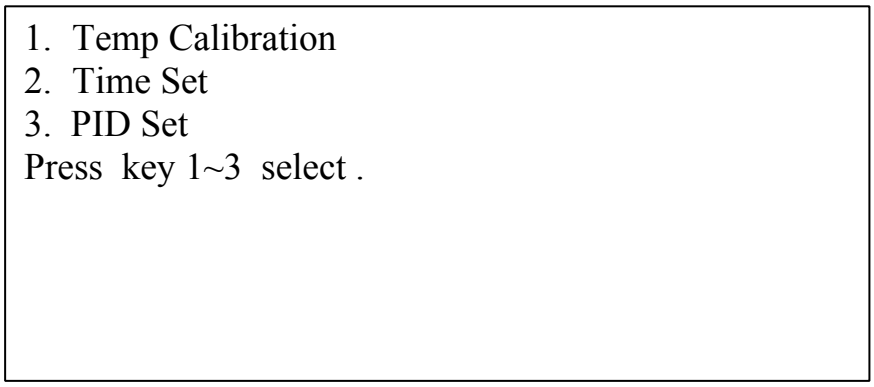
MFR 08:30:20

Temp : ℃
Time : S
m1 : g
MF : g/10min
(g/10min)

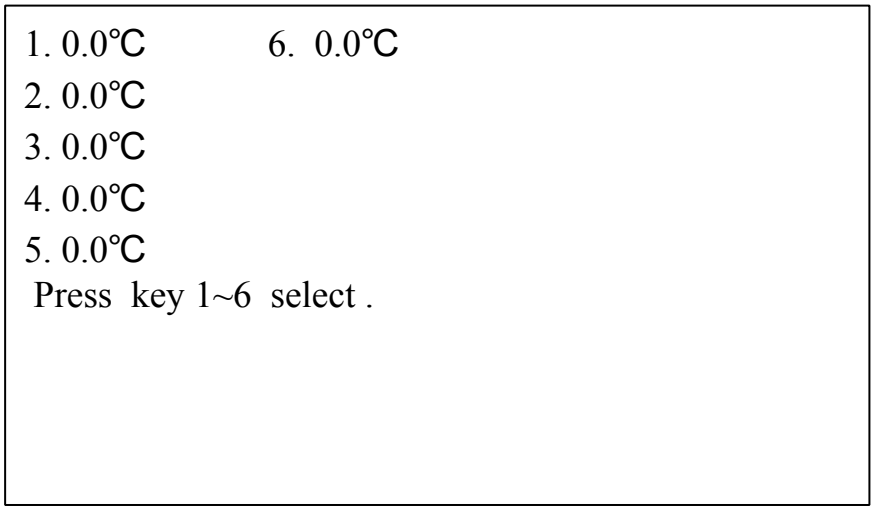
Parameters Set (P_3)

M

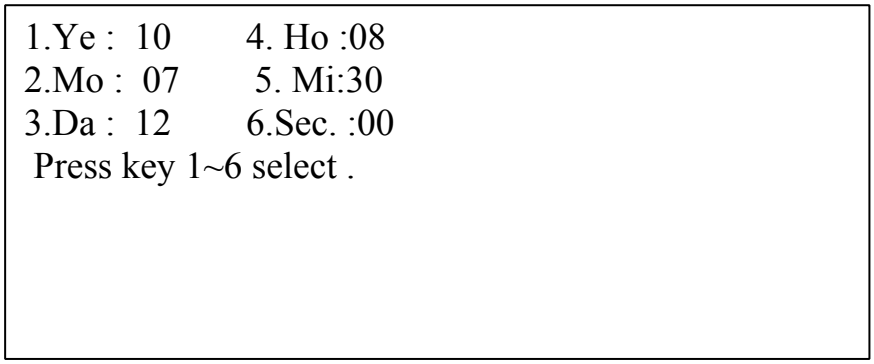
Test Display (P_4)



Calibration Page (P_5)

