Overview
In 1967, YOKOGAWA developed the Model VD6 Vibration Type Liquid Density Meter in response to user requests for an online density meter, to assist in process automation and saving labor resources and energy while further improving and stabilizing quality. This was an important development in the instrumentation field, because density is a fundamental physical quantity, the accurate measurement of which is important for almost all processes. The VD6 density meter has gone on to develop an excellent reputation as a highly stable high sensitivity meter.

The Model DM8 Vibration Type Density Meter is a highly reliable, multi-function meter developed on the basis of our experience with the VD6 and which takes advantage of the latest computer technology to integrate a wide range of sensor techniques. Its converter incorporates a microprocessor to directly convert frequency signals from the sensor into density values and display them and is provided with a variety of functions such as one-touch calibration, self diagnosis, digital output (RS-232C), etc.

System Configuration

1. General Specifications
   - Measurement object: Liquid density
   - Measurement principle: Vibration density measurement
   - Measurement range:
     - Density: 0.5 to 2.0 g/cm³
     - Temperature: -10 to 100°C
   - Distance between Detector and Converter: Up to 2 km
   - Power supply: 90 to 132 V AC or 180 to 264 V AC, 50/60 Hz
   - Power consumption: 20 VA

2. Detector
   - Note: These detectors cannot be used with highly corrosive liquids and solutions likely to stick to sensors. It is desired to be applied to solutions containing slurry or sludge, consult with YOKOGAWA. For measuring NaOH solutions, use sensors with a nickel vibrator.

   CAUTION
   Select the material of wetted parts with careful consideration of process characteristics. Inappropriate selection may cause leakage of process fluids, which greatly affects facilities. Considerable care must be taken particularly in the case of strongly corrosive process fluid such as hydrochloric acid, sulfuric acid, hydrogen sulfide, and sodium hypochlorite. If you have any questions about the wetted part construction of the product, be sure to contact Yokogawa.

   Any company’s names and product names mentioned in this GS are names, trademarks or registered trademarks of their respective companies.

Converter
Detector
3. Converter Model DM8C

Display: Digital display, five digits LED
Display contents:
- Density (g/cm³) after conversion to reference temperature (center temperature)
- Density (g/cm³) at the measuring temperature
- Measuring liquid temperature (°C)
- Set density value for the calibration liquid (g/cm³) (displayed on call)
- Temperature coefficient set value for the calibration liquid (x10⁻⁵ g/cm³/°C) (displayed on call)
- Output signal set value (%) (displayed on call)

Setting for output range low limit (g/cm³) (displayed on call)
Setting for output range high limit (g/cm³) (displayed on call)
Reference temperature (center temperature) set value (°C) (displayed on call)
Temperature coefficient set value for the measuring liquid (x10⁻⁵ g/cm³/°C) (displayed on call)
Fault contents display

Output signal:
- Analog output: 4 to 20 mA DC (load resistance 550 Ω or less), and 0 to 1 V DC (load resistance 250 kΩ or more), isolated output.
- Density (g/cm³) after conversion to the reference temperature
- Digital output: RS-232C

Asynchronous system (output only)
Baud rate: 1200 bps
Data format: ASCII, data length; 8bit
Data:
- Density (g/cm³) after conversion to the reference temperature
- Density (g/cm³) at the measured temperature
- Measured liquid temperature
- Calibration state
- Failure alarm

Output signal span: 0.05 to 0.5 g/cm³ settable
Reference temperature set range: 0 to 100°C (in increments or decrements of 1°C)
Contact output on failure:
- One point. Contact closed on failure or power failure. Contact open when normal.

Permissible voltage: 220 V DC, 250 V AC
Permissible current: 2A (resistive load)
Permissible contact power: 60 W
Fault detecting contents:
- Detector failure and converter failure
Failure output:
- Analog signal: Falls down to about -10% of the output signal span
- Digital signal: Error message outputs
Output signal hold:
- Holds in the CAL, or Maintenance mode.

