

# Model TVB-15 Viscometer

# Model TVB-10W Viscometer



responding swiftly to your needs

 **TOKI SANGYO**



# Model TVB-10W Viscometer

**Setting the standard in digital viscometers with simplicity in design for unmatched durability.**

“Ease-of-Use” and “Worry-Free Operation” are the key concepts underlying development of the TVB-10W digital viscometer.

At the instrument's core is an ingenious “Torsion wire and Magnetic bearing” mechanism which greatly improves durability and enables the TVB-10W to maintain its high initial repeatability with stability of measurement.

The Model TVB-10W has established itself as a product benchmark with features that include digital display, auto-stop function, and one-touch rotor mounting which allow even first time users to handle the unit with ease.

## Features

### ● **Pivotless Mechanism** ( Torsion Wire + Magnetic Bearing )

The contactless torsion wire and magnetic bearing mechanism employed eliminates parts wear. The product provides high accuracy and stable measurement and will maintain its excellent initial repeatability over time. The instrument is also designed for worry-free operation by first time users.

### ● **Digital Display**

Digital display for viscosity readings without error.

### ● **Data output**

The data output feature allows direct downloading of measurement data from the TVB-15 viscometer to PC's or printers

### ● **Zero Span Setting Function**

Calibration allows viscometer to be used at accuracies higher than catalog values and compensates for unit-to-unit variances.

### ● **Auto-Stop Function**

Measurement is automatically terminated at a prescribed time or when the liquid measured attains a preset viscosity.

Auto-Stop Time( TVB-10W / TVB-15 )

Auto-Stop Viscosity( TVB-15 )

### ● **External Input / Output Signal**

( I/O Input/Output Terminal )

To start and stop the main unit can be operated by out signal( Dry contact )when T-Bar Stage( TS-20 )is connected. And using output signal( Open collector ), the situation of viscometer can be confirmed by buzzer and lamp.

### ● **One Touch Rotor Mounting**

The instrument's rod insertion method allows easy rotor mounting and removal.

### ● **Display Switching**

Display can be switched between viscosity values and indicated values( % )when the UNIT key is depressed during measurement.

### ● **Data Interchangeability**

Model TVB-10W data is interchangeable with Model B viscometer data and conforms to JIS and ISO standards.

[Caution]

The viscometer's magnetic bearing may generate magnetic forces around parts of the instrument. Thus objects which may be susceptible to magnetism such as floppy discs, magnetic cards, watches, etc., should be kept away from the apparatus.

# Model TVB-15 Viscometer

## Data output capability for improved viscometer efficiency.

The new TVB-15 boasts a data output function which enhances user “peace-of-mind” in addition to the attributes of “ease-of-use” and “worry-free operation” offered by this versatile viscometer.

The exceptional durability provided by the viscometer’s robust torsion wire and magnetic bearing mechanism ensures that the product’s superior initial repeatability is maintained over time with a high degree of measurement consistency. These features are augmented by a data output capability which allows direct connection to PC’s and printers, enabling the user to save his precious measurement data while improving his work efficiency in the process. The TVB-15 viscometer is ideal for quality control and workplace data management applications.