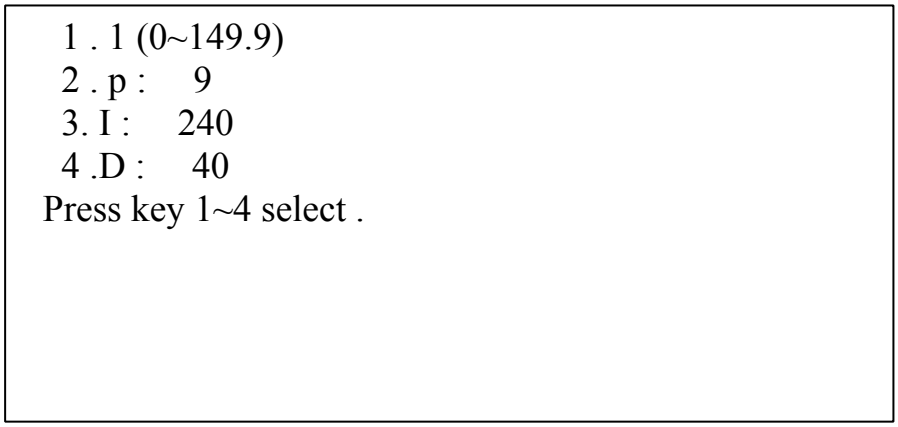


Temp Calibration Page (P_6)



Time Set Page (P_7)

PID Set Page (P_8)



(b)
LCD screen will display the Initial Page (P_1) after you turn on the power or press **"Reset"** button .

(c) LCD screen will display Meau Page (P_2) after you press **"MeNu"** key .

Press key 1~3 select relevant interface .

Press key 1 ,you will enter into Parameters Set .(P_3)

Press key 2 ,you will enter into Test Display .(P_4)

Press key 3 ,you will enter into Calibration .(P_5)

(d) Parameters Set

LCD screen will display content of P_3 after you enter into Parameters Set .

The options in Parameters Set are as following :

1. θ----test temperature
2. t ---- cut-off time-interval
3. d ---- sampling times
4. m ---- the test load mass
5. f ---- cut-off mode ,that is ,auto or manual

Press key 1 ,it will be displayed in reverse video indicating you to select test temperature.

Press key 2 ,it will be displayed in reverse video indicating you to select cut-off time-interval.

Press key 3 ,it will be displayed in reverse video indicating you to select sampling times.

Press key 4 ,it will be displayed in reverse video indicating you to select test load mass.

Press key 5 ,it will be displayed in reverse video indicating you to select cut-off mode.

(Reverse video refers that the displayed colour reverses to the normal displayed colour.)

Enter a value by figure key after you have selected one of the options and press **"Ent"** button .The relevant figure key will turn to be normal

displaying colour .If you have entered a wrong value and didn't press **"Ent"** button (At this condition ,the figure key remains displaying in reverse video.) ,Press **"Esc"** button and enter a needed one again .Press **"Esc"**button and enter the needed one and press **"Ent"** button if it is necessary to modify a data .

The temperature value should be Ent within 50~400℃ ,the cut-off time-interval value should be Ent within 1~999S ,the sampling times value should be Ent within 1~99 and the test load mass value should be Ent according to relevant sample standards .

The selection of Auto or Manual : After the user has selected the 5th option ,press figure key 1 to select Auto mode and it will be displayed to be "**f:Auto"**;press figure key 2 to select Manual mode and it will be displayed to be "**f:Manual** ".It is not necessary to press **"**ENT**"** button .

If you have selected **Auto** mode ,the rotating cutting tool of the motor will cut the sample automatically when the cut-off time-interval has been reached ;if you have chosen **Manual** mode ,the machine will alarm you to rotate cutting tool of the motor manually to cut-off the sample when the cut-oof time-interval has been reached .

(e) The Ent of the average weight of cut-off samples in Test Display

Enter the value by figure buttons and press **"**Ent**"** button after one group of tests is finished and the average weight of cut-off samples is calculated .The MFR will be calculated and indicated automatically .

(f) Testing Machine Main Correction Page

The options in Testing Machine Calibration Page are as following :

1. Temp Calibration
2. Time Set
3. PID Set

Press figure key 1 ,you will enter into Temp Calibration Page (P_6).

