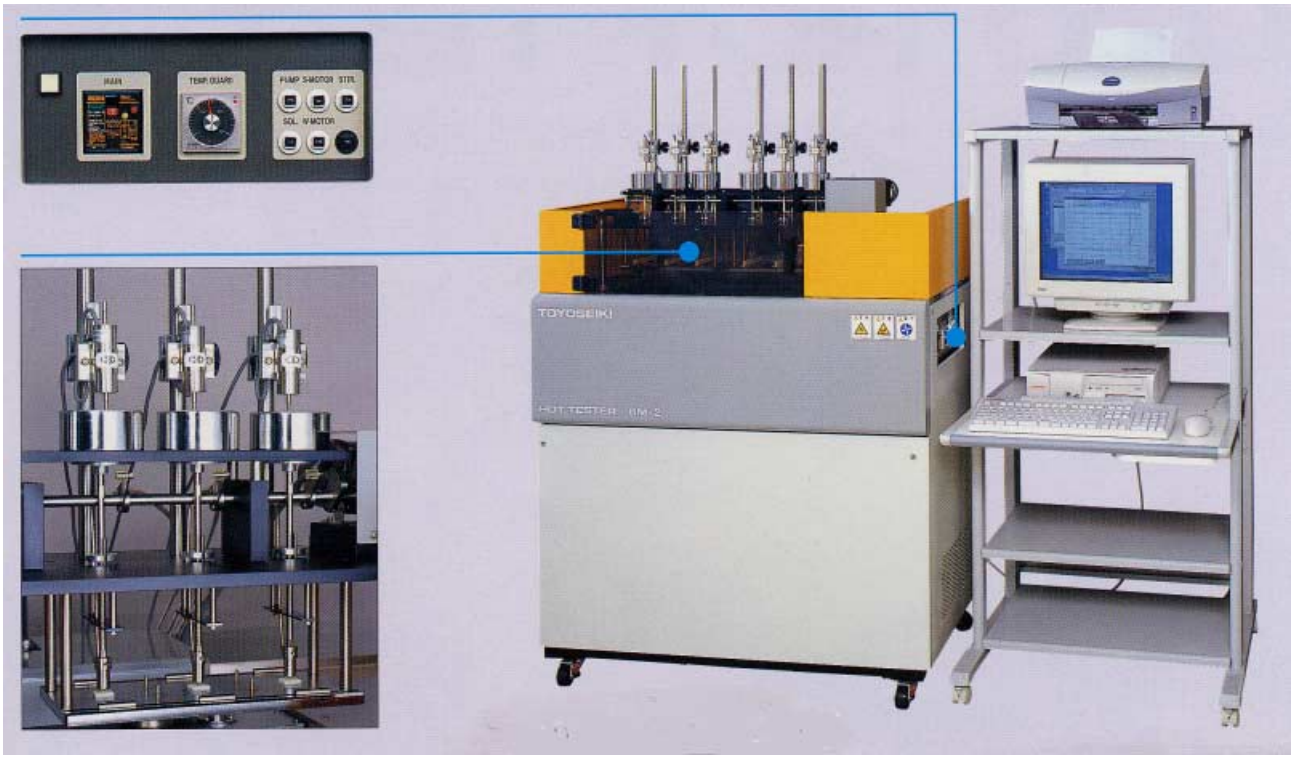
TOYO SEIKI SEISAKU-SHO, LTD.
15-4, Takinogawa 5-chome, Kita-ku, Tokyo 114-8557, Japan
Phone: 81-3-3916-8183 Fax: 81-3-3916-8173
http://www.toyoseiki.co.jp

No. 533 HDT Tester

Deflection Temperature Under Load (DTUL), Vicat Softening Temperature, Ball Pressure Tester



