High Accuracy

MT220 Series of Digital Manometers

– For Truly Efficient Field Calibration –

MT 220

High accuracy: ±0.01% of reading, with a maximum allowable input of 500 kPa (130 kPa-range model)

- Measurement with DCV and DCA
- 24 V DC output
- Percent reading
- Error reading
- Measurement data memory
- D/A conversion output, comparator output, and external trigger input (optional)
- GP-IB or RS-232 interfaces
- 12 V DC power supply
- Battery operation (optional)

The de facto standard of field calibrators for pressure and differential pressure transmitters

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... and subscribe to “Newswave,” our free e-mail newsletter
High-Performance, High-Efficiency Field Calibration
In electric power, gas, nuclear power, oil refinery, petrochemical and pharmaceutical plants, numerous sensors are used to measure such variables as pressure, temperature, flow rate, and to automate the process. These sensors must be calibrated periodically to maintain product quality. However, there are typically so many pressure/differential pressure transmitters out in the field, the transmitters are usually calibrated in-situ. This calibration accounts for much of plant maintenance work. Efficiency is therefore crucial to maintain uptime of equipment and for safety.

The MT220 is a precision digital manometer for use with pressure/differential pressure transmitters and is designed to maximize the efficiency of field calibration work.

Functions Tailored to Your Calibration Work
Calibration involves inputting the same pressure level to both a calibrator and a transmitter and comparing the transmitter output with a value measured by the calibrator. The MT220 comes with all the functions you need for such calibration work in the plant or field. Practical functions include measuring transmitter output (1-5 V or 4-20 mA), outputting 24 V DC for driving the transmitter, and indicating the transmitter output error as a percent value. The MT220 even has a pressure range pre-adjusted to that of transmitters.

Assured Compatibility with Earlier Models
The specifications of the MT220 are based on the earlier series of MT120 manometers to ensure compatibility; both series also share the same communications commands.

Years of Experience in Precision Pressure Measuring Instruments
Yokogawa, a leading company with a proven track record in the field of industrial instruments and instrumentation, also has decades of experience in pressure measurement. We've been developing digital manometers for more than 20 years and have won a great many loyal customers. Our wide range of pressure measuring instruments offer unrivalled functionality and performance.

Other Major Functions
Many other functions help you implement your specific applications successfully.

Front Panel
- LCD for 5.5-digit readings (pressure measurement) and 4.5-digit readings (measurement with DCV and DCA functions), 4.5-digit and 3.5-digit readings, respectively, for Model T705755. The EL-backlight LCD presents a clear, sharp view even in dark places.
- Pressure unit selector key
  - Used to select from up to seven units: factory-set to kPa.
- Comparator output LED indicator (optional)
- Pressure input connection
  - You can choose from three choices of connector configuration. The same connection is found on the rear panel.
- D/A conversion output terminal (optional)
- Communication interface
  - Selected from GP-IB and RS-232.
- Parameter setting keys
- Data storage keys
- Up to 2,000 data items can be stored in the internal memory.
- Error readout key (%ERROR function)
  - Shows an error in the volt-DC or ampere-DC reading of a pressure measurement (transmitter output) as a percent value.
- Relative key
  - Shows the deviation from a specified pressure measurement.
- Zero calibration key
  - Adjusts the zero reading to the atmospheric pressure or vacuum.
- DCV/DCA functions keys
  - Turn on or off the DCV/DCA functions, or toggle between the functions.
- Power switch

Rear Panel
- AC power supply input terminal
- DC power supply input terminal
- Output terminal (optional)
- Communication interface
  - Selected from GP-IB and RS-232.
- 4-20 mA conversion output terminal (optional)
- DCV/DCA measurement terminals
  - Greatly help reduce the field calibration work required for pressure/differential pressure transmitters. The current (A) terminal is protected by a built-in fuse against overrange input levels.

