TOYOSEIKI

Testing machines for rubber

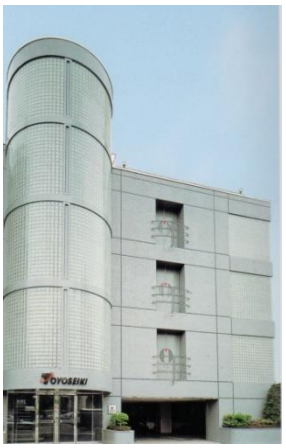
TOYO SEIKI SEISAKU-SHO, LTD.

5-15-4, Takinogawa, Kita-ku, Tokyo 114-8557 JAPAN

About TOYOSEIKI

Founded in 1934 in Tokyo, Japan, TOYOSEIKI has been contributing to the field of material R&D and quality assurance through supplying various types of reliable testing machines to the industries. Today, TOYOSEIKI is recognized as one of the leading supplier especially for polymer testing equipment.

Toyo Seiki Seisaku-sho, Ltd. Head Office
5-15-4, Takinogawa, Kita-ku, Tokyo 114-8557, Japan
Tel: +81-3-3916-8183 Fax: +81-3-3916-8173
www.toyoseiki.co.jp



Head office (Takinogawa, Kita-ku, Tokyo)

Tokyo factory (Ukima, Kita-ku, Tokyo)

Funado support center (Funado, Itabashi-ku, Tokyo)

Local Distributors

East Asia

China

Dongyang Jingji Trading (Shanghai) Co., Ltd. (Subsidiary)
Room 27039, 27F, Infinitus Tower, No.168 Hubin Road, Huangpu-dist., Shanghai, P.R. China.
Phone: +86-21-6385-0255
Fax: +86-21-6385-0256

Korea

TOSEI CO., LTD.
#1005/1006 Teheran Office Bldg., 6 Teheran-ro 52-gil, Gangnam-gu, Seoul, Korea 06211
Phone: +82-2-565-3456
Fax: +82-2-565-3459

Taiwan

FRIENDS UNION ENTERPRISES CO., LTD.
7F-2, No.33 Sec. 2, Hsin Yi Road, Taipei
Phone: +886-2-2321-0212
Fax: +886-2-2395-7385

Local Distributors

Southeast Asia

Indonesia

PT. Saga Jaya
Ruko Crystal I No.30, Gading Serpong, Tangerang, Banten 15810, Indonesia
Phone: +62-21-5421-5698
Fax: +62-21-5421-5697

Malaysia

BSL Technologies Sdn. Bhd.
B-6-18, Block B, Ativo Plaza, No 1, Jalan PJU 9/1, Damansara Avenue,
Bandar Sri Damansara, PJU 9, 52200 Kuala Lumpur, Malaysia
Phone: +60-3-6270-0618
Fax: +60-3-6270-9618

Singapore

SAGA Instruments Pte. Ltd.
21 Toh Guan Road East #06-07, Toh Guan Centre, Singapore 608609
Phone: +65-6779-9606
Fax: +65-6779-9609

Thailand

CG ENGINEERING LTD. PARTNERSHIP
7/10 Moo 6 Tambol Ban Pratum Amphure Samkohk Phatumtani 12160 Thailand
Phone: +66-2-1569470
Fax: +66-2-1569472

Vietnam

TECHNO VIETNAM INDUSTRIES CO.,LTD.
5th Floor, 84 Duy Tan Street, Cau Giay District., Hanoi, Vietnam
Phone: +84-24-3795-9933
Fax: +84-24-3795-9944

Local Distributors

South Asia

India

Sams Advanced Climatic Technologies Pvt. Ltd.
Plot No. 8 & 9/29, Mirra Industrial Estate, Phase – 1,
IDA Patancheru, Hyderabad – 502 319. India
Phone: +91-8455-297383/297384

North America

U.S.A.

Testing Machines, Inc.
40 McCullough Drive, New Castle, DE 19720 USA
Phone: +1-302-613-5618
Fax: +1-302-613-5619

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1. Universal Testing Systems

■No.210 Strograph E3

Single column, tabletop universal testing machines, up to 1kN

E3-S E3-L

The TOYOSEIKI **Strograph E3** series are the most cost effective single column tabletop universal tensile machines designed for performing tests such as tensile, bend/flexure, compression, peel, and friction on various materials with up to 1kN capacity.

Model	E3-S	E3-L
Load cell capacity	Max. 1kN	
Force accuracy	±1.0% of reading (Down to 1/500 of load cell capacity) Conforms to ISO 7500-1 (JIS B 7721) Class 1	
Crosshead speed range	0.05 to 1500mm/min., 22 steps	
Crosshead speed accuracy	±0.5% (0.5 to 1000mm/min)	
Crosshead travel distance (Excluding chucks)	490mm	990mm
Effective stroke	330mm (Using J-3 chuck)	830mm (Using J-3 chuck)
Power requirement	Single-phase, AC100 to 115V or AC200 to 230V, 50/60Hz, 0.3kVA	
Dimensions	W435 x D460 x H900mm	W435 x D460 x H1400mm
Weight	Approx. 47kg	Approx. 62kg

■No.260 Strograph VGS/VG series

Dual column, universal testing machine, up to 5kN (VGS), 20kN (VG)

VGS

VG with optional stand

The TOYOSEIKI **Strograph VGS/VG** series dual column, universal testing machines are designed for performing tests such as tensile, bend/flexure, compression, peel, and friction on various materials with up to 5kN (VGS), 20kN (VG).

Model	VGS (05F, 1F, 5F)	VG (1F, 5F, 10F, 20F)
Load cell capacity	Max. 5kN	Max. 20kN
Force accuracy	±1.0% of reading (Down to 1/500 of load cell capacity) Conforms to ISO 7500-1 (JIS B 7721) Class 1	
Crosshead speed range	0.0005 to 1000mm/min., 23 steps	
Crosshead speed accuracy	±0.1% (0.5 to 500mm/min)	
Crosshead travel distance (Excluding chucks)	830mm	1100mm
Effective stroke	495mm (Using C-3 chuck) 610mm (Using Box chuck)	595mm (Using C-1 chuck) 670mm (Using C-2 chuck) 750mm (Using C-3 chuck) 785mm (Using C-4 chuck)
Power requirement	Single-phase, AC100V, 50/60Hz, 0.7kVA	Single-phase, AC100V, 50/60Hz, 0.8kVA
Dimensions	W600 x D470 x H1300mm	W720 x D470 x H1600mm
Weight	Approx. 105kg	Approx. 135kg

■No.120 Strograph T

Universal testing machine with environmental chamber (-50 to +200ºC)

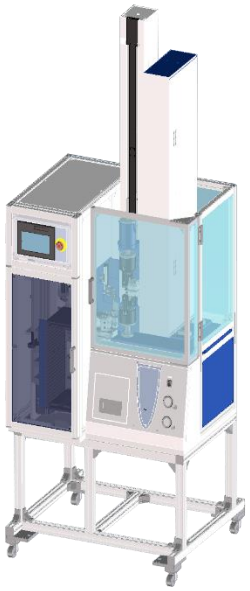
The TOYOSEIKI **Strograph T** universal testing machine with environmental chamber is capable of performing tensile, bending and flexural tests at temperatures in the range of -50 to +200ºC, load up to 10kN. Specially designed main unit and thermostatic chamber provides large crosshead stroke.

