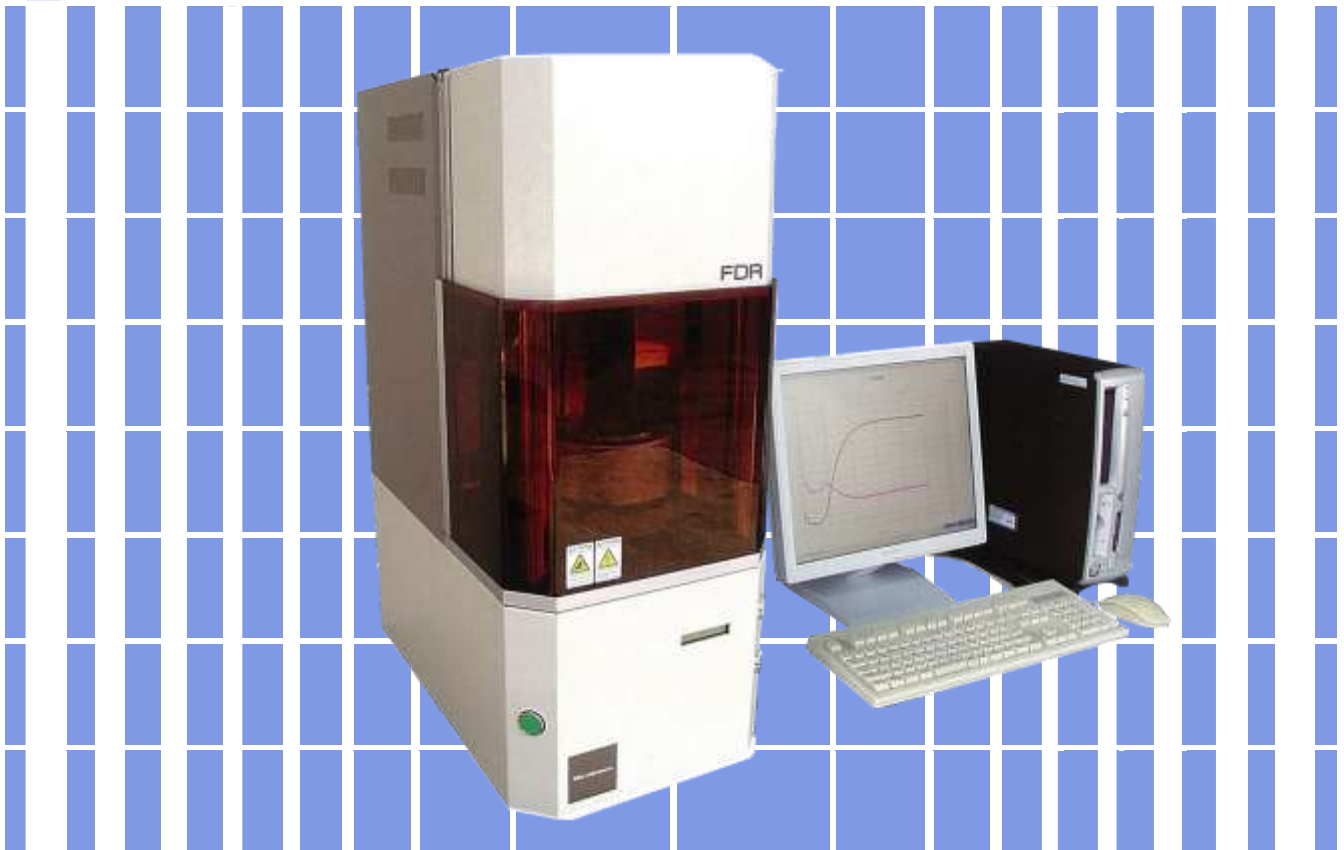




限りある資源と美しい自然を大切に

# FDR<sup>®</sup> SERIES VR-3110

## FLAT DIE RHEOMETER



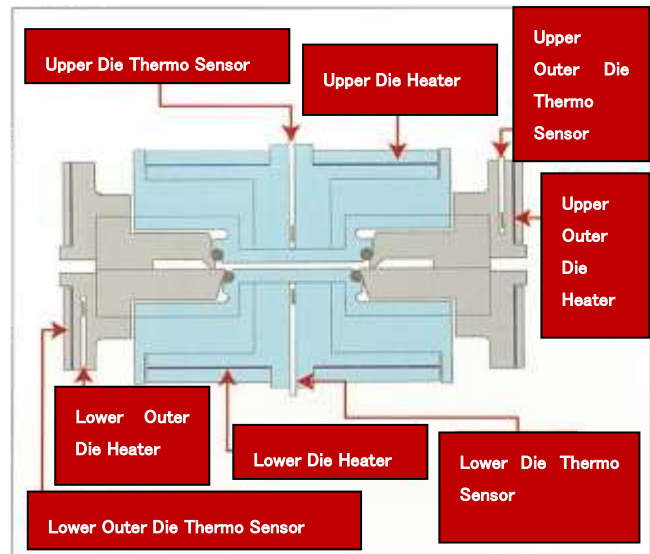
UESHIMA SEISAKUSHO CO., LTD.



FDR  
Vulcanization  
Tester



- Shortened warm-up time.
- Shortened temperature recovery time after placing a sample.
- Excellent repeatability of test results.



< Construction of Torsional Vibration-type Flat Plate Die >

## Applicable Standard

### JIS K6300-2, ISO 6502

(Oscillating Sealed Flat Die Cavity Rotorless Curemeter)  
FDR (Flat Die Rheometer), manufactured by Ueshima Seisakusho Co., Ltd., is a high precision rubber vulcanization tester in conformity to Japanese Industrial Standard (JIS) and International Organization for Standardization (ISO). It gives small sinusoidal vibration that does not destroy the compounded rubber and expresses the torque that changes with the progress of