YAMATAKE

No.CP-PC-1280E

Gas Mass Flow Monitor

CMS Series

High Performance and High Rangeability Next-Generation Flow Meters

The CMS series is a next-generation mass flow meter equipped with Yamatake's μF (Micro Flow) sensor, which can detect even the slightest gas flows. It combines the superb performance of the μF sensor not available before and Yamatake's original rectification mechanism to realize high accuracy, high resolution, and high rangeability, at the cost of a conventional float type flow meter. Available in a range of functions, the CMS series employs a unique method of measuring gas flow rate that is also resistant to changes in temperature and pressure.

High Accuracy and High Reliability Made Possible by μF Sensor

High rangeability with ±3%RD accuracy.
(* Standard Model only)

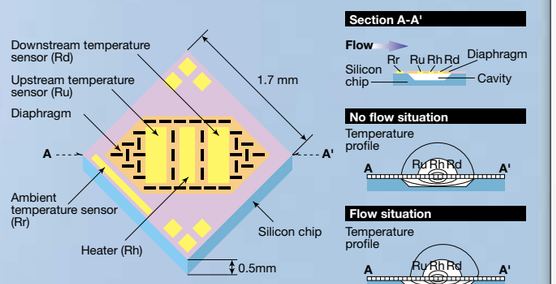
"standard" indicates the volume flow per minute converted to the conditions of 20°C and 1 atmospheric pressure.

Structure and features of μF (Micro Flow) sensor

•Manufactured by silicon micro-machining and thin-film technologies, this thermal type flow sensor is a mere 1.7mm (squared) and 0.5mm thickness.

•The use of ultra-precision machining technology minimizes variations in element layout and thermal capacity. High resolution of 1 mm/s in flow speed and high-speed response of approx. 2ms are achieved at the sensor chip level.

[Principle of Measurement] When gas flow does not exist, the temperature distribution around the heater is symmetric. When the gas starts to flow from Ru to Rd, the temperature at Ru upstream begins to decrease, while the temperature at Rd downstream increases, thus causing a distortion in the symmetry in temperature distribution. This temperature difference between Ru and Rd is used to calculate the mass velocity (velocity x density).



Solutions to a range of application needs...

Need : A Low cost and high accuracy / resolution mass flow meter

The CMS series is equipped with a Micro Flow sensor to offer high accuracy of ±3%RD*, high resolution of 0.1L/min (standard) and wide rangeability, all at low cost.

* Standard Model only CMS20: 4L/min (standard) or more, CMS50: 5L/min (standard) or more, CMS200: 20L/min (standard) or more

Need : Selecting a suitable model

A broad selection of the CMS series is available to meet any application and price range. Choose a suitable model according to flow rate range, with/without indication (CMS200: Indicator model only), gas passage material, types of gas measured, etc.

Need : A mass flow meter with a variety of functions

The CMS series offers a variety of functions, such as flow rate/integrated flow rate indication, analog output, event output (2 points) and analog output scaling. One out of two event outputs can be assigned to an integration pulse output.

➡Analog output

➡Event outputs: 2 points

(One point is applicable as an integrated pulse output.)

Need : A high sealing mass flow meter

The CMS series resin model uses an aluminum die cast for the pipe connection (1/4 Rc). This guarantees higher sealing performance when compared with standard resin pipe connection mode.

Need : Monitoring multiple units of mass flow meters by one indicator

A maximum of five CMS units can be connected to a single, dedicated CMW100A multi-channel indicator. This space-saving multi-channel indicator can monitor such functions as instantaneous flow rate indication, flow rate status indication (Hi/OK/Lo) and alarm output function.

Need : Elbow piping at upstream side

To obtain stable measurement, a conventional flow meter requires a long straight piping area at the upstream side. The CMS series, however, can assure stable measurement without a straight piping area, due to the superior performance of μF sensor and Yamatake's rectification mechanism. It can even be connected to an elbow pipe, allowing for easy design of piping layout.