APPLICATION

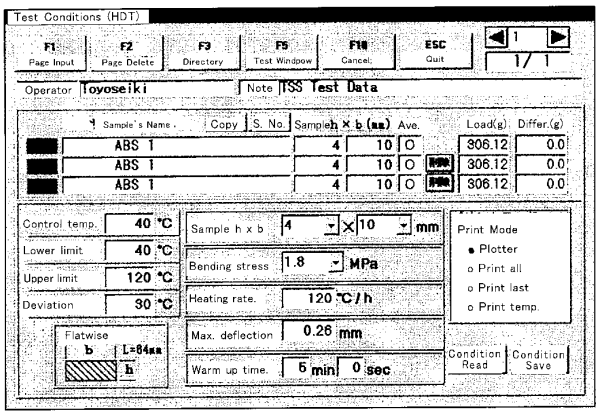
This machine evaluates thermal properties of plastics according to the following standards.

- Deflection Temperature Under Load (DTUL) testing method JIS K 7191-1, 2 (ISO 75-1, 2)
- Vicat Softening Temperature (VST) testing method JIS K 7206 (ISO 306)
- Ball Pressure Temperature testing method (IEC, 335-1)

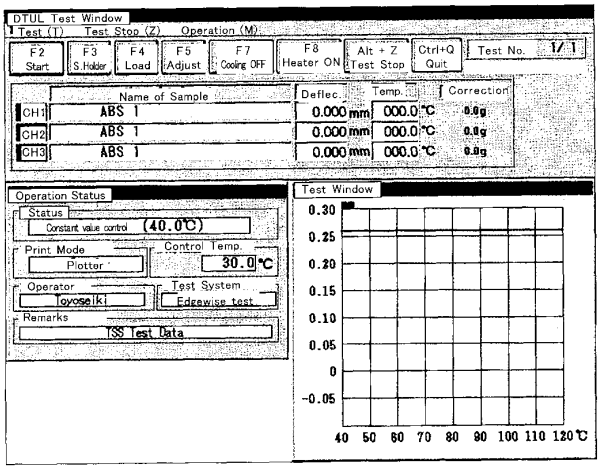
In testing deflection temperature under load, a specified bending stress is applied by means of a presser to the sample immersed in oil tank and temperature of the heating medium (oil) is raised at constant rate and the temperature when the sample attains specified deflection is determined as the deflection temperature under load (DTUL). There are flatwise testing method and edgewise testing method according to the direction of bending of sample. After conducting test, the heating medium is safely cooled at fast rate by means of an externally installed heat exchanger and repeated tests are automatically continued. Moreover, this machine can also determine vicat softening temperature (VST) manually or automatically by changing the presser with a needle shaped presser and measuring the temperature at which the needle penetrates 1mm into the sample. In addition, by manual operation it can also conduct ball pressure test specified as heat resistance test for electric products by changing the presser, etc.

TEST WINDOWS

Test condition input window

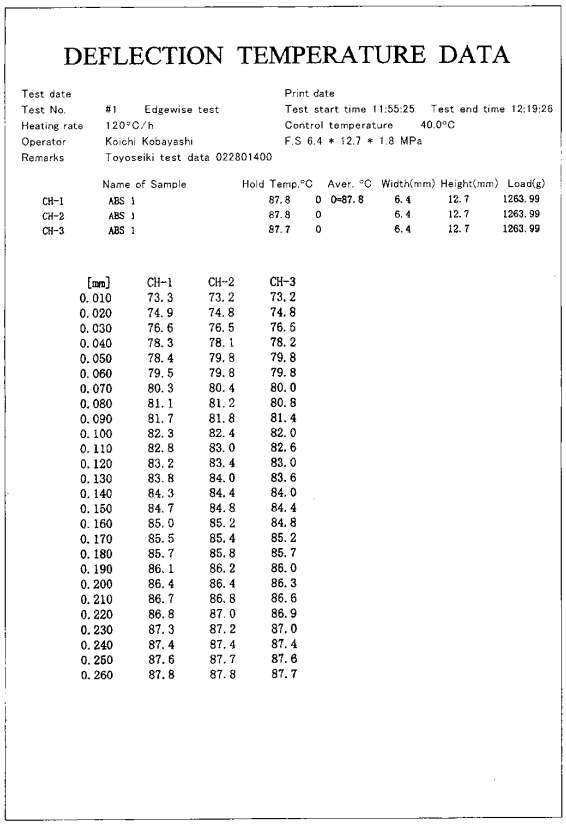


DTUL test window



TEST DATA

Print all mode (Deformation temperature list)



