MURPHY®

by ENOVATION CONTROLS

GENERAL CATALOG

CONTROLS & INSTRUMENTATION

MURPHY®

by ENOVATION CONTROLS

Controls and Instrumentation Catalog

Volume 79

Notes

How To Use The Catalog

The Murphy Catalog is a tool to assist you in finding the right product for your needs. Here are some of the key elements, you will find on most of the bulletins included.

For more information on any product, please visit our website at **www.enovationcontrols.com.** If you have questions, please call us at **(918) 317-4100.**


MURPHY
by ENOVATION CONTROLS

sect. 05 96023
rev. 2014/10/04

2 Inch and 2.5 Inch Vacuum Swichgage®
20, 25, A20 and A25 Series

The 20 Series (2 inch/51 mm dial) and the 25 Series (2 1/2 inch/64 mm dial) Swichgage instruments are diaphragm-actuated, vacuum-indicating gages with built-in electrical switches. These switches are used for tripping alarms and/or shut-down devices.
The 20 and 25 series gage mechanism is enclosed in a steel case coated to resist corrosion.
A-Series gages have a polycarbonate case and are sealed from the environment. All gages feature a polycarbonate, break-resistant lens and a polished, stainless steel bezel to help protect these rugged, built-to-last instruments.
The gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have a self-cleaning motion to ensure electrical continuity.
Gage-only models without contacts (MurphyGage® instruments) are also available.
A pulsation dampener (PD2160) is included with each Swichgage to help eliminate pointer flutter. When monitoring intake manifold vacuum, the PD2160 is mounted in the manifold. The PD2160 has a 1/8-27 NPT connection.
Commonly used to measure loading of spark-ignition engines through intake manifold vacuum, the gages also can serve as overspeed protection from sudden loss of load on these engines. Use anywhere the vacuum source is compatible with port materials.

25 Series

20 Series

CE

Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Specifications

Dial: White on black, dual scale; U.S.A. standard scale is inches of Hg/kPa
Case (mounting clamp included):
20 and 25 Series: Plated steel
A20 and A25 Series: Polycarbonate/glass filled
Bezel: Polished stainless steel, standard; others are available (see How to Order)
Lens: Polycarbonate, high-impact
Process Connection: 1/8-27 NPTM brass
Sensing Element: Beryllium copper diaphragm
Gage Accuracy: ±2% of scale in operating range (mid 1/3 of scale)
Adjustable Limit Contacts:
2-SPST contacts, pilot- duty only, 2 A @ 30 VAC/DC. Contacts are gold flashed silver.
Limit Contact Adjustment: by a 1/16 in. hex wrench
Limit Contact Wire Leads (20 and 25 Series): 18 AWG (1.0 mm2) x 12 in. (305 mm)
Limit Contact Terminals: A20 Series number 4 screw terminals; A25 Series number 6 screw terminals

Unit Weight:
20 Series: 8 oz. (0.23 kg)
25 Series: 11 oz. (0.31 kg)
A20 Series: 6 oz. (0.17 kg)
A25 Series: 10 oz. (0.28 kg)
Unit Dimensions:
20 and A20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm)
25 and A25 Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

3

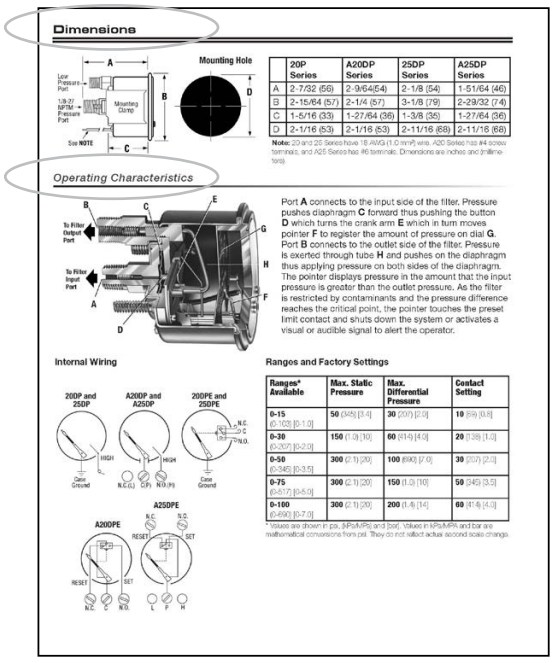
5 10 15 20 25 30 40 55 70 75 78 80

Brief Description
Each bulletin has a brief description of the product and its features. For more information on any product, please visit our website.

Document Number
Every bulletin has a document number. This number can be helpful when speaking with a sales representative to ensure you are referring to the same product. Some bulletins reference these numbers to indicate products that can be used in conjunction with other parts.

Section Sidebar
This convenient bar identifies the section each bulletin is in and allows for quick location of each section.

Important Features
Quickly find the features pertinent to your job with easy-to-find headers.


Dimensions

	20P Series	A20DP Series	25DP Series	A25DP Series
A	2-7/32 (56)	2-9/64(54)	2-1/8 (54)	1-51/64 (46)
B	2-15/64 (57)	2-1/4 (57)	3-1/8 (79)	2-29/32 (74)
C	1-5/16 (33)	1-27/64 (36)	1-3/8 (35)	1-27/64 (36)
D	2-1/16 (53)	2-1/16 (53)	2-11/16 (68)	2-11/16 (68)

Operating Characteristics

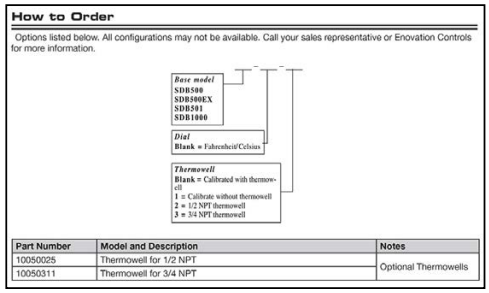
Port A connects to the input side of the filter. Pressure pushes diaphragm C forward thus pushing the button D which turns the crank arm E which in turn moves pointer F to register the amount of pressure on dial G. Port B connects to the outlet side of the filter. Pressure is exerted through tube H and pushes on the diaphragm thus applying pressure on both sides of the diaphragm. The pointer displays pressure in the amount that the input pressure is greater than the outlet pressure. As the filter is restricted by contaminants and the pressure difference reaches the critical point, the pointer touches the preset limit contact and shuts down the system or activates a visual or audible signal to alert the operator.

Internal Wiring

Ranges and Factory Settings

Ranges* Available	Max. Static Pressure	Max. Differential Pressure	Contact Setting
0-15 (0-103) [0-1.0]	50 (345) [3.4]	30 (207) [2.0]	10 (69) [0.8]
0-30 (0-207) [0-2.0]	150 (1.0) [10]	60 (414) [4.0]	20 (138) [1.0]
0-50 (0-345) [0-3.5]	300 (2.1) [20]	100 (690) [7.0]	30 (207) [2.0]
0-75 (0-517) [0-5.0]	300 (2.1) [20]	150 (1.0) [10]	50 (345) [3.5]
0-100 (0-690) [0-7.0]	300 (2.1) [20]	200 (1.4) [14]	60 (414) [4.0]

*Values are shown in psi, [kPa/kPS] and [bar]. Values in kPa/kPS and bar are mathematical conversions from psi. They do not reflect actual second scale change.


How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Base model
SDB500
SDB500EX
SDB501
SDB1000

Dial
Blank = Fahrenheit/Celsius

Thermowell
Blank = Calibrated with thermowell
1 = Calibrate without thermowell
2 = 1/2 NPT thermowell
3 = 3/4 NPT thermowell

Part Number	Model and Description	Notes
10050025	Thermowell for 1/2 NPT	Optional Thermowells
10050311	Thermowell for 3/4 NPT	

How To Order
Most bulletins will feature a list of product numbers to assist you in ordering. Others may have a matrix to guide you through creating the specific part you require. All combinations may not be available. Please call Enovation Controls for more information and availability.

Section 05 Pressure/Vacuum

Section 10 Temperature

Section 15 Fluid Level

Section 20 Time, Vibration and Overspeed

Section 25 Magnetic Switches & Annunciators

Section 30 Engine Panels

Section 40 Engine and Motor Controls

Section 55 Valves

Section 70 Electric Gauges

Section 75 Genset Controls

Section 78 MurphyLink® J1939

Section 80 CAN I/O Modules

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2 Inch and 2.5 Inch Vacuum Swichgage®

20, 25, A20 and A25 Series

The 20 Series (2 inch/51 mm dial) and the 25 Series (2 1/2 inch/64 mm dial) Swichgage instruments are diaphragm-actuated, vacuum-indicating gages with built-in electrical switches. These switches are used for tripping alarms and/or shut-down devices.

The 20 and 25 series gage mechanism is enclosed in a steel case coated to resist corrosion.

A-Series gages have a polycarbonate case and are sealed from the environment. All gages feature a polycarbonate, break-resistant lens and a polished, stainless steel bezel to help protect these rugged, built-to-last instruments.

The gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have a self-cleaning motion to ensure electrical continuity.

Gage-only models without contacts (MurphyGage® instruments) are also available.

A pulsation dampener (PD2160) is included with each Swichgage to help eliminate pointer flutter. When monitoring intake manifold vacuum, the PD2160 is mounted in the manifold. The PD2160 has a 1/8-27 NPT connection.

Commonly used to measure loading of spark-ignition engines through intake manifold vacuum, the gages also can serve as overspeed protection from sudden loss of load on these engines. Use anywhere the vacuum source is compatible with port materials.

25 Series

20 Series

CE

Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Specifications

Dial: White on black, dual scale; U.S.A. standard scale is Inches of Hg/kPa

Case (mounting clamp included):
20 and 25 Series: Plated steel
A20 and A25 Series: Polycarbonate/glass filled

Bezel: Polished stainless steel, standard; others are available (see How to Order)

Lens: Polycarbonate, high-impact

Process Connection: 1/8-27 NPTM brass

Sensing Element: Beryllium copper diaphragm

Gage Accuracy: ±2% of scale in operating range (mid 1/3 of scale)

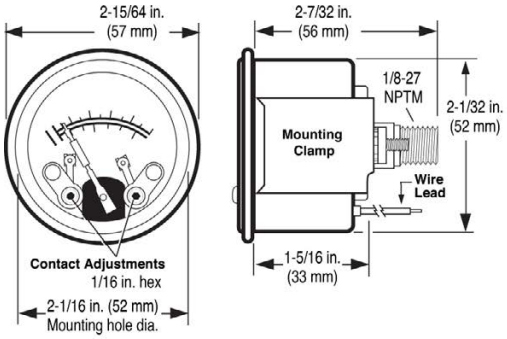
Adjustable Limit Contacts:
2-SPST contacts; pilot- duty only, 2 A @ 30 VAC/DC. Contacts are gold flashed silver.
Limit Contact Adjustment: by a 1/16 in. hex wrench
Limit Contact Wire Leads (20 and 25 Series):
18 AWG (1.0 mm2) x 12 in. (305 mm)
Limit Contact Terminals: A20 Series number 4 screw terminals; A25 Series number 6 screw terminals

Unit Weight:
20 Series: 8 oz. (0.23 kg)
25 Series: 11 oz. (0.31 kg)
A20 Series: 6 oz. (0.17 kg)
A25 Series: 10 oz. (0.28 kg)

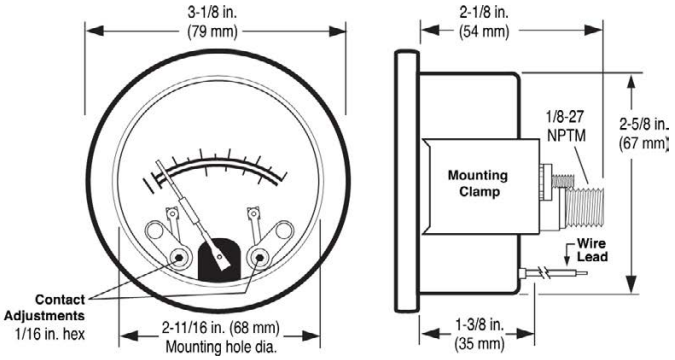
Unit Dimensions:
20 and A20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm)
25 and A25 Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

Dimensions

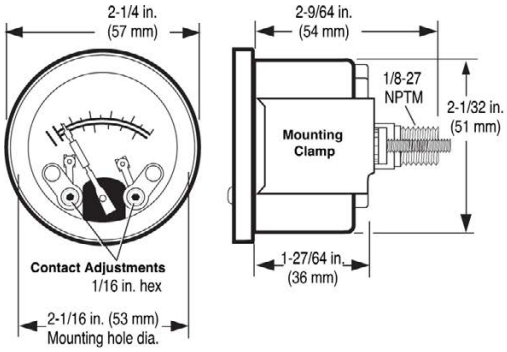
20 Series Models



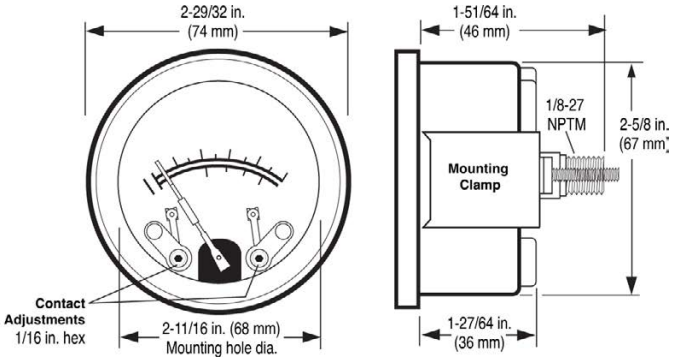
25 Series Models



A20 Series Models



A25 Series Models



How to Order

Part Number	Model and Description	Notes
05703194	**20V-20:** Vacuum Swichgage	20 Series Model
05703195	**20V-30:** Vacuum Swichgage	20 Series Model
05704227	**25V-30:** Vacuum Swichgage	25 Series Model
05704330	**A20V-30:** Vacuum Swichgage	A20 Series Model
05704394	**A25V-30:** Vacuum Swichgage	A25 Series Model

2 Inch and 2.5 Inch Differential Pressure Gage for Filter Restriction

20DP, 25DP, A20DP and A25DP Series

The 20DP and A20DP Series (2 inch/51 mm dial) and the 25DP and A25DP Series (2-1/2 inch/64 mm dial) Swichgage® instruments are diaphragm-actuated, differential pressure-indicating gages with a built-in electrical switch. This switch is used for tripping alarms and/or shutting down equipment. These gages are intended to monitor and indicate oil, fuel or water filter restriction and can reduce the risk of dangerously high pressure which may rupture the filter, resulting in contaminants entering the system.