CMS9500/0002/0005/0020/0050/0200/0500

Gas Mass Flow Meters (Standard Model)

Specifications

Item \ Model No.			CMS9500	CMS0002	CMS0005	CMS0020	CMS0050	CMS0200	CMS0500
Applicable gas			Air/Nitrogen, Argon, Carbon dioxide (CO_2), Oxygen, (CO_2), City gas 13A (LNG), Methane 100%,			Resin model: Air/Nitrogen, Argon, Carbon dioxide (CO_2) SUS model: Air/Nitrogen, Argon, Carbon dioxide (CO_2), Oxygen, City gas 13A (limited to LNG), Methane 100%, Propane 100%, Butane 100%		Air/Nitrogen, Argon, Carbon dioxide (CO_2), Oxygen, City gas 13A (LNG), Methane 100% Propane 100%, Butane	
			Gas must not contain corrosive components (chlorine, sulfur, acid, etc.). Gas must be dry and clean without dust and oil mist.						
Flow range			500mL/min (standard)	2L/min (standard)	5L/min (standard)	20L/min (standard)	50L/min (standard)	200L/min (standard)	500L/min (standard)
			Standard indicates the calibration criteria (1 atmosphere, 20°C conversion).						
Measurement accuracy			5≤χ<100mL/min 1%FS ±1 digit 25°C 100≤χ≤500mL/min ±3%RD±1 digit 25°C	0.02≤χ<0.4L/min 1%FS ±1 digit 25°C 0.4≤χ≤2L/min ±3%RD±1 digit 25°C	0.05≤χ<1L/min 1%FS ±1 digit 25°C 1≤χ≤5L/min ±3%RD±1 digit 25°C	0.2≤χ<4L/min 1%FS ±1 digit 25°C 4≤χ≤20L/min ±3%RD±1 digit 25°C	0.5≤χ<5L/min 1%FS ±1 digit 25°C 5≤χ≤50L/min ±3%RD±1 digit 25°C	2≤χ<20L/min 1%FS ±1 digit 25°C 20≤χ≤200L/min ±3%RD±1 digit 25°C	5≤χ<50L/min 1%FS ±1 digit 25°C 50≤χ≤500L/min ±3%RD±1 digit 25°C
Operating pressure range			0 to 1.0MPa						
Pressure resistance			1.0MPa			Resin model: 0.75MPa, SUS model: 1.0MPa		1.0MPa	
Sampling cycle			100 ± 20ms						
Output signal			0 to 5Vdc (allowable load resistance 10kΩ min.)						
Event output	**Number of events**		2						
	Integration pulse output rate		10, 100, 1000mL/pulse	1, 10, 100L/pulse				10, 100, 1000L/pulse	
External input	**Number of inputs**		1						
Serial data output			Open collector (rated 30Vdc, 50mA)						
Display	**Flow rate display**		7-segment LED 4-digit						
	Instantaneous flow rate	**Min. display**	1mL/min (standard)	0.01L/min (standard) (Note)		0.1L/min (standard) (Note)		1L/min (standard) (Note)	
		Resolution	1mL/min (standard)	0.01L/min (standard) (Note)		0.1L/min (standard) (Note)		1L/min (standard) (Note)	
	Integrated flow rate	**Display unit**	10mL	1L		1L		10L	
		Display range	0 to 99999999						
		Data storage	Data is written to memory every 10min. (Integrated value can be reset by operating the keys or external contact input.)						
Supply	**Rated voltage**		12 to 24Vdc						
	Supply voltage		10.8 to 26.4Vdc						
	Current consumption		100mA max.						
	Electrical interface		Harness with special connector (sold separately)						
Operating temperature			0 to 50°C (guaranteed accuracy temperature range: 10 to 35°C)						
Operating humidity			10 to 90%RH (no condensation allowed)						
Storage temperature			-20 to +70°C (no condensation allowed)			-20 to +70°C (no condensation allowed) Resin model: -20 to +50°C		-20 to +70°C (no condensation allowed)	
Connection method			Rc1/4 (female)					Rc1/2 (female)	
Mounting position			Horizontal mounting (Meter section must not face down.)						
Body material			Gas flow passage: SUS316 Pipe connection: SUS303	SUS303		[Resin model] Gas flow passage: PBT [Resin model] Pipe connection: Aluminum die cast SUS model: SUS303		SUS303	SUS316
Case material			Polycarbonate			Resin model: ABS resin SUS model: Polycarbonate		Polycarbonate	
Weight	**Without indicator**		–			Resin model: Approx. 260g		–	–
	With indicator		Approx. 800g			Resin model: Approx. 280g SUS model: Approx. 800g		Approx. 1400g	Approx. 2000g

