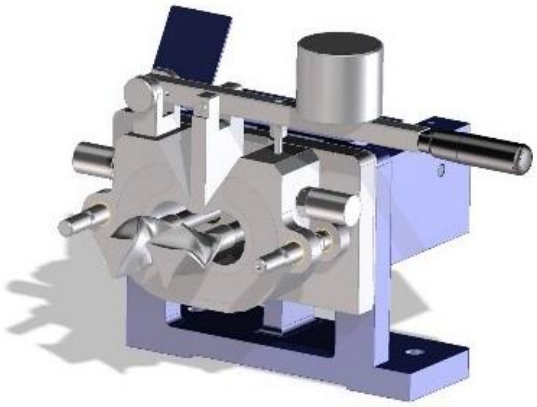
TOYOSEIKI

655 | LABO PLASTOMILL

Modular Torque Rheometer System

Base unit + measuring extruder

Base unit + measuring mixer



Roller blades mixer (R60)

Single-screw extruder (D2025)

■APPLICATION

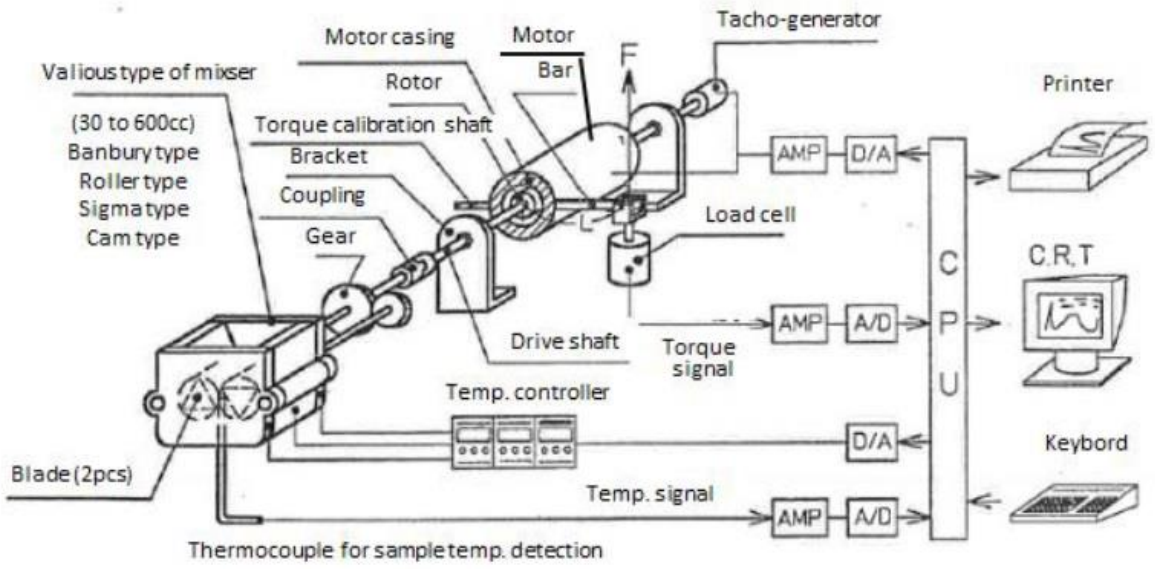
Knowing processing characteristics of polymer materials such as thermoplastic resins, thermosetting resins and elastomers is very important for cost reduction and quality control.

In developing of new materials in addition to knowing the processing characteristics it is also important to find out through simulation whether the material can be molded or not and determine appropriate processing conditions.

This Labo Plastomill perform these tests on small quantities of samples, mainly the following tests.

- Processing characteristics evaluation test by small mixer (30 to 90cm^3)
- Simulation and other evaluation tests by small extruder (Ø20mm)

The Labo Plastomill is a practical testing machine (shear force acts) which provides many reliable information necessary for molding process and is already being used in numerous industries and related fields for this purpose.



Principle (Base unit and Mixer)

1. BASE UNIT (Drive Unit)

Model S

The computer controls the machine and performs data processing of various characteristic values taking torque, resin temperature and pressure as parameters.
All controls and data processing are performed by computer. By recalling already registered testing conditions, filling sample and then starting the machine, waveform graphs of torque, pressure, resin temperature and energy, etc. are displayed and measurement proceeds according to the testing conditions.
In mixer test, programmed control operation of temperature and revolution is also possible.
In addition to allowing enlargement and reduction of waveform graph, data analysis processes the function of computing characteristic values of various patterns separately for each mode and allows multiplotting of up to 8 data.
Characteristic value points can be arbitrarily specified form waveform graph and in mixer test automatic detection by automatic calculation function is also possible.
(Note: Mixer shown is option)

Model	3S150	10S100	3S500
Operation & data processing	PC (comes standard with PC and testing software)		
Max. torque	300Nm	1000Nm	300Nm
Max. speed	150rpm	100rpm	500rpm
Drive output	3.5kW	5.5kW	15kW
Torque detection	Load cell		Torque meter
Torque measurement accuracy	±0.1% within FS		
Pressure & temperature amplifier	4 each of pressure & temperature		
Temperature controller	6 channels		
Safety devices	Torque limiter, pressure limiter, temperature limiter, heater disconnection alarm, emergency stop switch, coupling safety cover, earth leakage breaker etc.		
Power supply	Three-phase, AC200V, 50/60Hz, 60A		Three-phase, AC200V, 50/60Hz, 100A
Dimensions (Base unit only)	W525 x D790 x H1300mm		
Weight (Base unit only) (approx.)	● 215kg (3S150) ● 235kg (10S100) ● 285kg (3S500)		

SOFTWARE

■Common Specifications

- Register, delete and retrieve test conditions.
- Enlarge and reduce waveform graph, select and display waveform data according to kind, change display color.
- Save, delete and transfer measured data and search according to character or date.
- Multiplot (overlap plotting) up to 8 measured data.
- Measured data can be read in spreadsheet software such as Excel.
- Select unit system from SI and MKS unit systems.
- Turn cooling solenoid valve ON/OFF from personal computer.
- Automatic setting function for torque and pressure limiters according to kind of measuring head.
- Specify temperature limiter value as absolute value or deviation value.
- Auto scale function in waveform graph.
- Provides higher sampling speed and higher accuracy data than before.

■Mixer Test

Allows selection of 8 test modes in mixer test, equipped with characteristic value calculating function for each pattern.

1. Manual operation of mixer test
2. PVC plasticization evaluation test
3. PVC thermal stability evaluation test
4. Thermal stability evaluation test (torque reduction type)
5. Hardening reaction evaluation test
6. Curing reaction evaluation test
7. Carbon dispersion evaluation test
8. Plasticizer absorption evaluation test (PVC)

- Change revolutions, change set temperature, stop test, extend measuring time during testing.
- Specify temperature and revolutions program control operation in test conditions setting.
- In test model 1 you can calculate characteristic value by arbitrarily specifying maximum 6 points according to direct method, peak point method, tangent method, time method, etc. from waveform graph.
- In test modes 2~8, you can arbitrarily specify characteristic value point. The auto calculation function allows you to automatically detect characteristic value point.

