

# Economical OEM Digital Mass Flow Controller

## FEATURES

- Industry best off-the-shelf delivery
- Accuracy: +/- 1.0% full scale for common gases (Air, Ar, CO<sub>2</sub>, CO, CH<sub>4</sub>, He, H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>)
- Repeatability: +/- 0.25% full scale
- All the performance features of a digital mass flow controller at an OEM price
- Control gas mass flow rates to 50 slpm (nlpm)
- Advanced 316L SS platinum sensor technology and patented LFE provide excellent linear performance
- Available in both aluminum and 316 stainless steel flow bodies with Viton® elastomers
- Local display and digital setpoint control with optional analog setpoint/output signals
- RS-232 interfaces easily with PLC or workstation (user software and communication cables supplied)
- RS-485 (addressable)
- Dual I/O DB9 comm ports for installation flexibility
- Field adjustable zero and span
- Powerful direct-acting control valve minimizes leak-by
- 300 ms control valve time constant
- Small footprint facilitates replacement of older MFC's
- CE Approved



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SmartTrak 50



## DESCRIPTION

Sierra Instruments' SmartTrak® 50 Series is a digital gas mass flow controller designed to meet the low-cost budgetary requirements of OEM's while maintaining excellent quality and performance. Inspired by the need for accurate and reliable gas mass flow control at an OEM price, the 50 Series delivers by building on the same core sensor, LFE and valve technology found in our award-winning SmartTrak 100 Series, all backed by industry best off-the-shelf fast product delivery and Sierra's style of personalized customer support. Our 50 Series has a standard accuracy of +/- 1.0% of full scale. The flexible and powerful direct-acting control valve sets it apart from the competition by minimizing leak-by, while offering a 300 ms response time to setpoint changes at +/- 0.25% repeatability.

It is our philosophy that core sensor technology must be of the highest quality and performance to make an excellent MFC. In contrast to the many wetted parts of CMOS and MEMS flow sensors, Sierra uses its most advanced 316L stainless steel platinum-wound capillary sensor technology ensuring the very best mass flow control for nearly any clean gas. As a result, the 50 Series shares the same advanced sensor as the flagship SmartTrak 100 Series, while incorporating a slightly varied valve and laminar flow element design also inspired by the original Smart-Trak. A more efficient manufacturing process, a streamlined design, and our partnership with a very strong supplier base combined to make the 50 Series a reality.

Experience our passion for flow with the 50 Series in your next application.

**PERFORMANCE SPECIFICATIONS**

**Accuracy**  
 +/- 1.0% of full scale including linearity under calibration conditions over 32° to 122°F (0° to 50°C) and 5 to 145 psig (0.3 to 10 barg).

**Repeatability**  
 +/- 0.25% of full scale

**Temperature Coefficient**  
 0.025% of full scale per °F (0.05% of full scale per °C), or better

**Pressure Coefficient**  
 0.01% of full scale per psi (0.15% of full scale per bar), or better

**Response Time**  
 300 ms time constant; two seconds (typical) to within +/- 2% of final value including setting time. May be tuned to be faster or slower (consult factory)

**OPERATION SPECIFICATIONS**

**Gases**  
 All neutral, non-contaminated dry and clean gases compatible with wetted materials aluminum, stainless steel and Viton®

**Mass Flow Rates**  
 The 50 Series can be calibrated for any gas compatible with viton, aluminum and stainless steel, using any units, to either normal or standard conditions, for flow rates up to 50 slpm air equivalent. Standard calibrations are available for ranges (slpm air equivalent) from 20 sccm/nccm to 50 slpm/nlpm. For measuring or controlling flows below 5 sccm, please consider Micro-Trak™ Model 101. Above 50 slpm, please consider the SmartTrak® 100 Series

**Gas Pressure:**  
 145 psig (10 barg) maximum, burst tested to 225 psig (15 barg)

**Differential Pressure Requirement**  
 15 to 20 psi (1.0 to 1.3 bar) see table

**Gas and Ambient Temperature**  
 32°F to 122°F (0 to 50°C)

**Leak Integrity**  
 5 X 10<sup>-9</sup> atm cc/sec of helium maximum

**Power Requirements**  
 Meter: 15 or 24 VDC (+/- 10%) 85 mA regulated  
 Controller: 24 VDC (+/-10%), 315 mA, regulated, RS-485 option adds 130 mA

**Control Range**  
 5 to 100% of full scale flow (20:1) at published accuracy. Automatic shut-off off at 4.9% of full scale  
 Output and Command (Setpoint) Signal  
 • RS-232

