FCM Glossary

Applicable to compact flow rate controller FCM.

Term	Explanation
Control range	Calibration range of this product.
Accuracy	Calibration error from CKD reference device. (Conditions: Temperature 25±3°C, power supply voltage 24 VDC ±0.01 V, standard differential pressure, secondary side released to atmosphere)
Repeatability	Calculated from the variation (D=Max-Min) after 20 consecutive cycles of 0% F.S. and 50% F.S. flow control at a cycle in which the control is sufficiently stabilized. (Reproducibility) = ±D/2/FS control flow rate x 100[%]
Temperature characteristics	Indicates the fluctuation of the flow rate value according to changes in the ambient temperature and fluid temperature (reference temperature 25°C) converted per 1°C. Calibration is performed at a temperature of 25°C.
Pressure characteristics	Indicates the fluctuation of the flow rate value according to changes in the working pressure. Calibration is performed at standard differential pressure.
Standard differential pressure	Differential pressure when this product is calibrated. (Secondary side released to atmosphere)
Working pressure differential	Differential pressure required for normal operation of this product.
Proof pressure	Pressure at which the product will not be damaged.
Indicator resolution	Min. step at which the display changes.
(Integrated) pulse output rate	Accumulated flow per pulse when the integrated pulse is output.
LSB	Shows the lowest order bit of the data. (Abbreviation for Least Significant Bit)
MSB	Shows the highest order bit of the data. (Abbreviation for Most Significant Bit)
UInteger	Unsigned integer. Indicates the data type. Ex. If the data format is UInteger16 (Process data OUT setting flow rate, etc.) Expressed as 16 (digits) bits (0/1) The variable range on the data is 0 to 65535, but the variable range that can be taken by each data name is limited.
Integer	Signed integer. Indicates the data type. Ex. If the data format is Integer16 (Process data IN instantaneous flow rate, etc.) Expressed as 16 (digits) bits (0/1) with the most significant bit representing the sign. Data value can range from -32768 to +32767, but for instantaneous flow rates a negative value is used to check the shift from the zero point to check and does not indicate a reverse flow.
Digit	Digit. Min. value of digital display when decimal points are ignored.
AWG	Abbreviation of American Wire Gauge. Standard for cables.

Flow rate controller

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact flow rate controller FCM Series

Design / Selection

1. Working fluids

DANGER

■Do not feed gas at the explosion limit. There is a risk of explosive accidents.

■When using this product for hydrogen, be sure to purge with inert gas such as nitrogen or argon before use. Usage without purging with inert gas could result in explosive accidents.

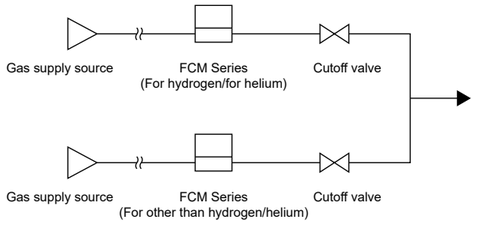
■For products without oil-free processing in gas-contacting parts, do not feed oxygen gas. Doing so could result in fire. Even for products with oil-free processing, do not use for oxygen gas if the product has been used even once for any other gas.

WARNING

■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act.

■This product is only for use with the gases indicated in the model No. Do not use products other than the applicable fluids, as specifications such as accuracy and control properties cannot be met. In particular, note that if hydrogen gas or helium gas flows into products in this series that is not in each dedicated model, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.)

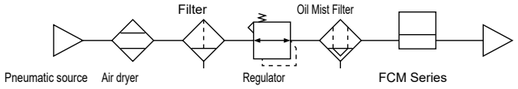
■When mixing hydrogen gas or helium gas with a gas other than hydrogen or helium, use caution regarding gas reverse flow. If hydrogen gas or helium gas flows into products in this series that is not in each dedicated model, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.) When cutting off the gas, provide individual cutoff valves as in the reference drawing below in order to prevent gas back-flow.



■Avoid the entry of foreign matter into the product. If foreign matter (foreign materials, water drops, or oil mist inside the piping, etc.) enters the product, accuracy or control properties may be adversely affected, leading to breakdown in some cases. If the entry of foreign matter is possible, install a filter, air dryer, and oil mist filter on the primary side (upstream side) of the product.

- The mesh inside the product rectifies flow in the pipe. Note that it does not filter out foreign matter.
- As compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), install a filter, air dryer, and oil mist filter (Micro-mist separator) on the primary side (upstream side) of the product.
- When using compressed air, use clean air compliant with ISO 8573-1: 2010 [1.1.1 to 1.6.2].

[Recommended circuit]



- When using a valve on the primary side of the product, use only valves with oil-prohibited specifications. The product could malfunction or breakdown if exposed to splattering grease, oil, etc.
- Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
- Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

■When using the valve with liquefied gases such as propane gas, always vaporize the gas. Failure may result if liquefied gas enters the product.