* User's manual No. : CP-SP-1114E

Note: When gas type conversion factor is 0.10 to 0.49, the Min. display and resolution are as follows:
CMS0002: 0.005L/min (standard)
CMS0020: 0.05L/min (standard)
CMS0200: 0.5L/min (standard)

Selection Guide

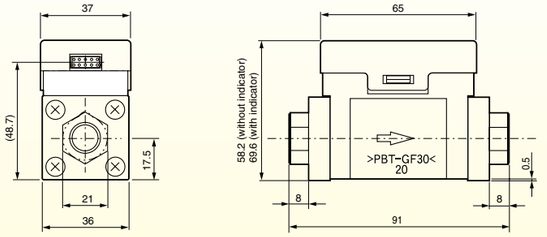
I II III IV V VI VII VIII IX X XI XII Example: **CMS0020APRN000000**

Table		Selection											Description
I	Basic Model No.	**CMS**	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	Gas mass flow meter
II	Flow range	**9500**	○	○	–	–	–	–	–	–	–	–	0 to 500mL/min (standard)
		0002	○	○	–	–	–	–	–	–	–	–	0 to 2L/min (standard)
		0005	○	○	–	–	–	–	–	–	–	–	0 to 5L/min (standard)
		0020	○	○	–	–	○	○	–	–	○	○	0 to 20L/min (standard)
		0050	○	○	–	–	○	○	–	–	○	○	0 to 50L/min (standard)
		0200	–	–	○	○	–	–	○	○	–	–	0 to 200L/min (standard)
		0500	–	–	○	○	–	–	–	–	–	–	0 to 500L/min (standard)
III	Indication	**A**	–	–	–	–	○	○	○	○	–	○	Without indicator / instantaneous flow output
		B	○	○	○	○	–	–	–	–	○	–	With indicator / instantaneous flow output / integration function + event output, integration pulse output + integration reset input
IV	Material	**P**	–	–	–	–	–	–	–	–	○	○	Resin
		S	○	○	○	○	○	○	○	○	–	–	SUS303
V	Connection	**R**	–	–	○	○	○	○	○	○	–	–	Rc 1/2
			○	○	–	–	–	–	–	–	○	○	Rc 1/4
VI	Gas type	**N**	–	–	–	–	○	–	○	–	–	○	Air, nitrogen
			○	–	○	–	–	–	–	–	–	–	Air, Nitrogen (setting changeable to Argon, CO_2, City gas 13A (LNG), Methane 100%, Propane 100% or Butane 100%)
			–	–	–	–	–	–	–	–	○	–	Air, Nitrogen (changeable to Argon or CO_2)
		C	–	–	–	–	○	–	○	–	–	○	CO_2
		S	–	○	–	○	–	○	–	○	–	–	Oxygen
		G	–	–	–	–	○	–	○	–	–	–	City gas 13A (LNG)
		L	–	–	–	–	○	–	○	–	–	–	Propane 100%
VII	Output	**0**	○	○	○	○	○	○	○	○	○	○	0 to 5Vdc
VIII	Option (1)	**0**	○	○	○	○	○	○	○	○	○	○	None
IX	Option (2)	**0**	○	○	○	○	○	○	○	○	○	○	None
X	Option (3)	**0**	○	–	○	–	○	–	○	–	○	○	None
		1	○	○	○	○	○	○	○	○	–	–	Oil elimination process used on gas passage material
XI	Option (4)	**0**	○	○	○	○	○	○	○	○	○	○	None
		D	○	○	○	○	○	○	○	○	○	○	With test data
XII	Design code	**0**	○	○	○	○	○	○	○	○	○	○	Product version

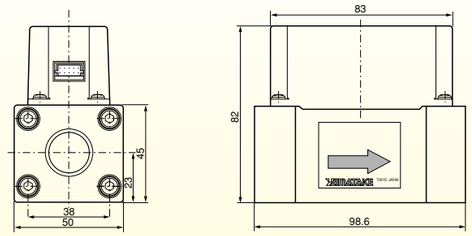
Dimensions

(unit:mm)