Settable range for temperature coefficient:
0 to 0.002 g/cm³/°C

Calibration procedure:
- One-touch calibration by strong calibration liquid density (one-point calibration)

Ambient temperature: -10 to 55°C
Power supply: 90 to 132 V AC or 180 to 264 V AC, 50/60 Hz
Case construction: Dust and rain proof construction
EMC compatibility: Korea Electromagnetic Conformity Standard Class A

Coating color:
- Door: Equivalent to Munsell 2.8GY6.4/0.9
- Case: Equivalent to Munsell 2.0GY3.1/0.5

Coating finish: Baked finish epoxy resin
Mounting: To panel, wall or 2-inch pipe
Air purge connector: Rc1/8, Rc1/4, or 1/4NPT female
is also optionally available

Electrical connection: Five holes, 27 mm dia.
Attached with four plastic waterproof plugs equivalent to JIS A15, and one plastic waterproof plug equivalent to JIS A20.

Weight: Approx. 7.0 kg

4. Special Cable Model DM8W

Type: Six-conductor double shield cable
Insulator: Polyethylene
Sheath: Polyvinyl chloride
Insulation resistance: 1000 MΩ/km
Conductor resistance: 15.31 Ω/km
Finished O.D.: 15.8 mm

Weight: Approx. 0.3 kg/m

5. Sampling Unit Model VD6SM

External dimensions:
- Approx. 400(W) x 400(D) x 1350(H) mm

Coating finish: Epoxy resin, baked gray finish (equivalent to Munsell N7)
Wetted part materials:
- 316 SS, Teflon (gasket for flowmeter, pressure gauge and strainer), Ni for /FN option.

Weight: Approx. 80 kg

Process conditions:
- Inlet temperature: 0 to 100°C
- Inlet pressure: 0 to 1 MPa or 0 to 2 MPa
- Required differential pressure: At least 0.1 MPa
- Flow rate: 1 to 10 L/min

Process connection: Screw, flange or welding socket

Sampling System Diagram

Element specifications
- F: Strainer body; 316 SS, element; 316 SS, Ni for /FN option
- PI: Pressure gauge, 0 to 1 MPa or 0 to 2 MPa, 316 SS
- TI: Thermometer, 0 to 100 °C or 0 to 150 °C, 316 SS
- FM: Flowmeter, tapered metal tube flowmeter, 1 to 10 L/min, 316 SS
- BV: Ball valve, 316 SS
- NV: Needle valve, 316 SS
- DD: Density detector

Note: This sampling system cannot normally be applied to food applications, if it is desired to be applied to food applications, consult with YOKOGAWA.
### Characteristics

(Overall characteristics after combing the detector and the converter)

**Repeatability:** $5 \times 10^{-4}$ g/cm³ (for digital output) 1% of span (for analog output)

**Linearity:**
- ±0.5% of span (when span is 0.2 g/cm³ or less)
- ±1% of span (when span is more than 0.2 g/cm³)

**Temperature characteristics:**
- ±0.5% of span/±10°C (Compensating error for changes in the measuring liquid temperature and detector temperature)

**Flow characteristics:**
- ±0.1% of span in the 0 to 5 L/min range

**Pressure characteristics:**
- ±0.0005 g/cm³/±98 kPa change

**Viscosity error:**
- ±0.1% of span in the 0 to 1500 cP range

### Standard Accessories

**Detector (VD6)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syringe</td>
<td>for injecting standard solution or solvent</td>
</tr>
<tr>
<td>Brush</td>
<td>for cleaning the detector</td>
</tr>
<tr>
<td>Allen wrench for terminal box</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Allen wrench for locking the cover</td>
<td>1 pc.</td>
</tr>
<tr>
<td>O-Ring</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Silica gel</td>
<td>2 packs</td>
</tr>
</tbody>
</table>

**Converter (DM8C)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuse for the converter (3A)</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Ferrite core</td>
<td>1 pc.</td>
</tr>
<tr>
<td>Cable straps</td>
<td>4 pcs.</td>
</tr>
</tbody>
</table>

*1: for /KC

### Characteristics

1. **Detector**

   **(1) General Purpose Detector**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD6D</td>
<td></td>
<td></td>
<td>General Purpose Liquid Density Detector</td>
</tr>
<tr>
<td>Vibrator material</td>
<td>-S3</td>
<td>*B</td>
<td>316 SS</td>
</tr>
<tr>
<td>-</td>
<td>*B</td>
<td>Style B</td>
<td></td>
</tr>
</tbody>
</table>

