

# **INSTRUCTION MANUAL**

Viscotester

**VT-03F / VT-04F**



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## Organization of This Manual

This manual describes the features and operation of the viscotester VT-03F (for low viscosity measurement) and VT-04F (for high viscosity measurement). The manual contains the following sections.

### Outline

Gives basic information on the configuration and features of the unit.

### Parts and Functions

Briefly identifies and explains all controls and other parts of the unit.

### Preparations

Explains how to make power connections and how to mount the rotor and cup.

## Measurement

Describes how to perform the measurement.

## Rotor Extension (for VT-04F)

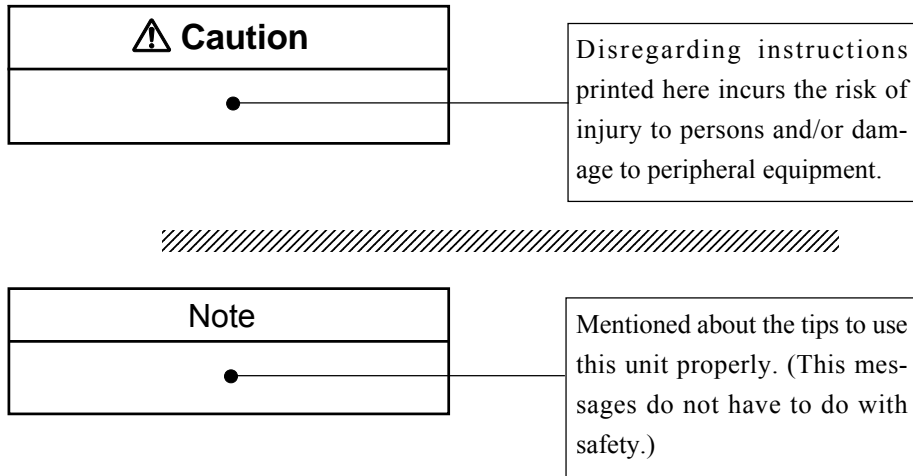
Describes rotor extension.

## Specifications

Lists the technical specifications of the unit.

## FOR SAFETY

In this manual, important safety instructions are specially marked as shown below. To prevent the risk of death or injury to persons and severe damage to the unit or peripheral equipment, make sure that all instructions are fully understood and observed.



# Precautions

- VT-03F:

The unit is designed for making measurements using cup A containing about 460 mL of sample fluid. If another container is used, the viscosity resistance working on the rotor will be different, leading to deviations in the measurement result.

- VT-04F:

The No. 1 rotor and No. 2 rotor are designed for making measurements using a JIS 300 mL beaker containing about 350 mL of sample fluid. If another container is used, the viscosity resistance working on the rotor will be different, leading to deviations in the measurement result. If a different container has to be used, make sure that it is considerably larger than the JIS 300 mL beaker. In this case, the obtained measurement values will be about 5% lower.

The No. 3 rotor must be combined with the No. 3 cup, otherwise large errors will occur in the reading.

\*The actual capacity of the JIS 300 mL beaker is about 420 mL.

- The viscosity scale readings for the various rotor types overlap in part. For example, the following viscosity ranges can be measured with the following both rotors:

VT-03F: 15 to 33 mPa·s: No. 4 or No. 5 rotor

50 to 150 mPa·s: No. 5 or No. 3 rotor

VT-04F: 3 to 13 dPa·s: No. 3 or No. 1 rotor

100 to 150 dPa·s: No. 2 or No. 1 rotor

However, depending on the properties of the sample fluid and on mechanical calibration results, the obtained measurement values may be different when changing rotors. To facilitate the correct evaluation of data, you should therefore note the rotor number along with the measurement results.

- Keep the time for one measurement under 100 seconds.
- The temperature range for operation of the unit is 5°C to 35°C.
- Because the drive section is not hermetically sealed, do not use the unit in environments with volatile gas or dust pollution. Otherwise the drive section may be damaged.
- When attaching or removing a rotor, put the viscotester in a horizontal position and carefully move the rotor in the vertical direction. To prevent the possibility of damage, take care not to exert strong force on the rotor axis in the vertical or horizontal direction.
- When not using the viscotester, secure the meter indicator needle with the clamp.
- Remove the batteries from the unit when it is not being used, to prevent the possibility of damage by leaking battery fluid.



- The optional stand (VA-04) is useful to stabilize the viscotester during long-term or continuous measurements.
- In case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.



# Change in Viscosity Unit

According to Japanese and international standard agreements, the unit for viscosity has changed from Poise (P) to Pascal-seconds (Pa·s).

VT-03F:  $1 \text{ cP} = 1 \text{ mPa}\cdot\text{s}$

VT-04F:  $1 \text{ P} = 1 \text{ dPa}\cdot\text{s}$

cP = Centipoise

dPa·s = Decipascal-seconds

mPa·s = Millipascal-seconds

# Contents

FOR SAFETY .....	iii
Outline .....	1
Parts and Functions .....	2
Configuration (VT-03F) .....	2
Configuration (VT-04F) .....	3
Top Panel .....	4
Rear Panel .....	5
Display for VT-03F .....	6
Display for VT-04F .....	7
Preparations .....	8
Power Supply .....	8
Attaching the Rotor and Cup .....	12
Preparing the Sample Fluid .....	14

Measurement .....	15
Rotor Extension (for VT-04F) .....	18
Specifications .....	19

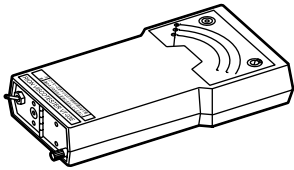


# Outline

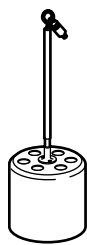
The VT-03F / VT-04F is a compact, single-cylinder type rotating viscotester designed for easy use in the field. The VT-03F is for low viscosity measurement and the VT-04F is for high viscosity measurement. A rotor turning at constant speed is inserted into the liquid to be measured. The resistance to rotor movement caused by the viscosity is measured using a special mechanism to obtain direct readings in millipascal-seconds (mPa·s) for VT-03F and decipascal-seconds (dPa·s) for VT-04F. Three different types of rotors are supplied, covering a wide range of applications.

# Parts and Functions

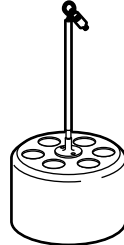
## Configuration (VT-03F)



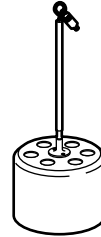
Main unit



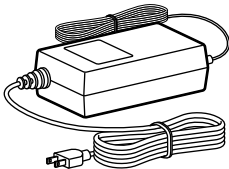
No. 3 rotor



No. 4 rotor



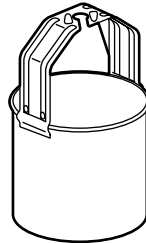
No. 5 rotor



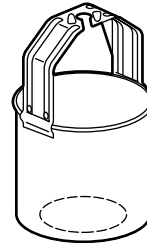
AC adapter (option)



IEC R6P  
(size AA)  
batteries



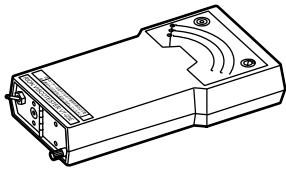
Cup A (no cutout)



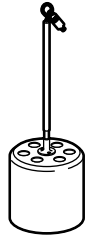
Cup B (with cutout)



## Configuration (VT-04F)



Main unit



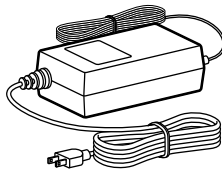
No. 3 rotor



No. 1 rotor



No. 2 rotor



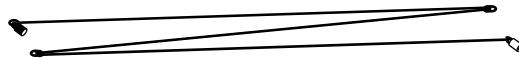
AC adapter (option)



IEC R6P  
(size AA)  
batteries



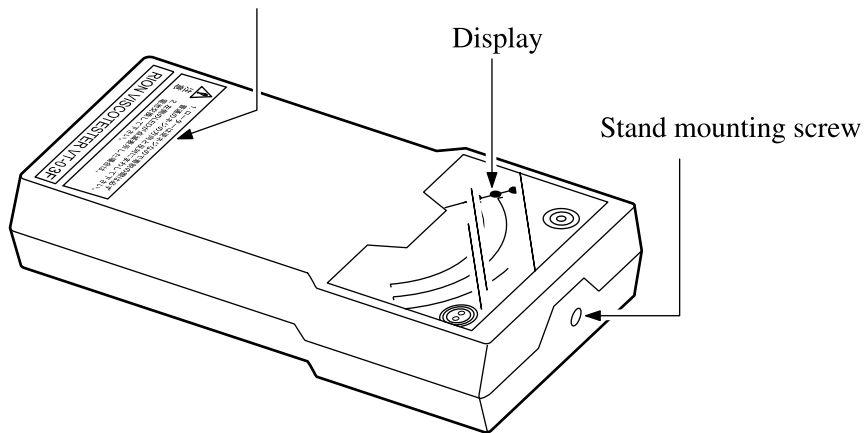
No. 3 cup



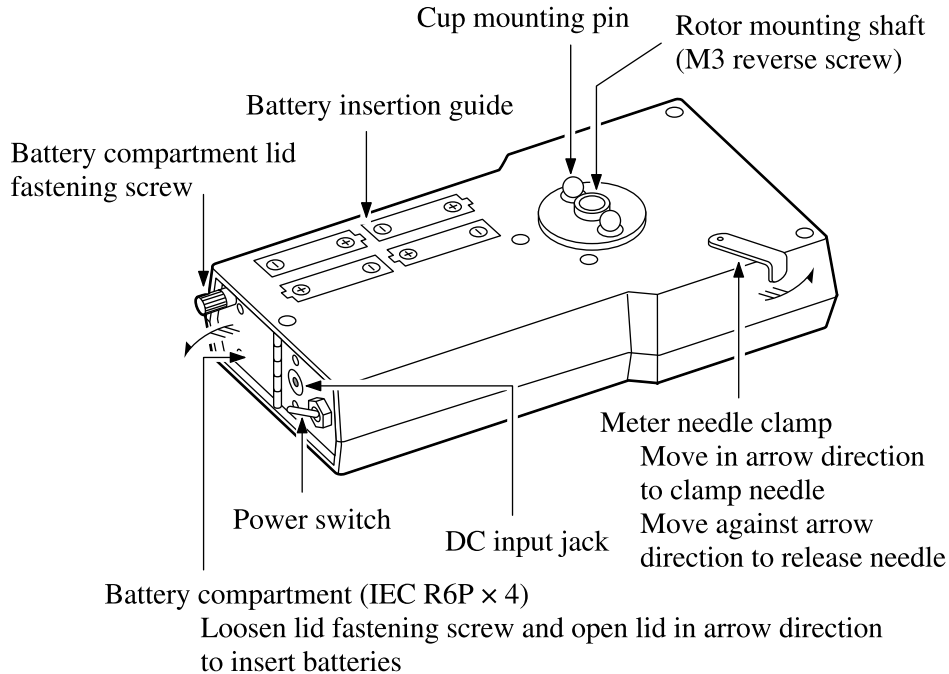
Rotor extension

## Top Panel

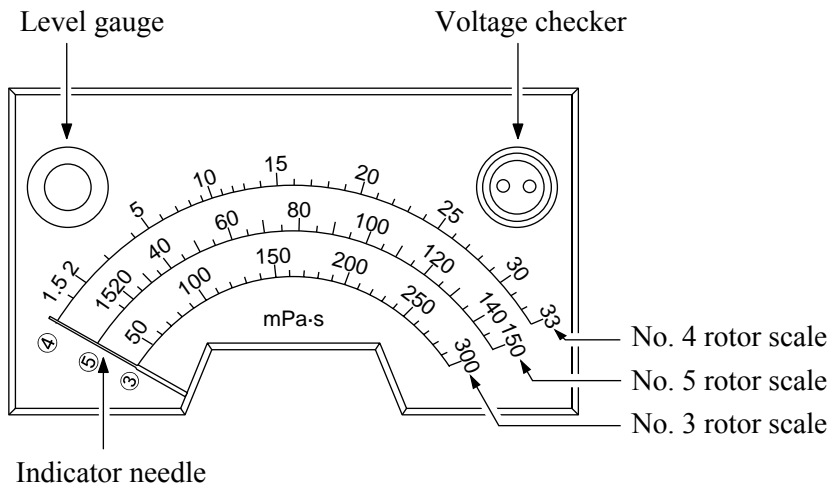
Because the rotor screw has a left-hand (reverse) screw thread, you must turn the rotor counterclockwise to screw it in. (See page 12 to 13.)