The 20DP and 25DP series mechanism is enclosed in a steel case coated to resist corrosion. The A20DP and A25DP series have a polycarbonate case and are sealed from the environment. All feature a polycarbonate, break-resistant lens and a polished, stainless steel bezel to help protect these rugged, built-to-last instruments.

The gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have self-cleaning motion to ensure electrical continuity.

Additional features:

- Constant visual indication of the condition of your filter is shown on the dial.
- Two instruments in one with an accurate indicating gage and adjustable p.s.i.d. limit switch reduces inventory and installation time.
- Adjustable contact lets you set the monitoring range of the gage. The contact is tamper proof and can be set only with a 1/16 Allen-head wrench.
- All gages are made of durable materials allowing them to withstand rugged applications.
- Early filter changes cost you money and increase the risk of contaminants entering the system. A Murphy filter restriction Swichgage instrument will let you know when to change the filter and maintain peak efficiency.

CE

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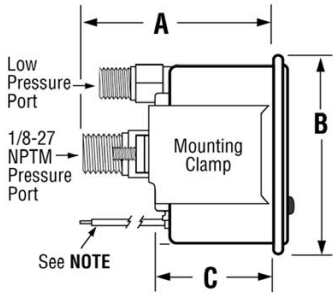
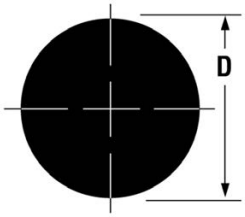
Dimensions



Mounting Hole



	20P Series	A20DP Series	25DP Series	A25DP Series
A	2-7/32 (56)	2-9/64(54)	2-1/8 (54)	1-51/64 (46)
B	2-15/64 (57)	2-1/4 (57)	3-1/8 (79)	2-29/32 (74)
C	1-5/16 (33)	1-27/64 (36)	1-3/8 (35)	1-27/64 (36)
D	2-1/16 (53)	2-1/16 (53)	2-11/16 (68)	2-11/16 (68)

Note: 20 and 25 Series have 18 AWG (1.0 mm²) wire. A20 Series has #4 screw terminals, and A25 Series has #6 terminals. Dimensions are inches and (millimeters).

Base Models

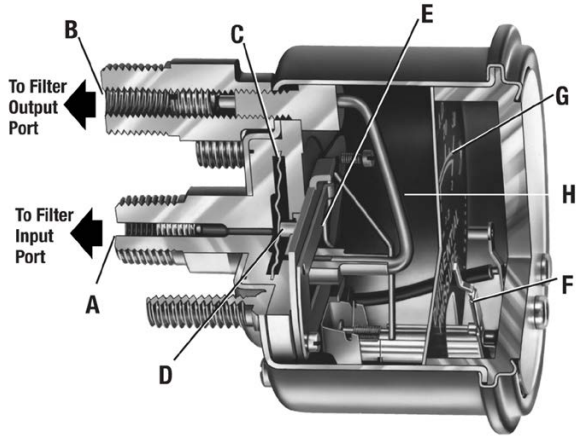
20DP, 25DP, A20DP and A25DP Swichgage instrument
The gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

20DPE, 25DPE, A20DPE and A25DPE Swichgage instrument
20DPE (was 20DPEO), **25DPE** (was 25DPEO), **A20DPE** (was A20DPEO) and **A25DPE** (was A25DPEO).
Features an internal snap-acting SPDT switch, instead of the single pole/pointer contacts. When the switch closes on rising pressure, it becomes set, as pressure falls the switch resets. 20DPG, 25DPG, A20DPG and A25DPG MurphyGage® instrument gage without contact(s).

Specifications

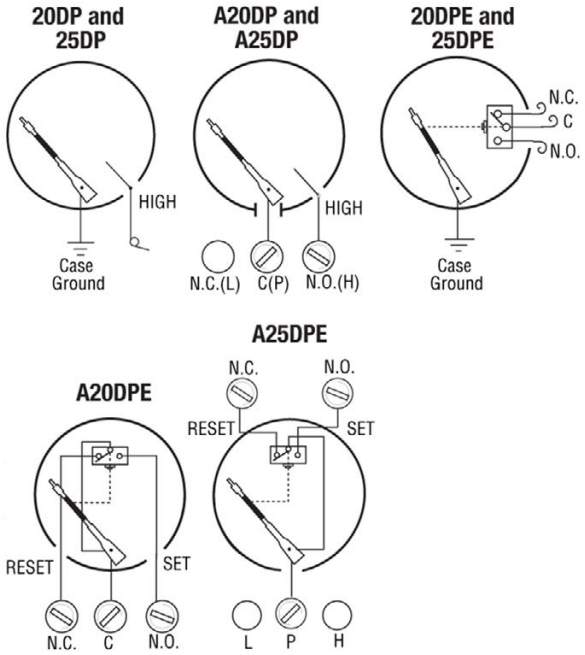
Dial: White on black, dual scale; U.S.A. standard scale is psi/kPa. Other scales available
Case: 20DP and 25DP Series: plated steel. A20DP and A25DP Series: polycarbonate
Bezel: Polished stainless steel, standard; others are available.
Lens: Polycarbonate, high-impact
Temperature Range:
Ambient: -40° to 150° F (-40° to 66° C)
Process: -40° to 250° F (-40° to 121° C)
Process Connection: 1/8-27 NPTM brass
Sensing Element: Beryllium copper diaphragm
Gage Accuracy: ±3% maximum across scale
Snap-Switch Rating (DPE models): SPDT, 3 A @ 30 VDC inductive; 4 A @ 125 VAC inductive
Adjustable Limit Contact: SPST contact; pilot duty only, 2 A @ 30 VAC/DC; closed when the low limit is met, open when pointer is in normal operating range. Contacts are gold flashed silver.
Limit Contact Adjustment: by 1/16 in. hex wrench through 100% of scale.
Limit Contact Wire Leads (20DP and 25DP Series): 18 AWG (1.0 mm^2) x 12 in. (305 mm)
Limit Contact Terminals: A20DP Series #4 screw terminals. A25DP Series #6 screw terminals
Unit Weight: 20DP and A20DP Series: 9 oz. (0.25 kg); 25DP and A25DP Series: 11 oz. (0.29 kg)
Unit Dimensions: 20DP and A20DP Series: 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm). 25DP and A25DP Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

Operating Characteristics



Port **A** connects to the input side of the filter. Pressure pushes diaphragm **C** forward thus pushing the button **D** which turns the crank arm **E** which in turn moves pointer **F** to register the amount of pressure on dial **G**. Port **B** connects to the outlet side of the filter. Pressure is exerted through tube **H** and pushes on the diaphragm thus applying pressure on both sides of the diaphragm. The pointer displays pressure in the amount that the input pressure is greater than the outlet pressure. As the filter is restricted by contaminants and the pressure difference reaches the critical point, the pointer touches the preset limit contact and shuts down the system or activates a visual or audible signal to alert the operator.

Internal Wiring



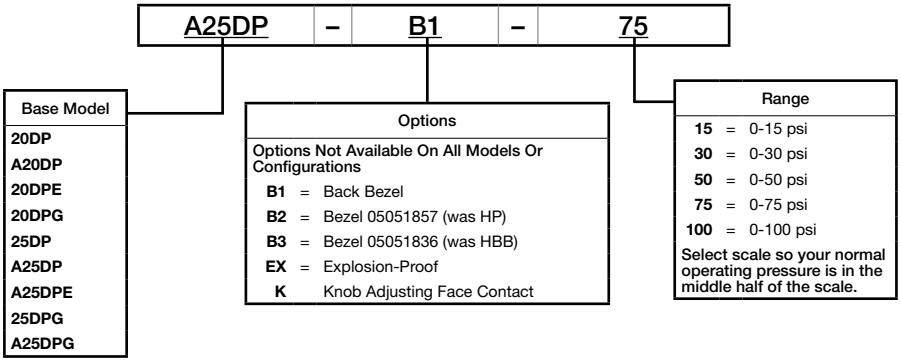
Ranges and Factory Settings

Ranges and Factory Settings			
Ranges* Available	**Max. Static Pressure**	**Max. Differential Pressure**	**Contact Setting**
0-15 (0-103) [0-1.0]	**50** (345) [3.4]	**30** (207) [2.0]	**10** (69) [0.8]
0-30 (0-207) [0-2.0]	**150** (1.0) [10]	**60** (414) [4.0]	**20** (138) [1.0]
0-50 (0-345) [0-3.5]	**300** (2.1) [20]	**100** (690) [7.0]	**30** (207) [2.0]
0-75 (0-517) [0-5.0]	**300** (2.1) [20]	**150** (1.0) [10]	**50** (345) [3.5]
0-100 (0-690) [0-7.0]	**300** (2.1) [20]	**200** (1.4) [14]	**60** (414) [4.0]

***** Values are shown in psi, (kPa/MPa) and [bar]. Values in kPa/MPA and bar are mathematical conversions from psi. They do not reflect actual second scale change.

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



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2 Inch and 2.5 Inch Pressure Swichgage®
20 and 25 Series

The 20 Series (2 inch/51 mm dial) and the 25 Series (2-1/2 inch/64 mm dial) Swichgage models are diaphragm-actuated, pressure-indicating gages with built-in electrical switches. These switches exceed SAE standards and are used for tripping alarms and/or shut-down devices.

Ranges are available from 0-15 psi (103 kPa) [1.0 bar] through 0-400 psi (2.8 MPa) [28 bar].

The gage mechanism is enclosed in a steel case coated to resist corrosion. A polycarbonate, break-resistant lens and a polished, stainless steel bezel help protect this rugged, built-to-last instrument. Accuracy and protection from moderate overpressure is assured by a unique, unitized diaphragm chamber. A built-in pulsation dampener helps eliminate pointer flutter and is removable for cleaning. For models 20P and 25P, the gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts are grounded through the case and have self-cleaning motion to ensure electrical continuity.

Models 20PE and 25PE have internal snap-acting SPDT switches.

Gage-only models without the switches (MurphyGage®) are also available.

The Swichgage® was specifically designed to protect engines/equipment in oil field, marine, irrigation, construction and trucking applications to monitor engine lube pressure, water pump pressure, hydraulic pressure, air pressure, etc.

CE

Products covered in this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Base Models

20P and 25P Series Swichgage
The gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

20PE and 25PE Swichgage
20PE (was 20EO) **and 25PE** (was 25EO)
Features internal snap-acting SPDT switches, instead of the single pole/pointer contacts. When the switch closes on falling pressure, it becomes set, as pressure rises the switch resets.

20PABS and 25PABS Swichgage
Same as 20P and 25P with internal SPDT snap-switch for pre-alarm.

20P7 and 25P7 Lockout Swichgage
Same as 20P and 25P Series. They also include a front, semi-automatic lockout for startup override. This built-in device holds the pointer away from the contact on startup. When pressure exceeds the set point, the lockout is automatically disengaged (see following pages for details).

20PG and 25PG MurphyGage
Gage without contact(s)

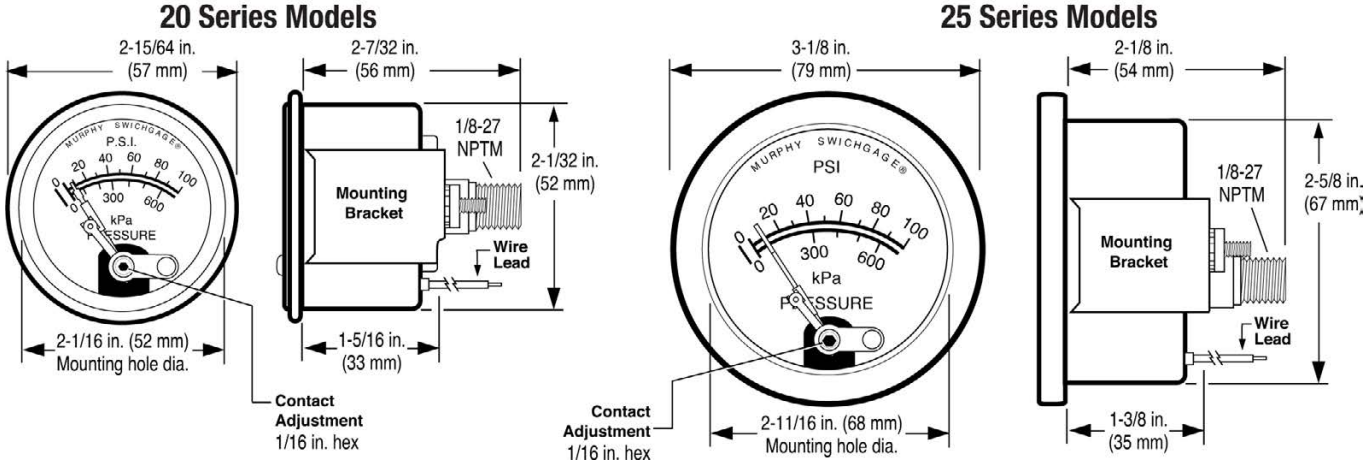
Specifications

Dial: White on black, dual scale; U.S.A. standard scale is psi/kPa; U.K. standard scale is psi/bar; others available (see How to Order).
Case: Plated steel; mounting clamp included (except for direct mount models)
Bezel: Polished stainless steel, standard; others are available.
Lens: Polycarbonate, high-impact
Oil: Silicon Oil
Temperature Range:
Ambient: -40° to 150° F (-40° to 66° C)
Process: -40° to 250° F (-40° to 121° C)
Process Connection: 1/8-27 NPTM brass
Sensing Element: Beryllium copper diaphragm
Gage Accuracy (% of Full Scale):

Range	Lower 1/4	Middle 1/2	Upper 1/4
≤300 psi (20 Bar)	±3%	±2%	±3%
400psi (28 Bar)	±3%	±3%	±5%

Maximum Pressure: See Pressure Ranges and Factory Settings table next page
Adjustable Limit Contact (20P and 25P): SPST contact; pilot-duty only, 2 A @ 30 VAC/DC; Normally Close (NC) when the low limit is met. Normally Open (NO) when pointer is in normal operating range. Contacts are gold flashed silver.
Limit Contact Adjustment: By a 1/16 in. hex wrench through 100% of the scale
Limit Contact Wire Leads: 18 AWG (1.0 mm2) x 12 in. (305 mm)
Snap-Switch Rating (20PE and 25PE): SPDT, 3 A@ 30 VDC inductive; 4 A @ 125 VAC inductive
Snap-Switch Wire Leads: 20 AWG (0.75 mm2) x 12 in. (305 mm)
Unit Weight: 20 Series: 8 oz. (0.23 kg); 25 Series Models: 11 oz. (0.31 kg)
Unit Dimensions: 20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm); 25 Series Models: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

Dimensions

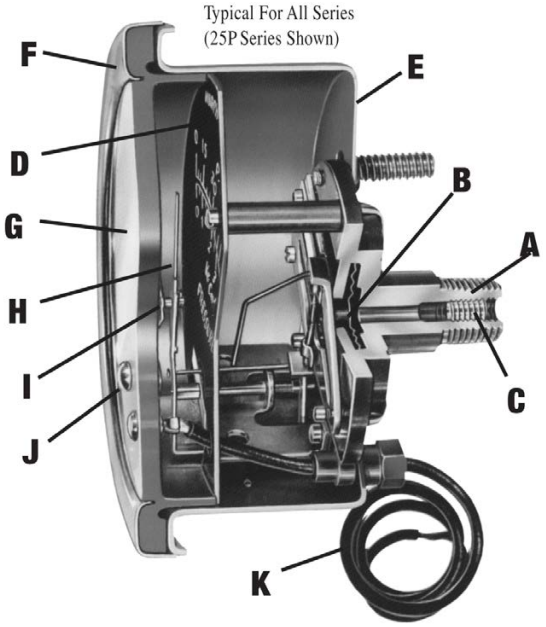


Pressure Ranges and Factory Settings

Ranges Available			Maximum Pressure	Standard Settings			High Settings			20PABS and 25PABS Settings Low			Alarm		
psi	(kPa)	[bar]		psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]
0-15	(103)	[1.0]	2 x scale	3	(21)	[0.2]	12	(83)	[0.8]	3	(21)	[0.2]	6	(41)	[0.3]
0-30	(103)	[1.0]	2 x scale	7	(48)	[0.4]	24	(165)	[1.6]	7	(48)	[0.4]	10	(69)	[0.6]
0-50	(345)	[3.5]	2 x scale	10	(69)	[0.8]	40	(276)	[2.8]	10	(69)	[0.8]	13	(90)	[1.0]
0-75	(517)	[5.0]	2 x scale	15	(103)	[1.0]	60	(414)	[4.0]	15	(103)	[1.0]	18	(124)	[1.5]
0-100	(690)	[7.0]	2 x scale	20	(138)	[1.5]	80	(552)	[5.5]	20	(138)	[1.0]	23	(159)	[1.5]
0-150	(1.0 MPa)	[10]	2 x scale	30	(207)	[2.0]	120	(827)	[8.0]	30	(207)	[1.5]	33	(228)	[2.0]
0-200	(1.4 MPa)	[14]	2 x scale	50	(345)	[3.0]	150	(1 MPa)	[10]	50	(345)	[3.0]	53	(365)	[4.0]
0-300	(2.1 MPa)	[20]	1-2/3 x scale	75	(517)	[5.0]	225	(1.6 MPa)	[15]	75	(517)	[5.0]	78	(538)	[5.0]
0-400	(2.8 MPa)	[28]	1-1/4 x scale	150	(1.0 MPa)	[7.0]	300	(2.1 MPa)	[20]	75	(517)	[5.0]	150	(1 MPa)	[10]

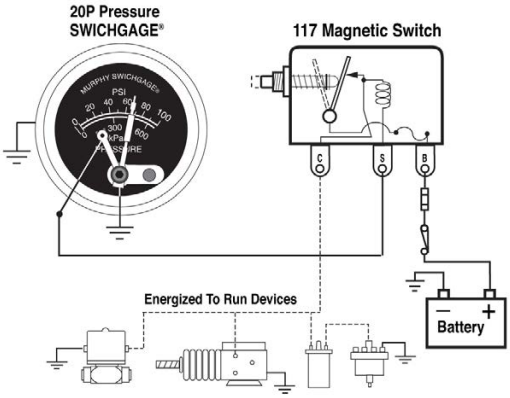
Features

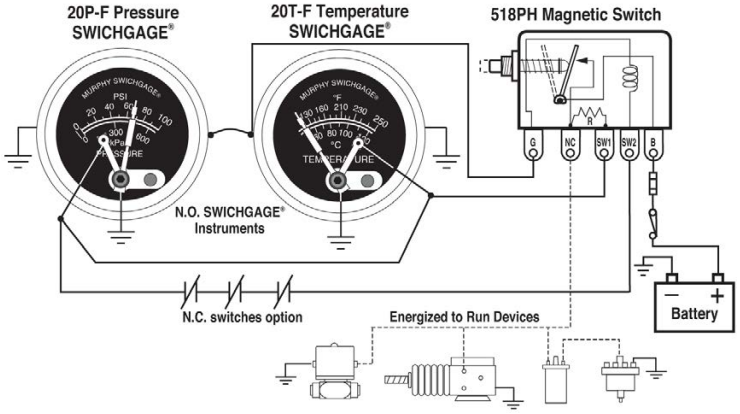
A. Process Connection and Port: Machined from brass bar stock; together with the diaphragm forms the diaphragm chamber.
B. Diaphragm: Beryllium copper; material is die formed and heat treated to very close physical and metallurgical specifications.
C. Pulsation Dampener: Designed to minimize undesirable pointer chatter. It is removable for cleaning.
D. Dial: White letters on a black background, dual scale (psi & kPa) standard; others available on request (see How to Order).
E. Case: Steel with zinc and iridite; mounting clamp included (except for direct mount models).
F. Bezel: Polished stainless steel standard, black bezel also available
G. Lens: Made of polycarbonate glass, high-impact treated
H. Pointer: Tempered nickel silver for continuity and corrosion resistance. It is mounted on a machined brass post.
I. Limit Contact: SPST contact; N.C. when low limit is met. N.O. when pointer operates above limit.
J. Limit Contact Adjustment: By 1/16 in. hex type wrench through 100% of the scale. Easy adjustment knob available.
K. Wire Leads: 12 in. (305 mm) long, 18 AWG (1.0 mm2) for face-adjustable contacts. 20 AWG (0.75 mm2) for snap-switches models.



Magnetic Switch

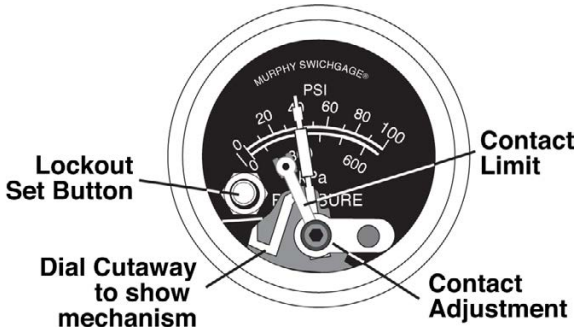
INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH. The Swichgage contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the light-duty Swichgage limit contacts. Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown.





Start-Up Lockout (P7 Versions)

The Swichgage low limit contact can be bypassed on start-up by pushing this optional lockout button. It holds the pointer away from the shut-down contact while the engine starts. The lockout will disengage automatically on rising pressure.



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

25P – B1 – 200

Base Model
20P
20PE
20P7
20PG
25P
25P7
25PG

Options	
Options Not Available On All Models Or Configurations	
B1	= Black Bezel
B2	= Bezel 05051857 (was HP)
B3	= Bezel 05051836 (was HBB)
D	= Direct Mount
F	= FS Contact (Includes ES as Appropriate)
HL	= High and Low Contacts
I	= Illuminations (See Illumination Options)
IP1	= Light Pipe Illumination, 12 VDC
IP2	= Light Pipe Illumination, 24 VDC
K	= Knob Adjusting Face Contact
OS	= Oil Sealed (Silicone Oil)

Illumination Options		
	IP1 / IP2	1
20 Series	X	X*
25 Series	N/A	N/A

* Can be used with Standard Clamp Lite Assembly (12 V = 05702176; 24 V = 05702177)

Pressure Range					
	Dual Scale			Single Scale	
	psi	kPa/MPa		bar	
15 =	0-15 psi	0-103 kPa	**1B** =	0-1 bar	
30 =	0-30 psi	0-207 kPa	**2B** =	0-2 bar	
50 =	0-50 psi	0-345 kPa	**3.5B** =	0-3.5 bar	
75 =	0-75 psi	0-517 kPa	**5B** =	0-5 bar	
100 =	0-100 psi	0-689 kPa	**7B** =	0-7 bar	
150 =	0-150 psi	0-1.03 MPa	**10B** =	0-10 bar	
200 =	0-200 psi	0-1.38 MPa	**14B** =	0-14 bar	
300 =	0-300 psi	0-2.07 MPa	**20B** =	0-20 bar	
400 =	0-400 psi	0-2.76 MPa	**28B** =	0-28 bar	

Consult factory for availability of dials other than psi/kPa. Select scale so your normal operating temperature is in the middle half of the scale.

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Pressure Swichgage® Instrument

A20 and A25 Series

The A20 Series (2 inch/51 mm dial) and the A25 Series (2-1/2 inch/64 mm dial) Swichgage instruments are diaphragm-actuated, pressure-indicating gages with built-in electrical switches for tripping alarms and/or shut-down devices.

Ranges are available from 0-15 psi (103 kPa) [1.0 bar] through 0-400 psi (2.8 MPa) [28 bar].

These rugged, built-to-last instruments are face sealed from the environment by the unique combination of a polycarbonate case and lens, a polished stainless steel bezel and O-ring seals. Ranges above 30 psi (207 kPa) [2 bar] are sealed from the external environment (except PE Series). Ranges of 30 psi and lower have a small weep hole in the bottom of the case. Accuracy and protection from moderate overpressure is assured by a unique, unitized diaphragm chamber. A built-in pulsation dampener helps eliminate pointer flutter and is removable for cleaning.

For series A20P and A25P, the gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contacts have self-cleaning motion to ensure electrical continuity.

Models A20PE and A25PE have internal snap-acting SPDT switches for three wire control and can be wired to make or to break a circuit.

Gage-only models without switches (MurphyGage® instrument) are also available.

A20/A25 Series applications include: engines/equipment in oil field, marine, irrigation, construction and trucking for lube oil pressure, water pump pressure, hydraulic pressure, air pressure, etc.

A20 Series

A25 Series

CE

Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Base Models

A20P and A25P Series Swichgage

The gage pointer makes with an adjustable contact to complete a pilot duty circuit.

A20PE and A25PE Swichgage

A20PE (was A20EO) and A25PE (was A25EO). Features internal snap-acting SPDT switches, instead of the single pole/pointer contacts. When the switch closes on falling pressure, it becomes set, as pressure rises the switch resets (refer to wiring diagram).

Model A25PE is CSA listed for non-hazardous areas.

Model A25PE-EX is CSA listed for Class I, Division 1, Groups C and D hazardous areas.

A20PABS and A25PABS Swichgage instrument

Same as A20P and A25P with internal SPDT snap-switch for pre-alarm

A20PG and A25PG MurphyGage instrument

Gage without contact(s)

Specifications

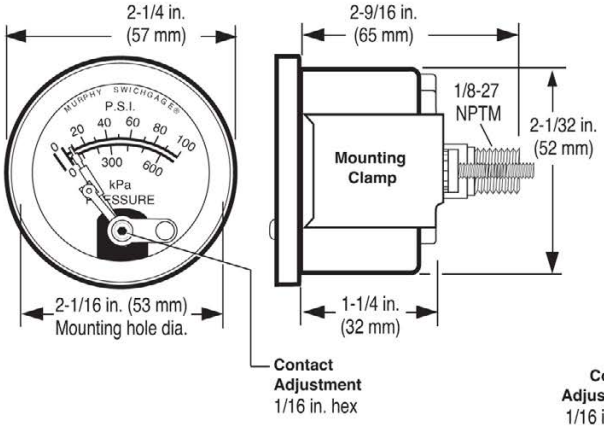
Dial: White on black, dual scale; U.S.A. standard scale is psi/kPa; U.K. standard scale is psi/bar.
Case: Polycarbonate/glass filled, corrosion-resistant; steel mounting clamp included
Bezel: Polished stainless steel, standard; others are available.
Pointer: Tempered nickel silver; Red tip
Lens: Polycarbonate, high-impact
Oil: Silicone Oil
Temperature Range:
Ambient: -40° to 150°F (-40° to 66°C)
Process: -40° to 250°F (-40° to 121°C)
Process Connection: 1/8-27 NPTM brass
Sensing Element: Beryllium copper diaphragm
Gage Accuracy (% of Full Scale):

Range	Lower 1/4	Middle 1/2	Upper 1/4
≤ 300psi (20 Bar)	±3%	±2%	±3%
400psi (28 Bar)	±3%	±3%	±5%

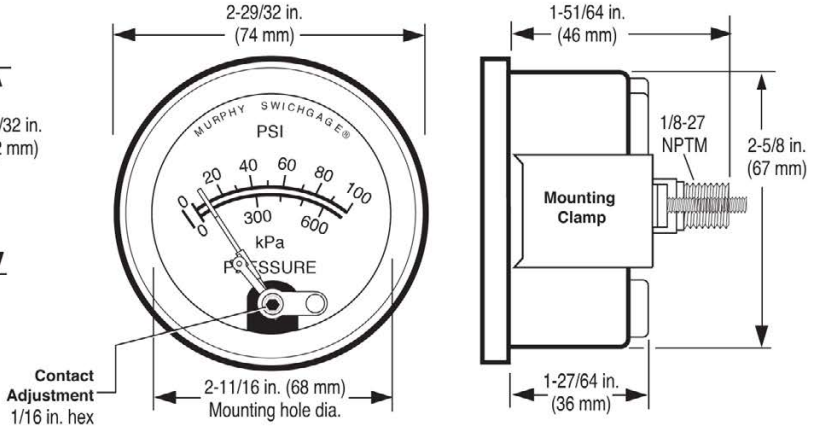
Maximum Pressure: See Pressure Ranges and Factory Settings table.
Adjustable Limit Contact (A20P and A25P): SPST contact; pilot-duty only, 2A@30 VAC/DC; Closed when the low limit is met. Open when pointer is in normal operating range. Contacts are gold flashed silver. Limit Contact Adjustment: by a 1/16 in. hex wrench through 100% of the scale.
Wiring: A20P: Number 4 screw terminals; A25P: Number 6 screw terminals
Snap-Switch Rating (A20PE and A25PE): SPDT, 3 A@ 30 VDC inductive; 4 A @ 125 VAC inductive
Wiring: A20PE: Number 4 screw terminals; A25PE: Number 6 screw terminals.
Unit Weight: A20 Series: 8 oz. (0.23 kg); A25 Series Models: 11 oz. (0.31 kg).
Unit Dimensions: A20 Series: 3 x 3 x 3 in. (76 x 76 x 76 mm); A25 Series Models: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

Dimensions

A20 Series Models



A25 Series Models



Pressure Ranges and Factory Settings

NOTES

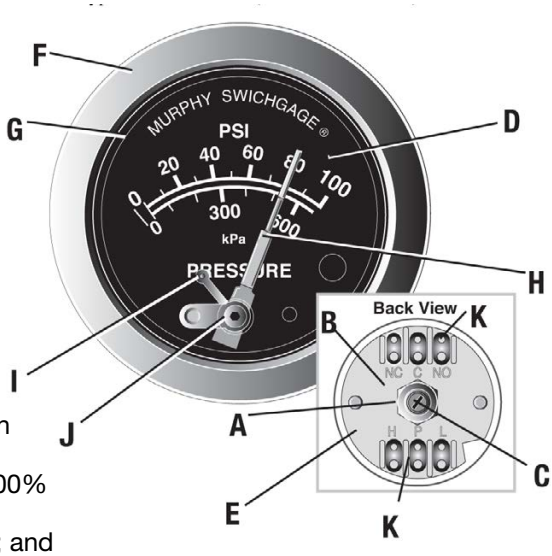
• Values in ( ) are mathematical conversions from psi to kPa/MPa — they do not reflect actual second scale range. U.S.A. standard scale is psi/kPa; U.K. standard scale is psi/bar — exact setpoint shown. Consult factory for other scales.