   **(2) Flameproof Detector**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD6DF</td>
<td></td>
<td></td>
<td>Flameproof Liquid Density Detector</td>
</tr>
<tr>
<td>Vibrator material</td>
<td>-S3</td>
<td>*B</td>
<td>316 SS</td>
</tr>
<tr>
<td>-</td>
<td>*B</td>
<td>Style B</td>
<td></td>
</tr>
</tbody>
</table>

   **(Option)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/FM</td>
<td></td>
<td></td>
<td>NEC Class I, Division 1, Group C and D, explosion-proof</td>
</tr>
</tbody>
</table>

### Converter

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM8C</td>
<td></td>
<td></td>
<td>Vibration Type Liquid Density Converter</td>
</tr>
<tr>
<td>Power supply</td>
<td>-A1</td>
<td>*D</td>
<td>90 to 132 V AC, 50/60Hz</td>
</tr>
<tr>
<td>-A2</td>
<td></td>
<td></td>
<td>180 to 264 V AC, 50/60Hz</td>
</tr>
<tr>
<td>(Option)</td>
<td>Air purge connector</td>
<td>/AP1</td>
<td>Rc1/4 female</td>
</tr>
<tr>
<td>/AP2</td>
<td></td>
<td></td>
<td>1/4NPT female</td>
</tr>
<tr>
<td>/KC</td>
<td></td>
<td></td>
<td>for Korea *1</td>
</tr>
</tbody>
</table>

*1: Be sure to select this if you want to use the converter in Korea.

### Special Cable

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM8W</td>
<td></td>
<td></td>
<td>Special Cable for Liquid Density Meter</td>
</tr>
<tr>
<td>Cable length</td>
<td>-L□□□□</td>
<td>*A</td>
<td>Length (unit: m)</td>
</tr>
</tbody>
</table>

*Note: Enter the cable length in “L□□□□” in m.*

[Example] L0050 for 50 m
L0100 for 100 m
L2000 for 2 km
### 4. Sampling Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD6SM</td>
<td>-----------</td>
<td>-----------</td>
<td>Sample Unit for Liquid Density Meter *1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Piping connection</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-JPT</td>
<td>Rc1/2</td>
<td>JIS 10K 15 RF Flange</td>
</tr>
<tr>
<td>-10K</td>
<td>JIS 20K 15 RF Flange</td>
<td></td>
</tr>
<tr>
<td>-20K</td>
<td>ANSI Class 150 1/2 RF Flange</td>
<td></td>
</tr>
<tr>
<td>-150</td>
<td>ANSI Class 300 1/2 RF Flange</td>
<td></td>
</tr>
<tr>
<td>-300</td>
<td>JPI Class 150 1/2 RF Flange</td>
<td></td>
</tr>
<tr>
<td>-151</td>
<td>JPI Class 300 1/2 RF Flange</td>
<td></td>
</tr>
<tr>
<td>-301</td>
<td>1/2 inch welding socket</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pressure gauge range</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-PG10</td>
<td>1 MPa</td>
<td>Diaphragm type 1 MPa</td>
</tr>
<tr>
<td>-PG20</td>
<td>2 MPa</td>
<td>Diaphragm type 2 MPa</td>
</tr>
<tr>
<td>-PK10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-PK20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-T100</td>
<td>0 to 100°C</td>
<td></td>
</tr>
<tr>
<td>-T150</td>
<td>0 to 150°C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Material of strainer element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>/ST</td>
<td>With steam tracing *2</td>
</tr>
<tr>
<td></td>
<td>/FN</td>
<td>Ni *3</td>
</tr>
</tbody>
</table>

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### Wiring Connection

*1: VD6SM sampling unit is not including the detector. Order the detector VD6D or VD6DF, separately. VD6DF.../FM can not be installed in this sampling unit. DM8C converter and special cable DM8W are also required for sampling system of density meter.

*2 If steam tracing is necessary, select the diaphragm type pressure gauge.