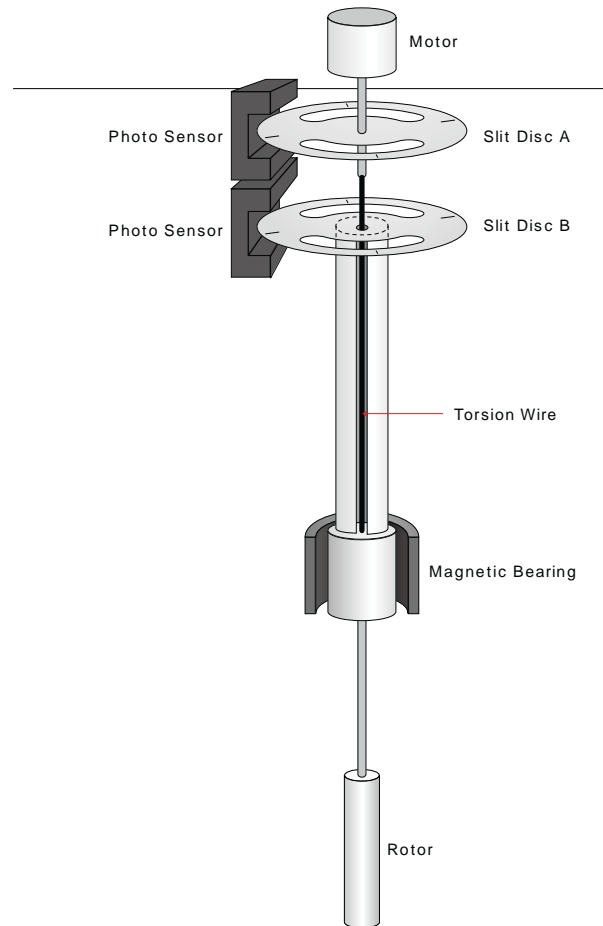
## Specifications

	TVB10W	TVB15
Rotational Speed	0.3 ~ 100 rpm( 18 Steps )	
Accuracy	less than $\pm 1.0$ % of Full Scale*	
Repeatability	less than $\pm 0.2$ % of Full Scale	
Viscosity Display	% / mPa · s / Pa · s / kPa · s ( cP/P switching possible )	
Digital Output	Nothing	RS232C
I/O Connector	Terminal for TS-20	
Input Signal	Start Signal ( Non-voltage contact )	
Output Signal	On measuring signal, Measuring stop signal, Buzzer signal ( Open collector )	
Auto Stop	Time	Time · Viscosity
Preheat	Nothing	60 minutes at Maximum
User Zero Setting	Applicable	Applicable
User Span Setting	Applicable	Applicable
Ambient Temperature Range	0 - 40	
Ambient Humidity	less than 90% Relative Humidity( Non condensation )	
Wetted Material	Stainless Steel	
Power	AC100 ~ 230V	
Power consumption	less than 20 VA	
Dimension of main unit	105( W )x 220( D )x 320( H )mm	
Dimension of roller stand	290( W )x 300( D )x 430( H )mm	
Weight	Approximately 6.0 kg	

\* When TM1 or TH2 Rotor used.

# Principle of Operation

Motor rotation is transmitted to the rotor via a torsion wire. Viscous torque acts on the rotor turning in the measured fluid. The torsion wire rotates with the wire in a deflected state at an angle which is proportional to the size of the viscous torque. The angle of deflection of the torsion wire is the same as the reciprocal deflection of slit discs A and B which are attached to the ends of the torsion wire. Each slit disc's photo sensor read the deflection angel of the disc and this information is converted into a viscosity measurement which is displayed. A magnetic bearing positioned at the lower part of the torsion wire provides non-contact support of the rotor spindle.



# Configurations

Item	TVB-10MW/TVB-15M	TVB-10HW/TVB-15H	TVB-10RW/TVB-15R	TVB-10UW/TVB-15U
Types	TVB-10MW/TVB-15M	TVB-10HW/TVB-15H	TVB-10RW/TVB-15R	TVB-10UW/TVB-15U
Full Scale Torque	67.37 $\mu\text{N}\cdot\text{m}$	718.7 $\mu\text{N}\cdot\text{m}$	1437.4 $\mu\text{N}\cdot\text{m}$	5749.6 $\mu\text{N}\cdot\text{m}$
Instrument configuration				
Viscometer Main Unit				
Rotor Set	TM Rotor Set( 4pcs) ( TM1 ~ TM4)	TH Rotor Set( 6pcs) ( TH2 ~ TH7)	TH Rotor Set( 6pcs) ( TH2 ~ TH7)	TH Rotor Set( 6pcs) ( TH2 ~ TH7)
Rotor Stand				
Guard	M Guard	H Guard	H Guard	H Guard
Roller Stand Set				
Carrying Case( main unit)				
Carrying Case( rotor)				
Option	Low Viscosity Adaptor Set	TH1 Rotor	TH1 Rotor	TH1 Rotor