Load cell capacity	Max. 10kN
Force accuracy	±1.0% of reading
Crosshead speed range	0.5 to 500mm/min., 14 steps
Crosshead speed accuracy	±0.1%
Crosshead travel distance (Excluding chucks)	900mm
Effective stroke	600mm (Using model C-2 chuck)
Temperature range	-50ºC to 200ºC
Power requirement	■Three-phase, AC200V, 50/60Hz, 3.5kVA (Main unit) ■Three-phase, AC200V, 50/60Hz, 17.3kVA (Thermostatic chamber) ■Single-phase, AC100V, 50/60Hz, 1kVA (PC)
Dimensions	W1270 x D920 x H2200mm
Weight	Approx. 500kg

2. Fully Automated Tensile & Flexure Testing Systems

■No.211 Strograph AE Elastomer, model AE3

Fully automatic tensile testing machine for rubber & TPE specimens



The TOYOSEIKI **Strograph Elastomer, AE3** is a fully automatic tensile testing machine for elastomers. The machine operates a sequence operation from dimensions measurement, chucking, tensile, and mark-tracing to data processing by simply introducing specimens into sample tray.

Max. capacity	700N
Crosshead speed range	0.5 to 500mm/min.
Effective stroke	Approx. 850mm
Thickness gauge for specimen thickness and width measurement	Digital type thickness gauge Resolution:1/100mm, Accuracy:±20μm, Measurement point:3 points Anvil: Tip Ø5mm
Extensometer	Contact type Gauge length: 20 or 25mm Effective stroke: approx. 500mm
Specimen feeder	Max. 150 specimens (n=6 specimens x 25 trays) Specimen type: JIS K 6251 Dumbbell No.3 or No.5
Power requirement	Single-phase, AC100V, 50/60Hz, 0.5kVA (Main unit)
Compressed air requirement	0.5MPa
Dimensions	W940 x D825 x H2410mm (Main unit)
Weight	Approx. 200kg
Related standards	ISO 37 (JIS K 6251)

■No.219 Strograph HT

Fully automatic tensile testing machine for rubber with chamber

The TOYOSEIKI **Strograph HT** is the fully automated tensile testing machine with the thermostatic chamber for rubber.

Max. capacity	1kN
Crosshead speed range	0.5 to 500mm/min., 14 steps
Crosshead speed accuracy	±1%
Effective stroke (Including chucks)	Approx. 700mm
Thickness gauge	Resolution: 1/100mm Accuracy:±2/100mm Meas. points: 3 Anvil: Ø5mm
Extensometer	Non-contact type (CCD camera system), Gauge length: 20mm
Specimen feeder	Max. 300 specimens (n=6 specimens x 50 trays)
Power requirement	■Main unit: Three-phase, AC200V, 50/60Hz, 3.5kVA ■Chamber: Three-phase, AC200V, 50/60Hz, 10.4kVA ■PC: Single-phase, AC100V, 0.5kVA
Compressed air requirement	0.5MPa, 40L/min.
Dimensions	■Main unit: W1780 x D920 x H2230mm ■Chamber: W630 x D1070 x H1300mm ■PC: W670 x D770 x H1650mm
Weight	■Main unit: Approx. 650kg
Related standards	ISO 37 (JIS K 6251)

3. Accessories (Options) for Universal Testing Systems

■Chucks (Grips)

Tensile tests

Pneumatic vise chuck

Model	Max. load	Grip width	Grip length	Clearance	Grip face
B-11	5kN	40mm	30mm	10mm	File teeth
B-12	1kN	30mm	24mm	10mm	■File teeth ■Rubber sheet
B-13	500N	30mm	20mm	10mm	■File teeth ■Rubber sheet

B-13

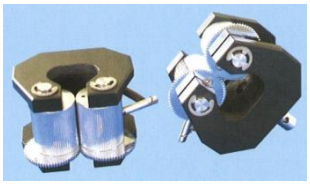
Dumbbell chuck

Model	Max. load	Grip width	Roll dia.	Clearance	Grip face
H-3	3kN	35mm	Ø8mm	4mm	Knurling
H-4	500N	35mm	Ø8mm	4mm	Knurling
H-1	3kN	35mm	Ø8mm	4mm	Non-knurling
H-2	500N	35mm	Ø8mm	4mm	Non-knurling

H-3

Eccentric chuck

Model	Max. load	Grip width	Clearance	Grip face
I-1	3kN	26mm	6mm	Knurling
I-2	1kN	26mm	6mm	Knurling



I-2

More grips available. Please visit our website for details.
www.toyoseiki.co.jp/en

■Extensometer

Contact type extensometer

Model	DE-C (Standard model)
Measurement range	Max. 1000mm
Measurement principle	Pulse type encoder
Resolution	0.01mm
Accuracy	±0.2mm or 1% of reading, whichever greater
Gauge length	20 to 50mm
	

Non-contact type extensometer

Model	DE-A (Video Extensometer)	DE-SP (Laser Extensometer)
Measurement range	Max. approx. 450mm (If used JIS No.3 dumbbell)	Within effective stroke of the crosshead（main unit)
Measurement principle	Optical (CCD camera)	Laser (Speckle pattern)
Resolution	0.1mm	0.001mm
Accuracy	±1%	±1% * Fine elongation : ±1μm
Gauge length	20, 25, 50mm	20 to 75mm
		

4. Moving Die Rheometers (MDR)

■No.292 Rotorless Rheometer, model RLR-4

Note: Data processing unit is option

The TOYOSEIKI **Rotorless Rheometer model RLR-4** measures vulcanizing characteristics of rubber with ease and simplicity at high accuracy. It allows labor saving in conducting test by installing the pin type automatic sample loading/unloading device of high reliability and high reputation and data processing unit as option. Moreover, it allows you to determine more physical characteristics of rubber by installing the optional foaming pressure measuring function and tanδ measuring function.

Test chamber	Rotorless, Non-friction sealed type ■Flat-plate-die (ISO 6502 / JIS K 6300-2)…Standard ■Biconical-die (ISO 6502 / JIS K 6300-2, ASTM D5289)…Option
Compression system	Pneumatic
Heating system	Electrical
Temperature range	Room temperature + 20ºC to 230ºC
Temperature accuracy	±0.3ºC
Temperature resolution	0.1ºC
Oscillation frequency	50cpm (0.83Hz) to 150cpm (2.5Hz) (Variable in 1cpm steps)
Oscillation amplitude	±0.10 to ±2.00º (Variable in 0.01º steps)
Drive motor	Stepper motor
Torque detector	Strain gauge type load cell
Torque range	100dN.m auto range, minimum unit 0.01dN.m (Max. 200dN.m)
Test time range	3 to 960 minutes in 10 steps
Torque calibration	Auto span function using built-in weight
Touch screen	5” LCD touch screen (Language: English & Japanese)
Options	Data processing unit etc.
Power requirement	Single-phase, AC200 to 230V, 50/60Hz, 2.4kVA
Compressed air requirement	0.4MPa
Dimensions	W430 x D600 x H1120mm (Main unit)
Weight	Approx. 145kg
Related standards	ISO 6502-3 (JIS K 6300-2) ISO 13145 (Optional) ASTM D5289 (Optional)

■Fully automated sample feeders for No.292 Rotorless Rheometer, model RLR-4

Fully automated sample feeders are available as option for No.292 Rotorless Rheometer, model RLR-4. Following 3 models are selectable.

MODEL	ROB-R4	ROBF84	ROBF06
Feeding method	Conveyor belt + Pin	Conveyor belt + Pin	Film
Ejection method	Ejector pin	Film	Film
Number of specimens (Max.)	84 specimens	84 specimens	6 specimens
			

■No.292 Rotorless Rheometer, model RLR-4 with rubber process analysis (RPA)

The TOYOSEIKI **Rotorless Rheometer, RLR-4 with optional rubber process analysis software (RPA)** measures dynamic properties of rubber or elastomers before, during and after the cure.

Model (Software)	**Viscoelasticity measurement, model ANG-R4**
Test chamber	Rotorless, Non-friction sealed type Biconical-die (ISO 6502 / JIS K 6300-2 / ASTM D5289)
Temperature range	Room temperature + 20ºC to 230ºC
Temperature accuracy	±0.3ºC
Temperature resolution	0.1ºC
Oscillation frequency	6cpm (0.1Hz) to 1200cpm (20Hz)
Oscillation strain	0.7% to 400% (0.05º to 29º)
Test mode	■Temperature ■Strain ■Frequency distribution
Measurement parameters	■G' (Storage modulus) ■G" (Loss modulus) ■Tanδ ■S* (Complex torque)
Power requirement	Single-phase, AC200 to 230V, 50/60Hz, 2.4kVA
Compressed air requirement	0.4MPa
Dimensions	W430 x D600 x H1120mm (Main unit)
Weight	Approx. 145kg
Related standards	ISO 6502 (JIS K 6300-2) ASTM D5289

5. Mooney Viscometers

■No.275 Mooney Viscometer, model AM-4

The TOYOSEIKI **Mooney Viscometer model AM-4** conducts Mooney viscosity test and Mooney scorch test of un-vulcanized rubber according to ISO 289 (JIS K6300-1).

Die type	V-groove die (Option: Square groove die)
Rotor type	L type (Option: S type)
Mooney viscosity	Max. 200M
Test temperature	Max. 200ºC
Compression system	Pneumatic
Heating system	Electrical
Rotor rotation speed	2±0.02rpm
Torque detector	Strain gauge type load cell
Mooney time range	0 to 480 minutes
Scorch time range	0.0 to 99.9M
Preheat time range	0 to 99 minutes 59 seconds
Post-heating time range	0 to 99 minutes 59 seconds
Power requirement	Single-phase, AC200 to 230V, 50/60Hz, 2.4kVA
Compressed air requirement	0.4 to 0.6MPa
Dimensions	W430 x D600 x H1190mm
Weight	Approx. 155kg
Related standards	ISO 289-1 (JIS K 6300-1) ASTM D1646

■No.274 Rotorless Mooney Viscometer, Model RLM-4

Optional small printer output example

The TOYOSEIKI **Rotorless Mooney Viscometer RLM-4** conducts Mooney viscosity test and Mooney scorch test. In order to eliminate the problem of frictional resistance of rotor of conventional Mooney Viscometer, this model employs a rotorless mechanism.

Sample chamber die	Rotorless (contactless, sealed type)
Reference standard	N/A
Temperature range	Room temp. +20 to 200ºC, accuracy ±0.3ºC
Rotation speed	0.1 to 8.0rpm
Drive motor	Stepping motor
Torque detector	Strain gauge type load cell
Mooney viscosity measurement range	0.0 to 200.0M
Mooney time setting range	0 to 200.0min. (t1, t2, t3, t4, t5…5 points)
Scorch setting range	0 to 99.9M (S1, S2, S3, S4, S5…5 points)
Test time setting range	0 to 480min.
Preheat time	0 to 99min. 59sec.
Torque calibration	Auto zero, auto span calibration by actual weight
Mooney value calibration	Built-in weight, Auto span
Power requirement	Single-phase, AC200V, 2.4kVA
Compressed air requirement	0.45MPa
Dimensions	W430 x D600 x H1190mm
Weight	Approx. 160kg
Related standard	N/A

6. Heat Aging

■No.272 Geer Oven

Stacking option

The TOYOSEIKI **Geer Oven** evaluates aging of materials in hot air atmosphere with a fixed air change rate. Air change rate is measured by methods of electric power consumption.

Models	A45A2S, A60A2S	A45S, A60S	S45, S60
Air change meter (Air change rate measuring device)	Built-in type equipped	Built-in type equipped	Not equipped (Portable air change meter is available as option)
Damper setting	Automatic	Manual	Manual

Inside dimensions	■Model 45 series: W450 x D450 x H500mm ■Model 60 series: W600 x D600 x H600mm
Temperature range	Max. 300ºC
Temperature control accuracy	±1ºC (40ºC to 100ºC) ±2ºC (125ºC to 300ºC)
Air speed	0.5±0.1m/s (Average of 18 points)
Air exchange rate	2 to 20* times/h (*Up to 50 times/h (Model 60) or 60 times/h (Model 45) is possible)
Test piece carrier rotation speed	8 to 10rpm
Options	Paper-less type recorder etc.
Power requirement	■Model 45 series: Three-phase, AC200V, 50/60Hz, 3.8kVA ■Model 60 series: Three-phase, AC200V, 50/60Hz, 4.8kVA
Dimensions	■Model 45 series: W1090 x D800 x H1430mm ■Model 60 series: W1240 x D950 x H1540mm
Weight	■Model 45 series: Approx. 200kg ■Model 60 series: Approx. 290kg
Related standards	ISO 188 (JIS K 6257) JIS B 7757, K 7212, K 6723, A 5756, C 3005

■No.273 Test Tube Aging Tester (Test Tube Oven)

The TOYOSEIKI **Test Tube Oven** conducts heat deterioration or aging test by keeping specimens inside glass tubes for eliminating the effect of migration of additives, etc.

Glass tubes	24 tubes (Ø38mm x Length 300mm)
Max. temperature	300ºC
Power requirement	Single-phase, AC200V, 50/60Hz, 5kVA
Dimensions	W500 x D600 x H450mm
Weight	Approx. 120kg
Related standards	ISO 188 (JIS K 6257) ASTM D865

7. Ozone Test Chamber

■No.253 UVC Ozone Aging Tester

The TOYOSEIKI **UVC Ozone Aging Tester** evaluate rubber deterioration in an ozone test chamber and to meet the requirement of ISO 1431“Rubber, vulcanized or thermoplastic – Resistance to ozone cracking”.

Standard model (PPHM)

Model	PPHM-S	PPHM-D	PPHM-SD
Test method	Static	Static & Dynamic (Holder need to be exchanged for changing test method)	Static & Dynamic (Dual use type)
Ozone concentration range	20 to 200 pphm		
Ozone concentration control	Auto control by ultraviolet rays absorption method, with recorder (Concentration recording)		
Ozone concentration accuracy	±1% FS		
Ozone generating system	Ozone lamp (Low pressure mercury lamp)		
Temperature range	Room temperature +10ºC to 40ºC		
Temperature control system	PID fuzzy control		
Temperature accuracy	±0.5% FS		
Method of circulating air inside the chamber	One direction flow from bottom to top, 12 to 16mm/s		
Static test	5 pcs. each of tension & bending holders are provided as standard		
Dynamic test		■Vertical tensile stretching method Stretching factor: 0 to 100% Stretching C/S: 0.5Hz ■Dimensions of specimen: JIS No.1 or No.3 dumbbell Length 40 to 120mm, width 15mm ■Number of specimens: 12 specimens (Standard) 24 specimens (Option) (Note: Please select upon order)	
Sample rotating rack	Revolutions 1.5rpm		
Test chamber material	SUS 304 fluorine resin coating		
Power requirement	Single-phase, AC100V, 1.5kVA		
Ozone test chamber	W500 x D500 x H500mm		W500 x D500 x H750mm
Dimensions	W1110 x D690 x H1700mm		W1110 x D690 x H1950mm
Weight	Approx. 180kg	Approx. 230kg	Approx. 240kg
Related standards	ISO 1431 (JIS K 6259)		