• For models A20PE and A25PE, the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential. Only certain models are adjustable.

• For adjustable switch models, the trip point is adjustable only over the lower half of the scale.

Ranges Available			Maximum Pressure	Standard Settings			High Settings			20PABS and 25PABS Settings Low			Alarm		
psi	(kPa)	[bar]		psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]	psi	(kPa)	[bar]
0-15	(103)	[1.0]	30 psi (207)	3	(21)	[0.2]	12	(83)	[0.8]	3	(21)	[0.2]	6	(41)	[0.3]
0-30	(207)	[2.0]	60 psi (413)	7	(48)	[0.4]	24	(165)	[1.6]	7	(48)	[0.4]	10	(69)	[0.6]
0-50	(345)	[3.5]	100 psi (690)	10	(69)	[0.8]	40	(276)	[2.8]	10	(69)	[0.8]	13	(90)	[1.0]
0-75	(517)	[5.0]	150 psi (1.0 MPa)	15	(103)	[1.0]	60	(414)	[4.0]	15	(103)	[1.0]	18	(124)	[1.5]
0-100	(690)	[7.0]	200 psi (1.4 MPa)	20	(138)	[1.5]	80	(552)	[5.5]	20	(138)	[1.0]	23	(159)	[1.5]
0-150	(1.0 MPa)	[10]	300 psi (2.1 MPa)	30	(207)	[2.0]	120	(827)	[8.0]	30	(207)	[1.5]	33	(228)	[2.0]
0-200	(1.4 MPa)	[14]	400 psi (2.8 MPa)	50	(345)	[3.0]	150	(1 MPa)	[10]	50	(345)	[3.0]	53	(365)	[4.0]
0-300	(2.1 MPa)	[20]	500 psi (3.4 MPa)	75	(517)	[5.0]	225	(1.6 MPa)	[15]	75	(517)	[5.0]	78	(538)	[5.0]
0-400	(2.8 MPa)	[28]	500 psi (3.4 MPa)	150	(1.0 MPa)	[7.0]	300	(2.1 MPa)	[20]	75	(517)	[5.0]	150	(1 MPa)	[10]

Features



A. Process Connection and Port: Machined from brass bar stock. Together with the diaphragm forms the diaphragm chamber.

B. Diaphragm (not shown): Beryllium copper die formed and heat treated to very close physical and metallurgical specifications.

C. Pulsation Dampener: Designed to minimize undesirable pointer chatter. It is removable for cleaning.

D. Dial: White letters on a black background, dual scale; others available on request.

E. Case: Polycarbonate/glass filled, corrosion resistant; mounting clamp included.

F. Bezel: Polished stainless steel standard, black bezel also available.

G. Lens: Made of high-impact resistant treated polycarbonate.

H. Pointer: Tempered nickel silver for continuity and corrosion resistance—mounted on a machined brass post. Red tip.

I. Limit Contact: SPST contact; N.C. when low limit is met. N.O. when pointer operates above limit.

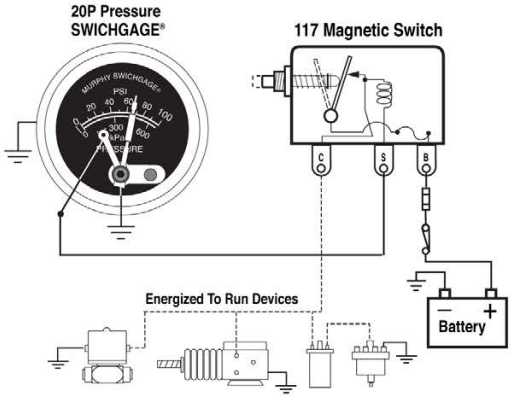
J. Limit Contact Adjustment: by 1/16 in. hex type wrench through 100% of the scale. Easy adjustment knob available.

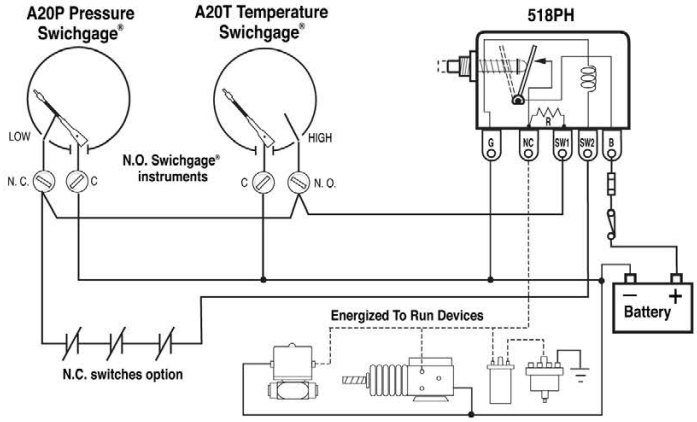
K. Electrical Connections: Number 4 screw terminals for A20 Series; and number 6 screw terminals for A25 Series models.

Magnetic Switch

INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH. The Swichgage contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the pilot-duty Swichgage limit contacts.

Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown below.

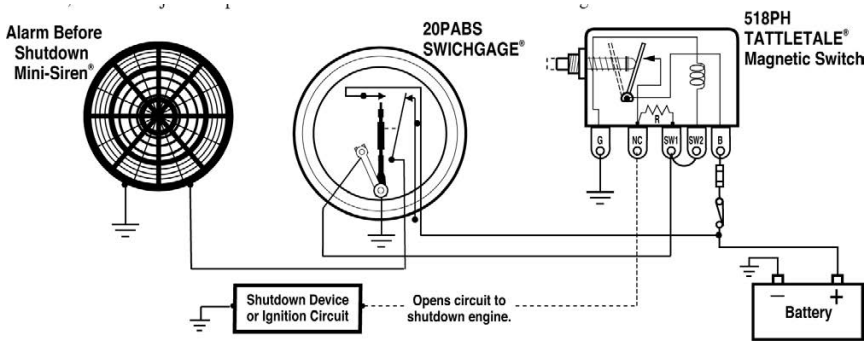




Pre-Alarm Using A20/A25PABS

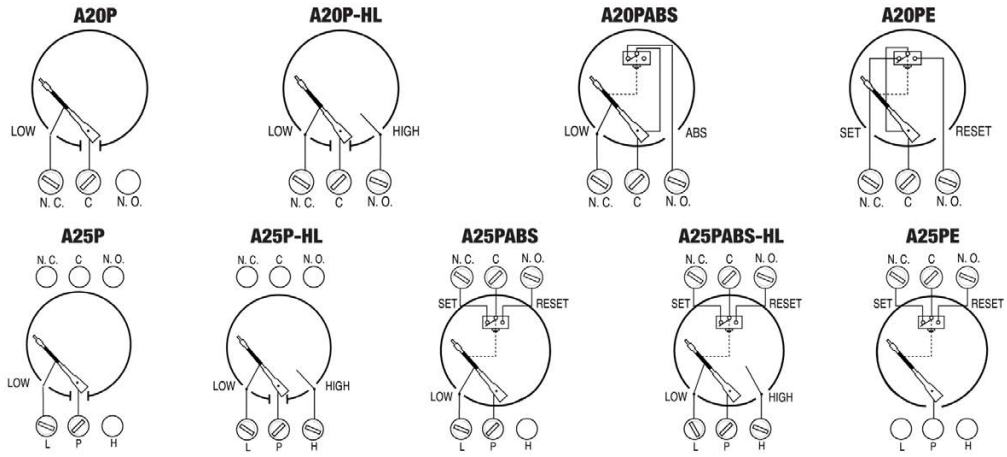
The A20PABS and A25PABS feature a standard limit contact for equipment shutdown on low pressure. They also have an internal SPDT snap-switch to signal an alarm before shutting down. When the snap-switch trips (preset point) on falling pressure, the switch completes a circuit to activate an alarm. If the pressure continues to fall, the face-adjustable pointer contact will make and the shut-down circuit will be completed (see the typical diagram below for reference).

The front contact shut-down limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to Pressure Ranges and Factory Settings table. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



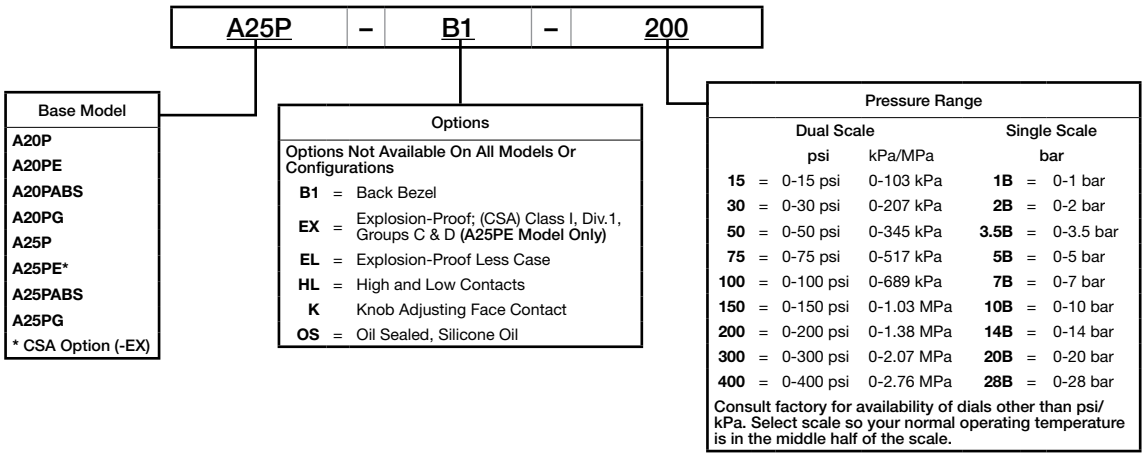
Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot-duty 2 A @ 30 VAC/VDC resistive. Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
05702176	A20 Series Clamp Lite Assembly; 12V	Illumination — Order Separately
05702177	A20 Series Clamp Lite Assembly; 24V	
N/A	A25 Series	

B-Series MurphyGage® Instrument

The B-Series MurphyGage® instrument is a high-quality, diaphragm-actuated indicating gage. Built by Enovation Controls with the same heavy-duty design as the standard 20 series and 25 series Swichgage® instrument, the B-gage is more compact and is the optimum instrument for gage-only applications. It has a high impact polycarbonate lens, sturdy steel case and a polished, low-profile stainless steel bezel. Accuracy and protection from moderate over-pressure/over-temperature are assured by a unique, unitized diaphragm chamber, superior quality materials and the design of the gage movement.

Pressure MurphyGage instrument

Pressure changes at the diaphragm convert to accurate mechanical movements that are indicated on an easy-to-read analog dial. A pulsation dampener in the pressure port helps eliminate pointer flutter. It can be removed for cleaning to maintain the gage's response and accuracy.

Vacuum MurphyGage instrument

Available in 0 to 20 or 0 to 30 in. Hg. (0 to -68 or 0 to -102 kPa) vacuum.

Temperature MurphyGage instrument

As temperature rises, the fluid in the sensing bulb vaporizes to apply pressure on the diaphragm. The movement translates this vapor pressure to a calibrated reading of temperature on the dial. The standard capillary is copper with a PVC armor. Optional armor covering is galvanized steel or 316 stainless steel (specify). Optional bulb types, adaptor nuts and thermowells are available.

The B-Series can be utilized in industrial engines and equipment in the oil field, marine, irrigation, construction and trucking industries as well as monitoring engine coolant, crankcase oil and transmission oil.

Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Specifications

Dial: White on black; U.S.A. standard scale is dual scale; others available.

Gage Accuracy:

Pressure/Vacuum (% of Full Scale):

Range	Lower 1/4	Middle 1/2	Upper 1/4
≤ 300 psi (24 bar)	±3%	±2%	±3%
400 psi (28 bar)	±3%	±3%	±5%

Temperature: See chart.

Temperature Range:

Pressure/Vacuum:
Ambient: -40° to 150° F (-40° to 66° C)
Process: -40° to 250° F (-40° to 121° C)

Temperature: See chart on reverse side.

Maximum Panel Thickness: 1/4 in. (6 mm)

Port: Brass

Case: Plated steel; mounting clamp included (except for direct mount models)

Bezel: Polished stainless steel, standard; optional bezels are available.

Pointer: White (black dial); black (white dial)

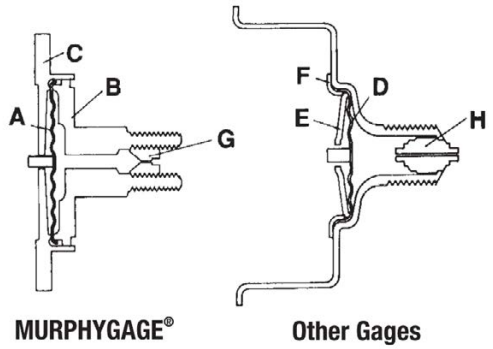
Lens: Polycarbonate, high-impact

Sensing Element: Beryllium copper diaphragm

Comparison of Murphy Gages to Most Other Gages

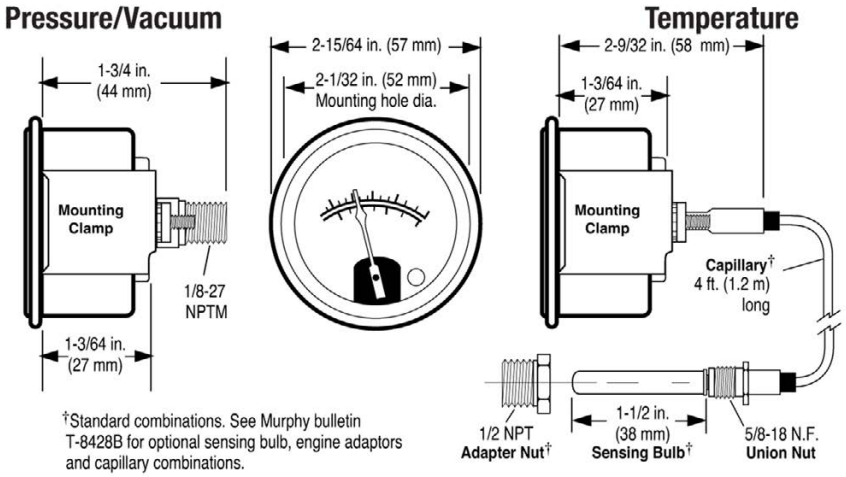
The basic difference between the MurphyGage instrument and most other gages is the internal design. The MurphyGage instrument does not rely on the gage case to serve as part of the sensing chamber. The diaphragm **(A)** which must expand and contract consistently with changing pressures and temperatures, is held firmly in place by the back plate **(B)** and the mounting plate **(C)**. In most other gages, the diaphragm **(D)** and an expansion retarding plate **(E)** are soldered directly into the case port and held in place by a locater ring **(F)**. Should the case receive any damage in this area the diaphragm operation could be affected. However, in the MurphyGage instrument, the diaphragm is protected and securely locked in position.

Another feature of the MurphyGage instrument is the removable pulsation dampener (pressure instruments only) **(G)** which provides for periodic cleaning when being used with liquids which might cause clogging. Other gages are usually equipped with a non-removable dampener (H).



NOTE: For optional temperature capillary lengths, engine adaptors,sensing bulbs and range combinations, see Murphy bulletinT-8428B.

Dimensions



Temperature Accuracy/Range Chart

Celsius measurements are shown in parentheses.

Range	Lower 1/3 Scale	Middle 1/3	Upper 1/3
32-120 (0-49)	±12° (±6°)	±5° (±2.4°)	±6° (±3°)
32-160 (0-71)	±20° (±10°)	±8° (±4.4°)	±7° (±4°)
130-220 (54-104)	±6° (±3°)	±3° (±1.6°)	±4° (±2°)
130-250 (54-121)	±9° (±5°)	±5° (±2.4°)	±4° (±2°)
140-300 (60-149)	±10° (±5.2°)	±6° (±3°)	±5° (±2.4°)
160-320 (71-160)	±10° (±5.2°)	±5° (±2.4°)	±5° (±2.4°)
180-350 (82-177)	±12° (±6°)	±5° (±2.4°)	±5° (±2.4°)
300-440 (149-227)	±9° (±5°)	±5° (±2.4°)	±4° (±2°)

Range	Maximum Process Temperature
≤250° (120°)	120 % of Full Scale
300° (140°)	350° (198°)
≤320° (160°)	120% of Full Scale

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

20BPG	–	B1	–	160	–	S2M	–	3/8

Base Models

20BPG	=	Pressure
20BVG	=	Vacuum
20BTG	=	Temperature

Options

Options Not Available On All Model Configurations

B1	=	Black Bezel
B2	=	Bezel 05051857 (was HP)
B3	=	Bezel 05051836 (was HBB)
D	=	Direct Mount
IP1	=	Light Pipe Illumination, 12 VDC
IP2	=	Light Pipe Illumination, 24 VDC

Pressure Range (20BPG)

Dual Scale		psi	kPa/MPa	Single Scale		bar
15	=	0-15 psi	0-103 kPa	**1B**	=	0-1 bar
30	=	0-30 psi	0-207 kPa	**2B**	=	0-2 bar
50	=	0-50 psi	0-345 kPa	**3.5B**	=	0-3.5 bar
75	=	0-75 psi	0-517 kPa	**5B**	=	0-5 bar
100	=	0-100 psi	0-689 kPa	**7B**	=	0-7 bar
150	=	0-150 psi	0-1.03 MPa	**10B**	=	0-10 bar
200	=	0-200 psi	0-1.38 MPa	**14B**	=	0-14 bar
300	=	0-300 psi	0-2.07 MPa	**20B**	=	0-20 bar
400	=	0-400 psi	0-2.76 MPa	**28B**	=	0-28 bar

Consult factory for availability of dials other than psi/kPa. Select scale so your normal operating temperature is in the middle half of the scale.

Vacuum Range (20BVG)

Dual Scale			
30	=	0-30 in. Hg	0-102 kPa

Temperature Range (BTG)

Dual Scale ° F (° C)			Single Scale ° C		
120	=	32-120 (0-49)	**70C**	=	0-70
160	=	32-160 (0-71)	**100C**	=	45-100
220	=	130-220 (54-104)	**120C**	=	50-120
250	=	130-250 (60-121)	**140C**	=	60-140
300	=	140-300 (60-149)	**160C**	=	70-160
320	=	160-320 (71-160)			
350	=	180-350 (82-177)			
440	=	300-440 (149-227)			

Consult factory for availability of dials other than °F (°C). Select scale so your normal operating temperature is in the middle half of the scale.

Temperature Capillary

Capillary Armor Type

Blank	=	PVC Armor, Copper Capillary
S	=	Stainless Steel Armor, Copper Capillary

Capillary Length
Specify length after capillary type example **S4**)

Feet

4	=	4 ft.

Specify Other Length = 2-ft. increments available to 20 ft., thereafter 5 ft. increments only.

Meters

1.5M	=	1.5 M.

Specify Other Length = 0.5 meter increments available from 1.5 to 10 meters, thereafter 2 meter increments to 34 meters only. Specify **M** following length. Example **S8M**

Adapter Nuts

Nut Must Match the Sensing Bulb

1/8	=	1/8-27 NPT
1/4	=	1/4-18 NPT
3/8	=	3/8-18 NPT
3/8B	=	3/8-19 BSPT
3/8K	=	3/8 NPSF
–	=	1/2-14 NPT (Standard)
1/2B	=	1/2 BSPT
1/2K	=	1/2 NPSF
5/8	=	5/8-18 UNF
3/4	=	3/4-14 NPT
3/4U	=	3/4-16 UNF
7/8	=	7/8-9 UNC
M10	=	10 mm x 1.5
M12	=	12 mm x 1.5
M14	=	14 mm x 1.5
M16	=	16 mm x 1.5
M18	=	18 mm x 1.5
M20	=	20 mm x 1.5
M22	=	22 mm x 1.5
M24	=	24 mm x 1.5

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Direct Mount Pressure Switch
Model PSB

The PSB switch is a direct-mount switch for critical pressure points. It has one limit contact that can be used to activate an alarm, actuate indicator lights or shut down equipment.

The construction of this instrument is the same as Murphy's time-proven Swichgage® instrument. A precision machined brass mounting plate and port captures a high-quality, stamped beryllium copper diaphragm. The single-pole, double-throw (SPDT) snap-switch is operated directly from the diaphragm for quick acting and positive switching. Trip point is factory preset according to your specifications.

Housing is weather sealed to prevent entry of moisture, dust, etc. A glass-filled nylon terminal block with screw terminal connections gives the PSB switch a real advantage in industrial engine applications. The PSB is ideal when reading is not desired, but pressure is critical to operational efficiency. Intended for use in general purpose non-classified areas.

Applications include:

Engine lubrication	Water pumps
Compressors	Oil field systems
Irrigation systems	Construction equipment
Marine engines	Generators
Light-duty mobile equipment	

Features include:

- Fits all engine applications
- SPDT snap-switch
- Activates indicator lights, alarms or shuts down equipment
- Time-proven Swichgage® construction
- Easy wiring terminal block
- Steel housing specially coated to resist corrosion
- Factory preset to your specifications

CE*

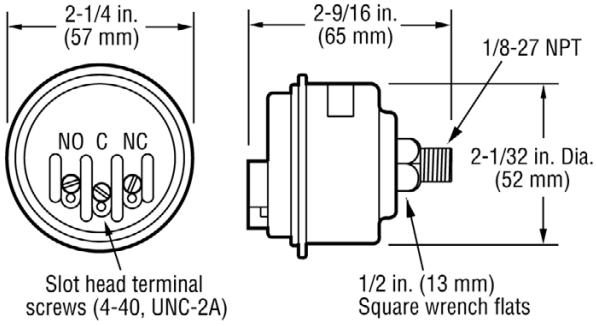
* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Specifications

Housing: Plated steel
Pressure Connection: 1/8-27 NPT, brass
Diaphragm: Formed beryllium copper (heat treated)
Pulsation Dampener: Brass (removable for cleaning)
Terminal Block: Three #4-40 screws
Accuracy: Trip point: ±3% of full scale
Switch reset differential: ±7% of full scale
Repeatability: ±1% of full scale
Contact Rating: SPDT 3 A @ 30 VDC inductive
Maximum Pressure: See Trip Point Chart
Temperature Range:
Ambient= -40° to 150° F (-40° to 66° C)
Process= -40° to 250° F (-40° to 121° C)
Factory Trip Point Setting: See Trip Point Chart
Pressure Range: Specify from 15-400 psi (0.21 kPa- 2.76 MPa) [1.03-27.58 bar]. See Trip Point Chart
Contact: Operates on rising or falling pressure (specify)
Shipping Weight: 8 oz. (0.25 kgs)
Shipping Dimensions: 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm)

NOTE: No customer replacement parts

Dimensions

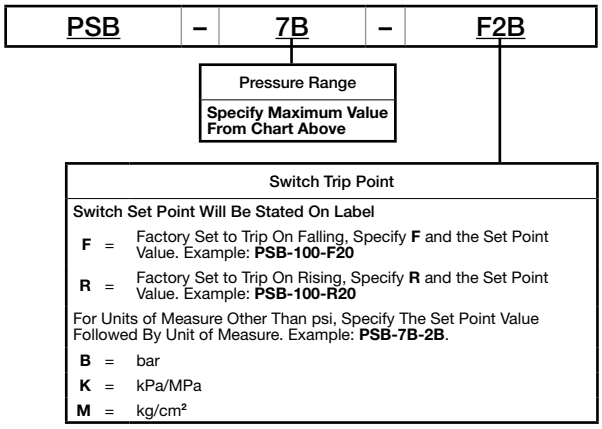


Base Model

Ranges available			Factory setting			Maximum pressure		
psi	(kPa/MPa)	[bar]	psi	(kPa/MPa)	[bar] Falling	psi	(kPa/MPa)	[bar]
0-15	(0-103)	[0-1.03]	3	(21)	[.21]	30	(207)	[2.07]
0-30	(0-207)	[0-2.07]	7	(48)	[.48]	60	(414)	[4.14]
0-50	(0-345)	[0-3.45]	10	(69)	[.69]	100	(0-689)	[0-6.89]
0-75	(0-517)	[0-5.17]	15	(103)	[1.03]	150	(0-1.03)	[0-10.34]
0-100	(0-689)	[0-6.89]	20	(138)	[1.38]	200	(0-1.38)	[0-13.79]
0-150	(0-1.03)	[0-10.34]	30	(207)	[2.07]	300	(0-2.07)	[0-20.70]
0-200	(0-1.38)	[0-13.79]	50	(345)	[3.45]	400	(0-2.76)	[0-27.60]
0-300	(0-2.07)	[0-20.70]	75	(517)	[5.17]	500	(3.45)	[34.50]
0-400	(0-2.76)	[0-27.60]	150	(1.03)	[10.34]	500	(3.45)	[34.50]

How to Order

Options listed at right. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Pressure Gage and Swichgage® Instruments

OPL Series 4-1/2 in. (114mm) Diameter Dial

The OPL-series pressure Swichgage instruments are combination pressure indicating gages with adjustable low and high limit switches. Limit switches can be wired directly to electric pilot circuits to operate alarms, shutdown or the start/stop of engines and electric motors. Surface mount or panel mount enclosure is available for most versions. All versions feature a 4-1/2 in. (114 mm) dial for easy viewing. Adjustable limit switches are accessible from the front of the Swichgage instrument. Limit contacts have self-cleaning motion to enhance electrical continuity.

Other versions available (details on next page):

- Gage only without contacts (MurphyGage® instrument);
- Swichgage instrument with built-in latching relay for start-stop operations.

1 2 3

1 Selected configurations are third-party listed. Consult factory for details.

2 Options not available on all models or configurations.

3 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

Specifications

Case: Die cast aluminum; weatherproof
Contacts: See details in the Electrical section, for contact ratings.
Dial: 4-1/2 in. (114 mm) white on black, dual scaled psi /kPa
Other dial configurations available. Consult factory
Gage Accuracy: 2-1-2 ±2% for the first and last quarters of the scale, the middle half is ±1%.
Accuracy for P4 & P6 Option:
Ranges 100 & 160 PSI; 6% full scale. 200 PSI 6-3-6. All other ranges 3% full scale
Geared Movement: 302 and 304 stainless steel
Lens: Optically clear polycarbonate
Pointer: High visibility with a pointer calibration hub
Process Connection: Available in 1/4 NPT and 1/2 NPT. See Table B.
Sensing Element: Select from bronze or 316 stainless steel bourdon tube. See Table B for bourdon tube/socket combinations.

Product Selection Information

WARNING: Selection of the proper gage/Swichgage instrument should include consideration for the service application, the medium being measured, electrical ratings, hazardous area requirements and general operating conditions. Improper selection and/or application may be detrimental to the gage/Swichgage instrument and could cause failure in the operating system and possibly personal injury or property damage. If in doubt, consult our sales/engineering staff.