■When using this product to control the burner air-fuel ratio, take design measures to prevent backfire and to avoid the effect of backfire on the product. Internal pressure increase in the piping or fire due to burner backfire may lead to failure.

■Check that the pressure inside the fluid supply line is within the working differential pressure range before using. If the source pressure is low or the pressure at the secondary side is high, the differential pressure becomes insufficient and the fluid does not flow.

■Due to the flow characteristics of the primary side regulator, the pressure is unstable when the flow rate flows, and FCM output may fluctuate.

2. Working environment

⚠ WARNING

■ Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■ Ambient/fluid temperatures
Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

■ Guaranteed proof pressure/working pressure differential range
Usage in applications exceeding the proof pressure or outside the working pressure differential could result in breakdown. Use only within the specified range. If the source pressure is low or the pressure at the secondary side is high, the differential pressure decreases and the fluid does not flow.

■ Drip-proof environment
The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

■ The solenoid proportional valve inside this product does not have a fully closed function. When a fully closed state is required, separately provide a cutoff valve outside the product. When the external cutoff valve is closed, keep the product valve in standby at a fully closed state (setting flow rate zero). If the product is left in the normal control state with the external cutoff valve closed, excessive flow is produced for a moment when the external cutoff valve is opened. When using with frequent ON/OFF operations, its service life as a proportional valve may be reduced depending on the working conditions.

■ Do not install this product in movable sections or where it may be subject to vibration. Vibration or impact may lead to malfunction.

⚠ CAUTION

■ Check leakage current to prevent malfunction caused by leakage current from other fluid control components. When using a PLC, etc., leakage current could cause the product to malfunction.

■ When the current input type is wired, the power ground and signal common are shared. When operating this product in multiples with one PLC and D/A unit, depending on the D/A unit circuit, wiring trouble could prevent the correct signal from being input. Consult with the PLC manufacturer for use.

■ The current input type can be used with input signal 1-5 V, but as opposed to other voltage input types, input impedance is small (250 Ω). Use an appropriate voltage generator.

■ Be alert for pressure loss in the piping. When piping to this product, keep the differential pressure between upstream and downstream sides within the working pressure differential range (refer to the specification table for each type). Using the product outside the working pressure differential range could cause incorrect operation. In particular, an orifice or restriction in the secondary side (downstream side) of the product could cause incorrect operation. Please be careful. In addition, the product's primary or secondary pressure may fluctuate repeatedly, or the product's control may not be track, leading to unstable flow rate control.

■ CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

3. Wiring and piping

⚠ WARNING

■ Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value in hot summer could exceed the rating and damage the product or reduce precision.

⚠ CAUTION

■ When using oxygen gas, take special care with the points below.
- The piping work should be performed by an expert in the handling of oxygen gas.
- Use piping with oil-free processing.
- Make sure to remove foreign materials, burrs, etc., in the piping before installing the product.
- Install a filter on the primary side of the product.

■ Do not install regulator/solenoid valve, etc., immediately before this product. Deflected currents may occur and cause errors. Provide a straight piping section if required.

■ Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

■ Do not install multiple bodies in close contact. The mutual generation of heat could cause the product body's temperature to rise, hastening changes in characteristics or in the resin material. When using the products in a row, set intervals of distance of 10 mm or more.

Analog input/parallel input/RS-485

■ Cable extension
When extending the cable beyond 3 m, the analog output and analog input error may increase or the control may become unstable due to wiring resistance. Use of a cable within 3 m is recommended.

■ Extension of cable for RS-485 communication
- Make sure that the total extension distance of the RS-485 communication cable is within 20 m.
- Use a shielded twisted-pair cable for the communication cable to be extended.

■ When using RS-485 communication
- Install terminating resistors on both ends of the communication path. A terminating resistor (120Ω) is built into the product. Can be used as a terminating resistor by connecting the terminating resistor pin of pin No. 12 and pin No. 7 or pin No. 9.
- Be sure to connect the digital signal ground. Stable communication may not be possible if not connected.

IO-Link

■ IO-Link power supply
- Make sure that the length of the cable is within 20 m. If extending the cable, use wiring length of 20 m or less between the master and device (this product).
- Insulate wires not being used so that they do not contact other wires. Unintended connection of unused wires to the ground, etc., could cause malfunction or damage to the product.
- Use a power supply with sufficient current supply capacity. Use a IO-Link master that has sufficient current supply per port. If these specifications are not met, the product performance may not be achieved. In this case, connect a DC stabilized power supply with sufficient current supply capacity, not the IO-Link master, to L+ (2VDC) or L- (GND).

4. Flow rate unit

⚠ CAUTION

■ This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 barometric pressure (101 kPa) relative humidity 65%.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual