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. 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.

(1) General Purpose Detector Model VD6D
   - Detector construction: Non-explosion protection, rainproof 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: 316 SS
     - Vibrator: 316 SS or Ni (Au Blazing: BAu·4)
   - Measuring liquid temperature: -10 to 100°C
   - Measuring liquid pressure: 2 MPa G or less
   - Withstanding pressure: 4.9 MPa G
   - Steam tracing: Available
   - Process connection: Rc1/4
   - Electrical connection: G3/4
   - Mounting: JIS 50A (2-inch) pipe mounting
   - Ambient temperature: -10 to 50°C
   - Weight: Approx. 12 kg

(2) Flameproof (Explosionproof) Detector Model VD6DF
   - Detector construction:
     - TIIS; d2G3 or FM; Class I, Division 1, Groups C and D, Flameproof construction
   - Process connection: Rc1/4 or 1/4NPT female (only for VD6DF-□□▪□B/FM)
   - Electrical connection: G3/4 or 3/4NPSM female (only for VD6DF-□□▪□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.

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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
- 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: Door: Equivalent to Munsell 2.8GY6.4/0.9
- Case: Equivalent to Munsell 2.0GY3.1/0.5
- Coating finish: Baked finish epoxy resin
- Air purge connector: Rc1/8
- Rc1/4, or 1/4NPT female is also optionally available

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/cm$^3$ (for digital output) 1% of span (for analog output)
- **Linearity**: ±0.5% of span (when span is 0.2 g/cm$^3$ or less) ±1% of span (when span is more than 0.2 g/cm$^3$)
- **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/cm$^3$/±98 kPa change
- **Viscosity error**: ±0.1% of span in the 0 to 1500 cP range

### Standard Accessories

- Syringe (for injecting standard solution or solvent) 1 pc. for Detector (VD6)
- Brush (for cleaning the detector) 1 pc.
- Allen wrench for terminal box 1 pc.
- Allen wrench for locking the cover 1 pc.
- O-Ring 1 bag
- Silica gel 2 packs
- Fuse for the converter (3A) 1 pc. for Converter (DM8C)

### 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>-N1</td>
<td>316 SS Nickel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*B</td>
<td>Style B</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>-N1</td>
<td>316 SS Nickel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*B</td>
<td>Style B</td>
</tr>
</tbody>
</table>

(Option) /FM NEC Class I, Division 1, Group C and D, explosion-proof

### 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>-A2</td>
<td>90 to 132 V AC, 50/60Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>180 to 264 V AC, 50/60Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*C</td>
<td>Style C</td>
</tr>
</tbody>
</table>

(Option) /AP1 /AP2 Rc1/4 female 1/4NPT female

### 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></td>
<td>Length (unit: m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*A</td>
<td>Style A</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>Sampling Unit for Liquid Density Meter (Note 1)</td>
</tr>
<tr>
<td></td>
<td>-JPT</td>
<td>-----------</td>
<td>Rec 1/2</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>
</tr>
<tr>
<td></td>
<td>-PK20</td>
<td>-----------</td>
<td>Diaphragm type 2 MPa</td>
</tr>
<tr>
<td></td>
<td>-T100</td>
<td>-----------</td>
<td>0 to 100°C</td>
</tr>
<tr>
<td></td>
<td>-T150</td>
<td>-----------</td>
<td>0 to 150°C</td>
</tr>
</tbody>
</table>

- **B** Style B

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

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

(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.

### Wiring Connection

- Detector
- Special cable
- Converter

Closed when a failure is detected or the power fails.

- Density signal after being converted to the reference temperature state
- Density signal before being converted to the reference temperature state
- Temperature signal

Density signal after being converted to the reference temperature state
External Dimensions

1. Detector

- General Purpose and Flameproof Detector Models VD6D and VD6DF

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Inlet Rc1/4</td>
<td>246 mm</td>
</tr>
<tr>
<td>Steam Connection Rc1/4</td>
<td>100 mm</td>
</tr>
<tr>
<td>Sample Outlet Rc1/4</td>
<td>192 mm</td>
</tr>
<tr>
<td>±</td>
<td>100 mm</td>
</tr>
<tr>
<td>±</td>
<td>110 mm</td>
</tr>
<tr>
<td>±</td>
<td>153 mm</td>
</tr>
<tr>
<td>±</td>
<td>166 mm</td>
</tr>
<tr>
<td>±</td>
<td>345 mm</td>
</tr>
<tr>
<td>±</td>
<td>103 mm</td>
</tr>
<tr>
<td>±</td>
<td>73 mm</td>
</tr>
<tr>
<td>±</td>
<td>200 mm</td>
</tr>
<tr>
<td>+58 mm</td>
<td>160 mm</td>
</tr>
<tr>
<td>±</td>
<td>146 mm</td>
</tr>
<tr>
<td>±</td>
<td>116 mm</td>
</tr>
<tr>
<td>±</td>
<td>74 mm</td>
</tr>
<tr>
<td>±</td>
<td>50A (2-inch) Pipe</td>
</tr>
<tr>
<td>±</td>
<td>Electrical Wiring Port G3/4</td>
</tr>
</tbody>
</table>

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

- Sanitary Use Detector Model VD6DS

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Inlet *</td>
<td>166 mm</td>
</tr>
<tr>
<td>Sample Output *</td>
<td>166 mm</td>
</tr>
<tr>
<td>±</td>
<td>146 mm</td>
</tr>
<tr>
<td>±</td>
<td>50A (2-inch) Pipe</td>
</tr>
<tr>
<td>±</td>
<td>Electrical Wiring Port G3/4</td>
</tr>
</tbody>
</table>

Unit: mm
2. Converter Model DM8C

![Diagram of converter model DM8C]

- Wiring port holes (5-Ø27) (with rubber plugs)
- Purge air outlet (with seal sheet)
- Mounting pipe (2-inch pipe)
- Mounting bracket (applicable with any mounting method to panels, walls or pipes)
- Mounting panel thickness Max. 12
- Panel Cutout: 2-Ø9 holes or M8 screws

*: When option code is specified, Rc1/4 or 1/4 NPT female connector is attached.

3. Special Cable Model DM8W

![Diagram of special cable model DM8W]

Density detector

- Specified length by "-L□□□□" (Note)

Density converter

- Unit: mm

(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

<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>
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: ____________________________________________
   Contact person: ____________________________________________
   Address: ________________________________________________
   Plant name: ______________________________________________
   Measurement location: _____________________________________
   Purpose: ☐ Indication ☐ Recording ☐ Alarm ☐ Control
   Power supply: VAC, Hz

2. Measurement conditions
   (1) Liquid temperature: _______ to _______ β
   (2) Liquid pressure: _______ to _______ kPa
   (3) Liquid flowrate: _______ to _______ 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. _______ β
   (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: