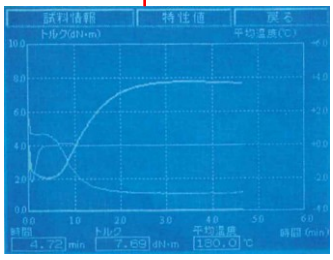
Toyo Seiki Seisaku-sho, Ltd. 5-15-4, Takinogawa, Kita-ku, Tokyo 114-8557, Japan

No.292 Rotorless Rheometer
Model RLR-4

Moving Die Rheometer



Touch screen display

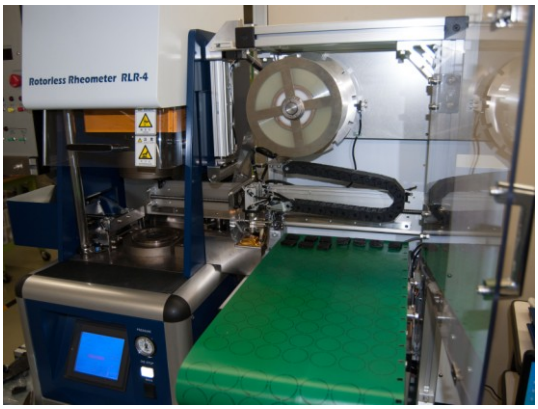
With optional data processing unit and table

■APPLICATION

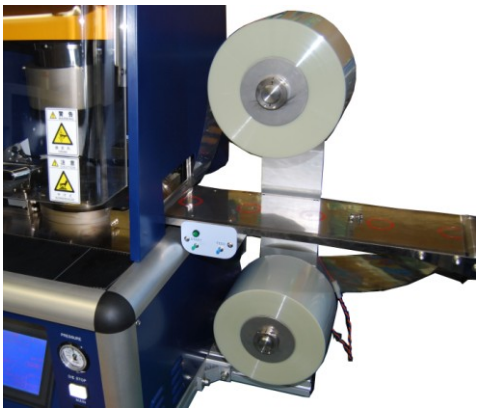
The **Rotorless Rheometer model RLR-4** measures vulcanizing characteristics of rubber with ease and simplicity at high accuracy.
It allows labor saving in conducting test by installing the pin type automatic sample loading/unloading device of high reliability and high reputation and data processing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

(ROB-R4)

With optional automatic sample feeder (Pin type)



(ROBF84…84 samples model)



(ROBF06…6 samples model)

With optional automatic sample feeder (Film type)

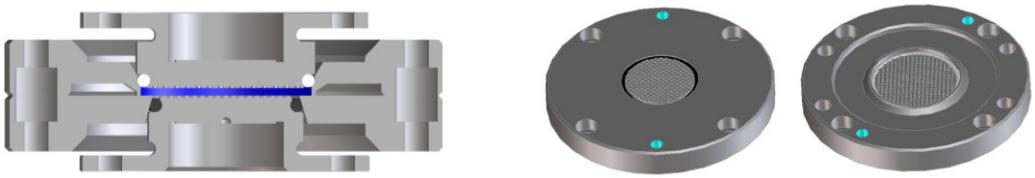
■FEATURES

● LCD touch screen control panel

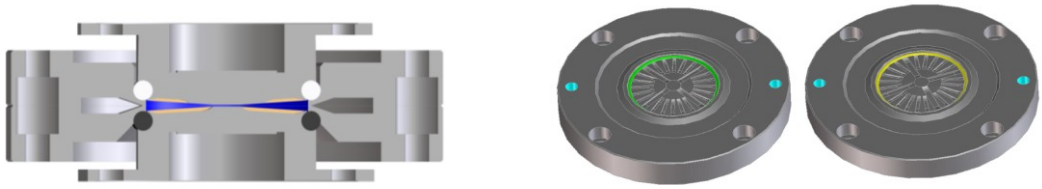
LCD touch screen is used to assure easy operation. Curing curve etc. can be monitored on the screen in real time and up to 5 curves can be displayed overlapped on the screen.
(Stand-alone operation without personal computer is possible)

● Flat-plate-die & Biconical-die is selectable

Flat-plate-die (ISO 6502 / JIS K 6300-2)…Standard

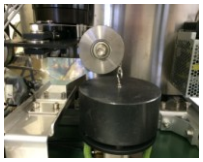


Biconical-die (ISO 6502 / ASTM D 5289, ISO 13145)…Option



● Automatic Torque Calibration

Calibration can be automatically performed by means of the built in actual weight by once touch from the control panel.