Base Models

OPLC

OPLC, OPLCE and OPLG

The **OPLC** is a surface mount, indicating pressure gage and switch. Adjustable high and low limit, ungrounded contacts are used to operate alarm, shutdown or start-stop circuits. Pointer closure against either of the adjustable contacts completes the pilot-duty circuit. An SPST toggle switch is provided to override the low limit contact for equipment startup. Suitable for engines or electric motors with appropriate Murphy magnetic switch or transformer relay assembly.

The **OPLCE** features a panel mount square case. It has all the features of the OPLC except the low limit contact lockout.

The **OPLG** is an indicating-only pressure MurphyGage instrument. Same as the OPLC except without switch (limit) contacts.

1 2 3

OPLFC

OPLFC and OPLFG

The **OPLFC** is a panel mounting version of the OPLC. It has all of the features of the OPLC except the low limit contact lockout. The lockout must be done externally through the control circuit. The OPLFC is typically used in control panels for compressors, pumps, etc. This version can be environmentally sealed with either the ES or OS options. Contact lead termination is by pigtail wires.

The **OPLFG** is an indicating only pressure MurphyGage instrument. Same as the OPLFC except without switch (limit) contacts.

1 3

OPLBP

OPLBP and OPLBPE

The **OPLBP** is a specialized version of the OPL series designed for start-stop operation of engines and electric motors. The pilot-duty limit switches are connected to an internal latching control relay for ON/OFF automation. Available for various voltages.

The **OPLBPE** is the same as the OPLBP except it has a panel mount square case.

1 2

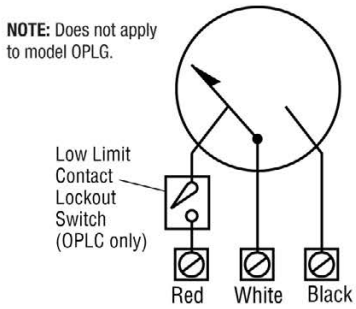
1 Selected configurations are third-party listed. Consult factory for details.

2 Options not available on all models or configurations.

3 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

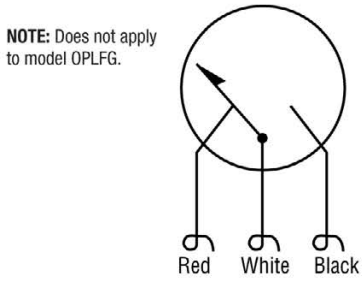
Electrical

OPLC and OPLCE



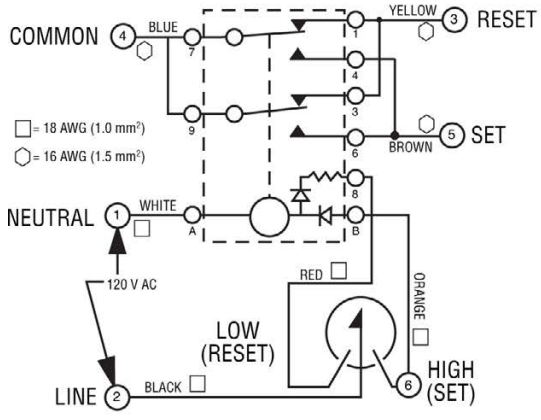
Contact Rating: 1 SPDT; Center off; 2 A, 30 VDC, 1 A, 125 VAC pilot duty

OPLFC



Contact Rating: 1 SPDT; Center off; 2 A, 30 VDC, 1 A, 125 VAC pilot duty

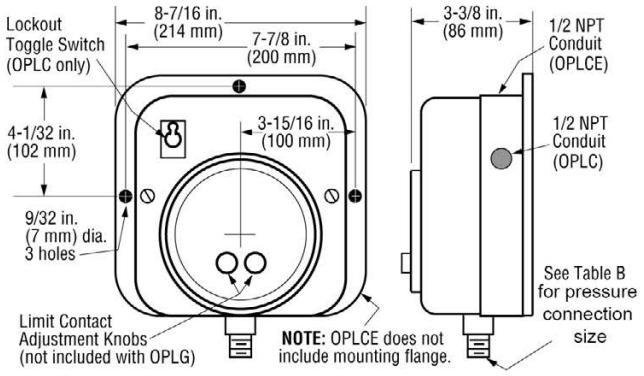
OPLBP and OPLBPE



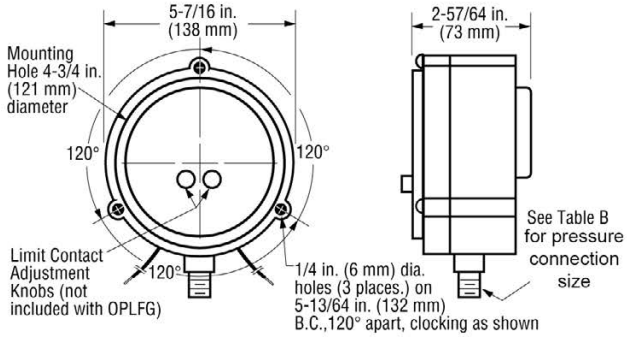
Contact Rating: SPDT dry relay contacts; 10 A, 125 VAC.

Dimensions

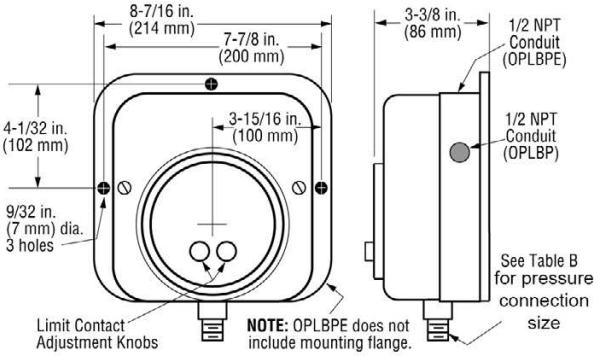
OPLC, OPLCE and OPLG



OPLFC and OPLFG



OPLBP and OPLBPE



P4 and P6 Options

The **P4 (*was PT147*)** option provides a remote seal mechanism to protect the Swichgage instrument sensing element from line pressures of highly viscous and mildly corrosive fluids. Ranges are 100 through 5,000 psi (689 kPa through 34.5 MPa) [6.9 through 344.7 bar]. A sealed stainless steel capillary tube with stainless steel armor transmits the pressure from the diaphragm seal to the Swichgage instrument. Standard capillary length is 5 ft. (1.5 m). Optional lengths to 50 ft. (15 m) in 5 ft. (1.5 m) increments are available. Oil well lead lines and pumps with highly viscous liquids are typical applications. If required, customer should provide a pulsation dampener.

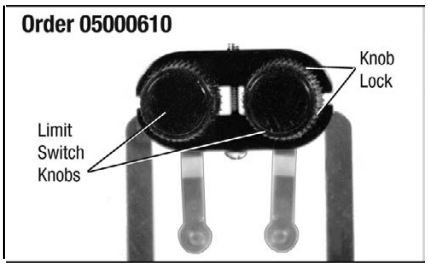
The **P6** ***(was PT167)*** option is a diaphragm sealed to a 2 NPT housing which attaches directly to the pressure gage connection. The gage sensing element and the diaphragm chamber are filled with a silicone fluid so that pressure against the diaphragm causes the gage to respond. The diaphragm housing is plated machined steel. Typical application is for oil well lead lines. Ranges are 100 through 1,000 psi (689 kPa through 6.8 MPa) [6.89 through 68.9 bar]. The P4 and P6 can be ordered as optional features to the Swichgage or indicating-only MurphyGage instrument. See *How to Order.*

NOTE:
P4 option not available for scales below 100 psi.
P6 option available for scales 100 psi thru 1,000 psi only.

OPLFC-A-1000-OS-P4L

OPLFC-A-600-OS-P6

Tamper-proof Contact Accessory



Pulsation Dampener

- Eliminate pointer contact flutter on pressure Swichgage and MurphyGage instruments which are subject to pulsating pressure from reciprocating pumps or compressors.
- Allow close high-low contact settings for more accurate pressure indication and equipment control.
- Decrease wear on internal geared movement and increase the life of your instrument by eliminating excessive strain and unnecessary pointer movement.
- Available in brass, carbon steel and stainless steel.
- **Must be ordered separately.**

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

OPLBP	–	S	–	2	–	1000	–	BC

Base Models

OPLC	=	Swichgage, surface mount, with low limit lockout switch
OPLCE	=	Swichgage, panel mount square case
OPLFC	=	Swichgage, panel mount
OPLBP*	=	Swichgage, surface mount, with latching control relay
OPLBPE*	=	Swichgage, panel mount square case, with latching control relay
OPLG	=	MurphyGage, surface mount
OPLFG	=	MurphyGage, panel mount

*Model not covered by the CE mark

BP Relay Voltage

BP Models Only, Feature Not Covered By CSA

Blank	=	120 VAC
2	=	12 VDC
4	=	24 VDC

Options

Verify Option Availability, Not All Options Can Be Provided For Every Model.

BC	=	Back Connected Bourdon Tube
ES	=	Environmentally Sealed
EX	=	Explosion-Proof; Swichgage enclosed with Explosion-Proof Case; Class I, Div.1, Groups C & D
EL	=	(EXLC) Explosion-Proof Less Case
LC	=	Less Case
OS	=	Oil-Sealed Case
P4L	=	(PT147) PT147 Pressure Transmitter with 5 ft. (1.5 m) Capillary (Pulsation Dampener No Longer Provided) For Capillary Greater Than 5 ft., Specify In 5 ft. Increments, Example: **P4l15** (P4L with 15 ft. Capillary)
P6	=	(PT167) PT167 Pressure Transmitter With Direct Mount.
TA	=	(TCA) Tickler Contact

Bourdon Tube and Socket Material/Size

Code		Connection	Tube and Socket Material	Tube Type	Range Selection Limits
A	=	1/4 NPT	Grade A Phosphor Bronze Tube Brass Socket (Brass Tip, Silver Brazed)	C-Tube	Thru 1000 psi (6.89MPa) [68.95 bar]
S	=		316 Stainless Steel Tube and Socket		
S	=	1/2 NPT	316 Stainless Steel Tube and Socket	Drawn Helical	1500-10000 psi (10.3-68.9 MPa) [103.42-700 bar]

NOTE: All Bourdon Tube and Tip Joints TIG Welded Except A

Ranges

Code		Vacuum/psi	kPa/MPa	bar
30HV60H	=	30” Hg/vac-60 Hg/Press.	-101-203 kPa	-1.01-2.03
30V	=	30” vac-0 psi	-101-0 kPa	-1.01-0
30V15	=	30” vac-15 psi	-101-103 kPa	-1.01-1.03
30V30	=	30” vac-30 psi	-101-207 kPa	-1.01-2.07
30V100	=	30” vac-100 psi	-101-689 kPa	-1.01-6.89
30V200	=	30” vac-200 psi	-101-1.38 MPa	-1.01-13.79
30V300	=	30” vac-300 psi	-101-2.07 MPa	-1.01-20.68
15	=	0-15 psi	0-103 kPa	0-1.3
30	=	0-30 psi	0-207 kPa	0-2.06
60	=	0-60 psi	0-414 kPa	0-4.13
100	=	0-100 psi	0-689 kPa	0-6.89
160	=	0-160 psi	0-1.10 MPa	0-11
200	=	0-200 psi	0-1.38 MPa	0-14
300	=	0-300 psi	0-2.07 MPa	0-20
400	=	0-400 psi	0-2.76 MPa	0-28
600	=	0-600 psi	0-4.14 MPa	0-40
1000	=	0-1000 psi	0-6.89 MPa	0-70
1500	=	0-1500 psi	0-10.34 MPa	0-100
2000	=	0-2000 psi	0-13.79 MPa	0-140
3000	=	0-3000 psi	0-20.68 MPa	0-200
5000	=	0-5000 psi	0-34.48 MPa	0-350
10000	=	0-10000 psi	0-68.95 MPa	0-700

Dials
All dials are dual scaled psi and kPa/MPa. Single scale dials and custom dials available. Additional charges may apply.

Gages
All 4-1/2 inch (114 mm) Swichgage instruments are available for Class I, Division 1, Groups C & D hazardous applications.

Division 2 locations can also be covered by our Non-Incendive or Intrinsically Safe systems. Contact Enovation Controls representative for complete details.

Shipping Information*

Shipping Weights:

OPLC: 5 lbs 9 oz (2.5 kg)
OPLG: 5 lbs 6 oz (2.4 kg)
OPLFC and OPLCE: 3 lbs 4 oz (1.5 kg)
OPLFG: 3 lbs 4 oz (1.5 kg)
OPLBP and OPLBPE: 5 lbs 11 oz (2.6 kg)

Shipping Dimensions:

OPLC, OPLG and OPLFG:
9-1/2 x 9-1/4 x 5-3/4 in. (241 x 235 x 146 mm)
OPLFC and OPLCE:
9-1/4 x 8-1/4 x 5-1/2 in. (235 x 210 x 140 mm)
OPLBP and OPLBPE:
9-1/4 x 8-1/4 x 5-1/2 in. (235 x 210 x 140 mm)

* Some options could alter shipping weights and dimensions. Consult factory.

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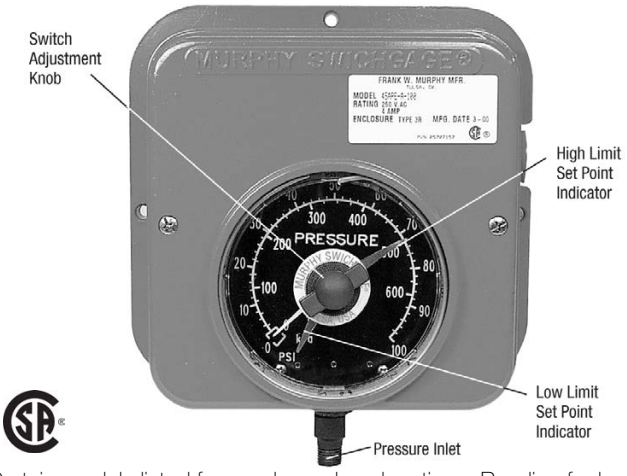
Pressure Swichgage®
45APE Series

The 45APE Series Swichgage instrument is a mechanical gage for pressure indication. It includes two adjustable SPDT switches. These snap-acting switches can be used for start and stop, to trip alarms and to shut down equipment. Ranges are available from 30" VAC (-100 kPa) [-1 bar] thru 10,000 psi (138 MPa) [1379 bar].

