General Specifications

Model DM8
Vibration Type Liquid Density Meter

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

- Model VD6SM Sampling unit
- Model VD6D Detector
- Model VD6DS Special cable Max. 2 km
- Model DM8 Converter
- Transmission signal

Standard Specifications

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
   (1) General Purpose Detector Model VD6D
      - Detector construction: Non-explosion protection, rain-proof construction
      - Case material: Cast Aluminium alloy
      - Case coating: Epoxy resin, baked finish
      - Case color: Jade green (equivalent to Munsell 7.5BG4/1.5)
      - Wetted part materials:
        - Base: SUS316
        - Vibrator: SUS316 or Ni (Au Blazing: BAu-4)

   Measuring liquid temperature: –10 to 100 °C
   Measuring liquid pressure: 2 MPa G or less
   Withstandable pressure: 4.9 MPa G
   Steam tracing: Available
   Process connection: Rc1/4
   Electrical connection: G3/4
   Mounting: JIS 50A pipe mounting
   Ambient temperature: –10 to 50 °C
   Weight: Approx. 12 kg

   (2) Flameproof (Explosionproof) Detector Model VD6DF
      - Detector construction: TIIS d2G3 or NEC Class I, Division 1, Groups C and D, Flameproof construction
      - Process connection: Rc1/4 or 1/4NPT female (only for VD6DF-uu*B/FM)
      - Electrical connection: G3/4 or 3/4NPSM female (only for VD6DF-uu*B/FM)
      - Specifications are the same as for the (1) General Purpose Detector except for the above construction.

   (3) Sanitary Use Detector Model VD6DS
      - Process connection: Special joint for connection to JIS 6A pipe (with gasket)
      - Wetted part materials: Added to the standard model
      - Gasket: Teflon
      - O-Ring: Viton
      - Stream tracing: Not available
      - Specifications are the same as for the (1) General Purpose Detector except for the above two items.
      - Temperature detector protecting tubes are detachable.

These detectors cannot be used with highly corrosive liquids and solutions likely to stick to sensors. If 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.
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 (×10⁻⁵ 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 (×10⁻⁵ 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:
  - To RS-232C
  - 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
Coating color:
- Equivalent to Munsell 2.8GY6.4/0.9
Coating finish:
- Baked finish epoxy resin
Mounting:
- To panel, wall or JIS 50A 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. 7.5 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

5. Sampling Unit Model VD6SM
External dimensions:
- Approx. 400(W) × 400(D) × 1350(H) mm
Coating finish:
- Epoxy resin, baked gray finish (equivalent to Munsell N7)
Watted part materials:
- SUS316, 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 100 kPa
Flow rate:
- 1 to 10 l/min

Sampling System Diagram

Element specifications:
- F: Strainer body; SUS316, element; SUS316, Ni for /FN option
- PI: Pressure gauge, 0 to 1 MPa or 0 to 2 MPa, SUS316
- TI: Thermometer, 0 to 100 °C or 0 to 150 °C, SUS316
- FM: Flowmeter, tapered metal tube flowmeter, 1 to 10 l/min, SUS316
- BV: Ball valve, SUS316
- NV: Needle valve, SUS316
- 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 × 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)
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>Sampling unit for Vibration type Density Meter (Note 1)</td>
</tr>
<tr>
<td></td>
<td>-JPT</td>
<td>-</td>
<td>Rc1/2</td>
</tr>
<tr>
<td></td>
<td>-10K</td>
<td>-</td>
<td>JIS 10K 15 RF Flange</td>
</tr>
<tr>
<td></td>
<td>-20K</td>
<td>-</td>
<td>JIS 20K 15 RF Flange</td>
</tr>
<tr>
<td></td>
<td>-150</td>
<td>-</td>
<td>ANSI Class 150 1/2 RF Flange</td>
</tr>
<tr>
<td></td>
<td>-300</td>
<td>-</td>
<td>ANSI Class 300 1/2 RF Flange</td>
</tr>
<tr>
<td></td>
<td>-151</td>
<td>-</td>
<td>JPI Class 150 1/2 RF Flange</td>
</tr>
<tr>
<td></td>
<td>-301</td>
<td>-</td>
<td>JPI Class 300 1/2 RF Flange</td>
</tr>
<tr>
<td></td>
<td>-WST</td>
<td>-</td>
<td>1/2 inch welding socket</td>
</tr>
<tr>
<td></td>
<td>-PG10</td>
<td>-</td>
<td>1 MPa</td>
</tr>
<tr>
<td></td>
<td>-PG20</td>
<td>-</td>
<td>2 MPa</td>
</tr>
<tr>
<td></td>
<td>-PK10</td>
<td>-</td>
<td>Diaphragm type 1 MPa</td>
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<td></td>
<td>-PK20</td>
<td>-</td>
<td>Diaphragm type 2 MPa</td>
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<td></td>
<td>T100</td>
<td>-</td>
<td>0 to 100°C</td>
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<tr>
<td></td>
<td>T150</td>
<td>-</td>
<td>0 to 150°C</td>
</tr>
<tr>
<td></td>
<td>+B</td>
<td>-</td>
<td>Style B</td>
</tr>
<tr>
<td></td>
<td>ST</td>
<td>-</td>
<td>With steam tracing (Note 2)</td>
</tr>
<tr>
<td></td>
<td>FN</td>
<td>-</td>
<td>Ni (Note 3)</td>
</tr>
</tbody>
</table>

(Note 1) VD6SM Sampling unit is not including Detector. Order detector VD6D or VD6DF, separately.

