OUTLINE

SONICMAX UL6300 is the ultrasonic flowmeter of the time flight system which combined the highly efficient converter (UFC300) with the clamp-on sensor (UFS6000).

Three kinds of sensors without direct contact to fluid allow wide range flow measurement of pipe size from 15 mm to 4000 mm.

A sensor mounted on the sensor rail and a sensor cable realized simple installation on pipe and easy maintenance.

The highly efficient converter corresponding to a multi-sensor can measure two lines or double line measurement by one set.

Moreover, the digital processing and substantial status diagnostic function enabled stable and high precision measurement for low velocity flow.

Furthermore, flameproof type etc. in combination with a field type converter (UFC300F) is also available.

FEATURES

- The non-contact measurement system where the sensor is installed on the exterior surface of pipe eliminates the generation of particles, and mixing of metal ions completely.

- The highly efficient converter corresponding to multi-sensors can measure two lines simultaneously.

- Signal processing system enables stable and precise measurement for low velocity flow.

- High accuracy measurement of ±1% of indicated values (Connection: 50 mm or more, Velocity: 0.5 m/s or more) is realized.

- Sensor part is applicable to pipe size from 15 mm to 4000 mm by three kinds of sensors (small / medium / large).

- Easy mounting and easy maintenance are realized because sensor is integrated on the mounting rail and greasing can be done keeping sensor distance fixed.

- A terminal box at the end of sensor rail allows easy wiring and cable connection by using composite sensor cable.

- Blue dot matrix LCD (with backlight) is used for the display (128 × 64 dots, 59 × 31 mm).

A multi-line indication by1-3-lines of the measured values, and a real-time trend indication, etc. are provided.

- A quick setup function allows easy change of flow range, pulse rate, etc.

- A touch panel system by an infrared sensor allows you to alter the settings without removing the cover of the conversion section.

MEASURING PRINCIPLE

As shown in Fig. 1 the ultrasonic is transferred from A to B and B to A in turn with an angle of ψ. The required duration of transfer of two directions is different when measuring medium is moving from upstream to downstream. The duration of transfer is expressed by the following formula:

$$t_{AB} = \frac{2L}{(C_0 + V_m \cos \psi)}$$
$$t_{BA} = \frac{2L}{(C_0 - V_m \cos \psi)}$$

Where

- $2L$ : Distance between A and B
- $V_m$ : Average velocity of medium
- $C_0$ : Sonic speed in stable medium
- $t_{AB}$, $t_{BA}$ : Duration of transfer of Ultrasonic from A to B and B to A

By measuring the difference of the transfer duration, the average velocity $V_m$ is mathematically calculated. The calculation is done by the following formula:

$$2V_m \cos \psi = \frac{2L}{t_{AB}} - \frac{2L}{t_{BA}}$$

$$\therefore V_m = L \left(\frac{t_{BA} - t_{AB}}{\cos \psi} \times \frac{t_{BA} \times t_{AB}}{t_{BA} - t_{AB}}\right)$$

The distance between A and B (L) and the angle (ψ) are known, and the average velocity $V_m$ is mathematically calculated.

Calculating average velocity $V_m$ and cross-sectional area of pipe, the result is indicated and transmitted as the output.
STANDARD SPECIFICATION

Common specification:
- Measurement method: Ultrasonic time flight system
- Sensor installation: Clamp on pipe
- Measurable pipe size:
  - Small sensor: 15 mm/1/2" to 100 mm/4"
  - Medium sensor: 50 mm/2" to 400 mm/16"
  - Large sensor (Preparing): 200 mm/8" to 4000 mm/160"
- Sensor installation: Small / Medium sensor: V path, Large sensor: V path and Z path

Instrument composition:
- Sensors (2 pcs), Sensor rail, Sensor cover, Converter, Sensor band (2 pcs), Sensor cable (coaxial cable with SMB connector)
- In addition to above items, the large sensor is equipped with:
  - Each two pairs of sensor rail and its cover: 4 pieces
  - 3 pieces of sensor bands: 3 pieces
  - 4 pieces of sensor cable: 4 pieces
  - Band fastening units: one connection box.