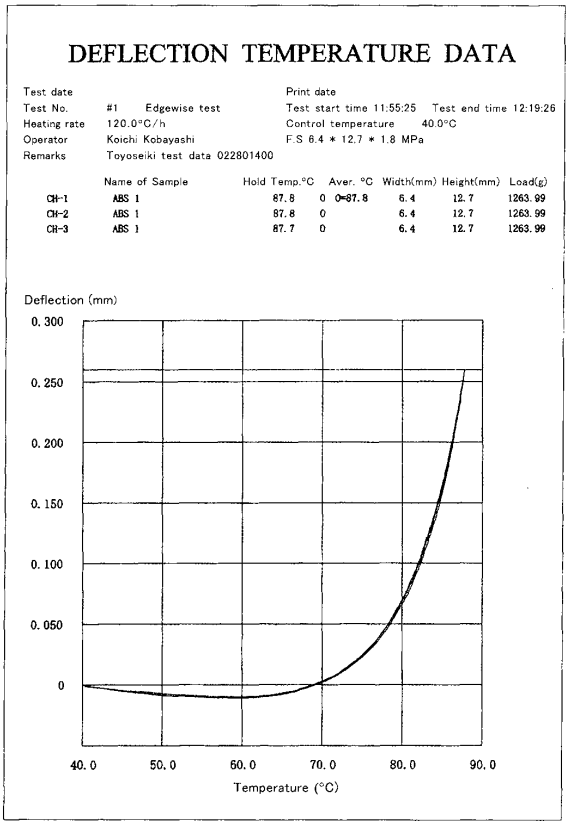
DEFLECTION TEMPERATURE DATA

Test date — Print date
Test No. #1 Edgewise test — Test start time 11:55:25 Test end time 12:19:26
Heating rate 120°C/h — Control temperature 40.0°C
Operator Koichi Kobayashi — F.S 6.4 * 12.7 * 1.8 MPa
Remarks Toyoseiki test data 022801400

	Name of Sample	Hold Temp.°C	Aver. °C	Width(mm)	Height(mm)	Load(g)
CH-1	ABS 1	87.8	0 0=87.8	6.4	12.7	1263.99
CH-2	ABS 1	87.8	0	6.4	12.7	1263.99
CH-3	ABS 1	87.7	0	6.4	12.7	1263.99

[mm]	CH-1	CH-2	CH-3
0.010	73.3	73.2	73.2
0.020	74.9	74.8	74.8
0.030	76.6	76.5	76.5
0.040	78.3	78.1	78.2
0.050	78.4	79.8	79.8
0.060	79.5	79.8	79.8
0.070	80.3	80.4	80.0
0.080	81.1	81.2	80.8
0.090	81.7	81.8	81.4
0.100	82.3	82.4	82.0
0.110	82.8	83.0	82.6
0.120	83.2	83.4	83.0
0.130	83.8	84.0	83.6
0.140	84.3	84.4	84.0
0.150	84.7	84.8	84.4
0.160	85.0	85.2	84.8
0.170	85.5	85.4	85.2
0.180	85.7	85.8	85.7
0.190	86.1	86.2	86.0
0.200	86.4	86.4	86.3
0.210	86.7	86.8	86.6
0.220	86.8	87.0	86.9
0.230	87.3	87.2	87.0
0.240	87.4	87.4	87.4
0.250	87.6	87.7	87.6
0.260	87.8	87.8	87.7