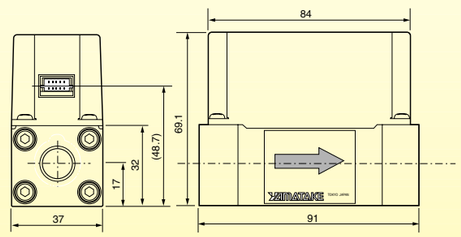
• CMS0020/0050 Resin model



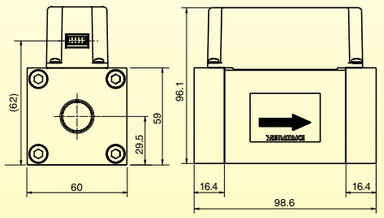
• CMS0200



• CMS9500/0002/0005/0020/0050 SUS model (with/without indicator)



• CMS0500



CMS0010/0050/0200/0500/1000/2000

Gas Mass Flow Meters (For Hydrogen and Helium Gases)

Specifications

Item \ Model No.			CMS0010	CMS0050	CMS0200	CMS0500	CMS1000	CMS2000
Applicable gas			Hydrogen, Helium. Gas must not contain corrosive components (chlorine, sulfur, acid, etc.).					
Flow range			10L/min (standard)	50L/min (standard)	200L/min (standard)	500L/min (standard)	1000L/min (standard)	2000L/min (standard)
			Standard indicates the calibration criteria (1 atmosphere, 20°C conversion)					
Measurement accuracy			0.1≤χ<2 ±0.1L/min (standard) ±1 digit 25°C 2≤χ<10 ±5%RD±1 digit 25°C	0.5≤χ<10 ±0.5L/min (standard) ±1 digit 25°C 10≤χ<50 ±5%RD±1 digit 25°C	2≤χ<40 ±2L/min (standard) ±1 digit 25°C 40≤χ<200 ±5%RD±1 digit 25°C	5≤χ<100 ±5L/min (standard) ±1 digit 25°C 100≤χ<500 ±5%RD±1 digit 25°C	10≤χ<200 ±10L/min (standard) ±1 digit 25°C 200≤χ<1000 ±5%RD±1 digit 25°C	20≤χ<400 ±20L/min (standard) ±1 digit 25°C 400≤χ<2000 ±5%RD±1 digit 25°C
			Different according to the range of measured flowrate χ L/min (standard)					
Operating pressure range			0 to 0.5MPa					
Pressure resistance			1.0MPa					
Sampling cycle			100 ± 20ms					
Output signal			0 to 5Vdc (allowable load resistance 10kΩ min.)					
Event output	Number of events		2					
	Integration pulse output rate		1, 10, 100L/pulse	1, 10, 100L/pulse	10, 100, 1000L/pulse			
External input	Number of inputs		1					
Serial data output			Open collector (rated 30Vdc, 50mA)					
Display	Flow rate display		7-segment LED 4-digit					
	Instantaneous flow rate	Min. display	0.01L/min (standard)	0.1L/min (standard)	1L/min (standard)	1L/min (standard)	1L/min (standard)	5L/min (standard)
		Resolution	0.01L/min (standard)	0.1L/min (standard)	1L/min (standard)	1L/min (standard)	1L/min (standard)	5L/min (standard)
	Integrated flow rate	Display unit	1L		10L			
		Display range	0 to 99999999					
		Data storage	Data is written to memory every 10min. (Integrated value can be reset by operating the keys or external contact input.)					
Supply	Rated voltage		12 to 24Vdc					
	Supply voltage		10.8 to 26.4Vdc					
	Current consumption		100mA max.					
	Electrical interface		Harness with special connector (sold separately)					
Operating temperature			0 to 50°C (guaranteed accuracy temperature range: 10 to 35°C)					
Operating humidity			10 to 90%RH (condensation not allowed)					
Storage temperature			-20 to +70°C (condensation not allowed)					
Connection method			9/16-18 UNF, Rc 1/4, 1/4 Swagelok, 1/4 VCR			3/4-16 UNF, Rc 1/2, 1/2 Swagelok, 3/8 VCR or equivalent product		
Mounting position			Horizontal mounting (Meter section must not face down.)					
Body material			SUS316					
Case material			Polycarbonate					
Material of gas contacting parts			SUS316, fluoro-resin rubber					
Mass			Approx. 800g			Approx. 1400g		Approx. 2000g