## Rear Panel



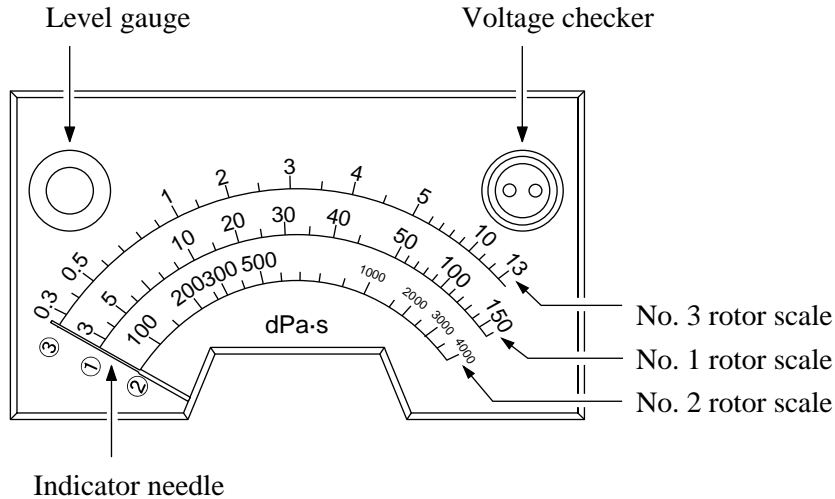
## Display for VT-03F



### Note

Scale calibrated according to JIS Z 8809 viscosity calibration standard.

## Display for VT-04F



### Note

Scale calibrated with silicon oil.

# Preparations

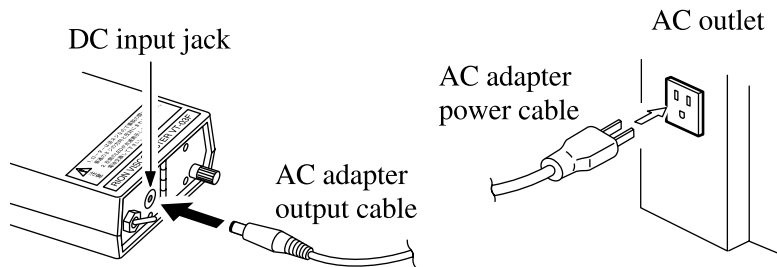
## Power Supply

### Using an AC Adapter (Optional accessory)

To power the unit from an AC adapter, plug the output cable from the adapter into the DC input jack on the viscotester and plug the AC adapter into an AC outlet rated for 100 V to 240 V AC.

#### **Caution**

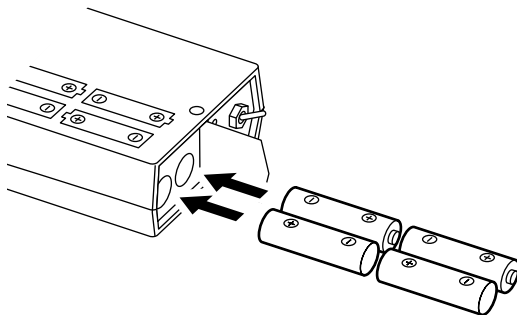
To prevent the risk of electric shock, always connect the adapter output cable to the viscotester first, and only then plug the AC adapter into the AC outlet.



## Using Batteries

To power the unit from batteries, open the battery compartment lid, insert four batteries as shown on the case, and close the lid with the fastening screw.

When preparations for powering the unit are complete, set the power switch to ON.



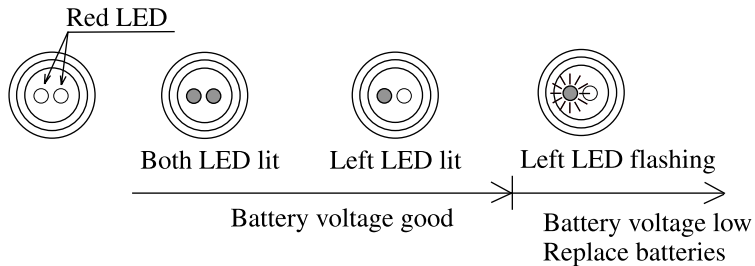


## Checking the battery voltage

During viscosity measurement, check the LEDs to verify the battery status.

When the battery voltage is low (left LED is flashing), correct measurement is not possible.

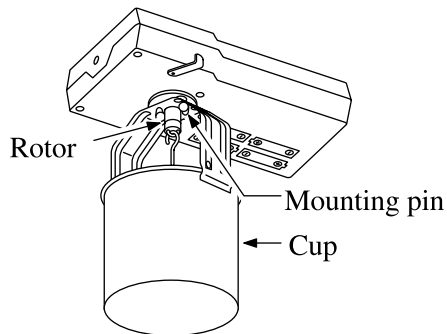
In this case, replace all four batteries with fresh ones.