Plot mode (Deformation process curve)



DEFLECTION TEMPERATURE DATA

Test date — Print date
Test No. #1 Edgewise test — Test start time 11:55:25 Test end time 12:19:26
Heating rate 120.0°C/h — Control temperature 40.0°C
Operator Koichi Kobayashi — F.S 6.4 * 12.7 * 1.8 MPa
Remarks Toyoseiki test data 022801400

	Name of Sample	Hold Temp.°C	Aver. °C	Width(mm)	Height(mm)	Load(g)
CH-1	ABS 1	87.8	0 0=87.8	6.4	12.7	1263.99
CH-2	ABS 1	87.8	0	6.4	12.7	1263.99
CH-3	ABS 1	87.7	0	6.4	12.7	1263.99

PERFORMANCE

(1) Oil Cooling System

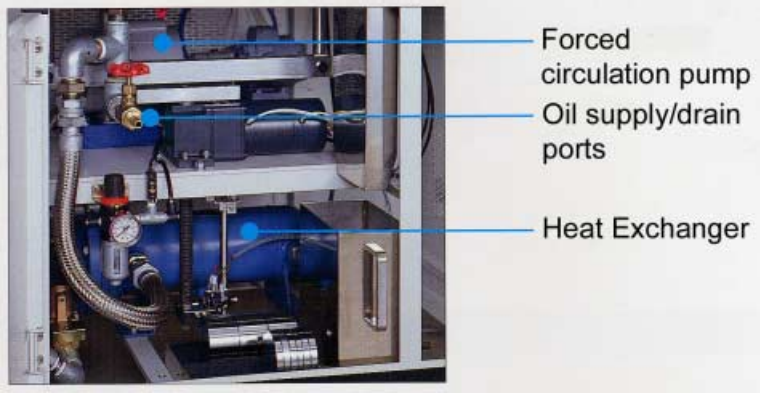
- To ensure safety the cooling system employs a water-cooled type heat exchanger installed outside the oil tank and the oil is cooled by forced-circulating by means of pump. (In conventional cooling system using a cooling coil placed inside the oil tank, there is danger of water leakage inside the tank, causing damage)
- Oil is easily supplied by using forced circulation pump.
- Since heat exchanger is used for cooling, cooling speed is faster compared to conventional cooling system of placing cooling coil inside the oil tank, thus considerably shortening the cooling cycle.

  (Example)

  300°C→30°C cooling (Water temp. 25°C)

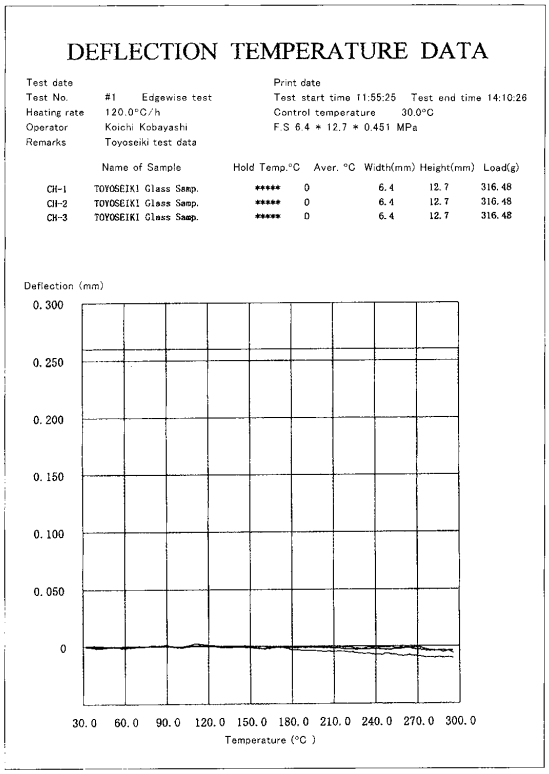
  Cooling coil-in-tank system…Approx. 55 min.

  Heat exchanger cooling sytem…Approx. 18 min.



(2) Distortion of measuring unit due to heating is automatically corrected by the computer and the measured value is directly read.

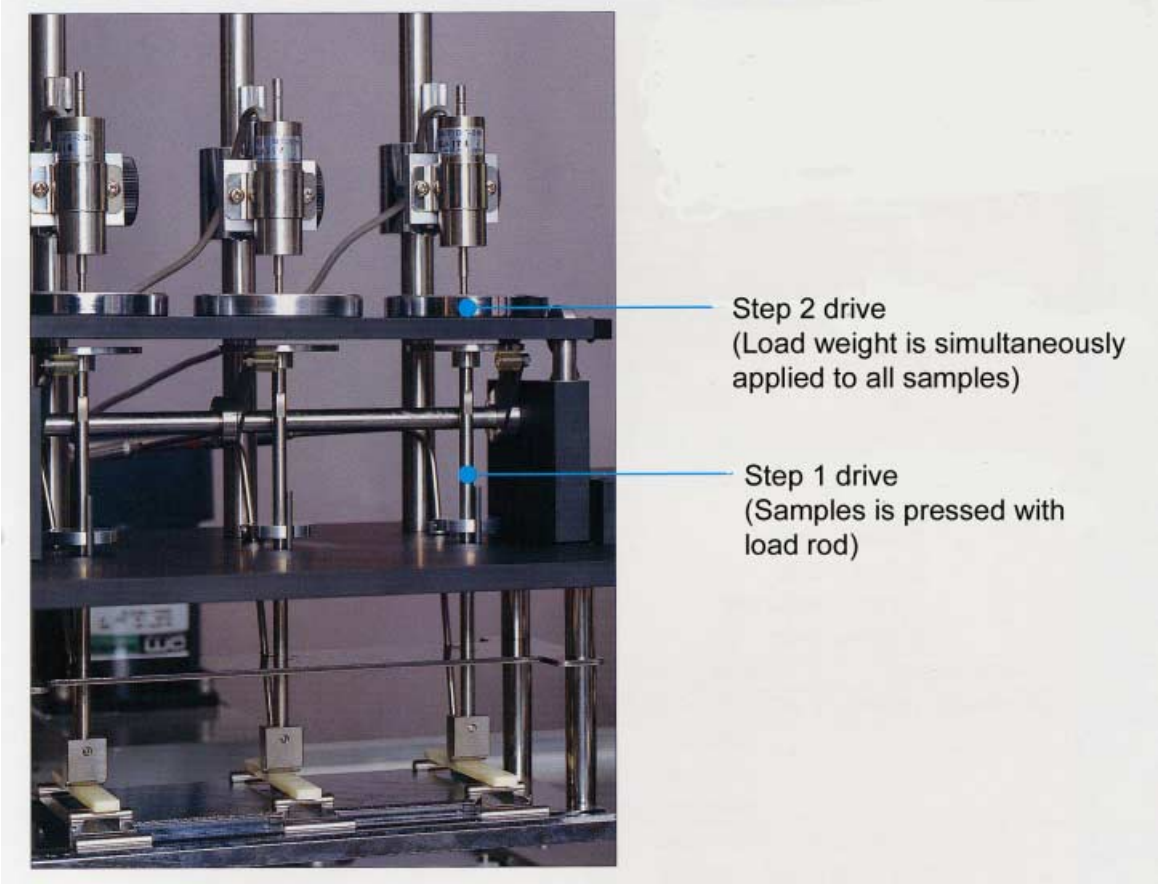
Zero point shift after measuring unit's distortion correction



LOAD SYSTEM

2-Step Split Load System (patent pending)

After putting the load rod on the sample, weight is applied simultaneously to all samples (3 or 6 samples), therefore creep correction (change of distortion with time due to stress) of sample during 5 minutes before heating is correctly performed.
Also compiles with split load system of vicat test (ISO 306).