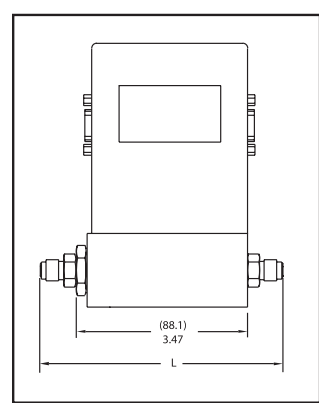
- Optional:**
- Linear 4-20 mA, 500 ohms maximum load resistance.
  - Linear 0-5 VDC
  - RS-485 Addressable (no analog outputs)
  - Zero, span, and setpoint are field adjustable via supplied user software and RS-232 communications cable

**Display**  
 Flow rate, units, full scale, and setpoint. Display may be mounted on the front or back of the unit.

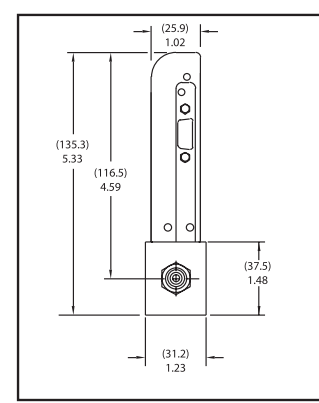
**PHYSICAL SPECIFICATIONS & DIMENSIONS**

**Wetted Material**  
 Anodized aluminum or 316 stainless steel flow body. 316L stainless steel sensor tubes; Viton® O-rings and valve seats.

50 Series - Front View

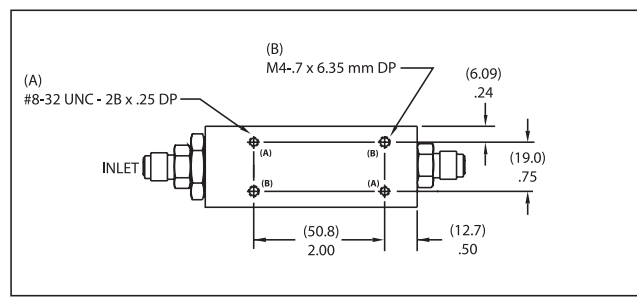


50 Series - Side View



Fittings	Dimension L
1/8-inch SS compression	5.31 (134.8)
1/4-inch SS compression	5.49 (139.4)
1/4-inch VCO	5.03 (127.7)
1/4-inch VCR	5.35 (135.8)
6 mm compression	5.51 (139.9)
1/4-inch NPT	5.32 (135.1)
1/8-inch brass compression	5.31 (134.8)
1/4-inch brass compression	5.49 (139.4)

50 Series - Bottom View

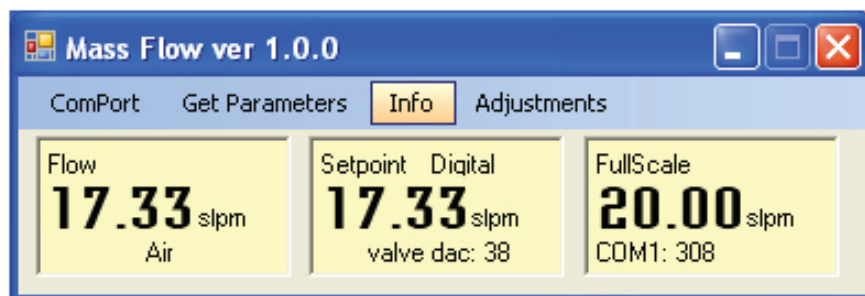


Note: Units in inches (mm in parenthesis)