## Attaching the Rotor and Cup

### Attaching the Cup

Select a suitable rotor for the viscosity of the sample fluid and insert the rotor into the cup. Taking care that the rotor does not fall out, raise the cup, engage the oval hole in the handle on the cup mounting pin of the main unit, and rotate it to the right to lock. Turn the cup again to the right to verify that it is securely fastened.



## Attaching the Rotor

Screw the rotor into the rotor mounting shaft.

### Note

- If you do not know the viscosity of the sample fluid, perform measurement using rotors in the following order: No. 3 rotor, No. 5 rotor, No. 4 rotor for VT-03F and No. 2 rotor, No. 1 rotor, No. 3 rotor for VT-04F.
- Because this is a left-hand (reverse) screw thread, you must turn the rotor counterclockwise to screw it in.
- To remove, detach the rotor first and then remove the cup.

## Preparing the Sample Fluid

VT-03F:

When using cup A (no cutout), fill the cup with sample fluid to the upper brim. When using cup B (with cutout), insert the cup into the sample fluid up to the upper brim. For both cups A and B, approximately 460 mL of sample fluid is required.

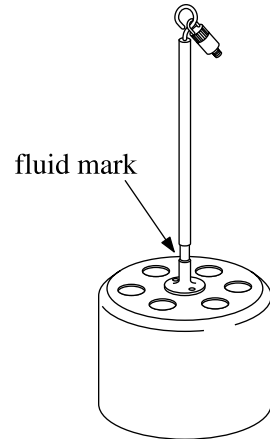
VT-04F:

Choose the rotor according to the viscosity of the sample fluid. Depending on the rotor, the required cup size also changes. For No. 1 and No. 2 rotors, use a JIS 300 mL beaker\* filled with about 350 mL of sample fluid. For the No. 3 rotor, use the No. 3 cup filled with about 170 mL of sample fluid.

\*The actual capacity of the JIS 300 mL beaker is about 420 mL.

# Measurement

1. Hold the viscotester in one hand or mount it to the optional stand (VA-04). Use the level gauge on the unit to verify that the unit is approximately horizontal.
2. Place the rotor in the center of the cup and fill in sample fluid so that it comes to about the center of the fluid mark on the rotor.
3. Move the meter needle clamp on the main unit in the opposite direction of the arrow.
4. Set the power switch to ON.



5. When the rotor starts to turn, the viscosity indicator needle temporarily deflects to the right and then balances out at the position that corresponds to the viscosity of the sample fluid. Read the viscosity value from the scale for the rotor being used. (On the rotor, the number is shown at the mounting screw section. The scale shows the rotor number at the left.)
6. When measurement is completed, set the power switch to OFF. After the needle has returned to the origin, secure it by moving the meter needle clamp in the direction of the arrow.

<b>Note</b>
The viscosity reading is calibrated according to the JIS Z 8809 viscosity calibration standard. The unit is millipascal-seconds (mPa·s) for VT-03F. The viscosity reading is calibrated using silicon oil. The unit is decipascal-seconds (dPa·s) for VT-04F.

**Note**

The battery life depends on the viscosity of the fluid being measured.

VT-03F: Using IEC R6P (size AA) batteries, about 300 measurements are possible, assuming 100 second measurements at 10 minute intervals in fluid with a viscosity of about 126 mPa·s.

VT-04F: Using IEC R6P (size AA) batteries, about 60 measurements are possible, assuming 100 second measurements at 10 minute intervals in fluid with a viscosity of about 132 dPa·s.

## Rotor Extension (for VT-04F)

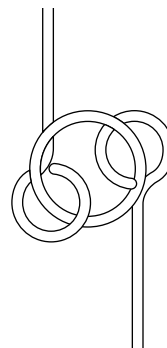
The supplied foldable rotor extension consists of three 30 cm rods joined by rings. The combined length is 90 cm. When wishing to use the extension at a length of 30 cm or 60 cm, open the connector rings with a pair of pliers, remove the desired number of elements, and rejoin the extension rods. Be sure to close the rings fully again, to prevent the extension from getting detached during use.

Attach the end with the male thread to the viscotester and the end with the female thread to the rotor.

Note that both are left-hand (reverse) screw threads, so you must turn the parts counterclockwise to screw them in.

When measuring a fluid with high viscosity, the joint will look as shown in the illustration, but this does not affect the measurement.

The rotor extension rods are made of stainless steel.