Measuring fluid:
- The liquids which ultrasonic waves transmit through
  - See also liquid properties at chapter "READ BEFORE USE."

Fluid temperature:
- –40 to +120°C at surface of pipes on which sensors are installed.

Pipe material:
- Carbon steel, Stainless steel, PVC, PP, PVDF, others
  - See detail material table below for each size of sensor.
  - See piping materials at chapter "READ BEFORE USE."

Sensor type:

<table>
<thead>
<tr>
<th>Piping materials</th>
<th>Small 15 to 100 mm</th>
<th>Medium 50 to 400 mm</th>
<th>Large 200 to 4000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon steel</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>PVC</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>PP</td>
<td>○</td>
<td>○</td>
<td>–</td>
</tr>
<tr>
<td>PVDF</td>
<td>○</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>FRP</td>
<td>○</td>
<td>○</td>
<td>–</td>
</tr>
<tr>
<td>PE lining pipe</td>
<td>–</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>PVC lining pipe</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Others</td>
<td>○</td>
<td>○</td>
<td>–</td>
</tr>
</tbody>
</table>

Sensor surface temperature:
- See sensor surface temperature table below

Measuring range:
- Velocity:
  - Min.: 0 to 0.5 m/s
  - Max.: 0 to 20 m/s
- Flow rate:
  - Min.: 0 to 0.319 m³/h
  - (Pipe size 15 mm)
  - Max.: 0 to 904778 m³/h
  - (Pipe size 4000 mm)

Converter specification:
- Cable entry:
  - 2 × M20 (with watertight glands)
  - 2 × G1/2 female thread
  - 2 × 1/2 NPT female thread
    - (Option: Watertight glands for G1/2)
    - (Option: Number of wiring connection; 3)
  - Sensor cable entry: M20 watertight gland (Std.)
- Supply voltage:
  - 100 to 230 V AC (85 to 250 V AC)
  - 24 V DC (9 to 31 V)
- Supply frequency:
  - 48 to 63 Hz (AC)
- Power consumption:
  - Approx. 22 VA (AC)
  - Approx. 12 W (DC)
- Ambient temp.:
  - –40 to +70°C (For operation)
  - –50 to +70°C (For storage)

[UFC300W (Wall installation type) specification]
- Protection class: IP65 (JIS C0920, equivalent to NEMA4)
- Housing material: Polyamide resin
- Color: Off-white (Converter housing / Terminal box cover), Jade green (Converter cover)
- Installation:
  - Wall installation
  - (Option: Fittings for 2B pipe installation)

[UFC300F (Field installation type) specification]
- Protection class: IP66/67
- Housing material: Aluminum alloy
- Color: Grey (Converter housing/Terminal box housing)
  - Jade green (Converter cover/Terminal box cover)
- Installation:
  - Wall installation
  - (Option: U bolt for 2B pipe installation)

Explosion proof specification:
[ATEX]
- Sensor type: UFS6000-x-EEx S; Small / M; Medium / L; Large sensor
- ATEX [EU ATEX directive (94/9/EC)]
  - PTB07 ATEX2010X II 2 G Ex ia IIC T6...T4
- Ambient temperature: –20 to +70°C
- Fluid temperature: –40°C

Sensor specification:
- Protection class: IP66/67
  - (JIS C0920, equivalent to NEMA6)
- Material:
  - Sensor rail: Aluminum alloy
  - Sensor band: Aluminum alloy
  - Connection box: Aluminum alloy
- Ambient temperature: –40 to +70°C
- Painting:
  - Sensor cover: Polyurethane resin paint
- Color:
  - Sensor cover: Silver / Jade green
- Cable entry:
  - 1 × M16 with watertight gland