vulcanization as a function of time (vulcanization curve), and shows the physical properties like minimum torque, the maximum torque, the scorch time, the vulcanization time and viscoelastic properties.

## Application

- Measurement of vulcanization characteristics of compounded rubber along with the vulcanization process.
- Measurement of viscosity of raw and compounded rubber.

## Outstanding Features

- Excellent Temperature Control by 4HD (4 Heater Drive)  
(Film Heaters are adopted and each of them is controlled by PID.)

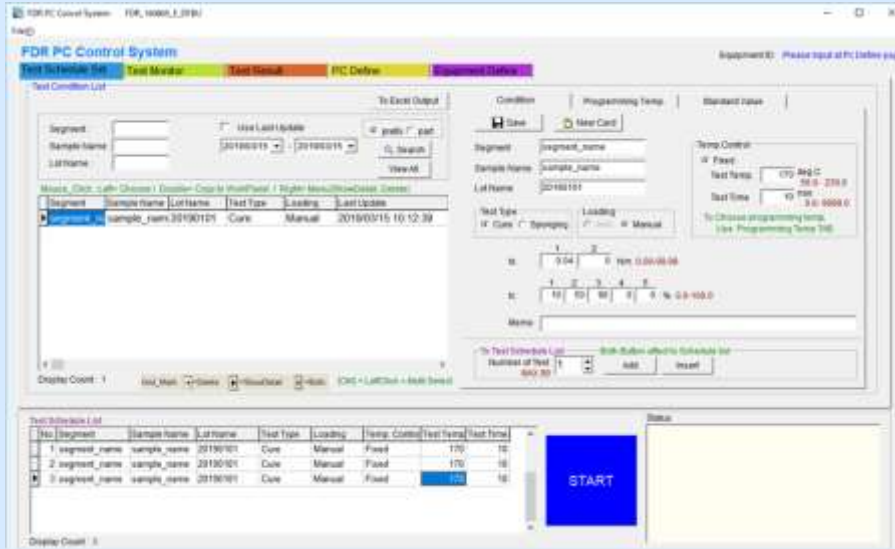
- Compact and Lightweight (Minimized installation space)
- Conical drive, which adopts conical rotary movement, realizes an accurate sinusoidal oscillation.
- Simple Calibration System
  - Automatic Calibration of Load Cell by Electric Calibration System
  - Automatic Calibration of Phase and Torque by a Dynamic Calibrator