# Specifications

## Measurement range for VT-03F

- No. 4 rotor: 2 to 33 mPa·s
- No. 5 rotor: 15 to 150 mPa·s
- No. 3 rotor: 50 to 300 mPa·s

## Measurement range for VT-04F

- No. 3 rotor: 0.3 to 13 dPa·s (with No. 3 cup)
- No. 1 rotor: 3 to 150 dPa·s (with JIS 300 mL beaker)
- No. 2 rotor: 100 to 4000 dPa·s (with JIS 300 mL beaker)

## Sample fluid capacity for VT-03F

(With supplied accessories for VT-03F cup A or cup B) Approx. 460 mL

## Sample fluid capacity for VT-04F

- No. 1 and No. 2 rotor (with JIS 300 mL beaker) Approx. 350 mL
- No. 3 rotor (with No. 3 cup) Approx. 170 mL

Clearance between rotor end and cup bottom: about 15 mm

Measurement accuracy for VT-03F

Within  $\pm 5\%$  of scale maximum (using supplied cup A or cup B)

Scale calibrated according to JIS Z 8809 viscosity calibration standard

Measurement accuracy and reproducibility for VT-04F

Measurement accuracy  $\pm 10\%$  of indicated value

Reproducibility  $\pm 5\%$

(calibrated with silicon oil)

Rotor speed

62.5 rpm

Power requirements

6 V DC (four IEC R6P batteries) or AC adapter VA-05 series

Current consumption at maximum torque approx. 100 mA for VT-03F

Current consumption at maximum torque approx. 300 mA for VT-04F

## Dimensions

98 (W) × 181 (D) × 40 (H) mm (without protruding parts)

## Weight

Approx. 570 g (without batteries)

## Supplied accessories for VT-03F

No. 3 rotor (dia. 45 × 47 × 160 mm)	SUS304	1
No. 4 rotor (dia. 78 × 46 × 159 mm)	A1050 (alumite)	1
No. 5 rotor (dia. 61.2 × 36 × 149 mm)	A1050 (alumite)	1
Cup A (dia. 92 × 76 mm)	A1050 (alumite)	1
Cup B (dia. 92 × 76 mm)	A1050 (alumite)	1
IEC R6P (size AA) battery		4
Instruction manual		1
Inspection Certificate		1

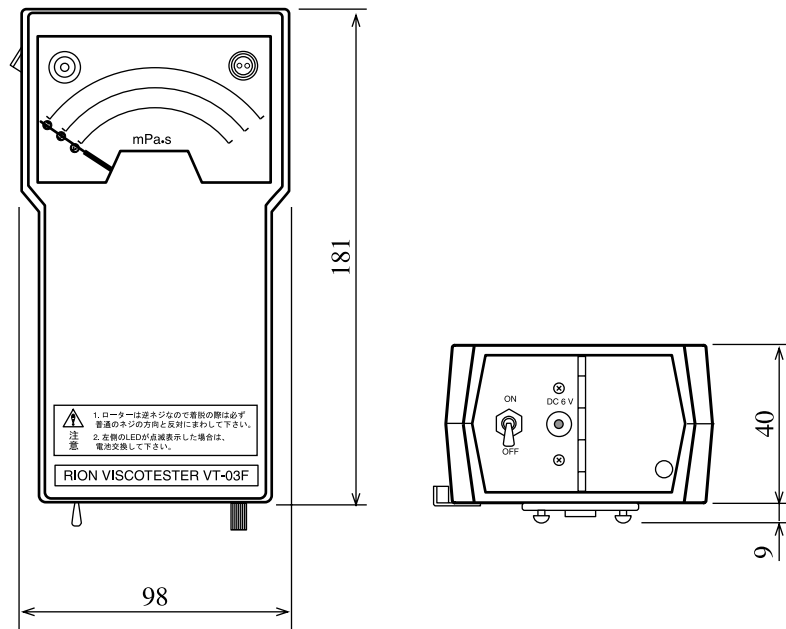
## Supplied accessories for VT-04F

No. 1 rotor (dia. 24 × 53 × 166 mm)	SUS304	1
No. 2 rotor (dia. 15 × 1 × 113 mm)	SUS304	1
No. 3 rotor (dia. 45 × 47 × 160 mm)	SUS304	1
No. 3 Cup (dia. 52.6 × 75 mm)	SUS304	1
Rotor Extension (900 mm · 300 × 3)	SUS304	1
IEC R6P (size AA) battery		4
Instruction manual		1
Inspection Certificate		1

## Optional accessory

AC adapter VA-05 series

Stand VA-04



Unit: mm

Dimensional Drawing (VT-03F)