Full Support for Higher Accuracy of Pressure/Differential Pressure Transmitters
The accuracy of pressure/differential pressure transmitters has continued to improve, from ±0.25% to ±0.1%, and now to ±0.075%. That means the accuracy and stability of the manometers used to calibrate these transmitters must keep pace.

The MT220 employs Yokogawa’s original silicon resonant sensor—a high precision pressure sensing device. We’ve also set up an advanced calibration environment, including a tightly-controlled traceability system. As a result, our Calibrators feature basic accuracy as high as ±0.01%, and excellent stability. With the MT220, you can verify the performance of even the most accurate of pressure/differential pressure transmitters, i.e. ±0.075%.
High-Performance Products Built on Sound Technology

Automation of Pressure Measurement

D/A Conversion Output (Optional)

Outputs a D/A-converted signal through the external terminal. This feature lets you easily send measurement data to a measuring system or a recorder.

Comparator Output and External Trigger Input (Optional)

The comparator output provides the result of comparing an input level with preset upper and lower limits through the external terminal. You can also apply a start-of-measurement trigger using the rising edge of an external trigger signal supplied through the external trigger input. These features help automate your production/inspection lines of pressure-related products.

GP-IB (or RS-232) Interface—Choose When Ordering

This feature lets you read measured values into your PC or set measurement conditions from the PC. Communication is still possible even when the MT210/210F series are operated on batteries or the DC power source.

Yokogawa Traceability System for Ensuring Top Reliability of Pressure measurement by customers

The company is committed to controlling and maintaining the accuracy of standards installed in the standards room of its Kofu plant.

Traceability System Chart

<table>
<thead>
<tr>
<th>Japanese national standards</th>
<th>Geographical Survey Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Institute of Advanced Industrial Science and Technology</td>
<td></td>
</tr>
</tbody>
</table>

Reference standards
- Pressure balances (Dead-weight pressure gauge)
- Reference weights
- Calibration standards
- Working Standards (Digital manometers)
- Products: MT220

Standards room under stringent control within the Kofu plant of Yokogawa
Field Calibration of Pressure/Differential Pressure Transmitters

The MT220 can measure pressure with outstanding accuracy, high resolution, minimal tempco, and excellent stability. It offers a wealth of functions for field calibration, including transmitter output measurement (DCV/DCA functions), 24-V DC output, percent error readout, measurement data memory, and Ni-Cd battery operation. The D/A conversion output makes it simple to output data to a recorder or other equipment. And of course, data output through a GP-IB or RS-232 interface is also possible—including data output during operation on a 12 V DC power supply or Ni-Cd batteries.

Calibration System Configuration Using a Combination of MT220 and Standard Pressure Source

Calibrating transmitters, pressure sensors and manometers is easy. Simply combine the MT220 with a standard pressure source (e.g., MC100 series) or a handheld pump (e.g., Model BA-11). You can also automate your calibration system by integrating your PC and relevant equipment with the system, making it ideal for a calibration laboratory, for example.

Major Users of Yokogawa Digital Manometers (for Reference Only)

National standards institutions in Japan and abroad; institutions related to nuclear power generation; national and public research institutions; electric-power companies; automakers and their affiliates; electric home appliances manufacturers; precision instruments manufacturers; semiconductor and electronic components manufacturers; pharmaceutical manufacturers; heavy electrical machinery builders; oil refinery companies and chemical and petrochemical companies; and engineering companies.
Technical Data