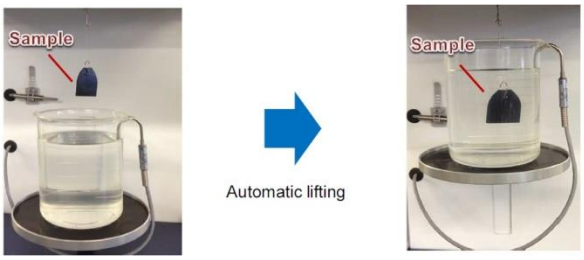
High concentration model (PPM)

Model	PPM-S	PPM-D	PPM-SD
Test method	Static	Static & Dynamic (Holder need to be exchanged for changing test method)	Static & Dynamic (Dual use type)
Ozone concentration range	20 to 200 pphm, 10 to 200ppm, two-stage switching		
Ozone concentration control	Auto control by ultraviolet rays absorption method, with recorder (Concentration recording)		
Ozone concentration accuracy	±1% FS		
Ozone generating system	■Low concentration: Ozone lamp (Low pressure mercury lamp) ■High concentration: Creeping discharge		
Temperature range	Room temperature +10ºC to 40ºC		
Temperature control system	PID fuzzy control		
Temperature accuracy	±0.5% FS		
Method of circulating air inside the chamber	One direction flow from bottom to top, 12 to 16mm/s		
Static test	5 pcs. each of tension & bending holders are provided as standard		
Dynamic test		■Vertical tensile stretching method Stretching factor: 0 to 100% Stretching C/S: 0.5Hz ■Dimensions of specimen: JIS No.1 or No.3 dumbbell Length 40 to 120mm, width 15mm ■Number of specimens: 12 specimens (Standard) 24 specimens (Option) (Note: Please select upon order)	
Sample rotating rack	Revolutions 1.5rpm		
Test chamber material	SUS 304 fluorine resin coating		
Power requirement	Single-phase, AC100V, 2kVA		
Ozone test chamber	W500 x D500 x H500mm		W500 x D500 x H750mm
Dimensions	W1110 x D690 x H1700mm		W1110 x D690 x H1950mm
Weight	Approx. 210kg	Approx. 260kg	Approx. 330kg
Related standards	ISO 1431 (JIS K 6259)		

8. Density

■No.265 Automatic Densimeter, model DSG-2

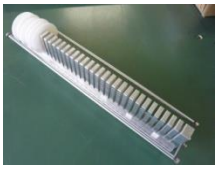
The TOYOSEIKI **Automatic Densimeter** measures density of materials such as polymers or rubber in various forms. The weighing operation is fully automatic and the density of the sample is automatically calculated and displayed on the screen at the end of the test. By using the optional attachments, it can also be used to determine density / specific gravity of liquids and rate of change of volume etc. An optional temperature sensor can also be added to allow direct measurement and input of air and Liquid temperatures.



Balance unit capacity	100g
Balance unit resolution	0.0001g (0.1mg)
Balance unit repeatability	0.1mg (Standard) 0.07mg (Optional high repeatability balance unit)
Beaker lifting mechanism	Motorized direct-drive actuator Lifting speed: 10, 20, 30mm/sec. (Selectable) Beaker stop position: Lower side: 0, 10, 20mm (Selectable) Upper side: 80, 90, 100mm (Selectable)
Data storage	200 lots, 1000 sets of data (Up to 100 sets of data per lot can be saved)
Immersion liquid	Water, ethanol, acetone (to be used in the range of 10 to 30ºC)
Immersion liquid temperature control (Option)	Possible to control immersion liquid temperature with optional refrigerated circulator and double-wall beaker
Immersion time range	1 to 999 sec.
Table of immersion liquid density	Table of water density is installed as standard Possible to save up to 2 kinds of table (Such as ethanol or acetone)
Power requirement	Single-phase, AC100 to 240V, 50/60Hz, 0.1kVA
Dimensions	W290 x D443 x H900mm
Weight	Approx. 35kg
Related standard	ISO 1183 (JIS K 7112), ISO 2781 (JIS K 6268) JIS Z 8807 ASTM D792

■No.265 Automatic Densimeter, model DSG-A2

Fully Automated Density Tester



Sample holder

The TOYOSEIKI **Automatic Densimeter, DSG-A** measures the density of rubber samples with fully automated operation.

Measurement unit	
Max. capacity	100g
Minimum readout	0.0001g (0.1mg)
Operation panel	4 inch LCD touch screen
Measurement item	Solid density
Measurement units	■g/cm^3 ■kg/m^3 (Selectable)
Density display resolution	0.000001g/cm^3
Beaker lifting mechanism	Motorized direct-drive actuator
Data saving capacity	200 lot (100data/lot; provided max. 1000 data can be saved)
Interface	RS-232 x 1
Power requirement	Single-phase, AC100 to 240V, 50/60Hz, 0.1kVA
Dimensions	W290 x D443 x H915mm
Weight	Approx. 35kg
Related standard	ISO 1183 (JIS K 7112), ISO 2781 (JIS K 6268) JIS Z 8807 ASTM D792
Automated sample feeder	
Sample dimensions	40 x 40 x 2mm or Ø40 x 2mm (On request basis. Need confirmation for other dimensions)
Number of samples	Max. 64 (Vary depending on sample dimensions)
Measurement time	Approx. 2 minutes / test (Depends on sample)
Sample feeding	Pick-up hand, Feeding arm (Pneumatic cylinder, Motorized actuator)
Operation panel	4 inch LCD touch screen
Compressed air requirement	0.3MPa
Power requirement	Single-phase, AC100 to 240V, 50/60Hz, 2kVA
Dimensions	W300 x D600 x H850mm
Weight	Approx. 40kg

9. Rebound Testers

■No.232 Schob type Rebound Tester, Model SB-M1

Rebound resilience tester conforms to ISO 4662

The TOYOSEIKI **Schob type Rebound Tester** evaluates rebound resilience of the rubber conforms to ISO 4662.

Hammer part	■Diameter of impact hemisphere: Ø12.5mm ■Impact force: 0.25kg ■Drop angle: 90º ■Hammer length: 180mm ■Impact velocity: 1.88m/s ■Hammer release system: Solenoid
Measurement part	Unloaded encoder (Minimum angle 0.1º)
Specimen clamp part	■Clamp method: Spring ■Number of specimen: 1 specimen ■Specimen diameter: Ø29.0mm ■Specimen thickness: 12.5mm ■Specimen holding force: 100 to 250N (Adjustable)
Operation panel	LCD touch screen (Language: English, Japanese)
Data transfer software	Provided Note: Personal computer and spread sheet software is required. (Not provided)
Power supply	Single-phase, AC100 to 240V, 50/60Hz, 0.1kVA
Dimensions	W275 x D415 x H450mm
Net weight	Approx. 30kg
Related standards	ISO 4662 (JIS K 6255)

■No.221 Resilience Tester, model A

Tripsometer method rebound resilience tester

The TOYOSEIKI **Resilience Tester, model A** is Tripson type rebound resilience tester conforms to ISO 4662. All setting operations are performed on the touch screen.