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Sensor surface temperature (Max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>80°C</td>
</tr>
<tr>
<td>T5</td>
<td>95°C</td>
</tr>
<tr>
<td>T4</td>
<td>120°C</td>
</tr>
<tr>
<td>T6...T4</td>
<td>Sensor surface temperature (Min.)</td>
</tr>
<tr>
<td></td>
<td>–40°C</td>
</tr>
</tbody>
</table>
Indication and output specification

- **Indicator**: Blue, dot matrix LCD (With backlight)
  - 128 × 64 dots (59 × 31 mm)
- **Indication function**:
  - Process data display screen: 2 screens
  - One to three lines are displayed at one screen.
  - Contents of indication: Flow rate, velocity, total flow
  - Trend display screen: 1 screen
  - Real-time trend of flow rate etc.
- **Current output**: Current output: 4 to 20 mA DC
  - (Max. 22 mA, at scale out mode)
- **Internal power supply**: Less than 1000ohms (Load resistance)
- **External power supply**: Less than 32 V DC (External voltage)
- **Pulse output**
  - **Open collector output**
    - **Load rating**: Less than 32 V DC, 20 mA (≤10 kHz)
      - Less than 100 mA (≤10 Hz)
    - **Pulse rate**: 2 to 36,000,000 pulse/h (0.00056 Hz to 10 kHz)
    - **Pulse width**: One of the following selectable
      - 1) Automatic: Pulse width by which duty factor to be
        50% at full scale
      - 2) Duty factor: 1:1 fixed
      - 3) Free setting: 0.05 to 2000 m/s
- **Status output**
  - **Open collector output**
    - **Rating**: Less than 32 V DC, 100 mA Max.
    - **Contents of output**: One of the following selectable
      - 1) No status output (Standard factory setting)
      - 2) Identification of flow direction
      - 3) Over range
      - 4) Error
      - 5) Flow alarm
- **Control input**
  - **Voltage input**
    - **Low**: 0 to 2.5 V DC, **High**: 19 to 32 V DC
    - **Contents**: One of the following selectable
      - 1) No control input (Standard factory setting)
      - 2) Output hold
      - 3) Output lock to 0%
      - 4) Total counter reset
      - 5) Error reset
- **Description of input and output terminal**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>1-line measurement</th>
<th>2-line measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (A+ / A-)</td>
<td>Current output</td>
<td>Current output</td>
</tr>
<tr>
<td>B (B+ / B-)</td>
<td>Status output</td>
<td>Control input</td>
</tr>
<tr>
<td>C (C+ / C-)</td>
<td>Status output</td>
<td>-</td>
</tr>
<tr>
<td>D (D+ / D-)</td>
<td>Pulse output</td>
<td>Status output</td>
</tr>
</tbody>
</table>

(* B terminal: For internal power supply)

- **Low flow cutoff**
  - Current output, Pulse output, Indicator (Separate setting is possible.)
  - Setting value: 0.0 to 20.0% FS
  - Damping time constant
    - Current output, Pulse output, Indicator (Separate setting is possible.)
    - Current output; 0.1 to 100.0s
    - Pulse output, Indicator; 0.0 to 100.0s
- **Isolation of input and output**
  - Each circuit of power supply, sensor signal, terminal A, terminal B, terminal C, and terminal D are isolated.

**Standard functions**

- **Customer's free measuring unit setting function**
  - Volume (or mass) and time unit in 7 characters can be created.
- **Automatic zero adjustment function**
  - Zero adjustment is automatically conducted at "ZERO ADJUST MODE" (Subject to zero flow)
- **Bi-directional flow measurement function**
  - A flow-direction distinction signal is outputted in state output and current.
- **Self-diagnosis function**
  - The following conditions are indicated by error message;
    - Functional diagnosis:
      - CPU, Memory, Software, Sensor connection, Input and Output module, and Output connection
    - Status diagnosis:
      - Sensor signal lost, Over range, Counter over flow, and Power fail detection
- **Memory save function for power fail**
  - Operation parameters and totalization figures are stored for more than 10 years by EEPROM (Non volatile memory).
- **Testing function**
  - Simulating output function for current, pulse and status outputs are integrated.
    - Current output test: Arbitrary output (0.0 to 22.0 mA)
    - Pulse output test: Arbitrary output (1 Hz to 10 kHz)
    - Status output test: On/Off
- **Touch sensor setting function (Infrared radiation)**
  - By four infrared sensors, data setup from exterior is possible without removing cover.
- **HART communication**
  - Standard

**Accuracy (m)**

- **Indication and Pulse output**
  1) **Pipe size**: 50 mm or more:
    - Flow velocity ≥ 0.5 m/s: ±1% of reading
    - Flow velocity < 0.5 m/s: Velocity error of ±0.005 m/s
  2) **Pipe size**: Less than 50 mm
    - Flow velocity ≥ 0.5 m/s: ±3% of reading
    - Flow velocity < 0.5 m/s: Velocity error of ±0.015 m/s
- **Current output**
  - Additional error of ±0.01 mA be added onto display and pulse output.

(*) Basis proofreading conditions

- **Fluid**: Water
  - Temperature fluctuation: ±0.5°C
- **Piping material**: Stainless steel (SS316)
- **Pipe length**: 20D/10D (D: Diameter)
- **Pipe size**: 100 mm

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TOKYO KEISO CO., LTD.
POWER SUPPLY AND INPUT-AND-OUTPUT CABLE  ELECTRIC CONNECTION

UFC300W (Wall installation type)

Terminal symbol | Polarity | Converter for 1-line measurement (Std.) | Converter for 2-line measurement (Internal power supply) | Converter for 1-line measurement (External power supply) |
--- | --- | --- | --- | --- |
L/L+ | (+) | AC power supply : L • N / DC power supply : L+ • L- | Current output | Current output |
N/L- | (-) | Grounding | Status output / Control input | Current output |

Terminal A can supply the circuit power of current output from the outside in the following combination.

Terminal symbol | Polarity | Converter for 1-line measurement (Std.) | Converter for 2-line measurement |
--- | --- | --- | --- |
A | + | Current output | Current output |
A | - | Current output | Current output |
B | + | Status output / Control input | Current output |
B- | - | Current output | Current output |
C | + | Status output | Pulse output |
C- | - | Status output | Pulse output |
D | + | Pulse output / Status output | Pulse output |
D- | - | Pulse output / Status output | Pulse output |

Terminal type : Plug-in type screw terminal
Applicable cable size : Power cable : 0.5 to 2.5 mm²
Signal cable : 0.5 to 1.5 mm² (UFC300W)
: 0.5 to 2.5 mm² (UFC300F)
ELECTRIC CONNECTION OF CONVERTER AND SMALL / MEDIUM SENSOR

UFC300W (Wall installation type)

1U  2U  1D  2D

Converter UFC300W

2U1U
1D 2D

Connection of the second UFS6000 sensor

Sensor UFS6000

UFC300F (Field installation type)

COMBINATION EXAMPLES OF CONVERTER AND SMALL / MEDIUM SIZE SENSORS

1) Converter for 1-line measurement (Std.)
   - Converter for 1-line measurement
   - Sensor × 1 set

2) Dual measurement
   - Converter for 1-line measurement
   - Sensor × 2 set

3) Converter for 2-line measurement
   - Converter for 1-line measurement
   - Sensor × 2 set
ELECTRICAL CONNECTION OF CONVERTER AND LARGE SENSOR

**UFC300W (Wall installation type)**

Converter UFC300W

Connection box

UP stream sensor

DOWN stream sensor

**UFC300F (Field installation type)**

Converter UFC300W
COMBINATION EXAMPLES OF CONVERTER AND LARGE SENSOR

1) Converter for 1-line measurement (Std.)
- Converter for 1-line measurement
- UP/DOWN stream sensor × 1 set
- Connection box × 1

2) Dual measurement
- Converter for 1-line measurement
- UP/DOWN stream sensor × 2 set
- Connection box × 2

3) Converter for 2-line measurement
- Converter for 1-line measurement
- UP/DOWN stream sensor × 2 set
- Connection box × 2
DIMENSIONS

Sensor UFS6000

- Small / Medium sensor

- Large sensor

- Connection box

<table>
<thead>
<tr>
<th>Item</th>
<th>Dimension (mm)</th>
<th>Mass (Approx. kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Small sensor</td>
<td>497</td>
<td>71</td>
</tr>
<tr>
<td>Medium sensor</td>
<td>827</td>
<td>71</td>
</tr>
<tr>
<td>Large sensor</td>
<td>497</td>
<td>71</td>
</tr>
<tr>
<td>Connection box</td>
<td>177</td>
<td>67</td>
</tr>
</tbody>
</table>

(Note 1) A large sensor has total 2 sensor rails, one for upstream and one for downstream.
(Note 2) Don't install sensors on the top and on the bottom of a horizontal pipe line.
**SONICMAX® Ultrasonic Clamp-on Flowmeter UL6300**

**UFC300W (Wall installation type)**

![Wall installation type diagram](image)

[Metal fittings for UFC300W]

**UFC300F (Field installation type)**

![Field installation type diagram](image)

Grounding terminal (M5)

Grounding 2B pipe (Supplied by customer)

U bolt for 2B pipe installation (Option)

Mass: Approx. 2.4kg
# MODEL AND SPECIFICATION CODE

**Representation type:** UL6300  
**Individual type:** Refer to following table.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Sensor code</th>
<th>Converter code</th>
<th>Description</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General type</strong></td>
<td>UFS6000</td>
<td>UFC300W</td>
<td>Sensor model: UFS6000, Clamp-on type</td>
<td>○</td>
</tr>
<tr>
<td><strong>ATEX</strong></td>
<td>UFS6000-x-EEx</td>
<td>-</td>
<td>Always 4</td>
<td>○</td>
</tr>
<tr>
<td><strong>TIIS</strong></td>
<td>[Preparing]</td>
<td>[Preparing]</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

### Specification code

<table>
<thead>
<tr>
<th>Sensor specification code</th>
<th>V N 6 0 4</th>
<th>1 0 7</th>
<th>0 0 2 1 0 0 0 0 0 0</th>
<th>Description</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Fixed code)</td>
<td>4</td>
<td></td>
<td></td>
<td>Sensor model: UFS6000, Clamp-on type</td>
<td>○</td>
</tr>
<tr>
<td>Sensor size / Nominal size</td>
<td>2</td>
<td></td>
<td></td>
<td>Small : 15 mm / 1/2” to 100 mm / 4”</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td>Medium : 50 mm / 2” to 400 mm / 16”</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>Large : 200 mm / 8” to 4000 mm / 160”</td>
<td>○</td>
</tr>
<tr>
<td>Version</td>
<td>0</td>
<td></td>
<td></td>
<td>General type (Non-protection)</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>ATEX</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td>Always 7</td>
<td>○</td>
</tr>
<tr>
<td>Connectable converter type</td>
<td>D</td>
<td>Field installation type</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Wall installation type</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material of sensor rail</td>
<td>0</td>
<td>Standard (Aluminum alloy)</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>10 m</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>20 m</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>30 m</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor cable length</td>
<td>*2</td>
<td></td>
<td></td>
<td>Always 02000000</td>
<td>○</td>
</tr>
<tr>
<td>Standard calibration</td>
<td>0</td>
<td>Calibration</td>
<td>○</td>
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<td></td>
</tr>
<tr>
<td>Special feature</td>
<td>(Blank)</td>
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<td>○</td>
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<tr>
<td></td>
<td>72</td>
<td>Provided</td>
<td>○</td>
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</tbody>
</table>

### Converter specification code

<table>
<thead>
<tr>
<th>Converter specification code</th>
<th>V N 3 2 4</th>
<th>2 0 S 1 2</th>
<th>1 0 0</th>
<th>Description</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Fixed code)</td>
<td>4</td>
<td></td>
<td></td>
<td>Converter model: UFC300</td>
<td>○</td>
</tr>
<tr>
<td>Type</td>
<td>H</td>
<td>Field installation</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Wall installation type</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>1</td>
<td>24 V DC (12 to 24 V)</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>100 to 230 V AC (85 to 250 V)</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of protection</td>
<td>0</td>
<td>General type (Non-protection)</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>ATEX</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable entry</td>
<td>*3</td>
<td></td>
<td></td>
<td>TIIS (Preparing)</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1/2 NPT female thread</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>G1/2 female thread</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>M20 with watertight gland</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>G1/2 with pressure tight packing adapter</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>1</td>
<td>Standard</td>
<td>○</td>
<td></td>
<td></td>
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<tr>
<td>(Fixed code)</td>
<td>2</td>
<td>Always 2</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output type</td>
<td>1 0 0</td>
<td>For 1 sensor: Standard (Current output + Pulse output + Control input + Status output)</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 A E</td>
<td>For 2 sensors: (2 x Current outputs + 2 x Pulse outputs)</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special feature</td>
<td>(Blank)</td>
<td>Special feature</td>
<td>○</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 2 pieces of 6 m cable between connection box and upstream sensor/downstream sensors are supplied.  
*2 Cable length between connection box and converter for large sensor.  
*3 Standard electrical connection of sensor cable is M20 water proof cable gland. Specify a G1/2 pressure tight packing adapter (its code: H) for TIIS explosion proof construction.  
*4 In case that special feature are involved, put /Z at the end of spec. code and specify the details. It is recommended to consult TOKYO KEISO for such availability before ordering.
README BEFORE USE

Following services may impair the designed functions of the flowmeters.
Customers are kindly requested to consult us about the assessment of its application including conducting actual tests before putting into services.

1) Measuring liquid properties
- Liquids contained large amounts of bubbles (approximately more than 2%)
- Liquids contained slurries and solids (approximately more than 5 weight%)
- Liquid flow of low Reynolds No. (approximately less than 10,000)
- Chemicals with changing properties such as concentration, density and viscosity

2) Installed pipe properties
- Inside carbon steel pipe is rusty
- Adhesives and residues inside pipe
- Clearance gap between lining and pipe itself, for example PVC lining pipe case
- Rough outer surface of cast iron pipe, for example
- PVDF pipe more than 9 mm in thickness
- PP pipe more than 15 mm in thickness
- Pipe more than 1000 mm in diameter

3) Required straight length
Precise flow measurement requires both upstream and downstream straight lengths as indicated in table below.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Required upstream straight length</th>
<th>Required downstream straight length</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 bend</td>
<td><img src="90_bend.png" alt="Image" /></td>
<td><img src="90_bend.png" alt="Image" /></td>
</tr>
<tr>
<td>Tee</td>
<td><img src="tee.png" alt="Image" /></td>
<td><img src="tee.png" alt="Image" /></td>
</tr>
<tr>
<td>Expansion pipe</td>
<td><img src="expansion.png" alt="Image" /></td>
<td><img src="expansion.png" alt="Image" /></td>
</tr>
<tr>
<td>Reducer</td>
<td><img src="reducer.png" alt="Image" /></td>
<td><img src="reducer.png" alt="Image" /></td>
</tr>
<tr>
<td>Valves</td>
<td><img src="valves.png" alt="Image" /></td>
<td><img src="valves.png" alt="Image" /></td>
</tr>
<tr>
<td>Pump</td>
<td><img src="pump.png" alt="Image" /></td>
<td><img src="pump.png" alt="Image" /></td>
</tr>
</tbody>
</table>