<Waveform Date Items>

- Torque (raw data and average data>
- Resin temperature (raw data)
- Mixer No.2 temperature (raw data)
- Consumed energy
- Set temperature
- Set revolutions

Extruder Test (Extruder Test Data Example 1)

- Change revolutions, change set temperature, stop test, extend measuring time during testing.
- Specify 2 arbitrary points from waveform graph and calculate the torque, pressure, resin temperature average value and standard deviation in between these points. Moreover, specific energy can also be calculated by inputting the sample discharge quantity between these points. (Each calculation up to 10 steps.)
- As regards sampling of discharge amount, perform calculation with regard to sampling at arbitrary time interval by using the foot switch.

<Waveform Data Items>

- Torque (raw data and average data)
- Resin temperature max. 4 points (raw data)
- Resin pressure max. 4 points (raw data and average data)
- Set revolutions

Slit Die Viscosity Test (Extruder Test Data Example 2)

- By specifying revolutions of maximum 10 steps in test conditions, test automatically changes to revolutions of each step.
- Apparent and true flow curves (shear rate – shear stress – viscosity) are calculated by inputting sample discharge amount for each step.
- As regards sampling of discharge amount, perform calculation with regard to sampling at arbitrary time interval by using the foot switch.

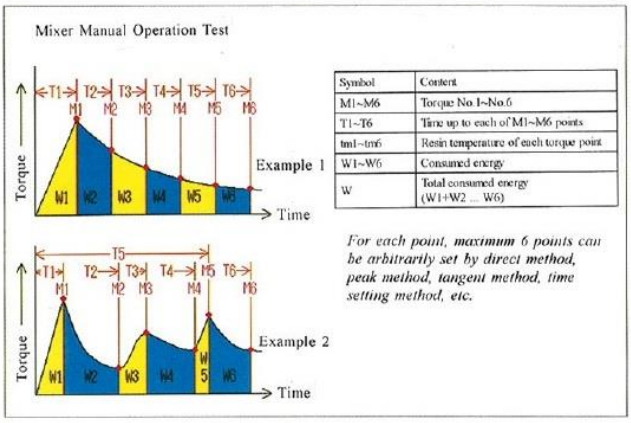
<Waveform Data Items>

- Torque (raw data and average data)
- Resin temperature max. 4 points (raw data)
- Resin pressure max. 4 points (raw data and average data)
- Set revolutions

Analysis Content and Data Example of Each Test Mode

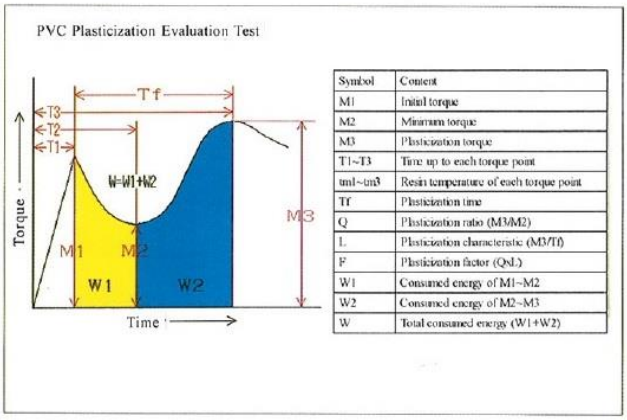
Mixer Test

Analysis Content of Mixer Test 1



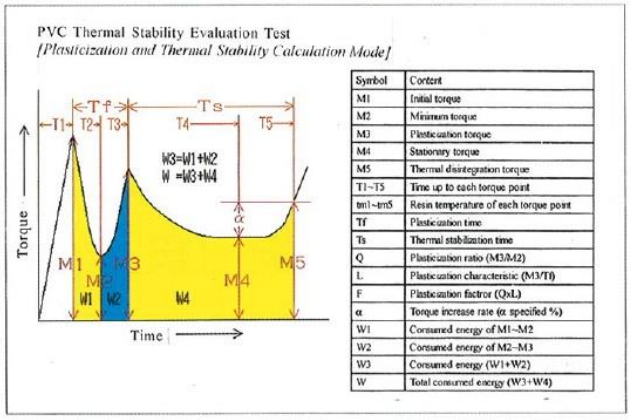
Symbol	Content
M1~M6	Torque No.1~No.6
T1~T6	Time up to each of M1~M6 points
tm1~tm6	Resin temperature of each torque point
W1~W6	Consumed energy
W	Total consumed energy (W1+W2 ... W6)

Analysis Content of Mixer Test 2



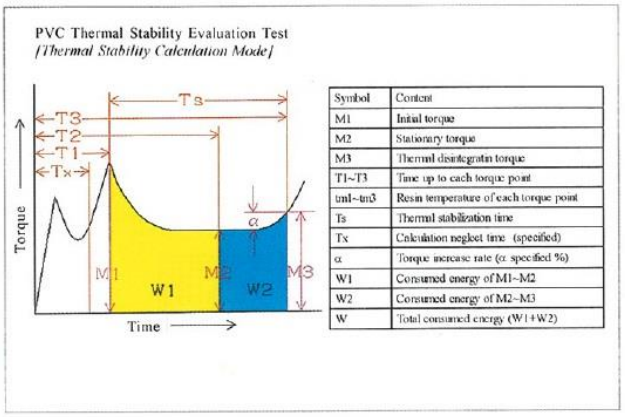
Symbol	Content
M1	Initial torque
M2	Minimum torque
M3	Plasticization torque
T1~T3	Time up to each torque point
tm1~tm3	Resin temperature of each torque point
Tf	Plasticization time
Q	Plasticization ratio (M3/M2)
L	Plasticization characteristic (M3/Tf)
F	Plasticization factor (QxL)
W1	Consumed energy of M1~M2
W2	Consumed energy of M2~M3
W	Total consumed energy (W1+W2)

Analysis Content of Mixer Test 3



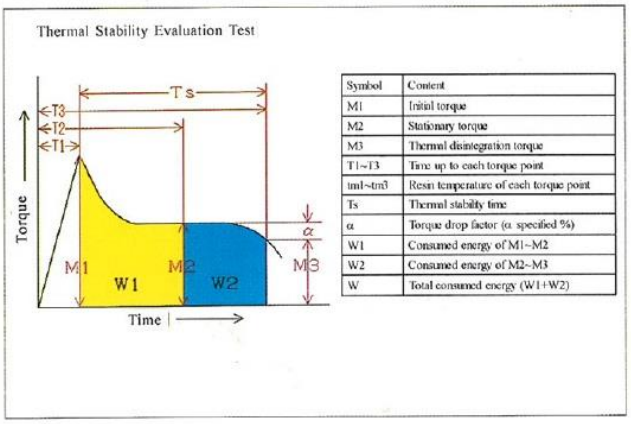
Symbol	Content
M1	Initial torque
M2	Minimum torque
M3	Plasticization torque
M4	Stationary torque
M5	Thermal disintegration torque
T1~T5	Time up to each torque point
tm1~tm5	Resin temperature of each torque point
Tf	Plasticization time
Ts	Thermal stabilization time
Q	Plasticization ratio (M3/M2)
L	Plasticization characteristic (M3/Tf)
F	Plasticization factror (QxL)
α	Torque increase rate (α specified %)
W1	Consumed energy of M1~M2
W2	Consumed energy of M2~M3
W3	Consumed energy (W1+W2)
W	Total consumed energy (W3+W4)