The 45APE Series utilizes a bourdon tube sensing unit with a stainless steel dual-sector geared movement. Each of the sectors drives separate pointers when pressure is applied to the bourdon tube. The indicating pointer (visible pointer) shows actual pressure reading, including below and beyond the low and high trip points. The low and high trip points are adjustable independently on the gage front lens. The switch operator pointer (behind the dial) is calibrated to follow the indicating pointer. The low and high trip point indicators arrest the switch operator pointer. As pressure decreases or increases through the principal of lost motion, the respective snap-switch is tripped.

The 45APE Series models are widely used in applications requiring pressure indication and Form C low and high pressure switches.



Certain models listed for non-hazardous locations. Pending for hazardous location.

Basic Models

45APE Series Swichgage instrument
Surface mount (square case) version

45APEF Series Swichgage instrument
Panel mount (round case) version

45APEBP Latching Control Relay Series
These models have a latching control relay for automatic ON/OFF control. They are designed to start and stop electric motor driven equipment.

45APEE and 45APEBPE
These models (square case) have the same features as the 45APE/45APEBP but are suitable for panel mounting.

Specifications

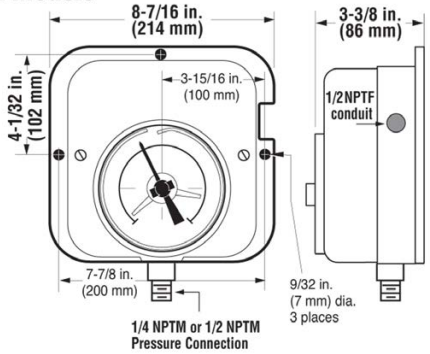
Dial: White on black, dual scale, psi and kPa standard, 4-1/2 in. (114 mm) diameter
Case: Die cast aluminum, surface or panel mount
Overrange: Do not exceed 10% FS above full range
Process Connection: 1/4 NPTM thru 1000 psi; 1/2 NPTM 1500 - 10,000 psi; back connection optional
Sensing Element: Bronze or 316 stainless steel bourdon tube
Gage Accuracy: Indicating pointer within switch points with hysteresis of <1%: ±2% for first and last quarters of scale; middle half of scale is ±1%. Indicating pointer above or below trip point:

Range	Accuracy (+/-) above & below to trip point only
< 100 (except 15 psi)	10
15	15
100-300	4
400-1500	2
2000	12
3000-5000	8

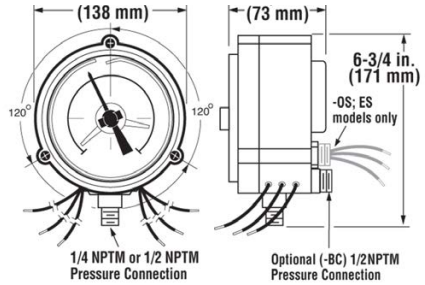
Reading based on testing performed with switch point at mid scale which represents worst case. Switch accuracy ±1.5%.
Pressure Relief Disc: Back of case (except EX models)
Switch Reset Deadband: Approximately 10% FS
Snap-Acting Switches: 2-SPDT; 2 A @ 250 VAC
Dry Relay Contact (BP Models): 10 A @ 28 VDC or 10 A @ 120 VAC
Wire Connections (Surface Mount): 1/2 NPTF conduit/ terminal block
Wire Connections (Panel Mount): Wire leads, 18 AWG (1.0 mm2) x 9 in. (229 mm) long
Wire Connections (-ES, -OS): 1/2 NPTM conduit and wire leads, 24 AWG (0.22 mm2) x 30 in. (762 mm) long
Weight: 5 lbs 6 oz (2.4 kg) approximately
Explosion-proof models: 21 lb. (9.5 kg) approx.
Dimensions: 10 x 9 x 6 in. (254 x 229 x 152 mm) approximately
Explosion-proof models: 12 x 12 x 9 in (305 x 305 x 229 mm) approximately
CSA Certified Models: 45APE Series models with pressure range thru 5000 psig (34.4 MPa) [344 bar] are CSA approved for non-hazardous locations, except options BC, ES, LC and OS. Explosion-proof EX models with pressure range thru 5000 psig (34.4 MPa) [344 bar] are CSA approved for Hazardous locations Class I, Groups, C & D. 45APEBP and 45APEBPE models are not CSA certified.

Dimensions

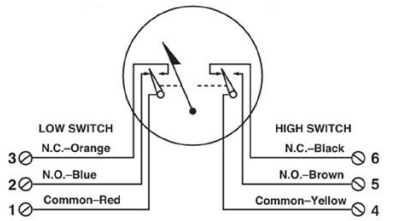
Surface Mount Models



Panel Mount Models



Typical Wiring Diagram



Contact Ratings: 2-SPDT snap-switches; 2 A @ 250 VAC

NOTE: *Diagram shows the pointer in the at rest (shelf) position.*

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

45APEBP – 4 – S – 100 – EX

Base Model
45APE
45APEF
45APEBP*
45APEE
45APEBPE*
* Not Covered By CSA

Voltage	
BP Models Only, Feature Not Covered By CSA	
Blank	= 120 VAC
2	= 12 VDC
4	= 24 VDC

Bourdon Tube and Socket	
A	= Bronze / Brass std. <=1000 psi
S	= 316 Stainless Steel / 316 Stainless Steel

Ranges				
Specify		Vacuum/psi	kPa/MPa	bar
30HV60H	=	30” Hg/vac-60 Hg/Press.	-101-203 kPa	-1.01-2.03
30V	=	30” vac-0 psi	-101-0 kPa	-1.01-0
30V15	=	30” vac-15 psi	-101-103 kPa	-1.01-1.03
30V30	=	30” vac-30 psi	-101-207 kPa	-1.01-2.07
30V100	=	30” vac-100 psi	-101-689 kPa	-1.01-6.89
30V200	=	30” vac-200 psi	-101-1.38 MPa	-1.01-13.79
30V300	=	30” vac-300 psi	-101-2.03 MPa	-1.01-20.68
15	=	0-15 psi	0-103 kPa	0-1.03
30	=	0-30 psi	0-207 kPa	0-2.06
60	=	0-60 psi	0-414 kPa	0-4.13
100	=	0-100 psi	0-689 kPa	0-6.89
160	=	0-160 psi	0-1.10 MPa	0-11.03
200	=	0-200 psi	0-1.38 MPa	0-13.78
300	=	0-300 psi	0-2.07 MPa	0-20.68
400	=	0-400 psi	0-2.76 MPa	0-27.57
600	=	0-600 psi	0-4.14 MPa	0-41.36
1000	=	0-1000 psi	0-6.89 MPa	0-68.95
1500	=	0-1500 psi	0-10.34 MPa	0-103.42
2000	=	0-2000 psi	0-13.79 MPa	0-137.89
3000	=	0-3000 psi	0-20.68 MPa	0-206.84
5000	=	0-5000 psi	0-34.48 MPa	0-344.73
10000	=	0-10000 psi	0-68.95 MPa	0-689.47

Options		
Verify Option Availability, Not All Options Can Be Provided For Every Model.		
BC	=	Back Connected Bourdon Tube
ES	=	Environmentally Sealed (45APEF Models Only)
EX	=	Explosion-Proof; Approved for Hazardous Areas Class I, Groups C and D to <=5000 psig
EL	=	(EXLC) Explosion-Proof Less Case
LC	=	Less Case
OS	=	Oil Sealed (45APEF Models Only)
P4L	=	(PT147) PT147 Pressure Transmitter With 5-Foot Capillary (Pulsation Dampener No Longer Provided) NOTE: For Capillary Greater Than 5 ft., Specify In 5 ft. Increments, Example: **P4I15** (Option P4I with 15 ft. Capillary)
P6	=	(PT167) PT167 Pressure Transmitter With Direct Mount. Available For Ranges >100-1000 psi Only

NOTE: For details on P4L or P6 options, see sales bulletin for the OPL Series 96001 located in section 05 of your Murphy General Catalog

Lead Line Pressure Swichgage® Instrument

Model PT167EX 4-1/2 in. (114 mm) Diameter Dial

The Murphy PT167EX is a pressure Swichgage instrument connected to a threaded pressure diaphragm housing. The Swichgage instrument is enclosed in an explosion-proof case and is CSA rated for Class I, Division 1, Groups C and D.

A Swichgage instrument is a pressure-indicating gage with adjustable low and high pressure limit switches. When the gage pointer touches the low or high limit switches, an electrical circuit is completed which can operate alarms and/or shut down equipment.

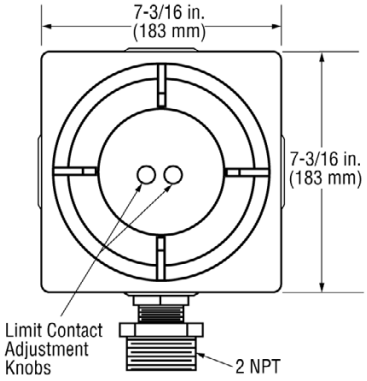
The 2 NPT, sealed diaphragm housing is attached directly to the Swichgage connection. The diaphragm housing is filled with a silicone fluid so that pressure against the diaphragm causes the Swichgage instrument to respond. The housing seals the Swichgage sensing element from the medium being measured.

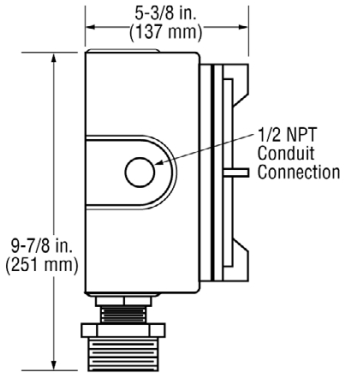
Applications include highly viscous liquids such as crude oil on lead line applications. Other applications have included asphalt, sludge, abrasive materials, etc.

* The PT167EX is CSA listed for ranges 100 to 5000 psi (689 kPa to 34.5 MPa) [6.89 to 344.74 bar].

† Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

Dimensions

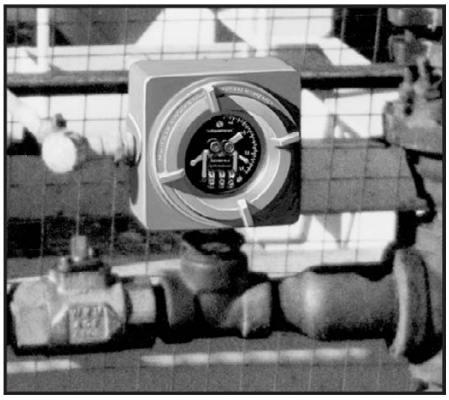




Specifications

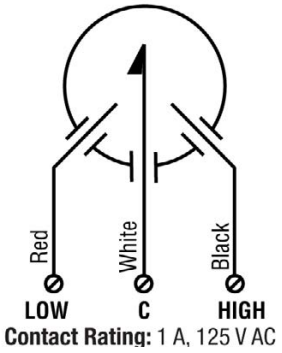
Case: Explosion-proof, sand cast aluminum. Lens is removable. CSA Listed for Class I, Division 1, Groups C and D.
Contact Rating: 1 A, 125 VAC
Dial: 4-1/2 in. (114 mm) white on black, dual scaled psi/kPa. Other dial configurations available. Consult factory.
Ranges: See How to Order
Gage Accuracy: ±3% full scale (± 6% Full Scale for 100 and 160 psi ranges), 200 PSI 6-3-6 (6% in the first and last 1/4 of scale, and 3% in the mid 1/2)
Process Connection: 2 NPT
Maximum Pressure: 30% overpressure
Diaphragm Housing: Plated steel, Ni-Span®; silicon filled
Diaphragm Fluid: Silicone 200
Shipping Weight: 16.5 lb (7.5 kg)
Shipping Dimensions: 12 x 12 x 9 in. (305 x 305 x 229 mm)

Typical Installation



This photo shows the PT167EX installed in a lead line. For optimum effectiveness, the PT167EX should be installed ahead of all other devices or valves. By positioning it immediately adjacent to the well outlet, the Swichgage instrument monitors the entire lead line, sensing any blockage whether build up of sludge in the line or an accidental closed valve. The pressure transmitter threads into a 2 NPT T on the lead line.

Internal Wiring



Contact Rating: 1 A, 125 V AC

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

PT167EX – S – 20B

Bourdon Tube and Socket Material/Size

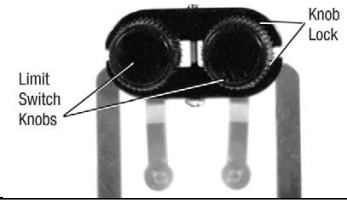
Specify		Tube and Socket Material	Tube Type	Range Selection Limits
A	=	Grade A Phosphor Bronze Tube Brass Socket	C-Tube	Thru 1000 psi (6.89MPa) [68.95 bar]
S	=	316 Stainless Steel Tube and Socket		

Ranges

Specify		Vacuum/psi	kPa/MPa	bar
100	=	0-100 psi	0-689 kPa	0-6.89
160	=	0-160 psi	0-1.10 MPa	0-11.03
200	=	0-200 psi	0-1.38 MPa	0-13.78
300	=	0-300 psi	0-2.07 MPa	0-20.68
400	=	0-400 psi	0-2.76 MPa	0-27.57
600	=	0-600 psi	0-4.14 MPa	0-41.36
1000	=	0-1000 psi	0-6.89 MPa	0-68.95

If specifying range in bar, kPa or kg/cm^2, specify appropriate designator after value. Example: 20**B** = 20 bar

B	=	bar
K	=	kPa/MPa
M	=	kg/cm^2

Part Number	Description	Notes
05000610	Tamper-proof Contact Accessory	

Pressure Transmitters
PXT-K Series

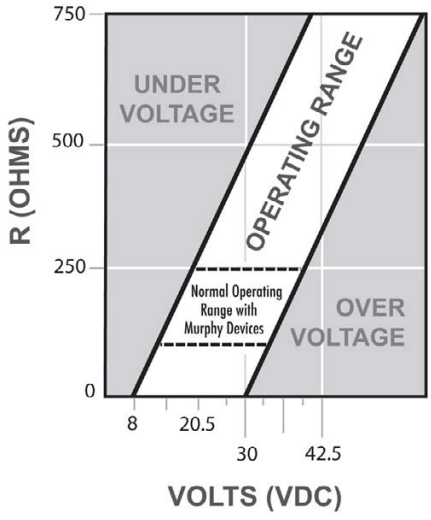
The PXT-K Series pressure transmitters are state-of-the-art instruments providing 4-20 mA output. Each Piezoresistive Pressure Transmitter contains a transducer comprised of a piezoresistive silicon chip mounted on a glass-metal feed-through header welded into a stainless steel housing and filled with silicone oil. The very thin laser-welded stainless steel isolation-diaphragm completes the front side. Media pressure is transferred from the stainless steel isolation-diaphragm via the oil inside the cell to the silicon measuring chip. This construction, combined with the advanced internal signal conditioning circuitry, results in a rugged instrument with extremely small temperature error and class-leading EMI/RFI resistance.