Dynamic Calibration



- Easy Operation and Data Management by PC
  - The measurement results can be easily exported to spreadsheet software like EXCEL, enabling easy preparation of reports, histograms and control charts.
- Unitization of Each Unit for Easy Maintenance
  - Heater, load cell and other input / output related amplifiers are unitized into a PCB in the machine.
  - Supply of units such as heater and temperature sensor

## Test Condition Input Screen of PC



### Vulcanization Test

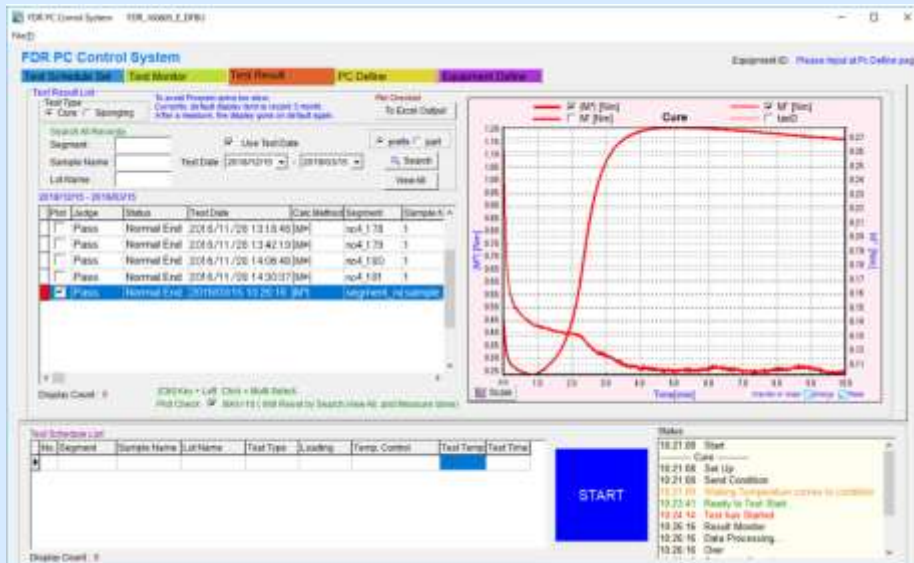
<Input Items>

- ① Testing Temperature
- ② Test Time※
- ③ Ts Scorch Time
- ④ Tc Vulcanization Time