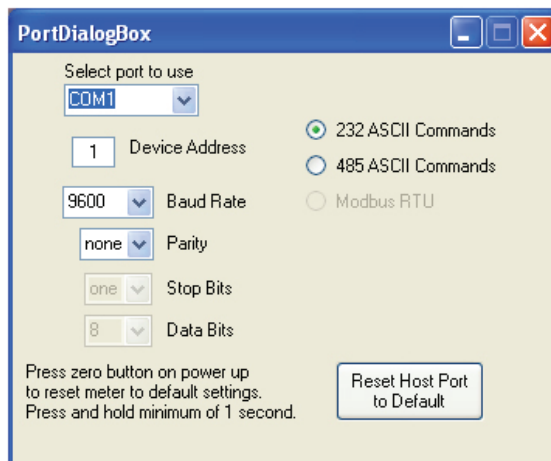
slpm	Pressure Drop psid (mbar) Meter	Minimum Delta psid (mbar) Controller	Pressure Drop psid (mbar) Meter	Minimum Delta psid (mbar) Controller
	<b>1/4-inch Standard Fitting</b>	<b>1/4-inch Standard Fitting</b>	<b>3/8-inch Standard Fitting</b>	<b>3/8-inch Standard Fitting</b>
0.02	.45 (31.0)	1 (68.95)	N/A	N/A
.200	.45 (31.0)	1.5 (103.4)	N/A	N/A
1.00	0.46 (31.7)	1.88 (129.6)	N/A	N/A
5.00	0.54 (37.2)	4.70 (324.1)	N/A	N/A
10.00	0.58 (40.0)	7.5 (517.1)	0.51 (35.2)	4.75 (327.5)
20.00	0.83 (57.2)	15 (1034.3)	0.59 (40.7)	8.25 (568.8)
50.00	2.72 (187.5)	50 (3448)	1.25 (86.2)	18.75 (1292.8)

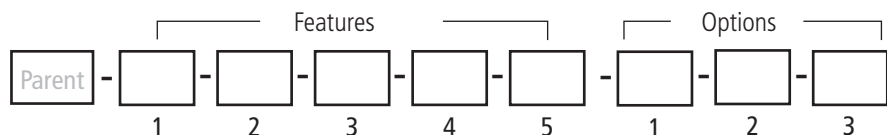
SOFTWARE SCREENSHOTS

User Program Interface



Communications Setup





Instructions: To order a 50 please fill in each number block by selecting the codes from the corresponding features below and following pages.

Parent Number	
<b>M50L-AL</b>	Flow meter aluminum (Note: Flow meter is only available in aluminum) to 50 slpm
<b>C50L-AI</b>	Flow controller aluminum to 50 slpm
<b>C50L-SS</b>	Flow controller 316 stainless steel to 50 slpm

Feature 2: Inlet / Outlet Fittings			
<b>1</b>	1/8-inch stainless steel compression (maximum 5 slpm)	<b>8</b>	1/4-inch stainless steel VCR
<b>2</b>	1/4-inch stainless steel compression	<b>9</b>	1/2-inch stainless steel VCR
<b>3</b>	3/8-inch compression (standard for 30 to 200 slpm). For low and medium bodies. (maximum 200 slpm)	<b>10</b>	6 mm stainless steel compression
<b>4</b>	1/2-inch stainless steel compression	<b>13</b>	1/4-FNPT adapter bushing (maximum 200 slpm). For low and med flow bodies only.
<b>5</b>	1/4-inch stainless steel VCO	<b>14</b>	3/8-FNPT stainless steel female NPT
<b>6</b>	1/2-inch stainless steel VCO		

Feature 1: Display	
<b>NR</b>	No display (standard)
<b>DD</b>	Digital display
<b>DDB</b>	Digital display (back mounted)

Feature 3: Input Power	
<b>PV1M</b>	12-15 VDC for M50L-AL meters only
<b>PV2</b>	24 VDC for all instruments

Feature 4: Output Signal/Setpoint	
<b>V0</b>	RS-232 (no analog out)
<b>V1</b>	0-5 VDC linear output signal (and setpoint if controller); includes RS-232
<b>V4</b>	4-20 mA linear output signal (and setpoint if controller); includes RS-232
<b>V6</b>	RS-485 (no analog out or RS-232)

Feature 5: Low Flow Option	
<b>LF</b>	Flow calibration for all C50L & M50L required for 0 to 10 sccm -0 or 20 sccm full scale calibration or less

Option 1 : Certificates	
<b>MC</b>	Material certificates--US mill certs on all wetted parts
<b>CC</b>	Certificate of conformance
<b>LT</b>	Leak test certificate
<b>PT</b>	Pressure test certificate
<b>OC2</b>	O2 cleaning. Includes certification. Product cleaned for O2 service. Inspected with ultra-violet light and double bagged prior to shipment. O2 cleaning only available for stainless steel bodies.
<b>5POINTCAL</b>	5-point calibration certificate (ISO 17025 compliant)