D : Nominal pipe diameter
Reference : JEMIMA standard JEMIS-32
FLOW RATE RANGE

<table>
<thead>
<tr>
<th>Inner diameter (mm)</th>
<th>Possible scale range (m³/h)</th>
<th>Min. (Velocity: 0 to 0.5 m/s)</th>
<th>Max. (Velocity: 0 to 20 m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td>0 to 0.319</td>
<td>0 to 12.7</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>0 to 0.566</td>
<td>0 to 22.6</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>0 to 0.884</td>
<td>0 to 35.3</td>
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<tr>
<td>40</td>
<td></td>
<td>0 to 2.27</td>
<td>0 to 90.4</td>
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<tr>
<td>50</td>
<td></td>
<td>0 to 3.54</td>
<td>0 to 141</td>
</tr>
<tr>
<td>65</td>
<td></td>
<td>0 to 5.98</td>
<td>0 to 238</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>0 to 9.05</td>
<td>0 to 361</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>0 to 14.2</td>
<td>0 to 565</td>
</tr>
<tr>
<td>125</td>
<td></td>
<td>0 to 22.1</td>
<td>0 to 883</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>0 to 31.9</td>
<td>0 to 1272</td>
</tr>
<tr>
<td>200</td>
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<td>0 to 56.6</td>
<td>0 to 2261</td>
</tr>
<tr>
<td>250</td>
<td></td>
<td>0 to 88.4</td>
<td>0 to 3534</td>
</tr>
<tr>
<td>300</td>
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<td>0 to 128</td>
<td>0 to 5089</td>
</tr>
<tr>
<td>350</td>
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<td>0 to 174</td>
<td>0 to 6927</td>
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<tr>
<td>400</td>
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<td>0 to 227</td>
<td>0 to 9047</td>
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<tr>
<td>500</td>
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<td>0 to 354</td>
<td>0 to 14137</td>
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<tr>
<td>600</td>
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<td>0 to 509</td>
<td>0 to 20357</td>
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<tr>
<td>700</td>
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<td>0 to 693</td>
<td>0 to 27708</td>
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<tr>
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<td>0 to 905</td>
<td>0 to 36191</td>
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<td>900</td>
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<td>0 to 1146</td>
<td>0 to 45804</td>
</tr>
<tr>
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<td></td>
<td>0 to 1414</td>
<td>0 to 56548</td>
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<td>0 to 3181</td>
<td>0 to 127234</td>
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<tr>
<td>2000</td>
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<td>0 to 5655</td>
<td>0 to 226194</td>
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<tr>
<td>3000</td>
<td></td>
<td>0 to 12724</td>
<td>0 to 508938</td>
</tr>
<tr>
<td>4000</td>
<td></td>
<td>0 to 22620</td>
<td>0 to 904778</td>
</tr>
</tbody>
</table>

PRECAUTION FOR USE

1) Provide upstream and downstream straight lengths.
2) Mount the sensor to the piping which is always filled with liquid.
3) Don’t install sensors on the top and on the bottom of a horizontal pipe line.
4) Keep sensor less than allowable temperature especially when the sensor covered by insulation materials.
5) When installing outdoors for use, it is recommended to attach a waterproof cover to the sensor in order to prevent deterioration of sensor grease.

STANDARD ACCESSORIES

- Parameter sheet : 1
- Instruction manual : 1

OPTION

- G1/2 watertight glands for cable entry : 1 set [Symbol : WG]
- Number of wiring connection : 3 [Symbol : 3G]
- 2B pipe installation metal fitting [Symbol: PM]
- Converter data (parameter) setting [Symbol : DS]
  Inform us of the piping specification, flow range and pulse rate etc.

ORDERING INSTRUCTIONS

Specify the following when ordering :
1. Model and spec. code
   Example : Model : UL6300
   Sensor specification code :
   VN6042007E1100210000000
   Converter specification code :
   VN324NA0620512100100
2. Option
   Refer to the option code and specify by the symbol.

* Specification is subject to change without notice.