Analysis Content of Mixer Test 4



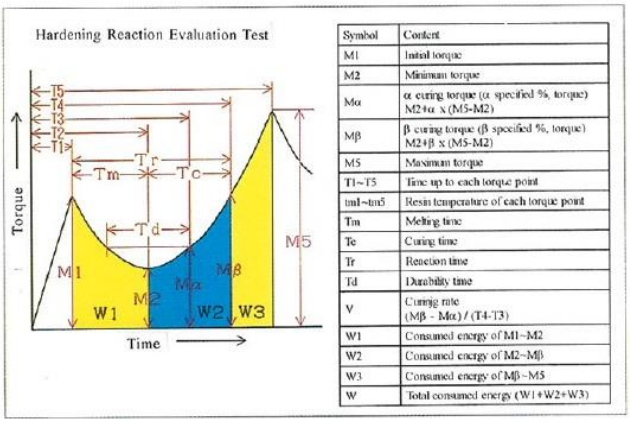
Symbol	Content
M1	Initial torque
M2	Stationary torque
M3	Thermal disintegratin torque
T1~T3	Time up to each torque point
tm1~tm3	Resin temperature of each torque point
Ts	Thermal stabilization time
Tx	Calculation neglect time (specified)
α	Torque increase rate (α specified %)
W1	Consumed energy of M1~M2
W2	Consumed energy of M2~M3
W	Total consumed energy (W1+W2)

Analysis Content of Mixer Test 5



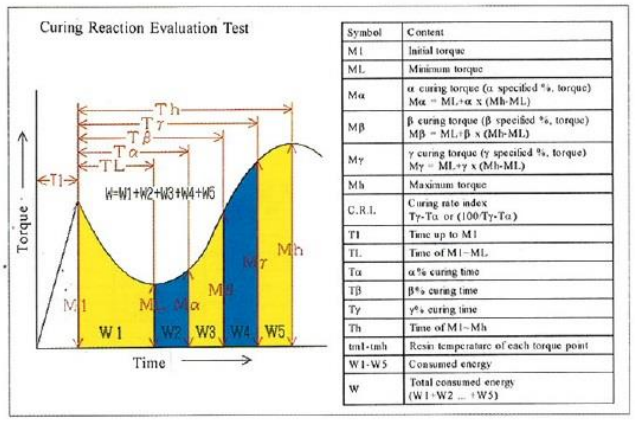
Symbol	Content
M1	Initial torque
M2	Stationary torque
M3	Thermal disintegration torque
T1~T3	Time up to each torque point
tm1~tm3	Resin temperature of each torque point
Ts	Thermal stability time
α	Torque drop factor (α specified %)
W1	Consumed energy of M1~M2
W2	Consumed energy of M2~M3
W	Total consumed energy (W1+W2)

Analysis Content of Mixer Test 6



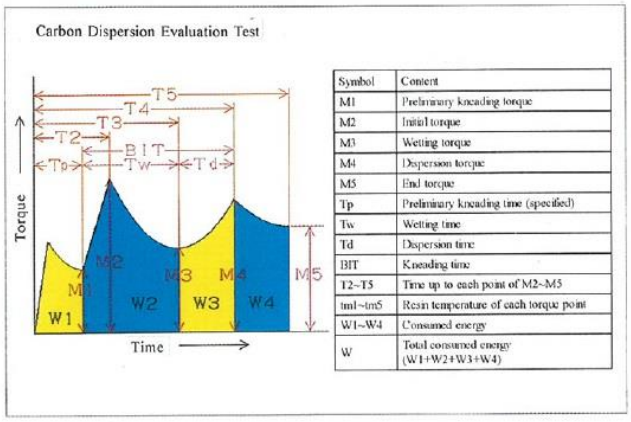
Symbol	Content
M1	Initial torque
M2	Minimum torque
Mα	α curing torque (α specified %, torque) M2+α x (M5-M2)
Mβ	β curing torque (β specified %, torque) M2+β x (M5-M2)
M5	Maximum torque
T1~T5	Time up to each torque point
tm1~tm5	Resin temperature of each torque point
Tm	Melting time
Te	Curing time
Tr	Reaction time
Td	Durability time
V	Curing rate (Mβ - Mα) / (T4-T3)
W1	Consumed energy of M1~M2
W2	Consumed energy of M2~Mβ
W3	Consumed energy of Mβ~M5
W	Total consumed energy (W1+W2+W3)

Analysis Content of Mixer Test 7



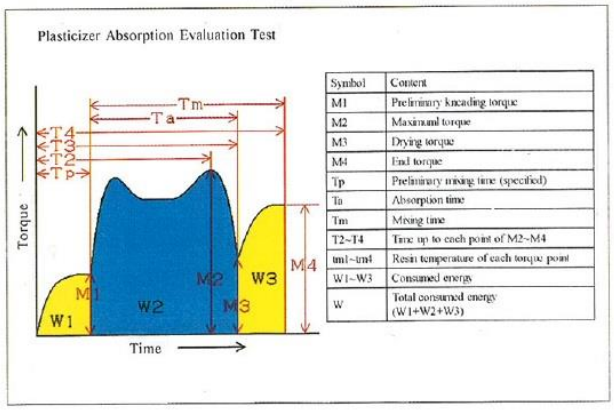
Symbol	Content
M1	Initial torque
ML	Minimum torque
Mα	α curing torque (α specified %, torque) Mα = ML+α x (Mh-ML)
Mβ	β curing torque (β specified %, torque) Mβ = ML+β x (Mh-ML)
Mγ	γ curing torque (γ specified %, torque) Mγ = ML+γ x (Mh-ML)
Mh	Maximum torque
C.R.I.	Curing rate index Tγ-Tα or (100/Tγ-Tα)
T1	Time up to M1
TL	Time of M1~ML
Tα	α% curing time
Tβ	β% curing time
Tγ	γ% curing time
Th	Time of M1~Mh
tm1~tmh	Resin temperature of each torque point
W1~W5	Consumed energy
W	Total consumed energy (W1+W2 ... +W5)

Analysis Content of Mixer Test 8



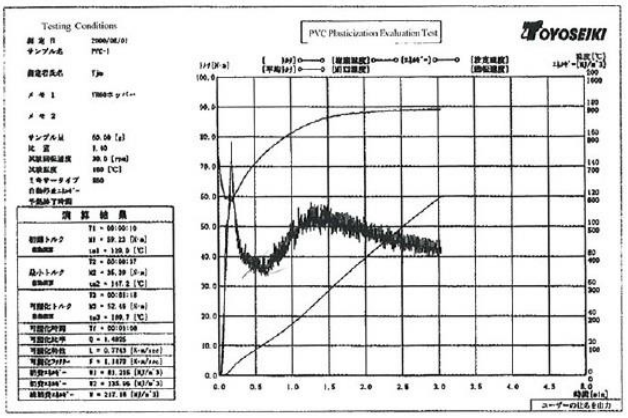
Symbol	Content
M1	Preliminary kneading torque
M2	Initial torque
M3	Wetting torque
M4	Dispersion torque
M5	End torque
Tp	Preliminary kneading time (specified)
Tw	Wetting time
Td	Dispersion time
BIT	Kneading time
T2~T5	Time up to each point of M2~M5
tm1~tm5	Resin temperature of each torque point
W1~W4	Consumed energy
W	Total consumed energy (W1+W2+W3+W4)