Option 2 : Electrical Connections			
<b>50-C9(0)</b>	9-pin mating connector with no cable	<b>50-C9RS232 (10)</b>	10-foot (3 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9(1)</b>	1-foot (304.8 mm) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-C9RS232 (25)</b>	25-foot (7.62 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9(3)</b>	3-foot (1 m) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-C9RS232 (50)</b>	50-foot (15.24 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9(10)</b>	10-foot (3 m) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-C9RS232 ( )</b>	Custom length digital/analog communication cable with DB9 mating connector, DB9 serial computer connector, and fly leads. Maximum length 50 feet (15 meters). Same price any length.
<b>50-C9(25)</b>	25-foot (8 m) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-SerialUSB</b>	USB to serial RS-232 converter. Needed for use with CRN. Many users elect to supply their own USB.
<b>50-C9( )</b>	Custom length analog communication cable with D9 mating connector and fly leads. Maximum length 50 feet (15 m). Same price any length.	<b>50-CRN</b>	6-foot (2 m) digital only cable with D9 mating connector and D9 computer connector.

Note: CE and ISO certificates are available for download from [www.sierrainstruments.com/downloads](http://www.sierrainstruments.com/downloads)

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# Economical OEM Digital Mass Flow Controller (up to 200 slpm)

## FEATURES

- All the performance features of a digital mass flow controller at an OEM price
- Control gas mass flow rates to 200 slpm (nlpm)
- Stability and reliability optimized for long-term process control
- Ideal for control of carrier gases used in wafer cleaning and polishing operations
- Wide utility in chamber purge operations for Physical Vapor Deposition (PVD) and other semiconductor process applications
- Accuracy: +/- 1.0% full scale for common gases (Air, Ar, CO<sub>2</sub>, CO, CH<sub>4</sub>, He, H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>)
- Repeatability: +/- 0.25% full scale
- Advanced 316L SS platinum sensor technology and patented LFE provide excellent linear performance
- Aluminum or 316 SS flow bodies with Viton® elastomers
- Local display and digital setpoint control with optional analog setpoint/output signals
- RS-232 interfaces easily with PLC or workstation (user software and communication cables available)
- Field adjustable zero and span
- RS-485 (addressable) enables networking within complex semiconductor tools
- Powerful direct-acting control valve minimizes leak-by
- CE Approved



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# SmartTrak 50 Medium



## DESCRIPTION

Optimized to feature the stability, reliability and simplicity of operation required in long-term process control applications, Sierra's SmartTrak® 50 Series Medium Flow Controller offers high accuracy and reliable gas mass flow control at an economical price. This makes it an ideal choice for OEMs who require exceptional performance at a price point that meets their budgetary constraints.

Sierra's new medium flow controller increases the maximum flow range of the award-winning SmartTrak 50 Series from 50 slpm to 200 slpm. This makes it a perfect fit for controlling the carrier gases used in wafer cleaning and polishing operations or for purge control in PVD and other semiconductor operations. It also excels in the mass flow control of common gases in general applications.

The 50 Series builds on the same core sensor, LFE and valve technology found in Sierra's flagship Smart-Trak 100 Series, all backed by Sierra's trademark personalized customer support. A flexible and powerful direct-acting frictionless-hovering control valve sets it apart from the competition by minimizing leak-by, while offering +/- 0.25% repeatability.

It is Sierra's philosophy that only the highest performing core sensor technology can produce an excellent MFC. In contrast to the many wetted parts of CMOS and MEMS flow sensors, Sierra uses its advanced 316L stainless steel platinum-wound capillary sensor technology to deliver the highest reliability, repeatability and stable accuracy.

The SmartTrak 50 Series offers flexibility and simplicity of operation. Both analog and digital inputs and outputs are available, enabling the 50 Series to work with older analog systems or the newest multi-drop digital tools. Field adjustment of zero and span enable small adjustments in calibration to align with on-site process conditions.

Experience our passion for flow with the SmartTrak 50 Series Medium Flow Controller and enjoy the peace of mind gained from unparalleled stability, reliability and simplicity in your next application.

**PERFORMANCE SPECIFICATIONS**

**Accuracy**

+/- 1.0% of full scale including linearity under calibration conditions over 32° to 122°F (0° to 50°C) and 5 to 145 psig (0.3 to 10 barg) for common gases: Air, Ar, CO2, CO, CH4, He, H2, O2, N2.

**Repeatability**

+/- 0.25% of full scale

**Temperature Coefficient**

0.025% of full scale per °F (0.05% of full scale per °C), or better

**Pressure Coefficient**

0.01% of full scale per psi (0.15% of full scale per bar), or better

**Response Time**

Two seconds (typical) to within +/- 2% of final value including setting time. 50 Series may be tuned to be faster or slower (consult factory)

**OPERATION SPECIFICATIONS**

**Gases**

All neutral, non-contaminated dry and clean gases compatible with wetted materials aluminum, stainless steel and Viton®

**Mass Flow Rates**

The 50 Series can be calibrated for any gas compatible with Viton®, aluminum and stainless steel, using any units, to either normal or standard conditions, for flow rates up to 200 slpm air equivalent.