* User's manual No. : CP-SP-1118E

Selection Guide

Ⅰ Ⅱ Ⅲ Ⅳ Ⅴ Ⅵ Ⅶ Ⅷ Ⅸ Ⅹ Ⅺ Ⅻ Example: **CMS0050BSUH000100**

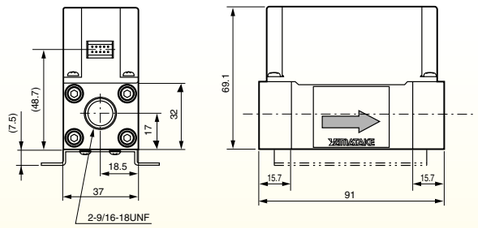
Table	Selection		↓	↓	Description
Ⅰ	Basic Model No.	**CMS**			Gas mass flow meter
Ⅱ	Flow rate range (Hydrogen conversion value)	**0010**	○	–	0 to 10L/min (standard)
		0050	○	–	0 to 50L/min (standard)
		0200	○	–	0 to 200L/min (standard)
		0500	–	○	0 to 500L/min (standard)
		1000	–	○	0 to 1000L/min (standard)
		2000	–	○	0 to 2000L/min (standard)
Ⅲ	Indication	**B**	○	○	With indicator
Ⅳ	Material	**S**	○	○	SUS316
Ⅴ	Connection	**U**	○	–	9/16-18 UNF
			–	○	3/4-16 UNF
		R	○	–	Rc 1/4
			–	○	Rc 1/2
		S	○	–	1/4 Swagelok
			–	○	1/2 Swagelok
		V	○	–	1/4 VCR
			–	○	3/8 VCR
Ⅵ	Gas	**H**	○	○	Hydrogen / helium (selectable)
Ⅶ	Output	**0**	○	○	0 to 5Vdc analog output
Ⅷ	Option (1)	**0**	○	○	None
Ⅸ	Option (2)	**0**	○	○	None
Ⅹ	Option (3)	**1**	○	○	Oil elimination process used on gas passage material
Ⅺ	Option (4)	**0**	○	○	None
		D	○	○	With test data
Ⅻ	Design code	**0**	○	○	Product version

Note: "standard" indicates the volume flow per minute converted to the conditions of 20°C and 1 atmospheric pressure.

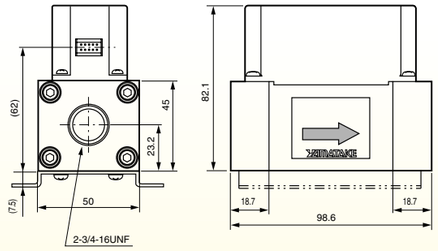
Dimensions

(unit:mm)

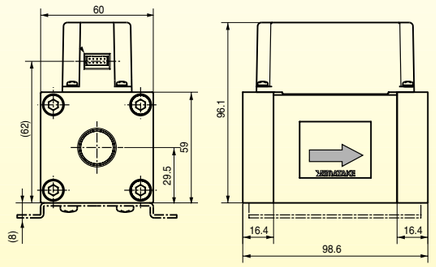
• CMS0010/0050/0200



• CMS0500/1000



• CMS2000



CMS1500

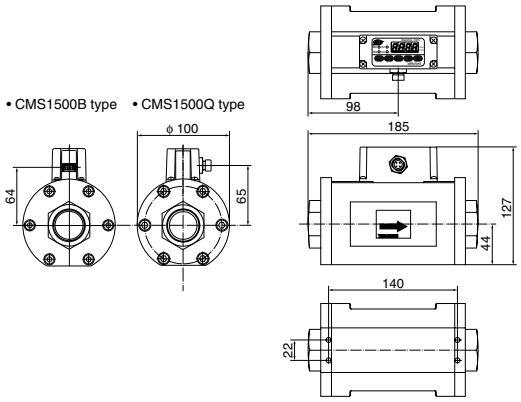
Gas Mass Flow Meter

Specifications

Applicable gas	Air, Nitrogen, Argon and CO_2 (Not applicable to oxygen and flammable gases)	Corrosive components such as chlorine, acid and sulfuric acid must not be included in these gases.
Flow range	1500L/min (standard) "standard" indicates the standard calibration conditions (20°C, 1 atmospheric pressure)	
Measurement accuracy (RD: Read value)	±5%RD±1 digit 150 to 1500L/min (standard), 25°C (25°C indicates ambient temperature at calibration)	
Pressure range	0 to 0.5MPa	
Pressure resistance	1.0MPa	
Sampling cycle	100ms ± 20ms	
Output signal	Instantaneous flow rate output: 4 to 20mA (allowable load resistance 300Ω max.)	
Display	7-segment LED, 4-digits	
Rated voltage	12 to 24Vdc	
Power supply range	10.8 to 26.4Vdc	
Current consumption	100mA max.	
Electrical connection	Dedicated connector	
Ambient temperature	0 to 50°C (Guaranteed accuracy range is from 10 to 35°C)	
Ambient humidity	10 to 90%RH (no condensation allowed)	
Connection	Rc 1 thread (female)	
Weight	3000g	