TM Rotor Set



TH Rotor Set

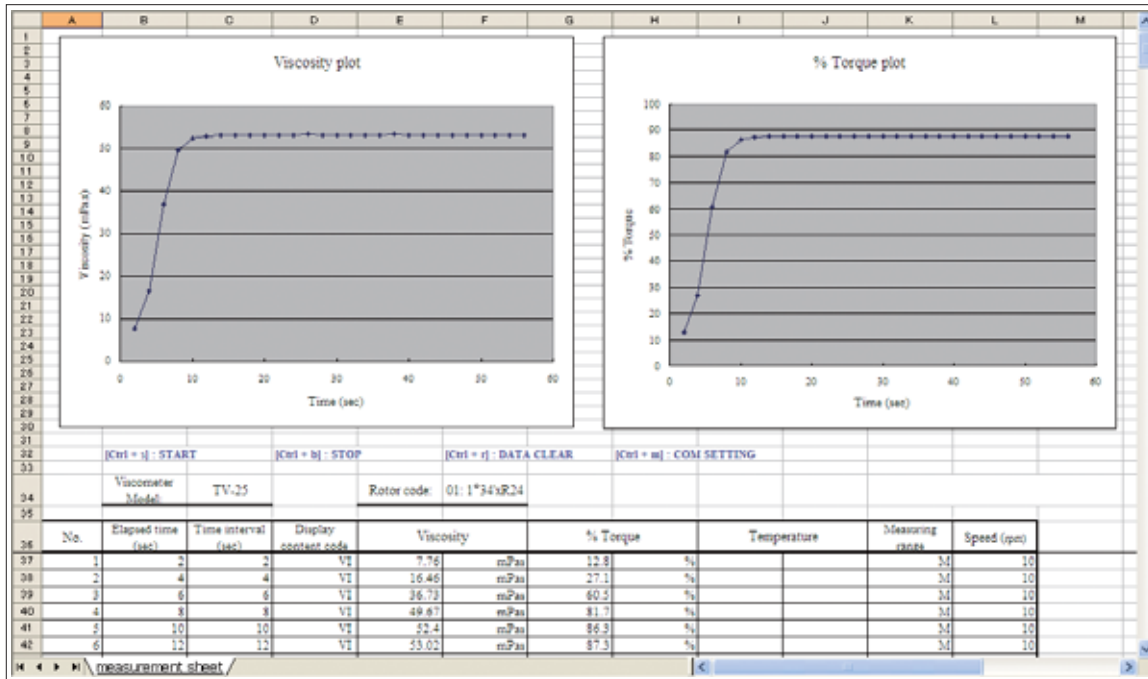


Carrying Cases



Roller Stand Set

# Software Sample View



# Form of Flow Curve

Newtonian	Non-Newtonian					
	Pseudoplastic (Structural viscosity)	Dilatant	Plastic		Time-Dependent	
			Bingham	Non-Bingham	Thixotropy	Rheopexy
$s = \mu D$    Water Solvent Motor oil Vegetable oil Sugar water solution Salt water Liquid paraffin Glycerin Silicone grease Oil-based cosmetics Water-based cosmetics Sodium alginate	$s = \mu D^n$ $1 > n > 0$    Highly polymerized solution and solution Rubber solution, Adhesive starch Starch paste Viscose Latex Acetate spinning liquid Emulsion Cellulose lacquer/Vanish Coating/Dye Wax Grease Lard Condensed milk Condensed fruit juice Pulp( Paper ) Aluminum soap Gasoline solution	$s = \mu D^n$ $n > 1$    Starch solution Powder solution of mica/quartz Suspension( high concentration ) Clay slurry Shifting sand/Wet seaside sand Coating Carbontetrachloride Chocolate made with buttermilk	$s = s_0 + \eta_p \dot{\gamma} D$ $s_0$ : Yield value $\eta_p \dot{\gamma}$ : Plastic viscosity    Tomato ketchup Margarine Toothpaste Various slurry Ceramic paste/Raw china clay Flour water suspension Whipped egg whites Putty Nutritious cream Limecream Konjak flour solution( Good quality )	$s = s_0 + \eta D^n$ $s_0$ : Yield value    Coating Printing ink Mayonnaise Konjak flour solution( High quality ) Asphalt Dense suspension	  Coating Cocoa Heavy printing ink Cleansing cream Vanishing cream Clay suspension Grease Toothpaste	  Clay slurry

s: Shear stress N: Rotational speed  $\dot{\gamma}$ : Indicated value  $\mu$ : Newtonian viscosity  $\eta$ : Non-Newtonian viscosity coefficient D: Shear rate  $\gamma_a$ : Apparent viscosity( Non-Newtonian ) n: Non-Newtonian Viscosity Index  
 [The source : Shigeharu Onogi, Rheology Theory, 1968]