(Note 2) If steam tracing is necessary, select the diaphragm type pressure gauge.

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

2. 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>Converter</td>
</tr>
<tr>
<td></td>
<td>-A1</td>
<td>-</td>
<td>90 to 132V AC, 50/60Hz</td>
</tr>
<tr>
<td></td>
<td>-A2</td>
<td>-</td>
<td>180 to 264V AC, 50/60Hz</td>
</tr>
<tr>
<td></td>
<td>-C</td>
<td>-</td>
<td>Style C</td>
</tr>
<tr>
<td></td>
<td>AP1</td>
<td>-</td>
<td>Rc1/4</td>
</tr>
<tr>
<td></td>
<td>AP2</td>
<td>-</td>
<td>1/4NPT female</td>
</tr>
</tbody>
</table>

3. 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>A</td>
<td>Special cable</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>Length (unit: m)</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>-</td>
<td>Style A</td>
</tr>
</tbody>
</table>

(Note) Enter the cable length in “-”.

[Example] L0050 for 50 m
L0100 for 100 m
L2000 for 2 km

Flow characteristics: ±0.1 % of span in the 0 to 5 l/min range
Pressure characteristics: ±0.0005 g/cm² (±98 kPa change
Viscosity error: ±0.1 % of span in the 0 to 1500 cP range
## Wiring Connection

A diagram shows the connections between the detector, special cable, and converter. The diagram includes labels for wires A2, A3, A4, A5, A6, B4, B5, A, B, C, N.C., C, G, RD, TD, SG, and L1, L2. Arrows indicate the direction of the connections, with labels like "Alarm," "Digital signal," and "0 to 1V DC." A note explains that the density signal is converted to the reference temperature state, and another note mentions the detection of failures or power failure.

## External Dimensions

### 1. Detector
- General Purpose and Flameproof Detector Models VD6D and VD6DF

A detailed diagram illustrates the external dimensions of the detector, including measurements for various parts such as the sample inlet, sample outlet, steam connection, and electrical wiring port. Units are provided in millimeters (mm).
Sanitary Use Detector Model VD6DS

Unit: mm

* 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

Wiring port holes (5-ø27) (with rubber plugs)

Mounting pipe (50A (2-inch) pipe)

Purge air outlet (with seal sheet)

Purge air inlet Rc1/8

Pipe mounting bracket

Mounting bracket (applicable with any mounting method to panels, walls or pipes)

Mounting panel thickness Max. 12

3. Special Cable Model DM8W

Density detector

Density converter

Unit: mm

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Code</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>B4</td>
<td>130 (from A)</td>
</tr>
<tr>
<td>GRAY</td>
<td>B5</td>
<td>60 (from A)</td>
</tr>
<tr>
<td>RED</td>
<td>A2</td>
<td>110 (from A)</td>
</tr>
<tr>
<td>BLUE</td>
<td>A3</td>
<td>110 (from A)</td>
</tr>
<tr>
<td>YELLOW</td>
<td>A4</td>
<td>60 (from A)</td>
</tr>
<tr>
<td>GREEN</td>
<td>A5</td>
<td>110 (from A)</td>
</tr>
<tr>
<td>BROWN</td>
<td>A6</td>
<td>60 (from A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Code</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>B4</td>
<td>100 (from B)</td>
</tr>
<tr>
<td>GRAY</td>
<td>B5</td>
<td>80 (from B)</td>
</tr>
<tr>
<td>RED</td>
<td>A2</td>
<td>120 (from B)</td>
</tr>
<tr>
<td>BLUE</td>
<td>A3</td>
<td>110 (from B)</td>
</tr>
<tr>
<td>YELLOW</td>
<td>A4</td>
<td>90 (from B)</td>
</tr>
<tr>
<td>GREEN</td>
<td>A5</td>
<td>80 (from B)</td>
</tr>
<tr>
<td>BROWN</td>
<td>A6</td>
<td>80 (from B)</td>
</tr>
</tbody>
</table>
4. Sampling Unit Model VD6SM

Model and Codes | Connection Type       | L  |
----------------|-----------------------|----|
VD6SM - JPT    | Rc 1/2 female         | 0  |
VD6SM - 10K    | JIS 10K 15 RF Flange  | 100|
VD6SM - 20K    | JIS 20K 15 RF Flange  | 100|
VD6SM - 150    | ANSI Class 150 1/2 RF Flange | 100|
VD6SM - 300    | ANSI Class 300 1/2 RF Flange | 100|
VD6SM - 151    | JPI Class 150 1/2 RF Flange | 100|
VD6SM - 301    | JPI Class 300 1/2 RF Flange | 100|
VD6SM - WST    | 1/2 B Welding Socket  | 100|

Unit: mm

Note: Some detail of steam trace tube omitted in this drawings.
(*1): Only for with steam trace (option /ST)
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

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: ___________________________
   (2) Installation location: □ Outdoors □ Indoors
   (3) Other: ___________________________

4. User requirements
   (1) Measurement range: ___________________________
   (2) Vibration material: □ SUS316 □ Ni
   (3) Cable length between detector and converter: ___________ m
   (4) Power supply: □ 90 to 132 V AC □ 180 to 264 V AC
   (5) Other: ___________________________