* User's manual No. : CP-SP-1119E

Dimensions (unit:mm)



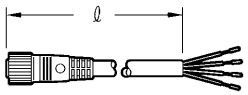
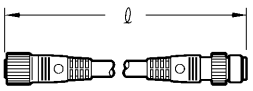
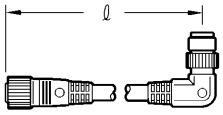
Selection Guide

I II III IV V VI VII VIII IX X XI XII Example: **CMS1500QARN100000**

Table	Selection		Description
I	Basic Model No.	**CMS**	Gas mass flow meter
II	Flow range	**1500**	0 to 1500L/min (standard)
III	Type	**B**	With indicator
		Q	With indicator/threaded type connector
IV	Material	**A**	Aluminium
V	Connection size	**R**	Rc1
VI	Gas type	**N**	Air, Nitrogen and Argon
VII	Output	**1**	4 to 20mA
VIII	Option (1)	**0**	None
IX	Option (2)	**0**	None
X	Option (3)	**0**	None
XI	Option (4)	**0**	None
		D	With test data
XII	Design code	**0**	Product version

Note: "standard" indicates the volume flow per minute converted to the conditions of 20°C and 1 atmospheric pressure.

• CMS1500Q type: Cable with thread connector

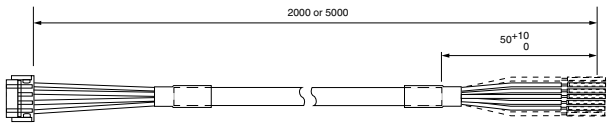
Appearance	Power	Cable: Oil resistant	Cable: Oil resistant and flexible	Cable length (ℓ)	Model No.
	DC	○		2m	PA5-4ISX2HK
				3m	PA5-4ISX3HK
				5m	PA5-4ISX5HK
			○	2m	PA5-4ISX2MK
				3m	PA5-4ISX3MK
				5m	PA5-4ISX5MK
	DC	○		2m	PA5-4ISB2HK
				3m	PA5-4ISB3HK
				5m	PA5-4ISB5HK
			○	2m	PA5-4ISB2MK
				3m	PA5-4ISB3MK
				5m	PA5-4ISB5MK
	DC	○		2m	PA5-4ISN2HK
				3m	PA5-4ISN3HK
				5m	PA5-4ISN5HK
			○	2m	PA5-4ISN2MK
				3m	PA5-4ISN3MK
				5m	PA5-4ISN5MK

Note: Angle type thread connector can not be used for CMS side.

Optional Parts for CMS Series

Part No.	Description	Applicable Models
81446594-005	Harness length 2m	CMS9500/0002/0005/0020/0050/0200/0500/1500B
		CMS0010/0050/0200/0500/1000/2000 (For Hydrogen and Helium Gases)
81446594-006	Harness length 5m	CMS9500/0002/0005/0020/0050/0200/0500/1500B
		CMS0010/0050/0200/0500/1000/2000 (For Hydrogen and Helium Gases)
81446628-001	Mounting bracket	CMS9500/0002/0005/0020/0050
		CMS0010/0050/0200 (For Hydrogen and Helium Gases)
81446721-001	Mounting bracket	CMS0200
		CMS0500/1000 (For Hydrogen and Helium Gases)
81446856-001	Mounting bracket	CMS0500
		CMS2000 (For Hydrogen and Helium Gases)

Harness



⚠CAUTION

The product has been designed, developed and manufactured for general purpose applications for machinery and equipment. The product shall be handled with extra caution to provide fail-safe and/or redundant design in the applications that require strict safety as those listed below.

・applications pertaining to the protection of human life ・applications pertaining directly to controlling transportation equipment and machinery (start/stop control, etc.)
・applications pertaining to aircraft ・applications pertaining to spacecraft ・applications pertaining to nuclear reactors

Do not use this device in applications where the device's functions are directly responsible for human safety.

YAMATAKE

Specifications are subject to change without notice.

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