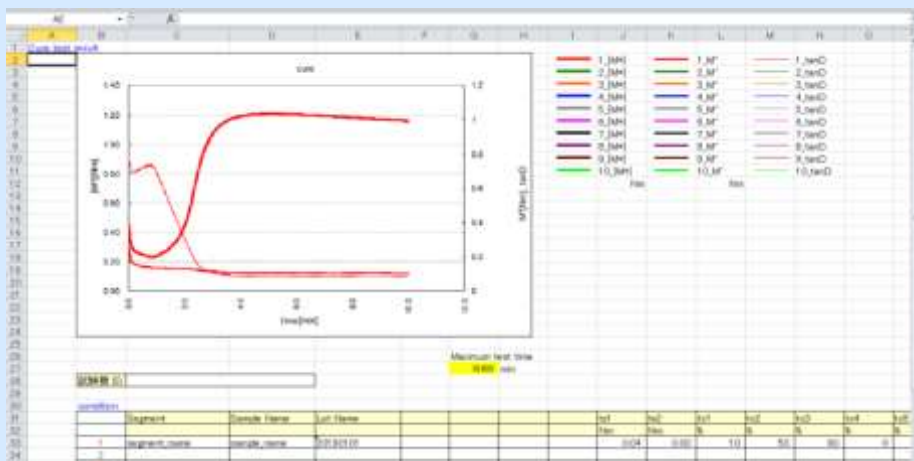
※Changeable during a test

## Data Base

### ● Test Result Confirmation Screen

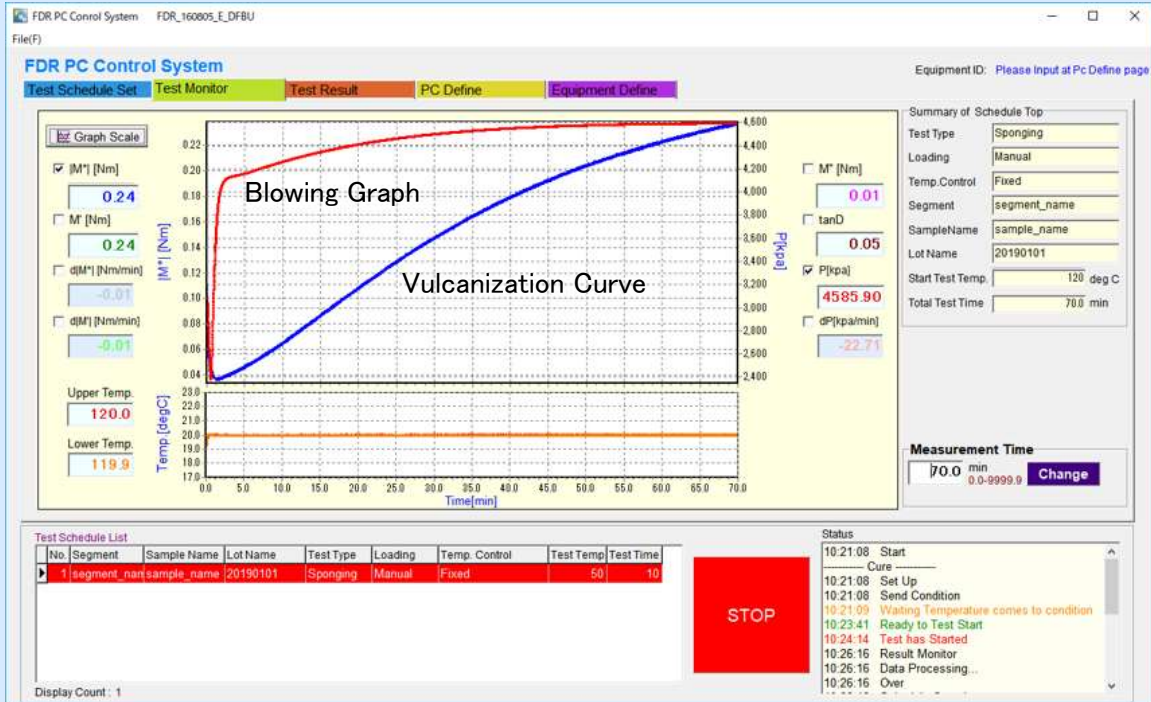


### ● Test Results Exported to EXCEL



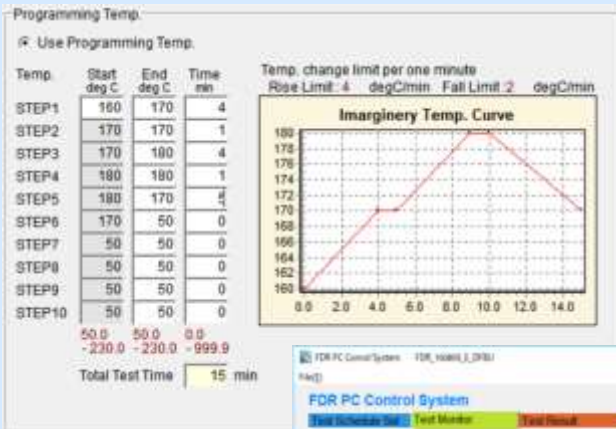
# FDR Sponging Pressure Measurement (VR-3111)