Built-in weight for automatic calibration

● Testing Operation

Angle of oscillation can be arbitrarily set within ±0.1°~±2.00° range in 0.01° steps.
Number of oscillations can be arbitrarily set within 50cpm ~ 150cpm range in 1cpm steps.

● Data Output

For output of measured data you can select mini printer output (option) or data processing unit (option) with control function.

● Safety Devices

For overheat protection, a temperature monitoring circuit independent from the test temperature control circuit is installed in the upper and lower heating platens.
By closing the wind protection door the heating platen comes down and test starts.

● Measuring Function Options

Programmed heating function can be added as option that can simulate the foaming pressure measuring function capable of measuring the relation between curing and forming, tan δ measuring function capable of measuring viscoelastic characteristics and multistage curing, etc.

■SPECIFICATIONS

Model	RLR-4
Test chamber	Rotorless, Non-friction sealed type ■ Flat-plate-die (ISO 6502 / JIS K 6300-2)…Standard ■ Biconical-die (ISO 6502 / ASTM D5289)…Option
Pressure applying system	Pneumatic cylinder (Non-lubrication type)
Heating system	Electric heating
Temperature range	Room temperature + 20°C to 230°C Accuracy ±0.3°C Resolution 0.1°C
Oscillation frequency	50cpm (0.83Hz) to 150cpm (2.5Hz) (Variable in 1cpm steps) *Note: cpm=Cycles per minute*
Oscillation amplitude	±0.10 to ±2.00° (Variable in 0.01°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 setting	3 to 960min in 10 steps
Torque calibration	Auto span function using built-in weight
Torque auto zero	Auto zero function before starting test
Safety devices	■ Overheat protector ■ Overload protector ■ Protection by wind cover against being caught in the heating platen
Communication	RS-232C
Control panel	5” LCD touch screen
Operation menu	■ Test conditions registration ■ Torque calibration ■ Main unit check ■ Data history refer function, etc.
Languages	■ English ■ Japanese
Power requirement	Single-phase, AC200 to 230V, 50Hz or 60Hz, 2.4kVA
Compressed air requirement	0.45MPa
Dimensions	W430 x D600 x H1120mm
Weight	Approx. 145kg
Related standards	ISO 6502 ISO 13145 (Option) JIS K 6300-2 ASTM D5289 (Option)

■DATA PROCESSING SOFTWARE, MODEL CON-L (OPTIONAL)

- 4 machines can be simultaneously operated individually by one data processing unit.
- By automatically calculating results judgment level from collected data, status can be monitored by data judgment and control diagram (X-R, X-Rs).
- Overwriting test, additional test and interrupt test can be performed.
- Common data processing unit for Rheometer and Mooney Viscometer is available.
- 2 languages (English/Japanese) switchable.

Characteristic values

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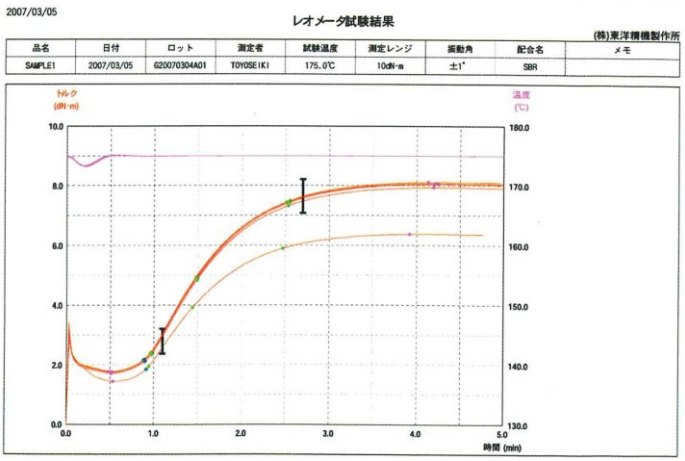
レオメータ試験結果 (トルク)