Inertia disk	Ø419mm x Thickness 14.3mm
Weight of inertia disk	16.5kg±50g
Mass of hammer	60g
Hammer edge	Ø4mm, steel ball
Oscillation period	10±0.5sec.
Angle detection	Optical sensing system
Inertia disk support system	Air bearing system
Clamp system	Pneumatic
Clamp unit temperature control	Max. 70ºC
Dimensions of specimen	8 x 50mm, Thickness 4mm
Power requirement	Single-phase, AC100V, 50/60Hz, 0.7kVA
Compressed air requirement	Dry air 0.3MPa (Refrigerator type air dryer)
Dimensions	W650 x D610 x H760mm
Related standards	ISO 4662 (JIS K 6255)

10. Abrasion Tester

■No.276 DIN type Abrasion Tester

The TOYOSEIKI **DIN type Abrasion Tester** evaluates the abrasion resistance of rubber specimens.

Test load	2.5 to 20N
Feed of specimen	4.2mm per rotation
Diameter of drum	Ø150mm
Drum rotating speed	40rpm
Power supply	Single-phase, AC100V, 50/60Hz, 0.5kVA
Dimensions	W950 x D330 x H380mm
Weight	50kg
Related standards	ISO 4649 DIN 53516 JIS K 6369, JIS K 6264

11. Fatigue Testers

■No.255 De Mattia Flex-Cracking Tester Model DM-01

The TOYOSEIKI **De Mattia Flex-Cracking Tester** measures the endurance of specimens from the crack generation and crack and the length of crack generated through repeated bending.

Number of specimens	Max. 12 specimens
Crank speed	300cpm
Stroke	57mm
Automatic test stop	Flex frequency: 0 to 999999 times Set time: 0 to 99999.9 minutes 0 to 99999.9 hours
Power requirement	Three-phase, AC200V, 50/60Hz, 10.4kVA
Dimensions	W450 x D450 x H600mm
Weight	78kg
Related standards	ISO 132 (JIS K 6260) ASTM D813

■No.263 De Mattia Flex Cracking Tester with Thermostatic Chamber, model G7A-L

The TOYOSEIKI **De Mattia Flex Cracking Tester with Chamber** evaluates endurance of rubber specimens with regard to repeated bending and growth of crack generated due to repeated bending at high temperature. Allows testing of 20 specimens at a time.

Break detection	Laser type break detection device
Number of specimens	20 specimens
Speed	300cpm
Break detection	Above approx. 20% of gauge length elongation (when gauge length 20mm)
Operation mode	■Counts setting test ■Break counts test (7 digits counter)
Temperature range	Room temperature+40ºC to 150ºC
Power requirement	Three-phase, AC200V, 50/60Hz, 10.4kVA
Dimensions	W1270 x D1050 x H1500mm
Weight	Approx. 700kg
Related standards	ISO 132 (JIS K 6260) ASTM D813

12. Low Temperature Testers

■No.525 Brittle Point Temperature Tester

S

FS

The TOYOSEIKI **Brittle Point Temperature Tester** evaluates specimens immersed in liquid at low temperature. Impact is applied by hammer at constant speed and evaluation is made from generation of cracks.

Model	S	FS
Cooling method	Dry ice	Refrigerator
Refrigerant	Ethanol, approx. 10L	
Number of specimens	5 samples for one chuck	
Temperature	-70ºC to +40ºC	
Standard chuck	2 set of JIS K 7216-A type (Group mounting type) Others are option	
Power supply requirement	Single-phase, AC100V, 1.5kVA	Single-phase, AC100V, 3kVA
Dimensions	W580 x D710 x H470mm	W650 x D700 x H1250mm
Weight	Approx. 110kg	Approx. 190kg
Related standards	ISO 812 (JIS K 6261)	

■No.223 Gehman Stiffness Tester, model GS-2

The TOYOSEIKI **Gehman Stiffness Tester** evaluates stiffness or rubber at low temperature according to ISO 1432 (Low temperature torsion test). The testing operation is automatic and specimens are twisted by means of a wires of known torque at programmed test temperature. The angle of twist produced at this time is detected and is sent to the data processing unit.

Number of samples	Max. 6 specimens
Dimensions of sample	3(Width) x 2(Thickness) x 40(Length) mm
Sample grips span	25±3mm
Test temperature range	-70ºC to +23ºC
Heat conducting material	Ethanol
Cooling system	Refrigerator system
Temperature control	Programmed heating system
Temperature resolution	0.1ºC
Angle of twist	180deg
Twist angle detection	Least count 0.1deg
Kinds of wire	3 kinds of torsion constant
Power requirement	Three-phase, AC200V, 50 or 60Hz, 6.9kVA
Dimensions	Main unit: W630 x D850 x H1570mm (H2000mm when test station is lift up position)
Weight	310kg
Related standards	ISO 1432 (JIS K 6261-3)

■No.226 Low Temperature Retraction Tester Model TR-1 (TR Tester)

The TOYOSEIKI **Low Temperature Retraction Tester** evaluates the temperature at which a specimen reaches a certain specified contraction ratio while the temperature of the specimen, which has been stretched to a certain level and frozen at a low temperature, is raised at a certain constant rate. The TR test is mainly used to determine the elastic recovery characteristics at a low temperature of the materials of which sealing performance is required, such as rubber seal components, hoses, etc. You can examine the correlation with the brittle temperature or the low-temperature permanent set using this very convenient tester.

Temperature range	-70ºC to +30ºC
Temperature resolution	0.1ºC
Temperature accuracy	±1.0ºC
Temperature sensor	Pt100
Displacement measurement	Rotary encoder
Test stations	6
Test specimen	■I shaped test specimen ■O-ring
Specimen size	■I shaped test specimen: 50mm ■O-ring: Available when the distance between chucks is 200mm or more
Max extension	125mm (150% with 50mm test specimen)
Test data output	TR10, TR30, TR50, TR70 (4 points) and 2 arbitrary setting points
Cooling system	Secondary refrigerator
Cooling medium	Ethanol (Not provided)
Power requirement	Three-phase, AC200V, 50/60Hz, 6.9kVA
Dimensions	W630 x D850 x H1670mm (Main unit)
Weight	300kg (Main unit, except refrigerant
Related standards	ISO 2921 (JIS K 6261-4) ASTM D1329

13. Hardness Tester

■No.298 Digital Hardness Tester (Type A & D Durometers)

SD-R

The TOYOSEIKI **Digital Hardness Tester (Durometer)** measures hardness of rubber by needle penetration method.