- **Pressure-Measurement Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>767351</th>
<th>767353</th>
<th>767355</th>
<th>767356</th>
<th>767357</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure type</td>
<td>Gauge</td>
<td></td>
<td></td>
<td></td>
<td>Absolute</td>
</tr>
<tr>
<td>Measurement range</td>
<td>Positive pressure: 0 to 10 kPa (Negative pressure: -10 to 0 kPa)</td>
<td>Positive pressure: 0 to 130 kPa (Negative pressure: -10 to 0 kPa)</td>
<td>Positive pressure: 0 to 700 kPa (Negative pressure: -40 to 0 kPa)</td>
<td>Positive pressure: 0 to 3000 kPa (Negative pressure: -40 to 0 kPa)</td>
<td>0 to 130 kPa abs</td>
</tr>
<tr>
<td>Readout range</td>
<td>12.0000 to 12.0000 kPa</td>
<td>Up to 158,000 kPa</td>
<td>Up to 840,000 kPa</td>
<td>Up to 3600.00 kPa</td>
<td>Up to 158,000 kPa abs</td>
</tr>
<tr>
<td>Accuracy***</td>
<td>Positive pressure: ±(0.01% of reading +0.01% of full scale)</td>
<td>Positive pressure: ±(0.01% of reading+2 digits) for 20 to 130 kPa ±(0.2% of reading +0.1% of full scale)</td>
<td>Positive pressure: ±(0.01% of reading +0.005% of full scale)</td>
<td>Positive pressure: ±(0.01% of reading +0.005% of full scale)</td>
<td>±(0.01% of reading +0.005% of full scale)</td>
</tr>
</tbody>
</table>

- **Material of measurement section**
  - Diaphragm: Hastelloy C276; flange of measurement chamber: stainless steel (JIS SUS316), Internal piping: stainless steel (JIS SUS316); O-ring: fluororubber; input connector: stainless steel (JIS SUS316)

- **Pressure-Measurement Specifications**

  - **Span:**
    - Negative pressure: -80 to 0 kPa
    - Positive pressure: 0 to 700 kPa
  - **Zero point:**
    - Zero point: ±0.01% of full scale

- **Internal volume:** Approx. 10 cm³

- **Weight (main unit):**
  - Approx. 8.5 kg

- **Liquid viscosity:**
  - 5 × 10⁻⁶ m²/s max.

- **Pressure reading unit:**
  - Silicon resonant sensor

- **Pressure input connector:**
  - R1/4 or NPT1/4 female-threaded or VCO1/4 male-threaded (specify when ordering), located on both front and rear panels; however, simultaneous input to connections on both sides is prohibited

- **Material of measurement section:**
  - Diaphragm: Hastelloy C276; flange of measurement chamber: stainless steel (JIS SUS316), Internal piping: stainless steel (JIS SUS316); O-ring: fluororubber; input connector: stainless steel (JIS SUS316)

- **Reference Information**

Yokogawa’s Original Silicon Resonant Sensor (Winner of the Ohkochi Grand Technology Prize and the Chairman’s Award of the Japan Federation of Economic Organizations (Keidanren))

Thanks to Yokogawa’s award-winning sensor, the MT220 boasts a basic accuracy as high as ±0.01%, and high resolution. The silicon resonant sensor is also practically immune to external effects such as temperature variations.

- **Pressure Unit Conversion Table**

<table>
<thead>
<tr>
<th>Pa</th>
<th>bar</th>
<th>kg/cm²</th>
<th>atm</th>
<th>mmH₂O or mmAg</th>
<th>mmHg or Torr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1 × 10⁻⁶</td>
<td>9.869 23 × 10⁻⁶</td>
<td>1.019 72 × 10⁻⁶</td>
<td>7.500 62 × 10⁻⁶</td>
</tr>
<tr>
<td>1 × 10⁵</td>
<td>1.000</td>
<td>1</td>
<td>9.869 23 × 10⁻⁶</td>
<td>1.019 72 × 10⁻⁶</td>
<td>7.500 62 × 10⁻⁶</td>
</tr>
<tr>
<td>9.806 65 × 10⁵</td>
<td>1</td>
<td>1</td>
<td>9.678 41 × 10⁻⁶</td>
<td>1.003 23 × 10⁻⁶</td>
<td>7.355 59 × 10⁻⁶</td>
</tr>
<tr>
<td>1.013 25 × 10⁵</td>
<td>1.013</td>
<td>1</td>
<td>9.678 41 × 10⁻⁶</td>
<td>1.003 23 × 10⁻⁶</td>
<td>7.600 00 × 10⁻⁶</td>
</tr>
<tr>
<td>1.333 22 × 10⁵</td>
<td>1.333</td>
<td>1.359 51 × 10⁻⁶</td>
<td>9.315 79 × 10⁻⁶</td>
<td>1.359 51 × 10⁻⁶</td>
<td>7.355 59 × 10⁻⁶</td>
</tr>
</tbody>
</table>
## DCV/DCA Function Specifications