Press figure key 2 ,you will enter into Time Set Page (P_7).

4. Press figure key 3 ,you will enter into PID Set Page (P_8).

a. Temp Calibration Page

LCD screen will display the content of P_6 after you enter into Temp Calibration Page .

The options in the page are as following :

1 ----125℃ Temp. correction value ;

2 ---- 190℃ Temp. correction value ;

3 ---- 230℃ Temp. correction value ;

4 ---- 300℃ Temp. correction value ;

5 ---- 400℃ Temp. correction value ;

6 ---- 450℃ Temp. correction value .

The test temperature correction value of the above mentioned points

equals to actual Temp. minus displayed Temp. plus manufacturer's Temp. deviation value .For example :the test Temp. constant point is Ent to be 125℃ .Then ,the displayed test Temp. is 125℃ after the temperature is constant ,but the actual measured test Temp. is 124℃ .So ,the Temp. correction value is (124-125) equals to –1.0℃ .The manufacturer's test Temp. deviation is 0.2℃ and the final Temp. correction value is (–1.0+0.2)℃ equals to -0.8℃ .If the actual measured test Temp. is 125.8℃ ,the 125℃ test Temp. correction value is (125.8-125)℃ equals to 0.8℃ ,the manufacturer's Temp. deviation value is 0.2℃ ,so the final Temp. correction value is (0.8+0.2)℃ equals to 1.0℃ .The Ent method is as following :

Press **"**Ent**"** button to Esc the manufacturer's test Temp. correction value after you press figure key 1 to select 125℃ test Temp. correction value.If the value is negative ,enter negative sign by "-" button at first .And then ,enter final test Temp. correction value by figure button and decimal button and press **"**Ent**"** button .If the value is positive ,enter the final test Temp. correction value by figure button and decimal button directly and press **"**ENT**"** button .At this time ,the relevant figure key turns to be normal displayed colour .If you have entered a wrong value and didn't press **"**ENT**"** button (At this condition ,the figure key remains displaying in reverse video.),press **"Esc"** button and enter the needed one .Press **"Esc"** button and enter the needed value and press **"**Ent**"** button if it is necessary to modify a data .

You must enter one-digit and one figure after decimal point for every test Temp. correction value ,that is ,you must press figure button "0" to enter even if the figure after decimal point is zero . It is applied to enter every test Temp. correction value .The Ent range of every test Temp. correction value is from –9.9℃ to +9.9℃ .

After you have finished to Ent every test Temp. correction value ,you must press "Esc" button or turn off the power of the apparatus and turn on it again so that the new correction value can be efficient .

b.Time Set Page

LCD screen will display the content of P_7 as following after you enter into Time Set Page.

1---- Year correction value ;
2 ---- Month correction value ;
3 ---- Date correction value ;
4 ---- Hour correction value ;
5 ---- Minute correction value ;
6 ---- Second correction value .

Enter the value by figure key after you have selected one of the options and press **"ENT"** button ,the relevant figure key turns to be normal displayed colour .If you have entered a wrong value and didn't press **"ENT"** button (At this condition ,the figure key remains displaying in reverse video.),press **"Esc"** button and enter a needed one . If it is necessary to modify a data ,press "**Esc"** button and enter the needed value after you have selected relevant option (The relevant figure key displays in reverse video.) and press **"ENT"** button .**you must enter tens digit and one digit for every Time correction value ,that is ,you must press figure button "0" to enter even if the tens digit is zero .**

c.PID Set Page

LCD screen will display the content of P_8 as following after you enter into PID Set Page .

1 ---- select one group among 4 PID groups ;

2 ---- correction value of P (proportion value) ;

3 ---- correction value of I (integral value);

4 ---- correction value of D (differential coefficient) .