Type A Durometer

Model	SA-C	SA-R
Application	General rubber, Soft plastic	
Measurement way	■Mounted to stand (*Stand is option*) ■Pushing by hand	■Pushing by hand only
Indenter height	2.5mm	
Pressurized face		39  gular)
Dimensions	W59 x D40 x H140mm	W59 x D39 x H134mm
Weight	Approx. 300g	
Measuring stand	Available as option	Not available
Related standards	JIS K 6253 ISO 7619, ISO 868 ASTM D2240	

Type D Durometer

Model	SD-C	SD-R
Application	Hard rubber, Plastic	
Measurement way	■Mounted to stand *(Stand is option)* ■Pushing by hand	■Pushing by hand only
Indenter height	2.5mm	
Pressurized face		39  ngular)
Dimensions	W59 x D40 x H140mm	W59 x D39 x H134mm
Weight	Approx. 300g	
Test stand	Available as option	Not available
Related standards	JIS K 6253 ISO 7619, ISO 868 ASTM D2240	

Automatic (Motor driven) test stand

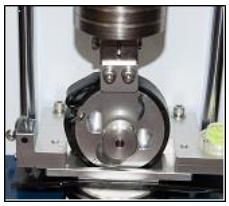
Model	AK-A	AK-AD
Applicable model of Digital Hardness Tester	SA-C (Type A Durometer)	SD-C (Type D Durometer)
Test weight	1kg	1kg + 4kg
Lowering speed adjustable range	1 to 19mm/sec (by 1mm/sec)	
Power supply	Single-phase, AC100-240V (AC adapter)	
Dimensions	W146 x D190 x H345mm	
Weight	9kg	

Manual type test stand

Model	K-A2	K-AD2
Applicable model of Digital Hardness Tester	SA-C (Type A Durometer)	SD-C (Type D Durometer)
Test weight	1kg	1kg + 4kg
Dimensions	W180 x D180 x H313mm	
Weight	8.5kg	

14. Tackiness Testers

■No.235 PICMA Tack Tester, model P-3



Specimen mounting wheel

The TOYOSEIKI **PICMA Tack Tester** measures tacking strength between unvulcanized rubbers and between unvulcanized rubber and other materials. Tacking strength of other adhesive materials can also be measured.

Measurement method	Load cell (Capacity: 100N)
Measuring load range	0.0 to 30.0N (Resolution: 0.1N)
Sticking load (Dead weight)	2 to 5N (Standard) Max. 20N (Optional)
Number of times to perform measurement (N)	1, 3, 5 (Selectable)
Sticking time	0.0 to 99.9 sec. (0.1 sec. steps)
Specimen mounting wheel Down speed	Can be set “LOW” or “HIGH” ■LOW (60mm/min.) ■HIGH (1000mm/min.)
Specimen mounting wheel UP speed (Separating speed)	Select one type from below when ordering ■Wide speed: 5, 10, 50, 100, 500, 1000, 1500, 3000mm/min. ■Low speed : 5, 7.5, 10, 15, 20, 25, 30, 50mm/min. (≒P-1) ■High speed: 100, 500, 700, 1000, 1250, 1500, 2000, 3000mm/min. (≒P-2)
Specimen mounting wheel drive method	Servo motor
Tackiness indicator	7seg LED
Interface	RS-232 x 1
Power requirement	Single-phase, AC100 to 240V, 50/60Hz, 0.5kVA
Dimensions	W300 x D330 x H510mm
Weight	Approx. 18kg

■No.236 Tackiness Checker, model HTC-1

The TOYOSEIKI **Tackiness Checker** is a convenient, easy-to-use instrument designed for on-site testing of the tackiness of rubber components. This instrument may also be used to test the tackiness of adhesive tapes, depending on the application. In the molding process of tires and belts, where components including rubber and reinforcement materials are bonded in multiple layers and vulcanized, it is very important to check the components tackiness before the forming process is completed. The Tackiness Checker HTC-1 provides a simple and portable method for accurate, on-site testing.

Measure tackiness	Max. 20N, resolution 0.1N (load cell system)
Press force	10N (Standard) (Variable between 5 to 12N)
Press time	3 sec. / 6 sec. (Selection)
Test number	1 / 3/ 5 (Selection)
Contact ring moving speed (Down and up)	Approx. 2.3mm/sec.
Contact ring	Aluminum R ring
Contact ring drive	Brushless DC motor
Contact ring rotation	Auto rotation function
Minimum sample size	50 x 50mm
Test condition (input)	■Sample name (4 digits) ■Results display (median or average if multiple) ■Number (1, 3, 5) ■Press time (3 sec. or 6 sec.)
Calendar function	Date, Time (yyyy/mm/dd hh:mm), auto refresh until 2099
Battery	Lithium ion battery 7.4V, 2000mA
Power consumption	Standby: 550mW, Motor drive: 800mW
Dimensions	W118 x D72 x H222mm
Weight	Approx. 1.3kg

15. Blow Point Tester

■No.642 Blow Point Tester, model BP-2

When a rubber-laden composite material is vulcanized under pressure, bubbles are generated within the material due to insufficient vulcanization in the final phase of the process. The blow point stands for the minimum vulcanization level required for eliminating the existence of these bubbles. To make a product with no bubbles in a shorter time of vulcanization, it is very important to measure the blow point.

Heating plate	W200 x D350 x t40mm
Material of heating plate	Duralumin; heated by an electric heater
Mold (Select 1 kind upon order)	■10mm type Inside dimensions: W55 x L140 x H6~10mm tapered (Standard) ■20mm type Inside dimensions: W55 x L140 x H6~20mm tapered ■30mm type Inside dimensions: W55 x L140 x H6~30mm tapered ■40mm type Inside dimensions: W55 x L140 x H6~40mm tapered
Heating plate driving	Air cylinder (inner diameter 300mm, stroke 150mm)
Mold clamping force	50kN ± 10% (@0.6 Mpa)
Temperature distribution	190ºC± 1ºC (on the mold surface)
Temperature sensor for control	Pt100Ω, sheath outer diameter of 1.6mm
Thermocouple for measurement	CC thermocouple, N-42169 sheath outer diameter of 1.2mm, four locations
Thermocouple movement	Pneumatic
Temperature range	Room temperature + 30ºC to 200ºC
Power requirement	Three-phase, AC200V, 50/60 Hz, 4.5kVA
Compressed air requirement	0.6 to 0.8MPa
Dimensions	W566 x D765 x H800mm
Weight	Approx. 270kg
Related standard	JIS K 6300-4

16. Dynamic Mechanical Analyzer (DMA)

■No.651 Rheolograph-Solid, model L-1R

The TOYOSEIKI **Rheolograph Solid L-1R** is especially developed for measuring dynamic viscoelasticity of rubbers. Measurement control and data processing are fully automated by means of computer. This is a new system with advanced functions and superb operation that makes further advances into measurement of viscoelasticity of rubbers.

Dynamic viscoelasticity	0.5 to 5x10^{4}MPa
Measuring frequency	1, 2, 5, 10, 20, 30, 50, 100Hz
Temperature range	-100ºC to +250ºC
Heating rate	1 to 5ºC/min.
Max. applied force	200N
Load system	Load cell capacity 300N
Dimensions of sample	5W x 3T x 40L (mm)
Power requirement	Single-phase, AC100V, 50/60Hz, 2kVA
Compressed air requirement	0.5MPa, 40L/min. or more
Dimensions	W1200 x D1150 x H800mm
Weight	Approx. 340kg
Related standard	ISO 4664 (JIS K 6394)

17. Gas Permeability

■No.571 Gas Transmission Rate Tester

Gas Permeability Tester

The TOYOSEIKI **Gas Transmission Rate Tester** measures gas transmission rate (protection from gas leakage) of packaging films, and any protective layers. The tester can be used for various test with gases such as oxygen, nitrogen, carbon dioxide and air, as well as provides the gas transmission rate, gas transmission coefficient and the diffusion coefficient as a standard, and dissolution
coefficient measurement as an option.