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to ±25 V</td>
<td>0 to ±2 mA</td>
</tr>
</tbody>
</table>

**Accuracy**

- Tested at 23 ±3°C
- ±0.1% of reading ± 2 digits 30 days after calibration
- ±0.03% of reading ± 2 digits 90 days after calibration
- ±0.05% of reading ± 3 digits 6 months after calibration
- ±0.07% of reading ± 3 digits 1 year after calibration

**Readout range**

- 0 to ±6,000 V
- 0 to ±24,000 mA

**Maximum allowable input**

- 30 VDC
- 100 mA

**Input impedance**

- Approx. 10 MΩ
- Approx. 20 MΩ

**CMRR**

- 120 dB min.
- (50/60 Hz; Rs = 1 kΩ)

**NMRR**

- 60 dB min.
- (50/60 Hz)

**Temperature effect**

- ±0.01% of reading ± 2 digits 10°C

Note: The maximum allowable potential difference between any measuring terminal and the grounding terminal is 42 Vpeak.

## 24 V DC Output Specifications

<table>
<thead>
<tr>
<th>Output voltage</th>
<th>24 ±1 V DC (fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output current</td>
<td>30 mA max. (with limiter)</td>
</tr>
</tbody>
</table>

Note: The maximum allowable potential difference between any measuring terminal and the grounding terminal is 42 Vpeak.

## Data Memory Specifications

**Memory capacity**

- 2000 data items

## Specifications of Communication Interfaces (choose one)

**GP-IB interface**

- Conforms to IEEE Standard 488-1978

**Functional specifications**

- SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0

**RS-232 interface**

- Start-stop synchronization

**Transfer rates**

- 1200, 2400, 4800, 9600 bits/s

## Specifications of "/DA" Option

**D/A Conversion Output**

- Switchable between 0 to ±2 V and 0 to ±5 V to reflect the readout of pressure measurement
- Example of corresponding output voltages when measured with a 130-kPa gauge-pressure model set to the ±2 V range:
  - 0 kPa = 0 V
  - 65 kPa = 1 V
  - 130 kPa = 2 V
  - 156 kPa = 2.4 V
  - -80 kPa = -1.230 V

- Output resolution
  - 16 bits, where full scale is approximately ±125% of range

- Output accuracy
  - Tested at 23 ±3°C, after zero calibration, using the D/A conversion output terminal
  - Add ±0.05% of full scale accuracy to the Pressure-measurement Specifications section.

- Temperature effect
  - ±0.005% of full scale/°C

- Output update interval
  - Approx. 2 ms

- Response time
  - Same as the response time specified in the Pressure-measurement Specifications section.

- Output resistance
  - 0.1 Ω max.

- Load resistance
  - 1 kΩ min.

## Comparator Output

**Output signal**

- HIGH, IN, LOW, BUSY

**Operation**

- HIGH = 1, if measured value > upper limit
- IN = 1, if upper limit > measured value ≥ lower limit
- LOW = 1, if measured value < lower limit
- BUSY = 1, if there is a transition in the output signal

- An LED lamp on the display corresponding to HIGH, LOW or IN comes on.

**Signal level**

- TTL

## External Trigger

**Input level**

- TTL

**Operation**

- A start-of-measurement trigger is applied at a falling edge when the high-state level of an external signal is input with the HOLD function enabled. At the moment of triggering, the LED lamp on the front panel comes on.

## Common Specifications

**Display**

- LCD (with backlight); number of readout digits: 5.5 or 4.5** digits

**Power**

- RS-232 interface (Equipped with RS-232 connector)
- GP-IB interface (Equipped with GP-IB connector)

- Power consumption
  - When in pressure measurement mode: 25 VA max. for 100-V power line; 40 VA max. for 200-V power line
  - When in pressure measurement mode: 45 VA max. for 100-V power line; 65 VA max. for 200-V power line

- Insulation resistance
  - 20 MΩ min. at 500 V DC between AC power supply and casing

- Withstanding voltage
  - 1000 V AC (50/60 Hz) for 1 minute, between AC power supply and casing

- External dimensions

  | Main unit | Approx. 132 mm × 213 mm × 350 mm, excluding protrusions |
  | Battery pack | Approx. 33 mm × 182 mm × 260 mm, excluding protrusions |

- Weight

  | Main unit | See the Pressure-measurement Specifications section. |
  | Battery pack | Approx. 2.7 kg |

- Accessories

  | Connector for DC power supply (1), rubber pads for rear foot (2), labels for indicating measurement object, test lead (1), power cord (1), and user’s manual (1) |

1 The interval of outputting data via communication is the same as the readout update interval.

2 Conditions of response time measurement

• The response time is defined as the interval from the start of change to the time the readout settles to within ±1% of its final value.

• The manometer under test is made open to the atmospheric pressure when it is at its full-scale value, where the input section is under no load. In the case of absolute-pressure models, the manometer under test is made open to the atmospheric pressure at a scale value of 0.

• Measurement is performed using the D/A conversion output.

3 All models are factory-set to kPa.

4 VCO is a registered trademark of Swagelok Company. A conversion connector is attached.

5 ±3.5 is digital for Model 767355.

6 Yokogawa’s pressure standards accuracy is excluded.

7 Long-term stability of zero point is excluded.
Models and Suffix Codes

### Main Units

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Suffix Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT210/210F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MT220 series</td>
<td>767351</td>
<td>10</td>
<td>10 kPa-range, gauge-pressure model</td>
</tr>
<tr>
<td></td>
<td>767353</td>
<td>130</td>
<td>130 kPa-range, gauge-pressure model</td>
</tr>
<tr>
<td></td>
<td>767355</td>
<td>700</td>
<td>700 kPa-range, gauge-pressure model</td>
</tr>
<tr>
<td></td>
<td>767356</td>
<td>3000</td>
<td>3000 kPa-range, gauge-pressure model</td>
</tr>
<tr>
<td></td>
<td>767357</td>
<td>130</td>
<td>130 kPa-range, absolute-pressure model</td>
</tr>
<tr>
<td>Pressure unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>–U1</td>
<td>kPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>–U2</td>
<td>kPa</td>
<td>switchable to kgf/cm², mmHg or mmH₂O</td>
</tr>
<tr>
<td></td>
<td>–U3</td>
<td>kPa</td>
<td>switchable to psi, inHg, inH₂O, kgf/cm², mmHg or mmH₂O</td>
</tr>
<tr>
<td>Communication interface</td>
<td></td>
<td>–C1</td>
<td>GP-IB</td>
</tr>
<tr>
<td></td>
<td>–C2</td>
<td></td>
<td>RS-232</td>
</tr>
<tr>
<td>Pressure I/O connection</td>
<td></td>
<td>–P1</td>
<td>Rc 1/4</td>
</tr>
<tr>
<td></td>
<td>–P2</td>
<td></td>
<td>NPT1/4 female-threaded</td>
</tr>
<tr>
<td></td>
<td>–P3</td>
<td></td>
<td>VCO 1/4 male-threaded*</td>
</tr>
<tr>
<td>Power cord</td>
<td></td>
<td>–D</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–F</td>
<td>VDE standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–H</td>
<td>GB standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–R</td>
<td>AS standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–Q</td>
<td>BS standard</td>
</tr>
<tr>
<td>Option</td>
<td></td>
<td>–DA</td>
<td>D/A conversion output, comparator output and external trigger input</td>
</tr>
</tbody>
</table>

*VCO is a registered trademark of Swagelok Company.