**Gas Pressure**

Max 145 psig (10 barg) maximum, burst tested to 225 psig (15 barg)

**Minimum Differential Pressure Requirement**

See Table

**Gas and Ambient Temperature**

32°F to 122°F (0° to 50°C)

**Leak Integrity**

5 X 10<sup>-9</sup> atm cc/sec of helium maximum

**Power Requirements**

24 VDC (+/- 10%), 850 mA, regulated, RS-485 option adds 130 mA

**Control Range**

5 to 100% of full scale flow (20:1) at published accuracy. Automatic valve shut-off with setpoints below 4.9% of full scale. Output and Command (Setpoint) Signal

- RS-232

**Optional:**

- Linear 4-20 mA, 500 ohms maximum load resistance
- Linear 0-5 VDC

- RS-485 Addressable (no analog outputs)
- Zero, span, and setpoint are field adjustable via supplied user software and optional RS-232 communications cable

**Display**

Flow rate, units, full scale, and setpoint

**PRESSURE DROP**

Minimum Pressure Drop for Air, Mass Flow Controller	
Flow Rate (slpm)	Medium Flow 3/8 or 1/2 inch fittings Pressure Drop in PSI (mbar)
20	1 (68)
30	1.2 (82)
40	1.6 (110)
50	2 (136)
100	5 (340)
150	10 (680)
200	15 (1020)

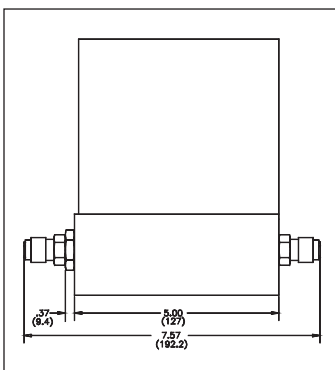
**PHYSICAL SPECIFICATIONS & DIMENSIONS**

**Wetted Material**

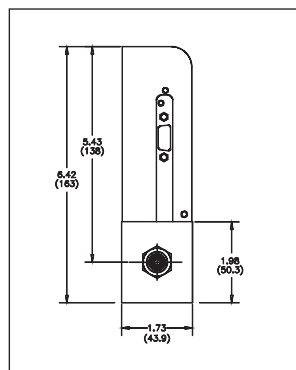
Anodized aluminum or 316 stainless steel flow body. 316L stainless steel sensor tubes; Viton® O-rings and valve seats. Note: All dimensions are in inches with mm in brackets.

Certified drawings are available upon request.

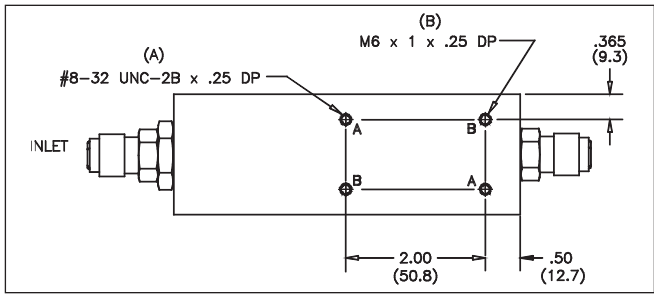
50 Series - Front View

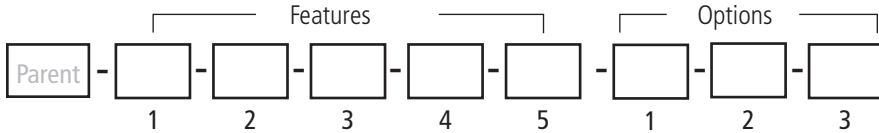


50 Series - Side View



50 Series - Bottom View





Instructions: To order a 50 please fill in each number block by selecting the codes from the corresponding features below and following pages.