Analysis Content of Mixer Test 9

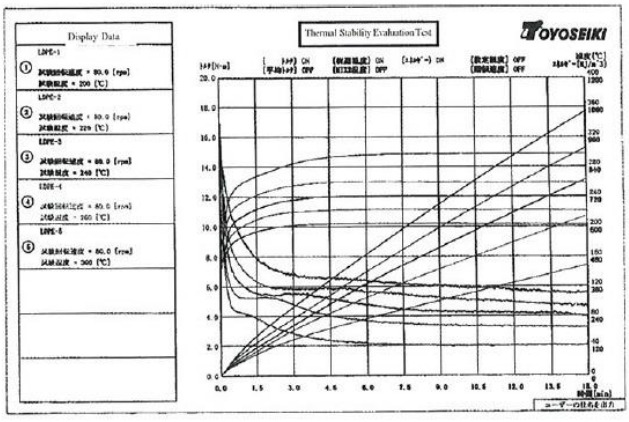


Symbol	Content
M1	Preliminary kneading torque
M2	Maximum torque
M3	Drying torque
M4	End torque
Tp	Preliminary mixing time (specified)
Ta	Absorption time
Tm	Mixing time
T2~T4	Time up to each point of M2~M4
tm1~tm4	Resin temperature of each torque point
W1~W3	Consumed energy
W	Total consumed energy (W1+W2+W3)

Mixer Test Data Example
PVC Plasticizatinon Evaluation Test



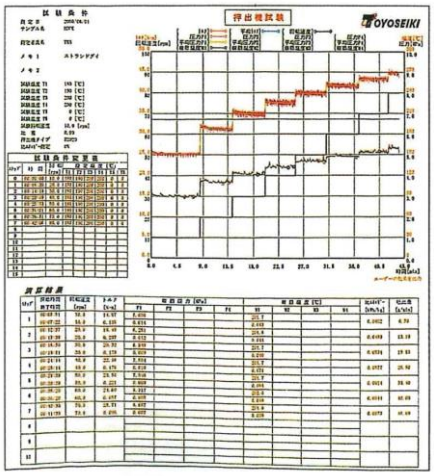
Mixer Test Data Example
Multiplotting of 5 Data



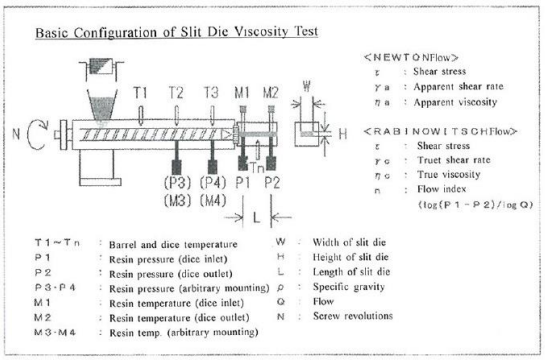
Extruder Test

Extruder Test Data Example 1

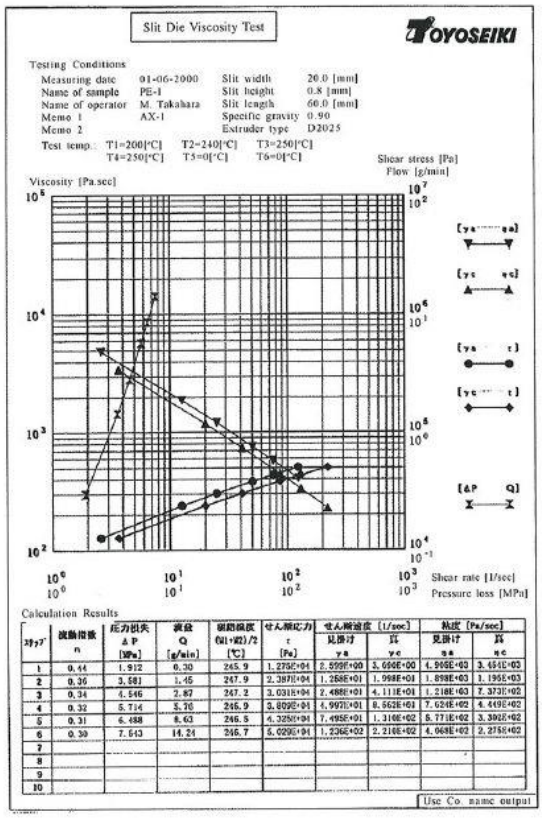
Extruder Characteristic Test

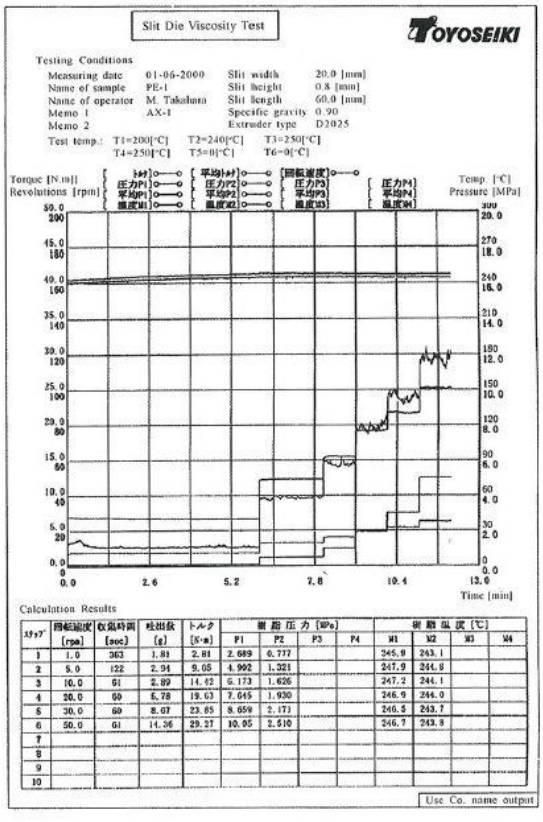


Extruder Test Analysis Contents 2

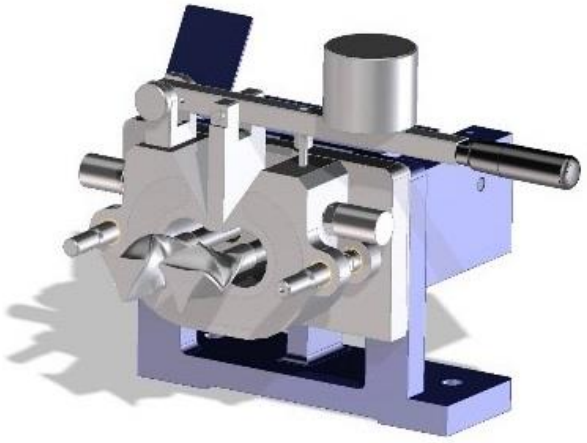


Extruder Test Data Example 2 ..... Slit Die Viscosity Test





2. MEASURING MIXERS



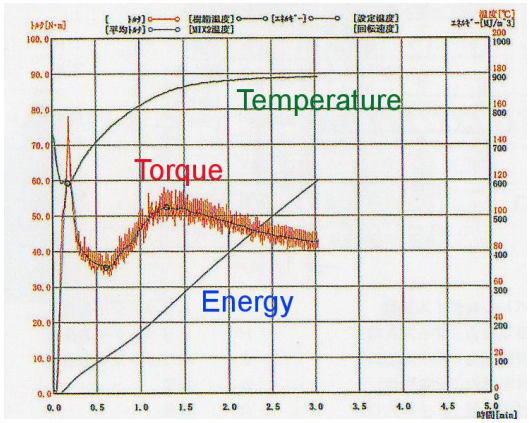
Mixer heating block, that is the sample kneading part of Labo Plastomill, contains 2 kneading blades rotating in same direction or two kneading blades rotating in different directions and resin temperature sensors.

