

Sierra Sensors



Thermal Mass Flow Meters
& Controllers for OEM's



Modular. Stable. Cost-effective.

The Ultimate OEM - MFC.

Engineers in the Biopharmaceuticals industry require precise control of the gases used in bioreactors to optimize microbial growth and ensure proper mixing and distribution of the biomass.

In addition, precision burner control is needed in order to produce the glass ampules, vials and bottles that are used to properly package the resulting biopharmaceuticals.



Combining superior physics, high reliability and unparalleled flexibility, RedySmart stands apart from competitive offerings.

RedySmart thermal mass flow devices contain no moving parts and are unaffected by upstream temperature and pressure fluctuations, resulting in exceptional accuracy and repeatability.

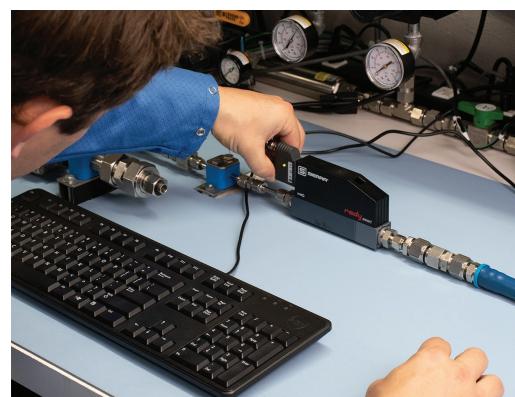
With a compact footprint, easy integration onto a cost-effective gas mixing block, and a wide array of communications protocols, Sierra can produce a mass flow meter or controller to meet your specific requirements.

Superior Physics for Lifetime No-Drift Warranty

Our Lifetime No-Drift Sensor Warranty is made possible because RedySmart employs high-precision MEMS (Micro-Electro Mechanical Systems) technology utilizing an advanced, ultrastable

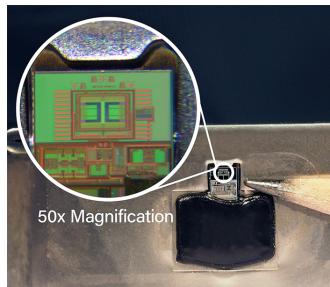
no-drift CMOS (Complementary Metal Oxide Semiconductor) sensor.

The use of MEMS techniques allow both electronic circuits and mechanical devices to be manufactured on a silicon chip, similar to the process used for integrated circuits.



Making the Ultimate Biopharm OEM Mass Flow Controller

At the macro level, RedySmart can be conceptualized in five core technologies, each of which contributes to unparalleled accuracy, adaptability and reliability.



Gas Mass Flow Sensor

Accurate and Reliable MEMS Technology

Our Lifetime No-Drift Sensor Warranty is backed by high-precision MEMS technology utilizing an advanced CMOS sensor for stable gas mass flow rate measurement.



Communications

Human & System Interface

An available local display readout communicates key flow data while each device can be configured in the field with a free software app. Connect to the network through Modbus RTU and analog outputs, industrial ethernet (EtherCAT and Profibus).

Modularity

Customize to Needs

An easy-connect communication and power cable system has been designed for ultimate flexibility. Numerous mass flow controllers can be mounted on a single flow block to minimize space in multiple gas mixing applications. Connect hundreds of units via daisy-chain as needed.



Control

Precision Valve

A precision electromagnetic control valve allows the valve seat to assume the exact height above the valve orifice necessary to maintain flow to the set point.



Cutaway View



3 Unit Mixing Block

Advanced Calibration

NIST-Traceable

Each unit is calibrated over its entire flow range using real gas to assure accuracy and repeatability over the life of the device. A fully automated system capable of calibrating hundreds of units at once eliminates any human error during the calibration process.



Auto-Calibration System

REDYSMART HIGHLIGHTS

Modular

Sierra will customize a solution to fit specific application needs for footprint or electrical connections.

Optional Built-in Display (top)

Integrated display shows mass flow rate, totalizer, unit of measure & set point control (controller only).



Operating Status Indication

All devices have a built-in LED status indicator.



Ethernet

Industrial ethernet provides ease of connection to the top of the device with available Profinet RT and EtherCAT.

Standard Digital & Analog Outputs

All devices have a digital Modbus RTU and analog interface standard.

Software App

Get efficient device management with our software app:

- View gas mass flow rate & temperature
- Datalogging
- Gas Mixing
- Change set points
- Select measured gas
- Adjust control parameters
- Adjustment/Calibration

Fast Set Point Control

Response times as fast as $\pm 80\text{ms}$.

Communications

Standard Modbus RTU, Optional: EtherCat, Profibus and Profinet.