SAFETY DEVICES

Temperature	1. When the temperature of oil tank reaches the upper limit on computer screen, the heater shuts off and oil cooling starts. (Arbitrary setting) 2. When the oil tank temperature reaches the limit set by the sample overheat protector, the heater circuit and machine operation circuit shut off. (Arbitrary setting) 3. Machine overheat protector: Same as above (Fixed approximately 10ºC higher than the maximum specified temperature of the machine.)
Mechanical	1. An optical sensor and a microswitch are used at each normal operation stop position. The microswitch is equipped for safety to directly shut off each motor circuit in case the sensor becomes abnormal. 2. Each motor is equipped with a circuit-protector or circuit-breaker circuit to shut off the motor when an overcurrent flows. A circuit to shut off the drive current when operating longer than the set time is also equipped.
Water	Equipped with a circuit to stop the oil circulation pump motor when cooling water does not flow.
Other	An I/O check window is provide to easily check the above-mentioned sensors, which facilitates quick recovery by quickly detecting and replacing faulty sensor.

SPECIFICATIONS

Model	**3M-2**	**6M-2**
Sample holders	3	6
Test temperature range	RT ~ 300°C	
Test tank	Oil tank (apr. 16L)	Oil tank (apr. 28L)
Heating rate	120°C/h, 50°C/h (arbitrary setting by computer)	
Temperature distribution	±0.5°C (near the sample) Pt sensors installed near each samples	
Temperature control system	PID control, SSR drive system	
Temperature sensor	Pt temperature sensor (Pt 100Ω class A)	
Number of temp. sensor	4 (with control Pt sensor)	7 (with control Pt sensor)
Displacement measurement	Differential transformer, 1/1000mm indication, 0~±2mm measurement	
Stirrer	Parallel circulation system by propeller type stirrer	
Cooling system	U tube type heat exchanger (forced oil circulation system 200W motor) installed outside oil tank	
Test items	1. Flatwise test (DTUL)…standard 2. Edgewise test (DTUL)…option 3. Vicat test (VST)…option 4. Ball pressure test…option	
Weight	1. For Flatwise test: 0.45MPa & 1.80MPa (standard) 2. For Egewise test: 0.45MPa & 1.80Mpa (option. These are different from Flatwise weights) 3. For Vicat: 10N, 50N (option) 4. For ball pressure: 20N (option)	
Control & data acquisition	Windows® 2000 based personal computer & software (English)	
Dimensions	72(W) x 63(D) x 135(H) cm	101(W) x 63(D) x 138(H) cm
Net weight	Approx. 150kg	Approx. 180kg
Electrical (Other voltages also possible)	AC100V, 1-P, 2.7kVA	AC100V, 1-P, 4.5kVA

OPTIONS

1	Edgewise test (DTUL)	Weights: 1. 1/2-0.45MPa (sample size: l:127mm, h:12.7mm, b:12.7mm) 2. 1/2-1.80MPa 3. 1/4-0.45MPa (sample size: l:127mm, h:6.4mm, b:12.7mm) 4. 1/4-1.80MPa 5. 1/8-0.45MPa (sample size: l:127mm, h:3.2mm, b:12.7mm) 6. 1/8-1.80MPa 7. 4x10-0.45MPa (sample size: l:110mm, h:4.0mm, b:10.0mm) 8. 4x10-1.80MPa
2	Vicat test (VST)	Weights: 10N, 50N Needle: 1mm^2
3	Ball pressure test	Weight: 20N Presser: Ball type Support for ball
4	Calibration kit	1. Dummy resistor for temperature calibration (0°C, 300°C) …1 pc. each 2. Micrometer for displacement calibration…1 pc.
5	Secondary cooling device (Refrigerator)	For cooling oil below room temperature
6	Silicon oil	15~18L/can