Parent Number	
<b>C50M-AL (Med Flow )</b>	SmartTrak® 50 OEM mass flow controller aluminum to 200 slpm
<b>C50M-SS (Med Flow )</b>	SmartTrak® 50 OEM mass flow controller stainless steel to 200 slpm

Feature 1: Display	
<b>NR</b>	No display (standard)
<b>DD</b>	Digital display
<b>DDB</b>	Digital display (back mounted)

Feature 2: Inlet/Outlet Fittings Medium Flow	
<b>3</b>	3/8-inch stainless steel compression
<b>4</b>	1/2-inch stainless steel compression
<b>6</b>	1/2-inch stainless steel VCO
<b>9</b>	1/2-inch stainless steel VCR
<b>11</b>	10 mm stainless steel compression
<b>12</b>	12 mm stainless steel compression
<b>13</b>	1/4-FNPT adapter bushing (maximum 200 slpm). Low & Med only
<b>14</b>	3/8-inch stainless steel female NPT

Feature 3: Input Power	
<b>PV1M</b>	12-15 VDC for M50L-AL meters only
<b>PV2</b>	24 VDC for all instruments

Feature 4: Output Signal/Setpoint	
<b>V0</b>	RS-232 (no analog out)
<b>V1</b>	0-5 VDC linear output signal (and setpoint if controller); includes RS-232
<b>V4</b>	4-20 mA linear output signal (and setpoint if controller); includes RS-232
<b>V6</b>	RS-485 (no analog out or RS-232)

Option 1 : Certificates	
<b>MC</b>	Material certificates--US mill certs on all wetted parts
<b>CC</b>	Certificate of conformance
<b>LT</b>	Leak test certificate
<b>PT</b>	Pressure test certificate
<b>O2C</b>	O2 cleaning. Includes certification. Product cleaned for O2 service. Inspected with ultra-violet light and double bagged prior to shipment. O2 cleaning only available for stainless steel bodies.
<b>5POINTCAL</b>	5-point calibration certificate (ISO 17025 compliant)

Option 2 : Electrical Connections			
<b>50-C9 (0)</b>	9-pin mating connector with no cable	<b>50-C9RS232 (10)</b>	10-foot (3 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9 (1)</b>	1-foot (304.8 mm) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-C9RS232 (25)</b>	25-foot (7.62 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9 (3)</b>	3-foot (1 m) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-C9RS232 (50)</b>	50-foot (15.24 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9 (10)</b>	10-foot (3 m) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-C9RS232 ( )</b>	50-foot (15.24 m) digital/analog communication cable with D9 mating connector, D9 serial computer connector, and fly leads.
<b>50-C9 (25)</b>	25-foot (8 m) 50-analog cable. 9 conductor cable with D-connector on one end, fly leads on the other.	<b>50-SerialUSB</b>	USB to serial RS-232 converter. Needed for use with CRN. Many users elect to supply their own USB.
<b>50-C9 ( )</b>	Custom length analog communication cable with D9 mating connector and fly leads. Maximum length 50 feet (15 m). Same price any length.	<b>50-CRN</b>	6-foot (2 m) digital only cable with D9 mating connector and D9 computer connector.

Note: CE and ISO certificates are available for download from [www.sierrainstruments.com/downloads](http://www.sierrainstruments.com/downloads)

Option 3 : Accessories & Options	
50 T8D ( )	Low flow controllers and all size meters. 24 VDC power supply with D-connector, 110-230 VAC, CE approved. Specify plug preference in parentheses: (US) for USA plug, (EU) for Euro plug, (UK) for Great Britain plug. Includes 2 x 9-pin connectors.
50 T8F ( )	Low flow controllers and all size meters. 24 VDC power supply with fly leads, 110-230 VAC, CE approved. Specify plug preference in parentheses: (US) for USA plug, (EU) for Euro plug, (UK) for Great Britain plug. Includes 2 x 9-pin connectors.
50 -T10D ( )	Medium and high flow controllers. 24 VDC power supply for C50M and C50H controllers. Supplied with D-connector, 1.25 Amps, 110-230 VAC, CE approved. Specify plug preference in parentheses: (US) for USA plug, (EU) for Euro plug, (UK) for Great Britain plug. Includes 1 x 9-pin connectors.
50- T10F ( )	Medium and high flow controllers. 24 VDC power supply for C50M and C50H controllers. Supplied with fly leads, 1.25 Amps, 110-230 VAC, CE approved. Specify plug preference in parentheses: (US) for USA plug, (EU) for Euro plug, (UK) for Great Britain plug. Includes 1 x 9 pin connectors.
100L Filter	10 micron-gas filter for use with C50L or M50L. 1/4 NPT inlet, auto drain, max pressure 150 psig (10.3 barg), max temp 125°F (52°C). Wetted materials: aluminum, ABS, polycarbonate cover, buna rubber seals. Includes mounting bracket.



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