Models	CR1	CR3	CT1	CT3
Number of specimens	1	3	1	3
Temperature range	Room temperature		10ºC to 90ºC (Hot water circulation)	
Specimen size	50 x 50mm (Measuring cell: Ø30mm, transmission area: 707mm^2) 90 x 90mm (Measuring cell: Ø70mm, transmission area: 3848mm^2)			
GTR measuring range ***To be selected Type A or B upon order***	■Type A: 0.1 to 100fm/Pa.s ■Type B: 1 to 1000fm/Pa.s (Vacuum pressure gauge: Accuracy 0.25% of reading)			
Test gas	O^2, N^2, Co^2, Air, H2 (Optional) etc.			
Test gas pressure	0 to 200kPa			
Measuring items	Gas transmission rate, Gas transmission coefficient, Diffusion coefficient, Dissolution coefficient (Optional)			
Power requirement	■Main unit: Single-phase, AC100V, 50Hz or 60Hz, 0.5kVA ■Vacuum pump: Single-phase, AC100V, 50Hz or 60Hz, 0.6kVA ■Warm water circulation bath (CT1, CT3): Single-phase, AC100V, 50Hz or 60Hz, 1.5kVA			
Compressed air requirement	0.4MPa			
Dimensions	Main unit (CR1, CT1): W550 x D560 x H470mm Main unit (CR3, CT3): W800 x D560 x H470mm			
Weight	Main unit (CR1, CT1): Approx. 50kg Main unit (CR3, CT3): Approx. 70kg			
Related standards	ISO 15105-1, ISO 2556 JIS K 7126-1, JIS K 6275-1, JIS K 6404-10 ASTM D 1434			

18. Lab-scale Extrusion & Compounding Systems (Torque Rheometer)

■No.655 Labo Plastomill (Base unit)

Laboratory mixer & extruder system

The TOYOSEIKI **Labo Plastomill** is torque rheometer for process parameters optimization or laboratory-scale simulation of polymer materials.

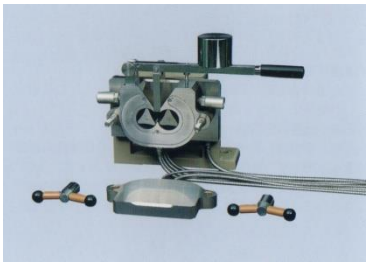
Base unit + Extruder

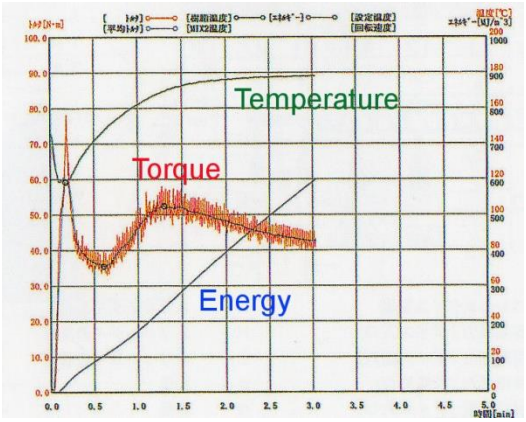
Base unit + Mixer

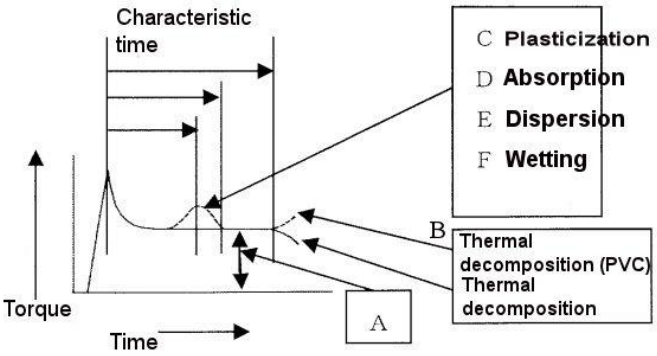
Model	3S150	10S100	3S500
Max. torque	300N.m	1000N.m	300N.m
Speed range	0.1 to 150rpm	0.1 to 100rpm	0.1 to 500rpm
Motor power	3.5kW	5.5kW	15kW
Torque detection	Load cell		Torque meter
Torque accuracy	±0.1% within FS		
Resin pressure measurement	4 channels (Note: Pressure sensor is option)		
Temperature controller	6 channels (Note: Temperature sensor is option)		
Power requirement	Three-phase, AC200V, 21kVA		Three-phase, AC200V, 35kVA
Compressed air requirement	0.5MPa, 40L/min.		
Dimensions	W525 x D660 x H950mm (Main unit)		
Weight	Approx. 215kg	Approx. 235kg	Approx. 285kg

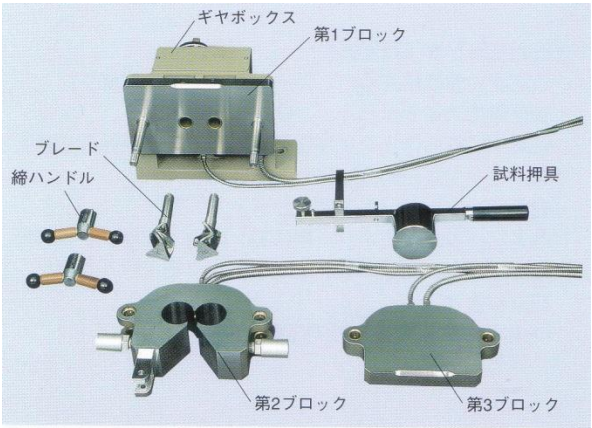
■No.655 Labo Plastomill (Roller Mixer)

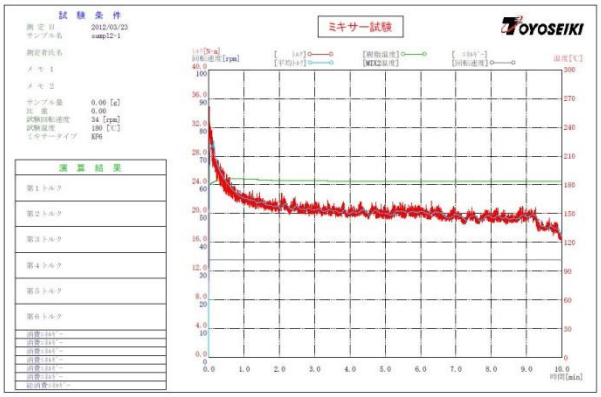
Model	R60	C90	S90	KF70V2
Chamber	60cm^3	90cm^3	90cm^3	70cm^3
Blade	Roller	Cam	Sigma	Disc
Application	Thermoplastics			
Shear strength	High	Middle	Low	Very high
Gear ratio	2 : 3			1:1
Heating system	Electric			
Max. temperature	250ºC (Option: 400ºC)			350ºC
Max. torque	200Nm			300Nm











■No.655 Labo Plastomill (Banbury type Mixer)

Electric heating type

Model	B75	B250	B600
Chamber	75cm^3	250cm^3	60cm^3
Blade	Banbury type		
Application	Elastomers		
Gear ratio	7:8	8:9	7:8
Heating system	Electric		
Max. temperature	250ºC	250ºC (Option: 400ºC)	
Max. torque	300Nm	750Nm	1000Nm

B600

Oil heating type

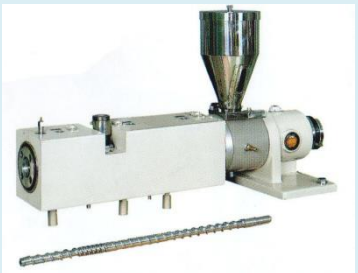
Model	BR250	BR600
Chamber	250cm^3	60cm^3
Blade	Banbury type	
Application	Elastomers	
Gear ratio	8:9	7:8
Heating system	Oil heating	
Max. temperature	180ºC	
Max. torque	750Nm	1000Nm