## ◆ Blowing Characteristics Test



# FDR Programmable Temperature Control (Option)

## ◆ Vulcanization Test under Programmable Temperature Control

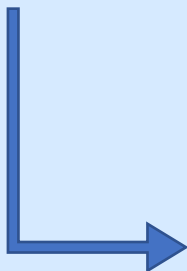


<Settings of Programmable Temperature Control Test>

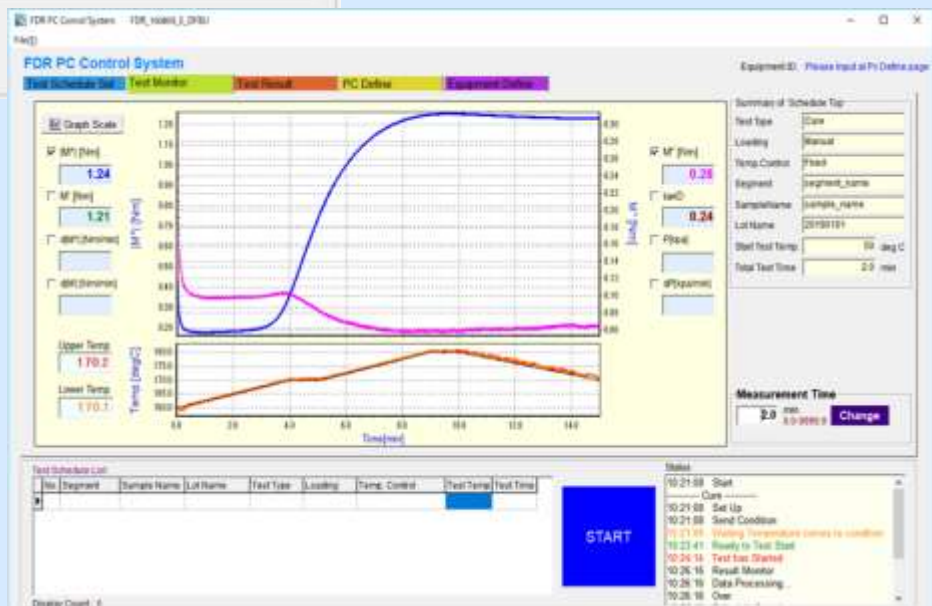
Temperature Setting: Settable up to 10 steps

Temperature Rising Condition: Less than 4° C/minute

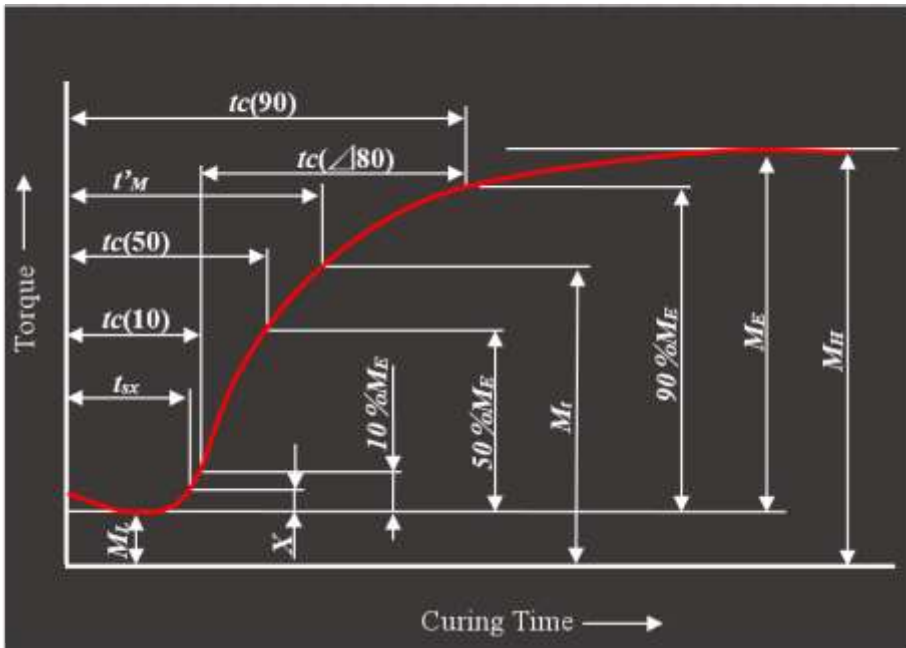
Temperature Lowering Condition: Less than 2° C /minute