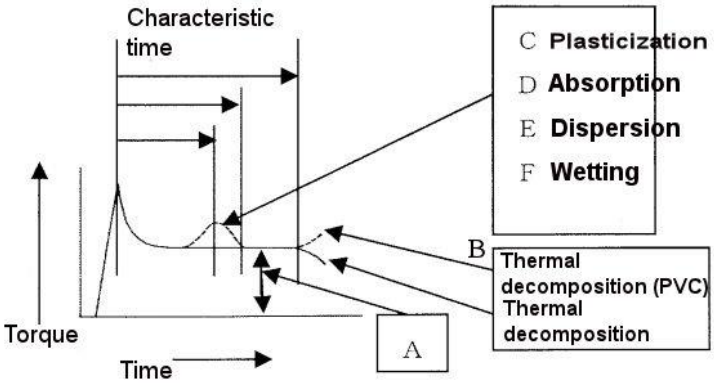
Mixing and kneading of sample filled in the mixer proceeds as it receives heat and shear from the blade and its state of melting, dispersion, distribution, steadiness, deterioration, curing reaction, cross-linking, heat generation, etc. changes in various forms according to the characteristics of the sample.

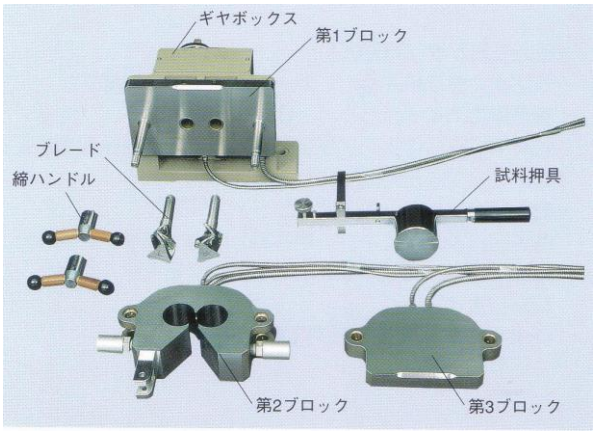
Since these changes in state appear as change in the torque acting mechanically on the blade, the behavior of torque and resin temperature are continuously detected and displayed on the monitor.

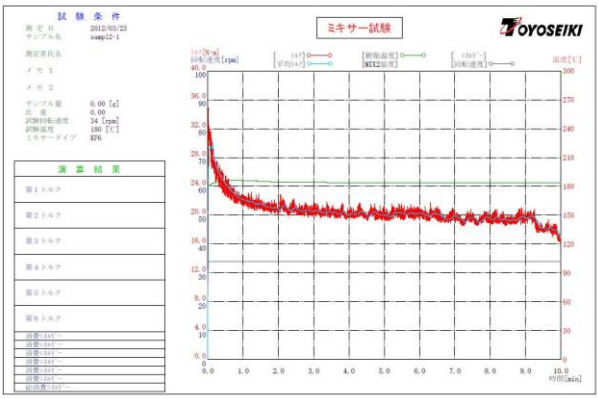
In mixer test, processing characteristics such as gelling characteristic, dynamic thermal stability, curing characteristic, dispersion characteristic, etc. can be determined as index.

Moreover, since mechanically provided energy (MH/m^3) consumed per unit volume is calculated, information regarding mixer scale up and comparison among samples can also be obtained. The middle size mixer (100cm3 or larger) is generally used to collect large quantity of kneaded substances as secondary sample in addition to conducting above-mentioned tests.









Example of application

<Thermoplastics>

- Relative melt viscosity
- Dynamic thermal stability
- Thermoplastic characteristic (PVC)
- Dispersion of magnetic material, metallic powder, reinforcement, etc.
- Nano particle dispersion evaluation test
- Ceramic wetting characteristic
- Consumed energy
- Effect of additives such as stabilizer, lubricant, plasticizer, compatibility agent, etc. with regard to above-mentioned items.
- Compounding, pelletization, etc.

<Elastomers>

- Relative melt viscosity
- Dynamic curing characteristic
- Carbon black dispersion
- Nano particle dispersion evaluation test
- Effect of curing agent, kind of carbon, filler, etc. with regard to above-mentioned items.
- Consumed energy
- Sample kneading for evaluation (JIS K 6299)
- Compounding, etc.

<Thermosetting resins>

- Relative melt viscosity
- Dynamic curing characteristic
- Consumed energy
- Effect of curing accelerator, retarding agent, filler, etc. on above mentioned items.

<Paints>

- Oil absorption characteristic of paints

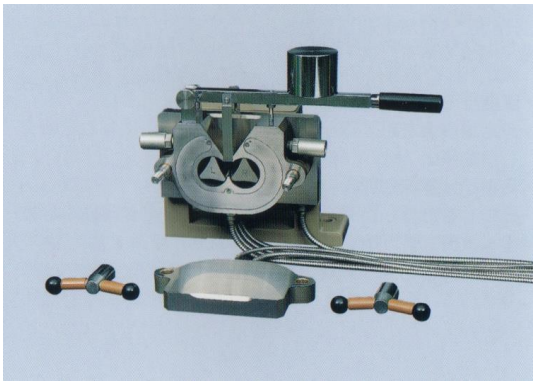
(Roller blades type mixer model R60)

(Banbury blades type mixer model BR250 with oil circulation bath
Note: Shown base unit is old generation model)

Mixers for Thermosetting Resins
(Roller & delta type blades mixers)

Model	R30 / R30H	D30 / D30H
Chamber capacity (approx.)	30cm^3	
Blade shape	Roller type 	Delta type 
Main application	Thermosetting resins	
Shear strength	High	
Rotation speed	Same speed of motor rotation	
Blade revolution ratio	2 : 3	
Sample insertion system	Lever type	
Heating system	Electric	
Max. temperature	250°C (R30H: 400°C)	250°C (D30H: 400°C)
Max. permissible torque	200Nm	300Nm
Cooling device (air)	Option	

Mixers for Thermoplastic Resins
(Roller type blades mixers etc.)