(株)東洋精機製作所

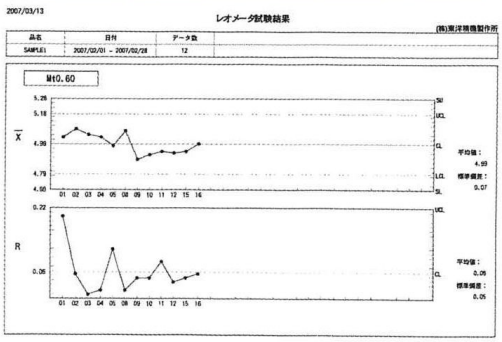
品名	日付	ロット	測定者	試験温度	測定レンジ	振動角	配合名	メモ
SAMPLE1	2007/03/05	G20070304A01	TOYOSEIKI	175.0℃	10dN·m	±1°	SBR	

サンプルNO.	tM (dN·m)	tL (dN·m)	ts0.40 (min)	t10 (min)	t50 (min)	t90 (min)	t90-10 (min)	Mt1.10 (dN·m)	Mt2.70 (dN·m)	tM (min)	tL (min)	Temp (℃)			判定
規格SU								5.21	8.21						
規格SL								2.38	7.05						
1	8.12	1.78	0.89	0.97	1.50	2.55	1.58	2.99	7.63	4.13	0.48	175.0			OK
2	8.06	1.74	0.90	0.98	1.50	2.55	1.57	2.94	7.57	4.24	0.52	175.0			OK
3	8.38	1.45	0.91	0.94	1.44	2.47	1.53	2.58	6.97	3.92	0.53	175.0			NG
4	7.94	1.71	0.89	0.97	1.49	2.53	1.57	2.94	7.48	4.19	0.51	175.0			OK
5	8.06	1.77	0.88	0.96	1.48	2.51	1.55	3.05	7.61	4.20	0.52	175.0			OK
6	8.08	1.78	0.89	0.97	1.49	2.54	1.58	3.00	7.60	4.21	0.48	175.0			OK
MEAN	7.77	1.71	0.89	0.97	1.48	2.53	1.56	2.92	7.33	4.15	0.51	175.0			
SIGMA	0.69	0.13	0.01	0.01	0.02	0.03	0.02	0.17	0.62	0.12	0.02	0.0			
CV(%)	8.82%	7.50%	1.16%	1.43%	1.52%	1.22%	1.26%	5.83%	8.43%	2.83%	3.82%	0.00%			

Graph



Control diagram



■VISCOELASTICITY MEASUREMENT, MODEL ANG-R4 (OPTIONAL)

Test chamber	Biconical-die
Oscillation frequency	6cpm (0.1Hz) to 1200cpm (20Hz) *Note: cpm=Cycles per minute*
Strain	0.7 to 400% (0.05 to 29 degrees)
Test mode	Temperature, Strain, Frequency distribution
Measurement parameters	G'(Storage modulus), G"(Loss modulus), tan δ , S*(Complex torque)

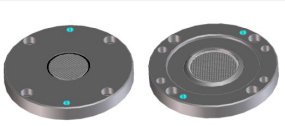
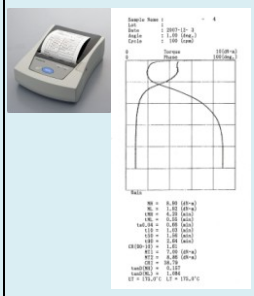
Note: Spread sheet application is required.(Not included in the model ANG-R4)

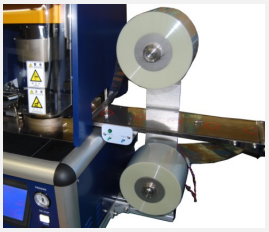
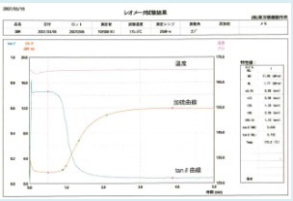
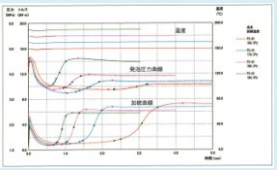
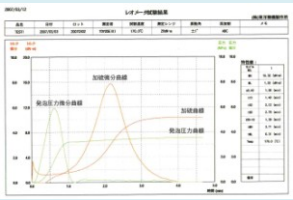
■VISCOCITY MEASUREMENT, MODEL (OPTIONAL)