BR250

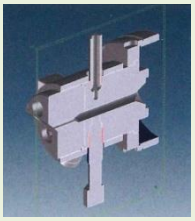
Banbury type mixer model BR250 with oil circulation bath
Note: Base unit shown is old generation model

■No.655 Labo Plastomill (Single-screw Extruder for elastomers)

Model	D2015
Screw diameter	20mm
L/D	15
Max. temperature	250ºC
Heating system	Electric
Heating zones	2
Cooling (Cylinder)	Air
Cooling (Feeding zone)	Water
Vent port	N/A
Sensor ports	2
Max. torque	200Nm
Die (Standard)	Garvey die
Screw (Standard)	Full flight Comp. rate: 1.6

Model	D2020	D2025
Screw diameter	20mm	
L/D	20	25
Max. temperature	350ºC	
Heating system	Electric	
Heating zones	3	
Cooling (Cylinder)	Air	
Cooling (Feeding zone)	Water	
Vent port	N/A	1
Sensor ports	4	
Max. torque	200Nm	
Die (Standard)	Strand die (Ø3mm x 1)	
Screw (Standard)	Full flight Comp. rate: 2.0	Vent screw Comp. rate: No.1=2.5, No.2= 3.0 (Option: Full flight screw)
		

■No.655 Labo Plastomill (Measuring dies for extruder)

Name	Model	Specifications	
Garvey die	GD	For elastomer	 
Tube die	TU10	Ø8mm x 10mm (Spider type)	
	TU20	Ø18mm x 20mm (Spider type)	

19. Capillary Rheometer

■No.583 Capilograph, model F-1 / F-2

Capillary Rheometer (Single & twin bore barrel)

The TOYOSEIKI **Capilograph** measures melt viscosity of polymers by detecting the shear rate and shear stress of melt polymer when it flows out of the capillary die. Die swell and melt strength can also be measured by equipping it with optional attachments.
The twin bore barrel model (F-2) allows easy Bagley & Weissenberg-Rabinowitsch correction (for determination of true viscosity) or elongational viscosity calculation in a single test run.

Model	F-1	F-2
Temperature range	60 to 400ºC (Option: 500ºC)	
Temperature accuracy	±1ºC (Less than 300ºC) Within ±2ºC (300ºC or more)	
Number of bores	Single	Twin
Bore diameter	Ø9.55mm or Ø15mm	Ø15mm
Barrel length	Length: 350mm, Effective length: 250mm	
Piston speed	0.1 to 1500mm/min.	
Force range (Load cell capacity)	25kN (Bore dia. Ø9.55mm) 50kN (Bore dia. Ø15mm)	25kN (Bore dia. Ø15mm)
Cleaning device for barrel	Included (Pneumatic)	
Safety cover with interlock	Included	
Melt strength measurement	Optional	
Die swell measurement	Optional	
Bagley & weissenberg-Rabinowitsch correction	Optional	
Elongational viscosity calculation	Optional	
Power requirement	Three-phase, AC200V, 50/60Hz, 5.2kVA (For main unit) Single-phase, AC100V, 50/60Hz, 0.3kVA (For PC)	
Compressed air requirement	0.5MPa	
Dimensions	W1060 x D1100 x H1950 to 2360mm (Main unit)	
Weight	Approx. 650kg (Main unit)	
Related standards	ISO 11443 (JIS K 7199) ASTM D3835	

20. Others

■No.519 Mini Test Press

MP-WNL

MP-2F
(With swivel type cooling plates)

The compact, bench-top TOYOSEIKI **Mini Test Press** is used as a rubber compression molding. The press is equipped with a two-speed manual hydraulic cylinder pressure system. An optional water-cooled, insulated plate sandwich to cold press samples without cooling down platens is also available.

Dimensions of heating plate	■200 x 200mm ■250 x 250mm
Platen separation	Max. 100mm (75mm with water cooling plate)
Pressure system	Hydraulic cylinder
Compression load	100kN at 30MPa
Pressure indicator	Analog pressure gauge, max. scale: 35MPa
Manual hydraulic pump	2-speed type (automatic switching)
Temperature range	Room temperature+10 to 300ºC or 400ºC
Heaters	Cartridge type balanced heaters
Temperature control	Dual PID controllers, with auto tuning function, digital readouts
Safety devices	Overheat prevention circuit Electrical leakage and overcurrent breaker
Power requirement	Single-phase, AC200V, 50/60Hz, 4kVA
Cooling water requirement	0.15MPa, 20L/min. maximum
Dimensions	W520 x D390 x H680mm (Handle is not included)
Weight	Approx. 90kg

List of contents (In numerical order)

List of contents (In numerical order)

Test standards

Standard	Description	Related instruments	
ISO 34	Rubber, vulcanized or thermoplastic -- Determination of tear strength	■No.210 Strograph E ■No.260 Strograph VGS/VG ■No.120 Strograph T ■No.211 Strograph AE Elastomer ■No.219 Strograph HT	10 11 12 13 14
ISO 37	Rubber, vulcanized or thermoplastic -- Determination of tensile stress-strain properties	■No.210 Strograph E ■No.260 Strograph VGS/VG ■No.120 Strograph T ■No.211 Strograph AE Elastomer ■No.219 Strograph HT	10 11 12 13 14
ISO 132	Rubber, vulcanized or thermoplastic -- Determination of flex cracking and crack growth (De Mattia)	■No.255 De Mattia Flex-Cracking Tester ■No.263 De Mattia Flex-Cracking Tester with Thermostatic Chamber	31 32
ISO 188	Rubber, vulcanized or thermoplastic -- Accelerated ageing and heat resistance tests	■No.272 Geer Oven	22
ISO 289	Rubber, unvulcanized -- Determinations using a shearing-disc viscometer	■No.275 Mooney Viscometer	20
ISO 812	Rubber, vulcanized or thermoplastic -- Determination of low-temperature brittleness	■No.525 Brittle Point Temperature Tester	33
ISO 1183	Plastics — Methods for determining the density of non-cellular plastics	■No.265 Automatic Densimeter	26
ISO 1431	Rubber, vulcanized or thermoplastic -- Resistance to ozone cracking	■No.253 UVC Ozone Aging Tester	24
ISO 1432	Rubber, vulcanized or thermoplastic -- Determination of low-temperature stiffening (Gehman test)	■No.223 Gehman Stiffness Tester	34
ISO 2781	Rubber, vulcanized or thermoplastic -- Determination of density	■No.265 Automatic Densimeter	26

Test standards

Standard	Description	Related instruments	
ISO 2921	Rubber, vulcanized -- Determination of low-temperature retraction (TR test)	■No.226 Low Temperature Retraction Tester	35
ISO 4649	Rubber, vulcanized or thermoplastic -- Determination of abrasion resistance using a rotating cylindrical drum device	■No.276 DIN type Abrasion Tester	30
ISO 4662	Rubber, vulcanized or thermoplastic -- Determination of rebound resilience	■No.232 Schob type Rebound Tester ■No.221 Resilience Tester	28 29
ISO 4664	Rubber, vulcanized or thermoplastic -- Determination of dynamic properties	■No.651 Rheolograph-Solid	42
ISO 6502	Rubber -- Measurement of vulcanization characteristics using curemeters	■No.292 Rotorless Rheometer	17
ISO 7619	Rubber, vulcanized or thermoplastic -- Determination of indentation hardness	■No.298 Digital Hardness Tester	36
ISO 13145	Rubber -- Determination of viscosity and stress relaxation using a rotorless sealed shear rheometer	■No.292 Rotorless Rheometer (Optional)	17

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

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