The PID parameters of the machine includes four groups .The 1st group is used to Ent PID parameter when the temperature contant point is within 0~149.9℃ ; the 2nd group is used to Ent PID parameter when the temperature contant point is within 150~199.9℃ ;the 3rd group is used to Ent PID parameter when the temperature contant point is within 200~299.9℃ and the 4th group is used to Ent PID parameter when the temperature contant point is within 300~400℃ .Press figure key 1 to select a certain group of PID parameter ,the key will display in reverse video .Press figure keys from 1 to 4 in turn ,the display turns to be :1(0~149.9) ,2(150~199.9) ,3(200~299.9) and 4(300~400) .Press **""ENT""** to ensure the modification of a certain group of PID parameter.

Press figure keys 2 to 4 to select correction value of P,I and D Ent option separately .The figure key 2 ,3 and 4 will display in reverse video . Enter the value by figure key after you have selected one of the options and press **""ENT""** button ,the relevant figure key turns to be normal displayed colour .If you have entered a wrong value and didn't press **""ENT""** button (At this condition ,the figure key remains displaying in reverse video.) ,press **"Esc"** button and enter a needed one .Press **"Esc"** button and enter the needed value after you have selected relevant option (The relevant figure key displays in reverse video.) and press **""ENT""** button if it is necessary to modify a data .The Ent range of P ,I and D is 1~100 ,0~3600s and 0~3600s seperately.It is strongly recommended that PID parameters should be modified by professional engineers or you should contact the manufacturer when it is necessary to modify a PID paramenter.

After you have finished to Ent every PID parameters ,you must press "Esc" button or turn on the apparatus again after you turning off it so that the new correction value can be efficient .

(2) The operation of **"MANUAL CUT"** button

Press **"Start"**button in Test Display ,the time display in the page will be circularly displayed according to the Ent cut-off time-interval .The cut-off electrical engine will cut the sample once as soon as the time is up to cut-off time-interval and alarms you .The cut-off time-interval stops displaying and the cut-off electrical engine stops cutting when the sampling times has been reached .

(3) The operation of **"Run"**button

Press **"Run"** button in Test Display ,the apparatus starts to heat and carries out temperature constant process according to the Ent temperature constant point .There is heating indication on the panel during heating process .

(4) The operation of **"Temp"** button

It is a dual key .Press the button in Test Display ,the display interface will display actual oven temperature ,but the heating process doesn't work . Press the button in other pages ,the selected option will be Escled .

(5) The operation of **"Print"** button

Press **"Print"** button to print the test report after one group of tests are finished .

(6)The operation of **"Rest"** button

Press **"Rest "** button ,the apparatus begins initialization again .

(7) The operation of **"Manual "** button

Press **"Manual"** button once ,the cut-off engine will rotate one circle.

V.Installation and operation :

1.Adjustment

①,After the disassemble of the package ,you shall check the main engine ,parts and components ,accessories and technical document accurately according to packing list and Fig.1. Clean the apparatus and put it on the stable platform after there is no damage and error is found in checking .

②,Push the push-and-pull stem (No.1 in fig.2) which is connected with the die-retaining plate into the oven .You can see that the die-retaining plate covers two thirds of the bottom caliber of the cylinder from the top of it .And then ,insert the support stem of bubble level into the cylinder from the top to assure that its bottom surface touches the die-retaining plate .

③,Put the bubble level onto the support stem (as shown in Fig.1) .Take the bubble as reference ,adjust the four screws (No.6 in fig.2) under the

base so that the cylinder can be vertical (Note:The procedure is used to avoid excessive friction caused by the piston or bending under heavy loads .) .At last ,you shall tighten the locknut on the adjusting screws and disassemble the bubble level and the support stem .

(1) Die Installation

Install die from the top of the cylinder and press it by charging bar till it touches die-retaining plate.

(2) Put the piston stem (compounding part) into the cylinder from the top .

(3) Insert power jack and turn on the power switch on the controlling panel ,the power light flashes.Ent test constant temperature point ,cut-off time-interval ,sampling times ,nominal test load according to the statement in **Part Ⅳ** .Press **"START"** button after you enter into the test main page .The apparatus begins to heat .Ensure that the cylinder has been at the selected temperature for less than 15min .