### Optional Accessories

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Suffix Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery pack</td>
<td>269912</td>
<td></td>
<td>Ni-Cd batteries for MT210/220 series</td>
</tr>
<tr>
<td>Ni-Cd batteries</td>
<td>269913</td>
<td></td>
<td>A kit of three Ni-Cd batteries for the 269913 battery pack</td>
</tr>
<tr>
<td>Carrying case</td>
<td>89320D</td>
<td></td>
<td>For use with MT210/220 series</td>
</tr>
<tr>
<td>Connector assembly kit</td>
<td>89348YB</td>
<td></td>
<td>For use with ø4 x ø6 PVC tubing for “P1” option</td>
</tr>
<tr>
<td>Connector assembly kit</td>
<td>89348WB</td>
<td></td>
<td>For use with ø4 x ø6 PVC tubing for “P2” option</td>
</tr>
<tr>
<td>Simplified connector assembly kit</td>
<td>89310ZH</td>
<td></td>
<td>For use with ø4 x ø6 PVC tubing</td>
</tr>
<tr>
<td>Adapting connector</td>
<td>G9612BG</td>
<td></td>
<td>JIS; R1/4-to-Rc1/8</td>
</tr>
<tr>
<td>Adapting connector</td>
<td>G9612BJ</td>
<td></td>
<td>ANSI; R1/4-to-NPT1/4 female thread</td>
</tr>
<tr>
<td>Adapting connector</td>
<td>G9612BW</td>
<td></td>
<td>ANSI; R1/4-to-NPT1/8 female thread</td>
</tr>
</tbody>
</table>

### Carrying Case

- Picture of B9320ND carrying case

### Adapting Connectors for Input Section

- Connector assembly kit B9948BW
- Simplified connector assembly kit B99310Z
- Adapting connector (JIS) G9612BG
- Adapting connector (ANSI) G9612BJ
- Adapting connector (ANSI) G9612BW

### Related Products

#### MT210/210F Digital Manometers

- High accuracy: ±0.01% of reading
- Maximum allowable input: 500 kPa (130 kPa-range model)
- A wide range of pressures, from low differential pressure of 1 kPa to high gauge pressure of 3000 kPa
- Selection from three measurement modes: normal speed, medium speed and high speed (MT210F series)
- D/A conversion output, comparator output, and external trigger input (optional)
- GP-IB and RS-232 interfaces
- 12-V DC power supply
- Battery operation (optional)

#### MT10 Mini-manometer

- Highly reliable design based on silicon resonant sensor
- Compact
- High accuracy: ±0.04% of reading + 0.03% of full scale for 130 kPa-range model
- Three choices of pressure range: 130, 700 and 3000 kPa
- Simple operation
- Data hold function
- RS-232 interface

#### MC100 Pressure Standard

- High accuracy: ±0.05% of full scale
- Excellent stability of operation based on silicon resonant sensor
- Two choices of pressure ranges: 25 and 200 kPa
- Output divider function for generating fractions of a pressure setpoint, to a maximum resolution of 1/20
- Output autostep function
- Output sweep function
- Offset monitor function

#### CA71 Handy Calibrators

- Source and measure operations at the same time. DC Voltage, DC Current, Resistance, Thermocouple (TC), Resistance Temperature Detector (RTD), Frequency, Pulse.
- AC voltages, including supply voltage, can be measured.
- Includes a wide array of additional functions.
- Easy operation.
- Compact size and Lightweight.

**NOTICE**

- Before operating the product, read the instruction manual thoroughly for proper and safe operation.
- If this product is for use with a system requiring safeguards that directly involve personnel safety, please contact the Yokogawa sales offices.