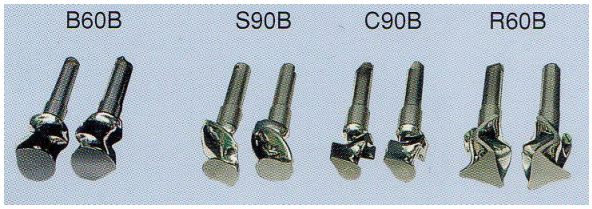


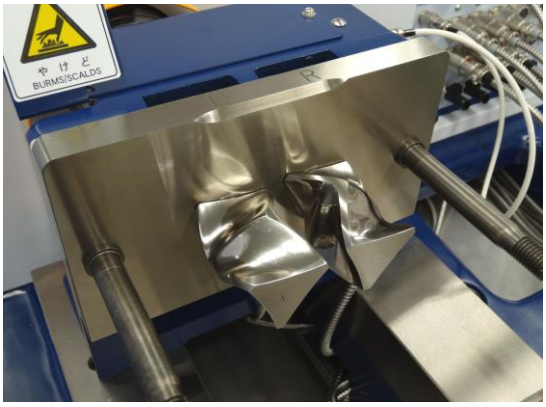
Features of Roller type blades mixer (R60)

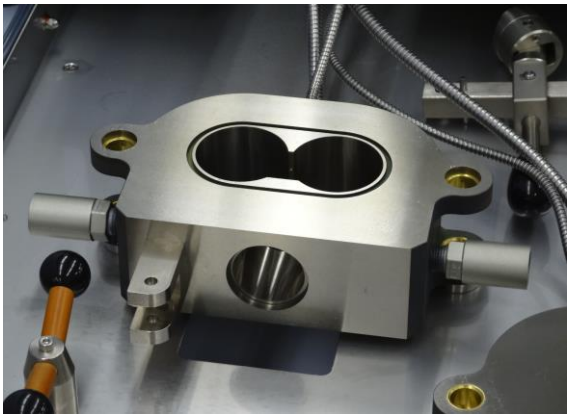
- Capacity: Approx. 60cm^3
- Blade rotation ratio: 2:3 (Left : Right)

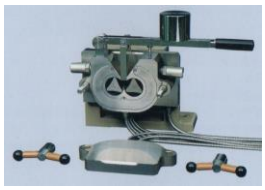
Rotating different direction

- Electric heating
- Cooling by compressed air (Option)
- 3 heating zones :
- Temperature range up to 250°C (400°C optional)
- Exchangeable rotor blades
  - -Roller rotor blade (R60B)
  - -Cam rotor blade (C90B)
  - -Sigma rotor blade (S90B)
  - -Banbury rotor blade (B60B)



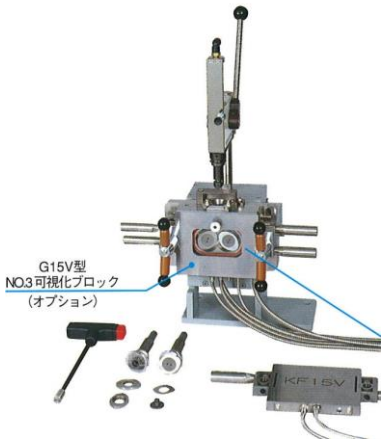




Model	R60 / R60H	C90 / C90H	S90 / S90H
Photo			
Chamber capacity (approx.)	60cm^3	90cm^3	
Blade shape	Roller type 	Cam type 	Sigma type 
Main application	Thermoplastics		
Shear strength	High	Middle	Low
Rotation speed	Same speed as motor rotation		
Blade revolution ratio	2 : 3		
Heating system	Electric		
Max. temperature	250°C (R60H: 400°C)	250°C (C90H: 400°C)	250°C (S90H: 400°C)
Max. permissible torque	200Nm		300Nm
Cooling device (air)	Option		

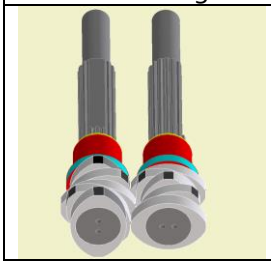
Model	R100 / R100H	R200 / R200H	R500 / R500H
Photo			
Chamber capacity (approx.)	100cm^3	200cm^3	500cm^3
Blade shape	Roller type		
Main application	Thermoplastics		
Shear strength	High		
Rotation speed	Same speed as motor rotation		
Blade revolution ratio	2 : 3		
Heating system	Electric		
Max. temperature	250°C (R100H: 400°C)	250°C (R200H: 400°C)	250°C (R500H: 400°C)
Max. permissible torque	300Nm	750Nm	1000Nm
Cooling device (air)	Option	Standard feature	

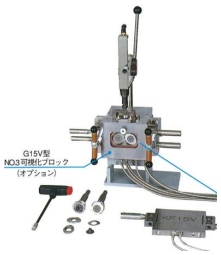
■Mixers for Thermoplastic Resins (Segment mixers)



Features of Segment Mixer (KF6/KF6V)

- Heavy kneading test by means of intermeshing type co-rotary blades.
- Arbitrary adjustment of heavy/light kneading by changing disk phase composition of blades.
- Disk phase of blade is possible to change

Low shearing disk phase	High shearing disk phase
Max share rate: 450 s^{-1} Dispersion: Low Distribution: High	Max share rate: 1173 s^{-1} Dispersion: High Distribution: Low
	

Model	KF6 / KF6V	KF15V	KF70V2
			
Disk model	Disk I (option) and Disk II (standard) Please select Disk I or Disk II		Disk I (standard)
Chamber capacity	Disk I: Approx. 6cm^3 Disk II: Approx. 5cm^3	Disk I: Approx. 15cm^3 Disk II: Approx. 14cm^3	Disk I: Approx. 70cm^3
Shape of blade	Disk		
Chip clearance	Disk I: 0.75mm Disk II: 0.3mm	Disk I: 0.88mm Disk II: 0.3mm	Disk I: 0.4mm
Rotation speed	Triple speed (3 times of motor rotation speed)		Double speed (2 times of motor rotation speed)
Blade revolution ratio	1:1		
Sample insertion system	Rack and pinion type lever (KF6: Lever type)		
Heating system	Electric		
Max. temperature	350°C		
Main application	Thermoplastic (Very high shear)		
Max. permissible torque	40Nm	100Nm	300Nm
Cooling device (Standard feature)	Compressed air cooling (Water cooling is possible under 100°C)		

Mixers for Elastomers (Banbury type)

Electric heating type

Model	B75	B250 / B250H	B600 / B600H
Photo			
Chamber capacity (approx.)	75cm^3	250cm^3	600cm^3
Blade shape	Banbury type		
Main application	Elastomers		
Blade revolution ratio	7 : 8	8 : 9	7 : 8
Sample insertion system	Lever type (Pneumatic cylinder: option)	Pneumatic cylinder	
Heating system	Electric		
Max. temperature	250°C	250°C (B250H: 400°C)	250°C (B600H: 400°C)
Max. permissible torque	300Nm	750Nm	1000Nm
Cooling device (air)	Option	Standard feature	

Oil heating type

Model	BR250	BR600
Photo		
Chamber capacity (approx.)	250 cm^3	600cm^3
Blade shape	Banbury type	
Main application	Elastomers	
Blade revolution ratio	8 : 9	7 : 8
Sample insertion system	Pneumatic cylinder	
Heating system	Oil heating	
Max. temperature	180°C	
Max. permissible torque	750Nm	1000Nm
Cooling device (air)	N/A	

Planetary type Mixer

Model	P600F
Photo	 Note: Shown with optional mobile bench
Chamber capacity (approx.)	600cm^3
Main application	● Evaluation tests of plasticizer absorption of PVC powder ● Dry blending of various types of powders
Heating system	Electric
Max. temperature	150°C
Max. permissible torque	30Nm
Dimensions	W310 x D620 x H460mm
Weight (approx.)	35kg

Mixer Options

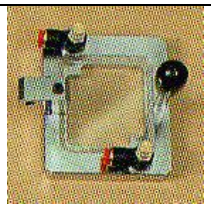
Dedicated mobile benches (mandatory)

Name	Model	Descriptions	Photo
Mobile bench for mixer	KMIX2	● Dedicated for 200V ● Heater output: 200V x 3ch ● Control temperature input: x 3ch ● Resin temperature input: x 1ch ● Water cooling control: x 1ch ● Power supply: Supplied from base unit ● Dimensions: W550 x D660 x H935mm ● Weight: 100kg ● Applicable mixers: R30, D30, R60, B60, C90, S90, R100, R200, B75, B250, B600, R500, KF70V2, KF15V, KF6V, KF6	
Mobile bench for mixer **Note:** KMIX1 should be selected when existing old generation mixer is used.	KMIX1	● 100V/200V dual use ● Heater output: 100V x 3ch, 200V x 3ch ● Control temperature input: x 3ch ● Resin temperature input: x 1ch ● Water cooling control: x 1ch ● Power supply: 1) Single-phase, AC200V: Supplied from base unit 2) Single-phase, AC100V, 50/60Hz, 30A ● Dimensions: W550 x D660 x H935mm ● Weight: 100kg ● Applicable mixers: R30, D30, R60, B60, C90, S90, R100, R200, B75, B250, B600, R500, KF70V2, KF15V, KF6V, KF6	
Mobile bench for planetary mixer	KPMIX2	● Dedicated for 200V ● Heater output: 200V x 3ch ● Control temperature input: x 3ch ● Resin temperature input: x 1 ch ● Power supply: Supplied from base unit ● Dimensions: W480 x D670 x H940mm ● Weight: 95kg ● Applicable mixer: P600F	
Mobile bench for planetary mixer **Note:** KPMIX1 should be selected when existing old generation mixer is used.	KPMIX1	● 100V/200V dual use ● Heater otput: 100V x 3ch, 200V x 3ch ● Control temperature input: x 3ch ● Resin temperature input: x 1 ch ● Power supply: 1) Single-phase, AC200V: Supplied from base unit 2) Single-phase, AC100V, 50/60Hz, 30A ● Dimensions: W480 x D670 x H940mm ● Weight: 95kg ● Applicable mixer: P600F	
Mobile bench for BR Mixer	KBR	● Dimensions: W550 x D660 x H935mm ● Weight: 100kg ● Applicable mixers: BR250, BR600	

Hoppers

Name	Model	Descriptions	Photo
Vertical hopper	VH	Pressurize the sample with a weight to maintain a constant feeding time. Available for following mixers as option: ● R30 / R30H ● D30 / D30H ● R60 / R60H ● C90 / C90H ● S90 / S90H ● R100 / R100H	
Nitrogen purge vertical hopper	VHN	Available for following mixers as option: ● R60 / R60H ● C90 / C90H ● S90 / S90H ● R100 / R100H Note: Comes standard for following mixers: ● P600F ● KF70V2	
Pneumatic hopper	VHC	Can be tested while pressurized by pneumatic cylinder ram. Available for following mixers as option ● R60 / R60H ● C90 / C90H ● S90 / S90H ● R100 / R100H ● B75 Note: Comes standard for following mixers: ● R200 / R200H ● R500 / R500H ● B250 / B250H ● B600 / B600H ● BR250 ● BR600	
Nitrogen purge pneumatic hopper	VHCN	Available for following mixers as option ● R60 / R60H ● C90 / C90H ● S90 / S90H ● R100 / R100H	

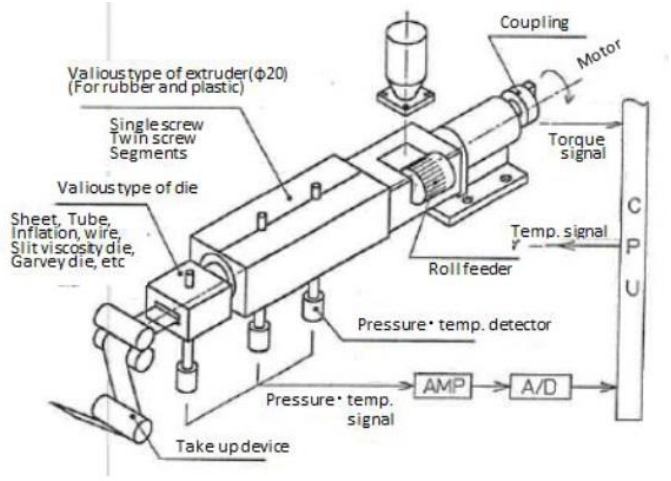
Others

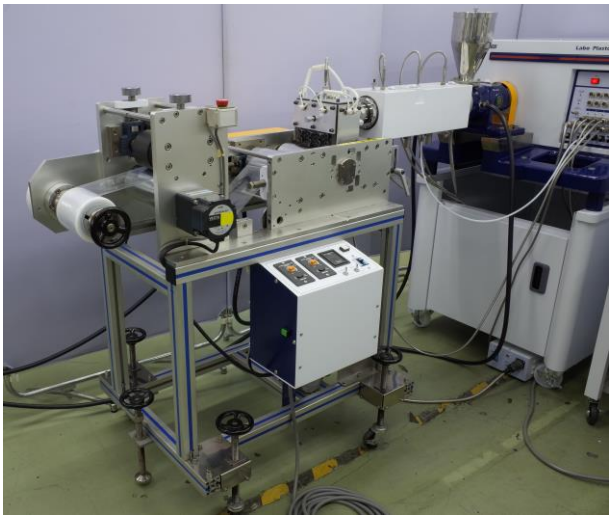
Name	Model	Descriptions	Photo
Cooling device	AC	Device for cooling down overheating of mixer by the heat generated by shearing of resin. Available for following models ● R60 / R60H ● C90 / C90H ● S90 / S90H ● R100 / R100H ● B75 Note: Comes standard for Following models ● R200 / R200H ● R500 / R500H ● B250 / B250H ● B600 / B600H ● KF15V ● KF70V2	
Nitrogen purge cover	N, GN	For preventing oxidation of sample. The cover has inlet and outlet for nitrogen gas. Available without observation window (model N9) and with observation window of heat-resistant glass (model GN)	
Oil circulation bath	OP3	For BR250, BR600 ● Dimensions: W380 x D830 x H1210mm ● Weight (approx.): 75kg ● Power supply: Single-phase, AC200V, 50/60Hz, 28A	

3. MEASURING EXTRUDERS

In small size extruder test of Labo Plastomill, in addition to detecting torque, the pressure and temperature (maximum 4 points each) are also continuously detected during molding by installing resin temperature sensor and resin pressure sensor in the cylinder or die and the values are displayed on the monitor.

Various kinds of molding dies and take-off devices are also available, allowing you to determine molding conditions by simulating and obtain various information such as pressure, temperature, torque, specific energy (MJ/m^3) and extrusion amount at each rpm (each shear rate) in addition to detecting mold status such as extrusion mold product's fish eye, dispersion, transparency and gloss by using a small quantity of sample.





Single screw extruder with T-die & film take-off unit

Note: Shown base unit is old generation model

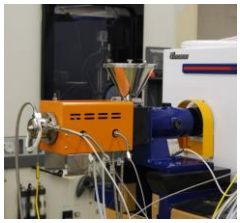
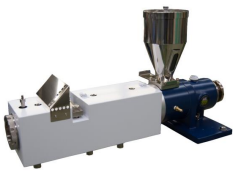
Example of application

- Simulation test using various kinds of molding die head
- Viscosity measuring test by slit die (measuring apparent and true values of shear rate, shear stress, viscosity)
- Specific energy measuring test (evaluation of productivity)
- Filter pressure resin test (measuring gel substance in resin)
- Die swell measuring test (resin(s elasticity recovery swelling test)
- Melt strength test (measuring melt tension and breaking speed)
- Garvey die test (ASTM D 2230, rubber moldability evaluation)
- Compounding and pelletization
- Fixed quantity extrusion test by gear pump (pressure/revolution control)
- Inflation take-off bubble tension measuring test (Take-off device with tension measuring device)

Single-Screw Extruders for Elastomers

Model	D2015
Screw diameter	20mm
L/D	15
Max. temperature	250°C
Heating system	Electric
Heating zones (cylinder)	2
Air cooling (cylinder)	Possible
Vent port	N/A
Pressure/temperature Measuring port(s)	2
Standard die head	Garvey die
Standard screw	Full flight screw (CR=1.6)
Standard hopper	Roll feeder
Max. permissible torque	200Nm

Single-Screw Extruders for Thermoplastics

Model	D1220	D2020	D2025
			
Screw diameter	12mm	20mm	
L/D	20		25
Max. temperature	350°C		
Heating system	Electric		
Heating zones (cylinder)	2	3	
Air cooling (cylinder)	Possible		
Vent port	N/A		1
Pressure/temperature measuring port(s)	1	4	
Standard die head	Strand die (Ø2.5mm x 1)	Strand die (Ø3mm x 1)	
Standard screw	Full flight screw (CR:2.5)		Vent screw (CR:No.1=2.5, No.2=3.0) (Full flight screw is available as option)
Standard hopper	Steel hopper		
Max. permissible torque	20Nm	200Nm	
Dimensions	W210 x D560 x H280mm	W230 x D680 x H450mm	W230 x D780 x H450mm

Extruder Options

Dedicated mobile benches (mandatory)

Name	Model	Descriptions	Photo
Mobile bench for extruder	KEXT2	● Dedicated for 200V ● Heater output: 200V x 5ch ● Control temperature input: x 5ch ● Resin temperature input: x 4ch ● Resin pressure input: x 4ch ● Constant feeder input: x 1ch ● Power supply: Supplied from base unit ● Dimensions: W390 x D660 x H935mm ● Weight: 95kg Applicable extruders: D2015, D2020, D2025, 2D20S, 2D25S, 2D20C, 2D20C2	
Mobile bench for extruder **Note:** KEXT1 should be selected when existing old generation extruder is used.	KEXT1	● 200V/100V dual use ● Heater output: 100V x 4ch and 200V x 5ch ● Control temperature input: x 5ch ● Resin temperature input: x 4ch ● Resin pressure input: x 4ch ● Constant feeder input: x 1ch ● Power supply: 1) Single-phase, AC200V: Supplied from base unit 2) Single-phase, AC100V, 50/60Hz, 30A ● Dimensions: W390 x D660 x H935mm ● Weight: 95kg ● Applicable extruders: D2015, D2020, D2025, 2D20S, 2D25S, 2D20C, 2D20C2	

Die Heads

Name	Model	Main spec.	Remarks	Photo
Strand die	ST1	Single strand type Ø1.5, 2, 3, 4, 5, 6, 2.095mm	For extruding rod, filament	
	ST3S	3 strands type Ø3mm		
T die	T25F	W=25, t=0.5-1.5mm (Fishtail type)	For extruding sheet & film	
	T60F	W=60, t=0.5-1.5mm (Fishtail type)		
	T120C	W=120, t=0-1.5mm (Coat-hanger type)		
	T150C	W=150, t=0-1.5mm (Coat-hanger type)		
	T300C	W=300, t=0.1-1.5mm (Coat-hanger type)		
Inflation die	I25C	Ø25mm, slit 0.7 (Cross type)…for PVC	For extruding blown film	
	I25S	Ø25mm, slit 0.7 (Spiral type)		
Tube die	TU10	Ø8x10mm (spider type)	For extruding tube	
	TU20	Ø8x20mm (spider type)		
Wire coating die	WD	Ø2mm, wire diameter=ø1mm (cross)	For electric wire	
Slit die	CAPF2	W=20, L=100 t=0.5, 0.8, 1, 1.5mm (set)	For viscosity measurement	
Capillary die	CAPR	Orifice ø 1x5mm, 1x10mm, 1x20mm	For die swell measurement	
Garvey die	GD		For test according to ASTM D2230 (elastomers)	

Pressure and Temperature Transducers

Name	Model	Remarks	Photo
Pressure transducer	PS	● Mercury fill ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 400ºC	
	PSY	● Mercury fill, anti-corrosion ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 400ºC	
	PSH	● Mercury fill ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 500ºC	
	PSN	● NaK fill (mercury free) ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 400ºC	
Pressure/temperature transducer	PTS	● Mercury fill ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 400ºC	
	PTSY	● Mercury fill, anti-corrosion ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 400ºC	
	PTSN	● NaK fill (mercury free) ● Pressure range: Max. 50MPa ● Permissible temperature: Max. 400ºC	
Temperature transducer	TS	● J thermocouple ● Permissible temperature: Max. 500ºC	

Feeding systems

Name	Model	Remarks	
Constant feeder	F3R/F3L	● Used to suppress vent-up during degassing and to improve kneading effect due to starvation.	
	RCF-1R/ RCF-1L	● Proportional control of extruder screw rotation and feeder screw rotation.	
Gravimetric feeder	WCF-1R/ WCF-1L	● The feeder is placed on an electronic balance, the weight of the sample to be discharged from the feeder is weighed from the overall feeder weighing value, and the screw rotation of the feeder is controlled to provide a fixed-volume feed.	
Forced feeder	FH2	● The lower part of the agitator blade in the hopper is screw-shaped, and a variable-speed motor forces the sample into the hopper. ● Funnel-flow, rat-hole, bridges, etc. occur in the hopper can be suppressed.	

Film Take-off Units

Name	Model	Dimensions	Weight (approx.)	Photo
Film take-off unit	FT2W20	W1200 x D720 x H1200mm	170kg	
Film & sheet take-off unit	FT3W20	W1200 x D720 x H1200mm	180kg	
Inflation (blow film) take-off unit	INT	W800 x D800 x H2400mm	250kg	

Pelletizers

Name	Model	Dimensions	Weight (approx.)	Photo
Cold cut pelletizer	PETEC4	W480 x D1150 x H1230mm	95kg	
Hot cut pelletizer	PETEH	W500 x D900 x H1450mm		

Others

Name	Model	Dimensions	
Belt conveyor + cooling roll	CON + R-1	W550 x D1540 x H900 to 1100mm	

Pelletizing

(3S150+Extruder+PETEC4)

Film/sheet casting

(3S500+Extruder+T-die head, T150CW+FT2W20)

Specifications are subject to change without notice.

TOYO SEIKI SEISAKU-SHO, LTD.
5-15-4, Takinogawa, Kita-ku, Tokyo 114-8557, Japan
Tel:+81-3-3916-8183 Fax:+81-3-3916-8173
www.toyoseiki.co.jp

20250319 MN (2021.07 JP)