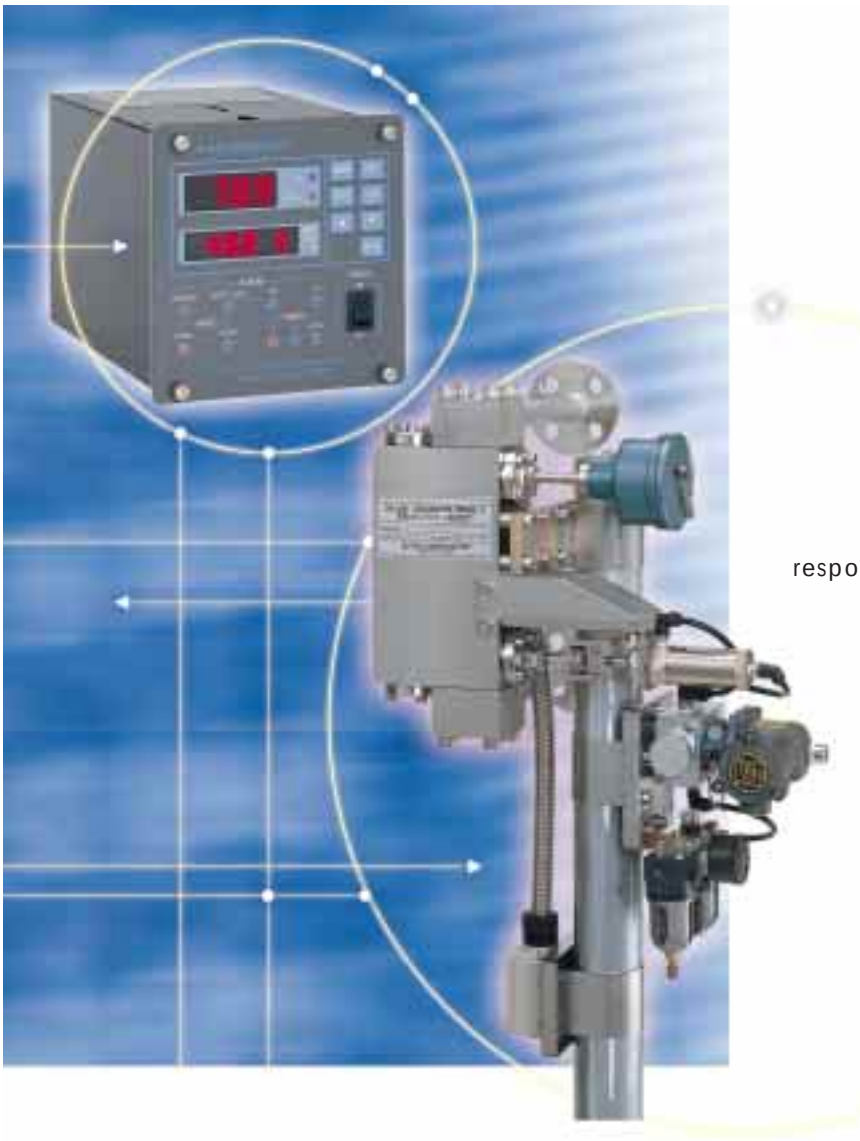
Falling piston type viscometers for processes

Model FM-300

On-line Viscometer

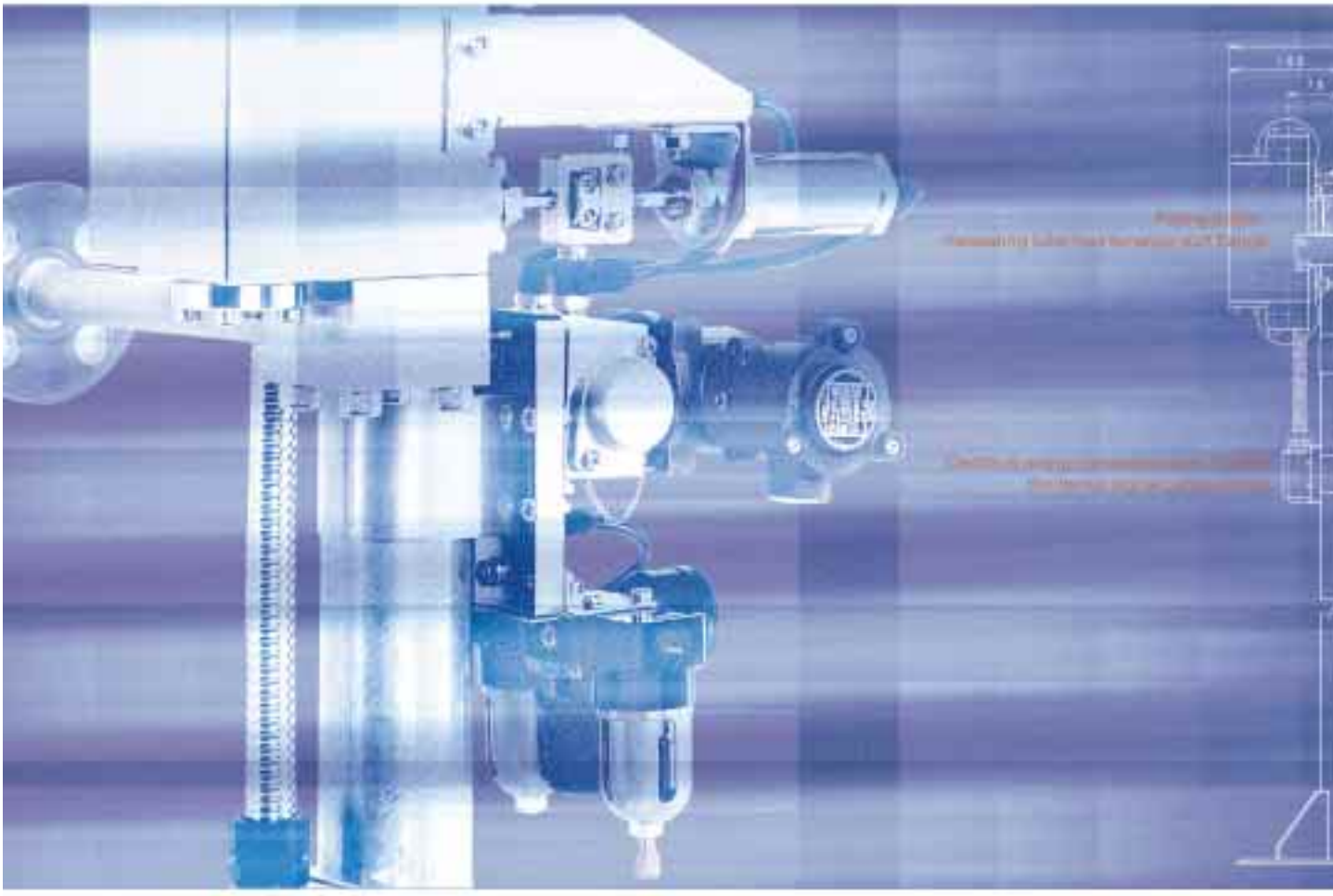


responding swiftly to your needs

TOKI SANGYO

Model FM-300 VISCOMETER

The Model FM-300 Viscometer - for consistency in quality control and automation of blending processes of various types of liquids and coating processes of polymer solutions.



Designed to provide advancements in automation and quality control stability of various industrial processes, our Model FM-300 of on-line viscometers embody the wealth of know-how and depth of experience we have gained in the more than 500 installations implemented to date.

The falling piston mechanism method of measurement employed by this viscometer is incorporated in a proprietary block design which results in better performance, handling, and durability for improved overall reliability.

Model FM-300 on-line viscometers are the ideal viscometers for stable quality control and automation of industrial processes.

Features

_ Initial product performance including repeatability and accuracy is maintained over time.
_ Outstanding product durability due to the unit's simple operating principle and construction, making breakdowns rare.
_ Almost no "pooling" of process fluid in the unit which enables simple cleaning - merely by flushing with cleaning liquid.
_ Wide measurement range - from less-than-water viscosities to high viscosities.
_ Unit is unaffected by flow velocities of the process fluid.

[Measurement Unit, CF-300]

[Sensing Unit, FM-300]

Main applications

_ Coating processes such as those involving paints, printing inks, adhesives, photosensitive chemicals, and fluorescent substances.
_ Control of chemical reactions and blending of various polymers such as varnishes and synthetic rubber.
_ Petroleum manufacturing processes.
_ Blending processes of various other liquids and polymerization processes involving high molecular substances.

Specifications

Overall Specifications

1. Measurable fluids

Types of process fluids: fluids with few impurities, fluids with no magnetic substances

Temperature range: 0 ～ +120 ℃
Pressure range: 0 ～ 1 MPa (10 kgf/cm²)
Measured fluid (process fluid) volume

Falling Piston Type	Proper Volume (L/min) of Process Fluid	
B	Min: (1/η1) + 0.5	Max: 5
C	Min: (2/η1) + 0.5	Max: 5
D	Min: (10/η1) + 0.5	Max: 5
E	Min: (50/η1) + 0.5	Max: 5a

* " η " is the normal lower limit of viscosity (units: mPa・s) in the viscosity measurement range.

2. Measurement range

Measurement range - two settings (double range) are possible within the value of the upper measurement limit.

User may specify setting and inspection measurement range of unit to be shipped from factory. Post-shipment, on-site measurement range changes are normally difficult.

●Upper Measurement Limit Table

Falling Piston Type	B	C	D	E
Upper Measurement Limit(mPa・s)	20	100	500	2000

※ Example of measurement range setting: in case of ' D ' type falling piston

Example 1: Range 1 - 0 ～ 250 mPa・s
Range 2 - 0 ～ 500 mPa・s
Example 2: Range 1 - 0 ～ 150 mPa・s
Range 2 - 0 ～ 450 mPa・s

3. Measurement accuracy

±1.5 % F.S. (for density variations less than ±0.l g/cm³)

4. Repeatability

±1.0 % F.S.

5. Explosion-proof (option)

Use the relay barrier RBNM-R2N in explosion-hazardous location

Measurement Unit, CF-300

1. Output display

Front panel, 7-segment LED display as follows.
Viscosity display: 4-digit display - units: %/mPa・s (units switching via ' UNIT ' key on keyboard)
Temperature display: 3-digit display - units: ℃
Date display: 6-digit display
Time display: 4-digit display
※ Use' SELECT 'key on keyboard to select among temperature, date, and time.

2. Operational display

Front panel LED displays as follows:
Over-scale, measurement anomaly, upper limit warning, lower limit warning, measurement range, measurement mode (purge/measurement)

3. Output signals

Warning outputs:
Dry contact output, contact capacity: 220 VAC 3 A (resistance load)
Status outputs:
Dry contact output - contact capacity: 220 VAC 3 A (resistance load)
Analog outputs:
Temperature measurement value - current output, 4 ～ 20 mADC
Viscosity measurement values -current output, 4 ～ 20 mADC
Viscosity measurement values -voltage output, 0 ～ 10 VDC

4. Power

100 ～ 240 VAC±10 % 50/60 Hz

5. Working temperature range

0 ～+40 ℃

6. Working humidity range

10 ～ 90 %RH

7. Power consumption

Approx. 30VA

8. Mounting

Panel mounting

9. Mass

Approx. 5 kg

10. Dimensions

W146×H146×D200 (however panel opening dimensions are 138 ×138)

Sensing Unit, FM-300

1. Air supply pressure

0.2～1MPa (2 ～ 10kgf/cm²)

2. Working temperature range

-10～+40 ℃

3. Working humidity range

10～ 90% RH

4. Withstand pressure

Wetted section: 1.0 MPa (10 kgf/cm²)