(4) Wear gloves **(in case of scald**) and take out piston stem after 15min .Charge the sample into the cylinder and compress it by charging hopper and packing rod within 1min .Put the piston stem into the cylinder again .The nominal test load can be added onto the piston stem after 4min.

Pre-estimate melt flow rate ,sample mass in cylinder and cut-off time-interval (See Appendix Ⅰ) .

The test material corresponding to test Temp. and nominal test load is shown as Appendix Ⅱ .

(5) Extruded samples' cut-off .The Ent is shown as the above mentioned **AUTO** or **MANUAL** option .

A. **AUTO** cut-off

Put the tray under the die .Press **"**AUTO CUT**"** button when the lower reference mark on the piston stem has reaches the top edge of the cylinder ,the cutting tool cut the samples automatically according to the selected sampling times and cut-off time-intervals .

B. **MANUAL** cut-off

Install manual knob on the cut-off engine axis at the back part of the apparatus. Put the tray under the die .Ent the sampling manner to be **MANUAL** .When the lower reference mark on the piston stem has reached the top edge of the cylinder ,press**"AUTO CUT"**button ,the cut-off time-interval has been reached and the apparatus alarms .Rotate manual knob to cut .

C.The manual knob shall be removed when it is under **AUTO** cut-off mode .

(The cut-off shall be carried out between the upper and lower reference marks on the piston stem) .

(6) Result calculation

Select 3~5 no air bubble cut-offs and put them on the balance after cooling and weigh individually (The balance shall be accurate to 0.5mg .) ,calculate their average mass .Enter average mass in MainTest Page and press **"ENT"** button .The apparatus will calculate MFR value and displays it in the main interface page .Press **"Print"** button to print test report .

After the above mentioned procedure ,the test is finished .

Vl. Cleaning after tests :

The apparatus shall be cleaned thoroughly after each determination .

(1) Wear gloves **(in case of scald)** and remove the weight and piston stem after all the samples in the cylinder is extruded .Clean the piston stem .

(2) Pull the push-and-pull rod out and take the die out carefully by the packing rod ;take out the left sample in the die by die cleaning bar and clean die hole ,the die and the feeding bar with cotton.

(3) Wrap the gauze onto the cylinder cleaning bar to clean the cylinder while it is hot .

(4) Turn off the power of the apparatus and pull out the jack .

Vll.Attention

(1) The single-phase power jack shall have grounding hole and is stable grounded.

(2) Press **"Esc"** button if LCD screen displays abnormally .Ent the test temperature again and press **"START"** button .

(3) If the temperature is more than 450℃ during the normal test ,the software will be protected ,the apparatus stops to heat and alarms .

(4) If the abnormal phenomenon are such that the apparatus can't control temperature or can't display appear ,measures shall be taken to turn off the power and check the apparatus .

(5) Abrasives or material likely shall not be used when cleaning the piston stem .

Appendixl:

MFR (g/ 10min)	Sample Mass in Cylinder (g)	Extruded Cut-off Time-interval (s)
0.1~0.5	3~5	240
>0.5~1	4~6	120
>1~3.5	4~6	60
>3.5~10	6~8	30
>10	6~8	5~15

1) It is recommended that a melt flow rate shall not be measured if the value obtained in this test is less than 0.1g/10min or great than 100g/ 10min .

2) When the density of the material is greater than 1.0g/cm^3 ,it may be necessary to increase the mass of the test portion .

3) To achieve adequate repeatability when testing materials having an MFR greater than 25g/10min ,it may be necessary either to control and measure cut-off intervals automatically to less than 0.1s or to use MVR method .

Appendix Ⅱ

Material	Test Temp. (θin℃)	Nominal test load (m_{nom} in kg)
PS	200	5.00
PE	190	2.16
PE	190	0.325
PE	190	21.60
PE	190	5.00
PP	230	2.16
ABS	220	10.00
PS-1	200	5.00
E/VAC	150	2.16
E/VAC	190	2.16

E/VAC	125	0.325
SAN	220	10.00
ASA,ACS,AEC	220	10.00
PC	300	1.2
PMMA	230	3.8
PB	190	2.16
PB	190	10.00
POM	190	2.16
MABS	220	10.00