Temperature Profile



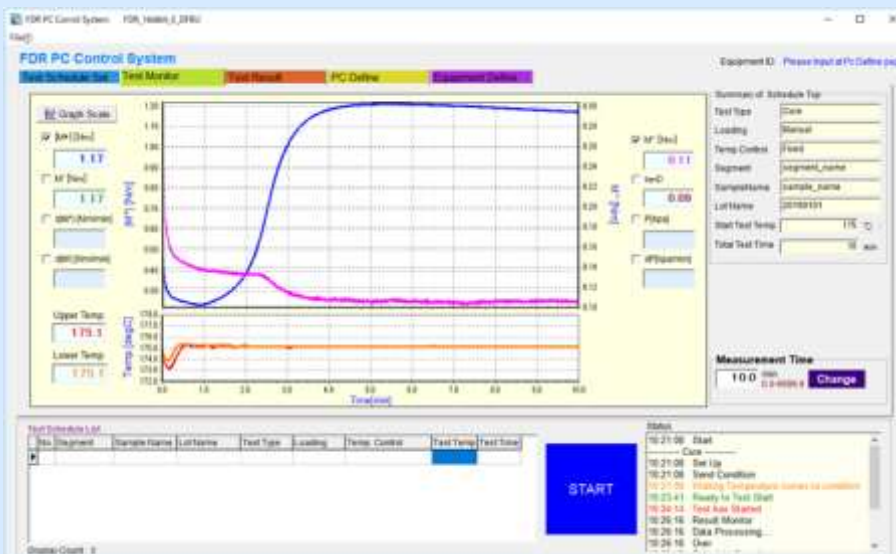
# Measurement Principle



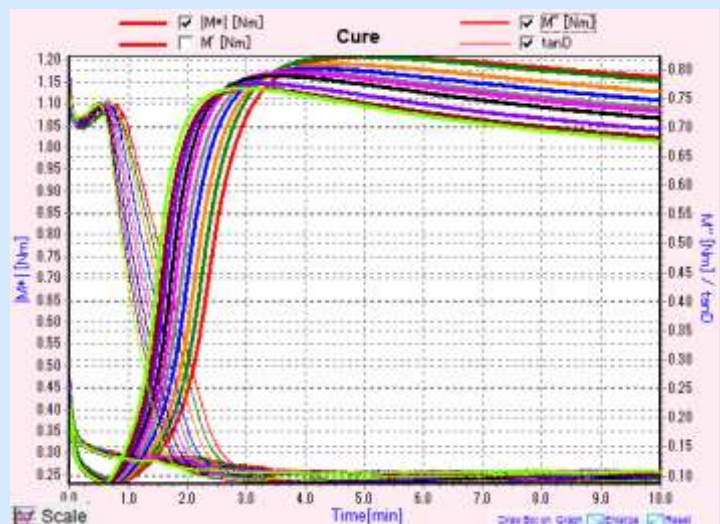
By placing compounded rubber between the upper and lower dies at a specified temperature, it measures torque which varies with rubber vulcanization while being subjected to sinusoidal torsional vibration. The vulcanization characteristics can be obtained while tracing changes in viscoelasticity during vulcanization process.

## FDR Standard Type (VR-3110)

### ◆Vulcanization Test



◆The vulcanization curve can be measured in every 1°C.