No-Drift Warranty

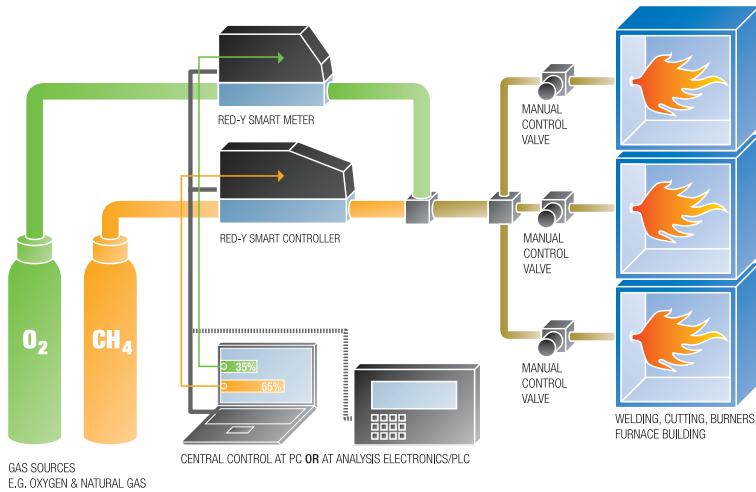
Lifetime No-drift Sensor Warranty. If drift occurs, instrument will be repaired or replaced free of charge.

Warranty

3-year operating warranty.

Bioreactors

In a typical bioreactor, microbes are used to produce pharmaceutically active compounds. Vaccines, blood and/or blood components, allergenics, somatic cells, gene therapies, tissues, recombinant therapeutic protein and living cells are all produced as biopharmaceuticals. Bioreactors require precision mass flow control of the gases used to feed the biomass and to ensure proper mixing and distribution. This ensures healthy fermentation. RedySmart delivers.



Burner Control

High accuracy and stable gas mass flow rate control are critical to ensure precise temperature control and the highest quality glass used for pharmaceutical packaging, such as ampoules and vials. RedySmart provides an accurate, stable and highly modular cost-effective solution for this application.

TECHNICAL DATA

INSTRUMENT TYPES



Smart Meter GSM

Thermal Mass Flow Meter



Smart Controller GSC

Thermal Mass Controller



OEM Version

For customer-specific requirements

ACCURACY

<Standard>

The economic solution

Accuracy: $\pm 1.0\%$ of full scale⁽¹⁾

Turndown ratio: 1: 50

<High Accuracy>

With highest accuracy and turndown ratio

(available for GIM < 200 ln/min / GIC < 150 ln/min (air)

Accuracy: $\pm 0.3\%$ of full scale $\pm 0.5\%$ of reading⁽¹⁾

Turndown ratio: 1: 100

⁽¹⁾An additional error of $\pm 0.25\%$ may apply for analogue signals

MEASURING RANGES

(Air/Full Scale Freely Selectable)	Type	Measuring Range (Air)	Process Connection
RedyIndustrial Meter GIM	GIM-A	from 0 ... 25 mln/min	G $\frac{1}{4}$ "
	GIM-B	from 0 ... 600 mln/min	G $\frac{1}{4}$ "
	GIM-C	from 0 ... 6 ln/min	G $\frac{1}{4}$ "
	GIM-D	from 0 ... 60 ln/min	G $\frac{1}{2}$ "
RedyIndustrial Controller GIC	GIM-A	from 0 ... 25 mln/min	G $\frac{1}{4}$ "
	GIM-B	from 0 ... 600 mln/min	G $\frac{1}{4}$ "
	GIM-C	from 0 ... 6 ln/min	G $\frac{1}{4}$ "
	GIM-D	from 0 ... 60 ln/min	G $\frac{1}{2}$ "

PERFORMANCE DATA

Gases (real gas calibration)	Air, O ₂ ⁽²⁾ , N ₂ ⁽²⁾ , He, Ar, CO ₂ , H ₂ , CH ₄ , C ₃ H ₈ (other gases and gas mixtures on request)
	⁽²⁾ O ₂ & N ₂ are calibrated with Air
Response Time	Meter (GIM): ± 80 ms ⁽³⁾ ; Controller (GIC): ± 500 ms ⁽³⁾
	⁽³⁾ depending on device configuration & according to SEMI standard E17-1011, 5-100% of range under optimized conditions
Repeatability	$\pm 0.2\%$ of full scale (according to SEMI standard E56-0309)
Longterm Stability	< 1% of measured value / year
Power Supply	24 Vdc (18 – 30 Vdc), 15 Vdc on request
Current Consumption Standard	Meter (GIM): max. 100mA; Controller (GIC): max. 250mA (GIC with valve type 8 max. 490mA)
Current Consumption Profinet RT / EtherCAT	Meter (GIM): max. 125mA; Controller (GIC): max. 340mA (GIC with valve type 8 max. 560mA)
Operation Pressure	0.2 – 11 bar a (GIC with valve type 4.5 and 8 max. 8 bar a)
Temperature (Environment/Gas)	0 – 50°C
Pressure Sensitivity	Less than 0.2% RD per bar (typical N ₂)
Temperature Sensitivity	Less than 0.025% FS per °C
Warm-up Time	< 1 sec. for full accuracy

MATERIALS

Body	Anodized aluminium, optional stainless steel electropolished
Seals	FKM, EPDM, optional FFKM

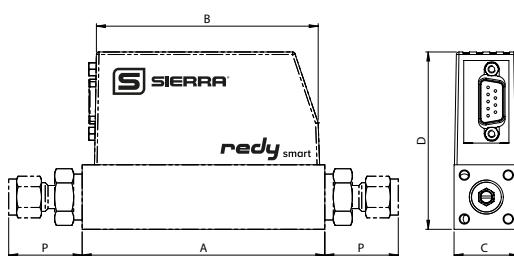
INTEGRATION

In- / Output Signals Analog	0.20 mA, 4...20 mA, 0.5 V, 1.5 V, 0.10 V, 2.10 V
In- / Output Signals Digital	RS-485; Modbus RTU 2 wire (Slave); Lab View-VIs available Option: Profibus DP-V0, DP-V1 / Profinet RT / EtherCAT
Process Connection	G $\frac{1}{4}$ " (BSPP ⁽⁴⁾ female) up to 60 ln/min, G $\frac{1}{2}$ " (BSPP ⁽⁴⁾ female) up to 450 ln/min ⁽⁴⁾ British Standard Pipe Parallel
Inlet Section	None required
Electrical Connection	Sub D plug, 9 pole Option Profibus: Sub D 9 pole / Option Profinet RT or EtherCAT: 2x RJ45 (IN/OUT)
Mounting Orientation	Any position (consult manufacturer above 5 bar or vertical mounting)

SAFETY

Test pressure	16 bara
Leak rate	< 1 x 10-6 mbar l/s He
Ingress Protection Class	IP-50
EMC	EN 61326-1

DIMENSIONS



Dimensions in mm	A	B	C	D ⁽⁵⁾	D ⁽⁶⁾
GSM G $\frac{1}{4}$ "	94	87	25	69	87
GSM G $\frac{1}{2}$ "	145	87	35	79	97
GSC G $\frac{1}{4}$ "	124	117	25	69	87
GSC G $\frac{1}{2}$ "	170	117	35	79	97
GSC G $\frac{1}{2}$ " valve type 8	186.4	117	35	79	97

⁽⁵⁾Standard version

⁽⁶⁾Profinet RT / EtherCAT version

REDYSMART SERIES

TYPE CODE

Instrument Type	RedyIndustrial Series (Gas)	G	S
Function	Meter	M	
	Controller	C	
Full Scale of Measuring Range (Air) Defined By Manufacturer	Customer-specific (Divider A, up to 600 mln/min) Customer-specific (Divider B, up to 6000 mln/min) Customer-specific (Divider C, up to 60 ln/min) Customer-specific (Divider D, up to 450 ln/min)	A X B X C X D X	
Instruments Version	Standard ($\pm 1.0\%$ full scale, 1: 50) Hi-Performance ($\pm 0.3\%$ full scale, $\pm 0.5\%$ reading, 1: 100) Customer-specific / OEM		S T K
Materials (body, seals)	Aluminium, FKM** Aluminium, EPDM Stainless steel, FKM Stainless steel, EPDM Customer-specific / OEM		A B S T K
Analog Signals (output)	Current 4..20 mA** Current 0..20 mA Voltage 0..5 V Voltage 1..5 V Voltage 0..10 V Voltage 2..10 V G Customer-specific / OEM		B C D E F G K
Analog Signals (input)	Current 4..20 mA** Current 0..20 mA Voltage 0..5 V Voltage 1..5 V Voltage 0..10 V Voltage 2..10 V Not Defined Customer-specific / OEM		B C D E F G N K
Control Valve (integrated) Defined by Manufacturer	Type 0.1 Type 0.2 Type 0.5 Type 1.2 Type 4.5 Type 8.0 Valve Not Defined Valve Mounted Customer-specific / OEM No valve		2 1 2 2 2 3 2 6 1 2 1 3 8 8 9 5 9 9 0 0
Type Code		G S	- -

**standard



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