5. Vibration resistance

Less than 0.5G, 33 Hz

6. Process fluid connection flange

150#RF 1/2B

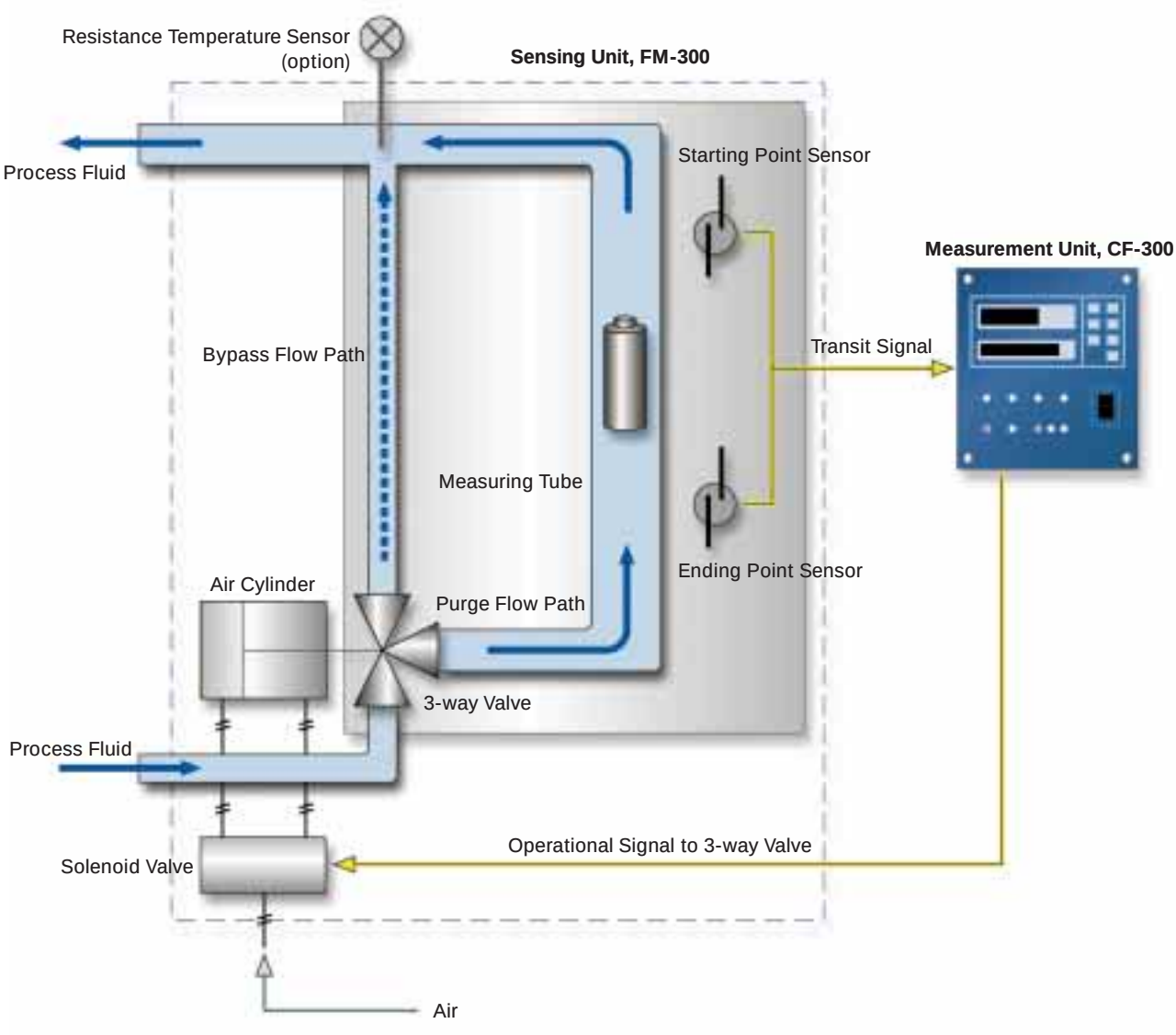
7. Material

Wetted section: SUS316

8. Mass

Approx. 30 kg

Measurement Principle



1. There are two flow paths in the sensing unit - a purge flow path (solid line) and a bypass flow path (dotted line). A control signal from the measurement unit to the 3-way valve opens the purge path for a specified interval. While the purge path is open, process fluid flows into the measuring tube and the falling piston is pushed upward by the force of the flow.
2. When a preset interval of time (purge time) elapses, the measurement unit sends a control signal to the 3-way valve which closes off the purge flow path and opens the bypass flow path. When the purge flow path is closed, the flow of process fluid in the measuring tube ceases and the falling piston begins to descend at a velocity proportional to the viscosity of the liquid.
3. A permanent magnet is incorporated in the falling piston. Two magnetic sensors are positioned at the side of the measuring tube. The upper magnetic sensor is referred to as the starting point sensor and the lower magnetic sensor is referred to as the ending point sensor. The starting point sensor and ending point sensor in turn, output transit signals to the measurement unit as they detect the passing of the falling piston.
4. The measurement unit computes the time it takes for the falling piston to transit the starting and ending point sensors ('fall time'). It then converts this 'fall time' into viscosity which is displayed in % or SI units and outputs current and voltage signals in addition to various warning and status signals.
5. When the preset fixed time (measurement time) elapses, the measurement unit sends a control signal to the 3-way valve which closes off the bypass flow path and opens the purge path - in other words, returning the cycle to step [1] above.

Steps [1] through [5] are repeated and in this cyclical manner, the Model F on-line viscometer measures the viscosity of the fluid.

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.

www.tokisangyo.com

※ 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.

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