Test standard	ISO 13145 (Rubber - Determination of viscosity and stress relaxation using a rotorless sealed shear rheometer)
Test chamber	Biconical-die
Preheat time	1 min. (Arbitrary setting possible)
Oscillation frequency	6cpm (0.1Hz) (Arbitrary setting possible) *Note: cpm=Cycles per minute*
Strain	±150% (Arbitrary setting possible)
Measurement parameters	G'(Storage modulus), G"(Loss modulus), tan δ , S*(Complex torque)

■STANDARD ACCESSORIES & OPTIONS

●Standard ○Option

	Name	Model (Part No.)	Remarks	Photo	RLR-4
1	Test chamber, Flat-plate-die type	-----	-----		●
2	O-Ring for upper die (For flat-plate die)	P-39 (4202800)	-----		●
3	O-Ring for lower die (For flat-plate die)	P-32 (4202801)	-----		●
4	Test chamber, Biconical-die type	-----	For ASTM 5289 / ISO 6502, *ISO 13145 **Optional software required*		○
5	O-Ring for upper die (For Biconical-die)	WP-28-4F	-----		○
6	O-Ring for lower die (For Biconical-die)	WP-28-4D	-----		○
7	Data processing unit including data processing software	CON-L	Computer, Display, Printer, Rack and data processing software Dimensions: Approx. W600 x D700 x H1350mm Net weight: Approx. 30kg Note: Application software (such as spreadsheet) is not included.		○
8	Mini printer	CP1-R4	Printing system: Thermal dot system Printing paper: 80mm width thermal paper Printing item: Curing curve, Characteristic values		○
9	Pin type automatic sample feeder	ROB-R4	Feeding method: Conveyor belt + Pin Ejection method: Ejector pin Number of samples: Max. 84 pcs.		○
10	Film type automatic sample feeder (84 samples model)	ROBF84	Feeding method: Conveyor belt + Pin Ejection method: Film Number of samples: Max. 84 pcs.		○

11	Film type automatic sample feeder (6 samples model)	ROBF06	Feeding method: Film Ejection method: Film Number of samples: Max. 6 pcs.		○
12	Film for automatic sample feeder	4203001	Length: 1000m Width: 120mm		○
13	Viscoelasticity measurement *Note:Biconical-die & data processing unit model CON-L required*	ANG-R4	Measurement item: ■ G' (Storage modulus) ■ G"(Loss modulus) ■ tan δ ■ S*(Complex torque)		○
14	Phase angle measurement *Note:Data processing unit model CON-L required.*	PHA-J PHA-A	Measurement item: tan δ (ML, MH) tan δ indicates the ratio of viscosity element with regard to elastic element taking the phase angle (δ) of sample's storage elastic modulus (elastic element) and loss elastic modulus as tan δ . This value allow to evaluate physical properties of rubber.		○
15	Programmed heating *Note:Data processing unit model CON-L required.*	PTC-R4	Heating rate: Max. 16°C/min. Temperature change points: Max. 5 points		○
16	Foaming pressure measurement	HP-R4	By simultaneously measuring aging of curing and foaming, relation between curing and the temperature that affects decomposition rate of foaming agent, kind and quantity of decomposition agent and grain size of foaming agent, etc. can be quantitatively evaluated. By differentiating the curing curve and foaming pressure curve, timings of maximum curing and maximum foaming can be determined. Pressure measurement range: 0~7MPa Measurement accuracy: ±1%/FS Resolution: 0.01MPa	 	○

17	Table for main unit *(For main unit alone)*	DAI-S	Dimensions: W900 x D750 x H740mm Load capacity: 300kg		○
18	Table for main unit *(For main unit & automatic sample feeder)*	DAI-L	Dimensions: W1200 x D750 x H740mm Load capacity: 300kg		○
19	Air Filter	DC-R4	Inlet air condition: Pressure: Max. 0.7MPa Flow rate: 500L/min.		○

Note:

Note:

Specifications are subject to change without notice.

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