*3 If measuring solution includes NaOH (≤30%), select option code /FN of Ni.

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*1: If you selected the /KC option, be sure to attach the included ferrite cores to both ends of the special cable.
## External Dimensions

1. Detector

- General Purpose and Flameproof Detector Models VD6D and VD6DF

### Unit: mm

![Diagram of VD6D and VD6DF models]

- Sanitary Use Detector Model VD6DS

### Unit: mm

![Diagram of VD6DS model]

*1: The ends of sample inlet and outlet are connected with 6A (1/8-inch) pipe in welding. The pipe may be removed by loosing the gland.
2. Converter Model DM8C

3. Special Cable Model DM8W

(Note) Cable length is specified by the suffix code of "-L□□□□", □□□□ is specified in meter.
   e.g. for 50 m, -L0050
   for 100 m, -L0100
   for 2 km, -L2000
4. Sampling Unit Model VD6SM

![Diagram of Sampling Unit Model VD6SM](image)

**Model and Codes**

<table>
<thead>
<tr>
<th>Model and Codes</th>
<th>Connection Type</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD6SM - JPT - P□□ 0 - T1 □ 0 *B</td>
<td>Rc 1/2 female</td>
<td>0</td>
</tr>
<tr>
<td>VD6SM - 10K - P□□ 0 - T1 □ 0 *B</td>
<td>JIS 10K 15 RF Flange</td>
<td>100</td>
</tr>
<tr>
<td>VD6SM - 20K - P□□ 0 - T1 □ 0 *B</td>
<td>JIS 20K 15 RF Flange</td>
<td>100</td>
</tr>
<tr>
<td>VD6SM - 150 - P□□ 0 - T1 □ 0 *B</td>
<td>ANSI Class 150 1/2 RF Flange</td>
<td>100</td>
</tr>
<tr>
<td>VD6SM - 300 - P□□ 0 - T1 □ 0 *B</td>
<td>ANSI Class 300 1/2 RF Flange</td>
<td>100</td>
</tr>
<tr>
<td>VD6SM - 151 - P□□ 0 - T1 □ 0 *B</td>
<td>JPI Class 150 1/2 RF Flange</td>
<td>100</td>
</tr>
<tr>
<td>VD6SM - 301 - P□□ 0 - T1 □ 0 *B</td>
<td>JPI Class 300 1/2 RF Flange</td>
<td>100</td>
</tr>
<tr>
<td>VD6SM - WST - P□□ 0 - T1 □ 0*B</td>
<td>1/2 inch Welding Socket</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Some detail of steam trace tube omitted in this drawings.

*1: Only for with steam trace (option /ST)

Unit: mm
Inquireis sheet for the Vibration Liquid Density Meter

Thank you for inquiry on our vibration liquid density meter.
Please specify your requirements by checking the appropriate boxes and filling in the blanks with the requested information.

1. General Items
   Company name: ____________________________ Section: ____________________________
   Contact person: ____________________________ (Phone No. ____________________________)
   Address: ____________________________
   Plant name: ____________________________
   Measurement location: ____________________________
   Purpose: ☐ Indication ☐ Recording ☐ Alarm ☐ Control
   Power supply: VAC, Hz

2. Measurement conditions
   (1) Liquid temperature: ____________ to ____________ normally ____________ [°C]
   (2) Liquid pressure: ____________ to ____________ normally ____________ [kPa]
   (3) Liquid flowrate: ____________ to ____________ normally ____________ [L/min]
   (4) Slurry or soiling components?: ☐ Yes ☐ No
   (5) Name of measured liquid: ____________________________
   (6) Composition of measured liquid: ____________________________
   (7) Other: ____________________________

3. Installation location
   (1) Ambient temperature: Approx. ____________ [°C]
   (2) Installation location: ☐ Outdoors ☐ Indoors
   (3) Other: ____________________________

4. User requirements
   (1) Measurement range: ____________________________
   (2) Vibration material: ☐ 316 SS ☐ Ni
   (3) Cable length between detector and converter: ____________ m
   (4) Sampling system: ☐ No ☐ Yes with VD6SM
   (5) Other: ____________________________