## Specifications

| MODEL                           | VR-3110                                                                                                                                                                                                                     | VR-3111                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Name                            | FDR (Standard type)                                                                                                                                                                                                         | FDR (Sparging pressure type)          |
| Applicable Standard             | JIS K 6300-2, ISO 6502                                                                                                                                                                                                      |                                       |
| Shape of Die                    | No friction flat sealed cavity (JIS & ISO compliant)                                                                                                                                                                        |                                       |
| Pressurizing Method             | Pneumatic Cylinder (Oil-less type) Cylinder Inner Diameter: 160mm                                                                                                                                                           |                                       |
| Oscillation Drive Method        | Sinusoidal Vibration Mechanism by Conical Rotational Motion "Cone Drive"                                                                                                                                                    |                                       |
| Oscillation Drive Motor         | Synchronous Motor 25W AC100V                                                                                                                                                                                                |                                       |
| Oscillation Transmitting Method | Elastic Connection by Leaf Spring                                                                                                                                                                                           |                                       |
| Frequency                       | 1.67Hz (100cpm)                                                                                                                                                                                                             |                                       |
| Oscillation Angle               | ±1°                                                                                                                                                                                                                         |                                       |
| Oscillation Angle Accuracy      | 2±0.03° (Without Load)                                                                                                                                                                                                      |                                       |
| Torque Detecting Method         | Strain Gauge Type Load Cell                                                                                                                                                                                                 |                                       |
| Torque Transmission Method      | Elastic Connection by Leaf Spring                                                                                                                                                                                           |                                       |
| Sparging Pressure Measurement   | -                                                                                                                                                                                                                           | 0 to 6000kPa (no applicable standard) |
| Testing Temperature Range       | 50 to 230°C                                                                                                                                                                                                                 |                                       |
| Temperature Control Accuracy    | Die Temperature: ±0.3°C at 190°C<br>Internal and External Die Temperature Difference: ±1.0°C at 190°C                                                                                                                       |                                       |
| Heat Control Method             | Independent PID Control on four pieces of Film Heaters (Upper / Lower Die, Upper Outer / Lower Outer Die)                                                                                                                   |                                       |
| Temperature Sensor              | Pt100 4pcs                                                                                                                                                                                                                  |                                       |
| Maximum Testing Time            | 9999minutes                                                                                                                                                                                                                 |                                       |
| Shield Cover                    | Colored Acrylic on Front and Sides (Preventing external air and for Safety)                                                                                                                                                 |                                       |
| Safety Equipment                | (1) Two-hand Press Start Switch (Cylinder lifts only when both buttons are pressed simultaneously.)<br>(2) Overload Protection (more than 22N·m)<br>(3) Overheat Protection (Heater will be turned off at 240°C or higher.) |                                       |
| Communications                  | RS232C                                                                                                                                                                                                                      |                                       |
| Utilities                       | (1) Power Source: AC100V, Single Phase, Power Consumption less than 700VA<br>(2) Air Source: Dry Air 0.343 to 0.7MPa                                                                                                        |                                       |
| Dimensions and Weight           | Approx.333(W)×520(D)×780(H)mm, Approx.110kg                                                                                                                                                                                 |                                       |
| Standard Items                  | (1) Equipment main unit: 1 set<br>(2) Accessories 1set (Software, Calibration Kit, Special Tool,)                                                                                                                           |                                       |

● The PC is basically to be provided by the customer. The following PC specifications are recommended.

OS : Windows 10 or later CPU : Intel Core i3 or higher Memory : 8 GB or more Storage : 256 GB or more

Serial port : × 1

Slots : VR-3111 requires 1pc PCI Slot

Display : 1280 × 1024 Software : Microsoft Excel

## Option

● Programmable Temperature Control

[Application] It simulates vulcanization of large sized rubber products, continuous vulcanization, mold vulcanization, etc. to examine vulcanization characteristics with rising temperature at a preset temperature rise.

UESHIMA SEISAKUSHO CO., LTD.

<Manufacturer>

# Ueshima

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<https://www.ueshima-seisakusho.co.jp>

※Please be noted that the contents in this brochure may change without prior notice due to improvement of the equipment. 027-468685-8