# Options

## ● Viscosity Data Processing Software [ Visco-viewer ] for TVB-15 viscometer )

The TVB-15 viscometer runs software, developed by Toki Sangyo for viscometers, which allows direct downloading of measurement data from viscometers to PC's. We highly recommend this option for use with the TVB-15 Series viscometer. (This software can also be used with the TV-25, TV-35, and R-85 Series of viscometers.)

## ● Printer ( for TVB-15 viscometer )

The DPU-414 thermal printer provides hardcopy printouts of measurement data from the TVB-15 viscometer.



Printing Method	Thermal serial dot
Printing Digits	40 digits
Paper Width	Approx. 90mm
Printing Speed	52.5 cps (Max)
Dimensions	160 ( W ) x 170 ( D ) x 66.5 ( H ) mm
Weight	Approx. 700g ( Inc. Battery )
( Thermal Paper )	
Paper Width	112mm
External Diameter	48mm
Length	Approx. 28m

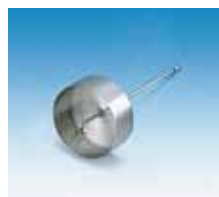
## ● Low Viscosity Adaptor

This adaptor for TVB-10MW and TVB-15M Series viscometers enables measurement of low viscosity samples.



## ● TH1 Rotor

This TH1 rotor is used with viscometers which measure high viscosities and allows the extension of the measurement range in the low viscosity range.



## ● T-Bar Stage [ TS-20 ]

The T-bar stage enables accurate measurement of substances such as pastes and gels that are subject to structural failures due to yield values and shear characteristics ( thixotropic substances, mayonnaise, etc. ) and is ideal for use in manufacturing processes and quality control.

The device vertically raises and lowers the sample allowing a "T" shaped spindle ( T-bar ) to describe a helical path through the sample so that the spindle always comes into contact with fresh parts of the sample. Slipping ( "channeling" ) and thixotropic breakdown of the sample is avoided to provide stable and accurate measurement.



## ● Small Sample Adaptors ( Circulator type · Immersion type )

The small sample adaptor is attached to spindle type viscometers to enable viscosity measurement of small volume samples. For small samples ( 8-13ml ), these adaptors must be used in combination with temperature baths for proper temperature control. Temperatures can be regulated quickly due to the small volume of such samples. Circulator or immersion type small sample adaptors can be selected for use with the temperature baths.



Circulator Type



Immersion Type

## ● Temperature baths

These baths control the temperatures of samples and are used in combination with the small sample adaptor.



# Upper Measurement Limit Tables ( mPa · s )

**TVB-10MW** Model TVB-10MW / TVB-15M are ideal for high accuracy measurement of low viscosities. L-Adaptor combination enables measurement of viscosities below 15mPa·s

ロータ	Rotational Speed (rpm)							
	60	30	12	6	3	1.5	0.6	0.3
L/Adp	10	20	50	100	200	400	1,000	2,000
M1	100	200	500	1,000	2,000	4,000	10,000	20,000
M2	500	1,000	2,500	5,000	10,000	20,000	50,000	100,000
M3	2,000	4,000	10,000	20,000	40,000	80,000	200,000	400,000
M4	10,000	20,000	50,000	100,000	200,000	400,000	1,000,000	2,000,000

**TVB-10HW** Model TVB-10HW / TVB-15H are suitable for measurement of high viscosities. Accessory 6-pc. rotor set and variations in rotation speed enable measurement in the ranges indicated in this table.

ロータ	Rotational Speed (rpm)									
	100	50	20	10	5	4	2.5	2	1	0.5
H1	100	200	500	1,000	2,000	2,500	4,000	5,000	10,000	20,000
H2	400	800	2,000	4,000	8,000	10,000	16,000	20,000	40,000	80,000
H3	1,000	2,000	5,000	10,000	20,000	25,000	40,000	50,000	100,000	200,000
H4	2,000	4,000	10,000	20,000	40,000	50,000	80,000	100,000	200,000	400,000
H5	4,000	8,000	20,000	40,000	80,000	100,000	160,000	200,000	400,000	800,000
H6	10,000	20,000	50,000	100,000	200,000	250,000	400,000	500,000	1,000,000	2,000,000
H7	40,000	80,000	200,000	400,000	800,000	1,000,000	1,600,000	2,000,000	4,000,000	8,000,000

**TVB-10RW** Model TVB-10RW / TVB-15R offer twice the torque of Model TVB-10HW / TVB-15H for double the measurement range as indicated in this table.

ロータ	Rotational Speed (rpm)								
	100	50	20	10	5	2.5	1	0.5	
H1	200	400	1,000	2,000	4,000	8,000	20,000	40,000	
H2	800	1,600	4,000	8,000	16,000	32,000	80,000	160,000	
H3	2,000	4,000	10,000	20,000	40,000	80,000	200,000	400,000	
H4	4,000	8,000	20,000	40,000	80,000	160,000	400,000	800,000	
H5	8,000	16,000	40,000	80,000	160,000	320,000	800,000	1,600,000	
H6	20,000	40,000	100,000	200,000	400,000	800,000	2,000,000	4,000,000	
H7	80,000	160,000	400,000	800,000	1,600,000	3,200,000	8,000,000	16,000,000	

**TVB-10UW** Model TVB-10UW / TVB-15U offer an eight-fold increase in torque over the TVB-10HW / TVB-15H for an eight-fold increase in measurement range as indicated in this table.

ロータ	Rotational Speed (rpm)							
	100	50	20	10	5	2.5	1	0.5
H1	800	1,600	4,000	8,000	16,000	32,000	80,000	160,000
H2	3,200	6,400	16,000	32,000	64,000	128,000	320,000	640,000
H3	8,000	16,000	40,000	80,000	160,000	320,000	800,000	1,600,000
H4	16,000	32,000	80,000	160,000	320,000	640,000	1,600,000	3,200,000
H5	32,000	64,000	160,000	320,000	640,000	1,280,000	3,200,000	6,400,000
H6	80,000	160,000	400,000	800,000	1,600,000	3,200,000	8,000,000	16,000,000
H7	320,000	640,000	1,600,000	3,200,000	6,400,000	12,800,000	32,000,000	64,000,000

denotes option.

Accurate measurement values might not be obtained in the entire area indicated by dark shading or portions of the area indicated by light shading these areas are subject to turbulent flow.

# VISCOMETER



Reflecting our motto, “providing our customers what they want in the format they desire”, our development effort is focused on the diverse needs of customers and underscores our ceaseless drive in improving the reliability of viscosity measurement as well as the level of our measurement expertise. As a dedicated manufacturer of rheological equipment, our viscometers are endowed with TOKI SANGYO’s wealth of knowhow and depth of experience products which our customers can use with the highest degree of confidence.

This product is certified the compliance of CE mark.  
Product specifications and design are subject to change or modification without notice.

- Warning** Do not operate equipment in flame or explosion-hazardous location.
- Caution relating to safety** Manual should be thoroughly read before use and equipment should be operated and handled in the prescribed correct manner.

**TOKI SANGYO CO.,LTD** [www.tokisangyo.com](http://www.tokisangyo.com)

**Headquarters** Fuji Building, 32-6, Shinbashi 5-Chome, Minato-ku, Tokyo, 105-0004 Japan Tel. +81-3-3434-5501 / Fax +81-3433-4044 / Email : tokyo@tokisangyo.co.jp  
**Osaka Sales Office** 2-15, Kawaramachi 3-Chome, Chuo-ku, Osaka 541-0043 Japan Tel. +81-6-6228-1991 / Fax +81-6-6228-1454 / Email : osaka@tokisangyo.co.jp  
**Nagoya Sales Office** 1-20, Sengen 1-Chome, Nishi-ku, Nagoya, 451-0035 Japan Tel. +81-52-522-8277 / Fax +81-52-522-7510 / Email : nagoya@tokisangyo.co.jp