The enclosure and all wetted parts are made of 316L stainless steel to comply with NACE MR0175.

PXT-K Series Pressure Transmitters can be used in applications such as compressors, engines, process control, liquid level and pumps.

Operating Range

Supply voltage for the PXT-K must be within range of 8-30 VDC. The graph below shows the minimum supply voltage (VDC) required for a given load resistance (R).



LOOP RESISTANCE GRAPH

Specifications

Operating Pressure Range: See How to Order under the PXT-K Series Model Number Matrix.
Operating Temperature: -40 to 180° F (-40 to 82° C)
Compensated Temp Range: -20 to 160° F (-29 to 71° C)

Physical Characteristics

Process Connection: 1/4 NPT female with 7/8" Hex nut
Electrical Connection (PXT-K-XXX): 1/2" NPT male conduit connection with 60" long cable, vented
Enclosure: NEMA 4/IP65 or better
Body: 316L stainless steel. Complies with NACE MR0175
Wetted Parts: 316L stainless steel
Environmental Effect (Humidity): No effect for 0-95%, non-condensing
Mounting: Transmitter can be installed in any axis. Transmitter position has negligible effect on performance as long as it is perpendicular to the flow being monitored.
Shock Resistance: 1000g per IEC 60068-2-6 (Mechanical Shock)
Vibration Resistance: 20G per IEC 60068-2-6 (Vibration under resonance)
Wiring Protection: Protected against reverse polarity and short circuit, 48 VDC Maximum
Supply Voltage: 8 - 30 VDC (Typically 24 VDC)
Transmitter Output: 4-20 mA, two wire configurations with load characteristics
Insulation: Greater than 10 MΩ @ 300 VDC
Electromagnetic Compatibility (EMC): Standards; EN 61000-6-2:2005, EN 61000-6-3:2007, EN 61326-2-3:2006
Voltage Surge/Spike Protection: Protection against a 600 volt spike per IEC 60-2
Shipping Weight: 6.5 ounces

Applicable Standards

NACE MR0175 Compliant with the requirements
CSA (c/us): Class I / II / III, Div 1, Groups A-F T4
Class I / II / III, Div 2, Groups A-D,F,G T4
ATEX: IBExU 10 ATEX 1124 X
II 1G Ex ia IIC T6-T4
II 3G Ex nA IIC T6

Specifications (continued)

Accuracy:

% of Span (BFSL)	+/- 0.25% of span*
Zero/Span Setting Tolerance	+/- 2.5% of full scale* max. (30V30WC only) +/- 0.25% of span* typical, +/-0.5% of span* max (all other ranges)
Operating Temperature	+/- 2.5% of span T.E.B.
Compensated Temperature	+/- 1.7% of span T.E.B.
Response Time	<5mS

* Accuracy Tolerance to be applied at 25° C.

PXT and PXT-K Series Transmitter Cabling Identification

The PXT Series Pressure Transmitters have been changed. Previous pressure transmitters in this series were identified as **PXT Pressure Transmitters**. The newest version is the **PXT-K Series Pressure Transmitters**. Identification of electrical cable color is NOT interchangeable between the two series of pressure transmitters.

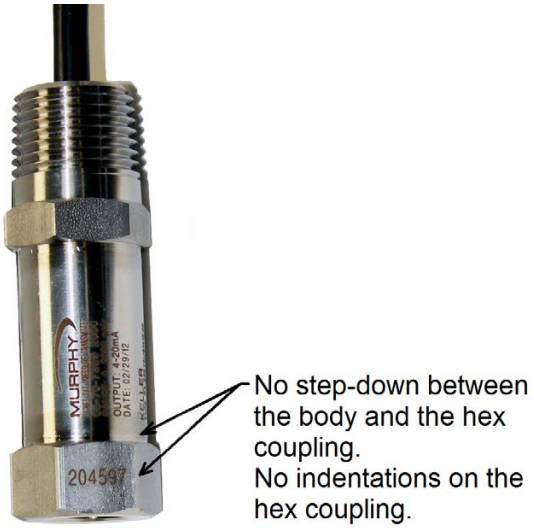
This section contains information to assist you in identifying the pressure transmitter unit you have and the correct electrical cable colors to avoid wiring mistakes.

PXT Series

Cable Color	Connection
RED	POWER
BLUE	SIGNAL
BLACK	CASE GROUND
ORANGE, YELLOW, WHITE	N/A
Installation Instructions	00020475
Installation Diagram	05-08-0754

Shield drain wire is isolated from case.

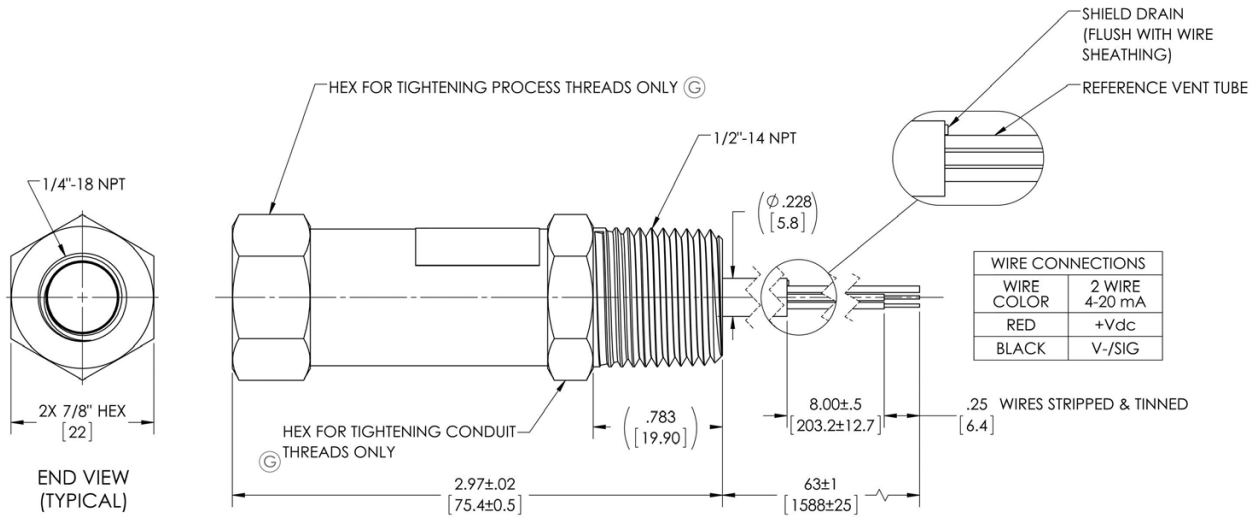
PXT-K Series



Cable Color	Connection
RED	POWER
BLUE	N/A
BLACK	SIGNAL
ORANGE, YELLOW, WHITE	N/A
Installation Manual	00020840
Installation Diagram	05-08-0763

Shield drain wire is common to case.

Dimensions



How to Order

Options listed a below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Example: PXT-K-600 = Murphy two wire Pressure Transmitter with Flying Lead Connection, 0-600 psig range, 4-20 mAdc output.

NOTE: If no digit follows the pressure range, it is automatically a 4-20mAdc output signal.

PXT	–	K	–	600	–	__

Connector	
K	= PXT (Flying Lead)
KM	= PXM (M12 x 1 Connector)
KD	= PXD (DIN 43650 Connector)

Pressure Range		
30V30WC	=	(-30" H2O to +30" H2O)
30V30	=	(-30" HG to +30 psig)
30V100	=	(-30" HG to +100 psig)
15	=	0-15 (psig)
60	=	0-60 (psig)
100	=	0-100 (psig)
200	=	0-200 (psig)
300	=	0-300 (psig)
400	=	0-400 (psig)
600	=	0-600 (psig)
1000	=	0-1000 (psig)
2000	=	0-2000 (psig)
3000	=	0-3000 (psig)
5000	=	0-5000 (psig)
6000	=	0-6000 (psig)
10000	=	0-10000 (psig)

Output Signal	
Blank	= 4-20 mAdc

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Temperature Swichgage®
A20 and A25 Series

The A20 Series (2 inch/51 mm dial) and the A25 Series (2-1/2 inch/64 mm dial) Swichgage models are diaphragm-actuated, temperature-indicating gages, with built-in electrical switches for tripping alarms and/or shutdown devices.

Ranges are available from 32°-120° F (0°-45° C) through 300°-440° F (160°-220° C).

All models of these rugged, built-to-last instruments are fully sealed from the environment by the unique combination of a polycarbonate case and lens, a polished stainless steel bezel and O-ring seals.

These vapor/pressure actuated gages feature a sealed capillary tube and a sensing bulb. When subjected to heat, the liquid in the sensing bulb changes to vapor creating pressure against a diaphragm mechanism. The diaphragm translates this vapor pressure into a mechanical gage reading.

For series A20T and A25T, the gage pointer acts as a temperature indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contact(s) are isolated from ground. They have a self-cleaning motion to enhance electrical continuity.

Models A20TE and A25TE have internal snap-acting SPDT switches.

Gage-only models, without contacts (MurphyGage®) are also available.

Applications for A20 and A25 Series temperature Swichgage instruments include: engines and equipment in the oil field, marine, irrigation, construction and trucking industries, monitoring engine coolant temperature, crankcase oil, transmission oil.

A20T Series

Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Base Model

Coolant or Oil Temperature

A20T and A25T Series Swichgage: For these models the gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

A20TL and A25TL Swichgage: For use on Ford Worldwide engines. Supplied with special sensing bulb.

A20TE and A25TE Swichgage: A20TE (was A20ESR) and A25TE (was A25ESR). Models with internal SPDT snap-switches, instead of the single pole/pointer contact(s). When the switch closes on rising temperature, it becomes set. As temperature decreases the switch resets.

Model A25TE is CSA listed for non-hazardous areas.
Model A25TE-EX is CSA listed for Class I, Division 1, Groups C & D hazardous areas.

A20TABS and A25TABS Swichgage: Same as A20 and A25T with internal SPDT snap-switch for pre-alarm.

Cylinder Head Temperature

A20TH and A25TH Swichgage: A20TH (was A20TL8133) and A25TH (was A25TL8133). For use on air-cooled engines.

Gage–Only Models

A20TG and A25TG MurphyGage: Gage without contact(s).

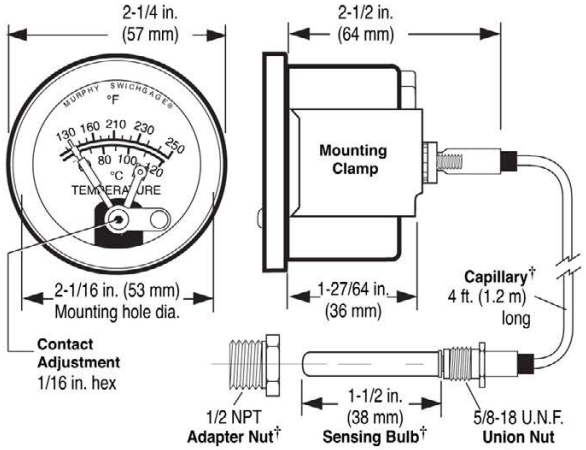
Specifications

Dial: White on black; U.S.A. standard scale is dual scale °F/°C; others available
Case: Glass filled/Polycarbonate, corrosion-resistant; steel mounting clamp included
Bezel: Polished stainless steel, standard; others are available.
Pointer: Tempered nickel silver; red tip
Lens: Polycarbonate, high-impact
Sensing Element: Beryllium copper diaphragm
Capillary: PVC armored copper; 4 ft. (1.2 m).* Stainless steel armor optional
Sensing Bulb: Copper*
Gage Accuracy: See accuracy chart
Maximum Temperature:
See Temperature Ranges and Factory Settings table
Maximum Ambient Temperature:
-40° F (-40° C) through 150° F (66° C)
Adjustable Limit Contact (A20T and A25T): SPST contact; pilot-duty only, 2 A @ 30 VAC/VDC; isolated from case ground
Closed when the high limit is met. Normally Open when pointer is in normal operating range. Contacts are gold flashed silver.
Limit Contact Adjustment: by a 1/16 in. hex wrench through 100% of the scale.
Wiring: A20T: Number 4 screw terminals; A25T: Number 6 screw terminals.
Snap-Switch Rating (A20TE and A25TE): SPDT, 3 A @ 30 VDC inductive; 4 A @ 125 VAC inductive
Wiring: A20TE: Number 4 screw terminals; A25TE: Number 6 screw terminals
Unit Weight: A20 Series: 11.9 oz. (0.370 kg); A25 Series Models: 13.3 oz. (0.413 kg)
Unit Dimensions: A20 Series: 4-3/4 x 4-3/4 x 3 in. (121 x 121 x 76 mm); A25 Series Models: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)

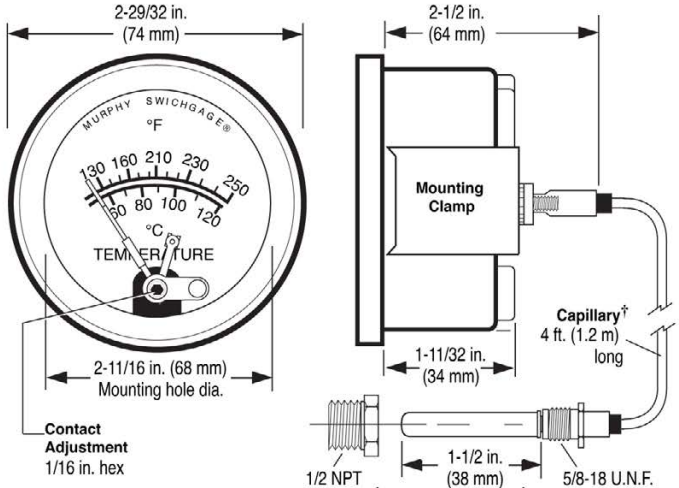
*For optional capillary lengths, engine adapters, sensing bulbs and range combinations, see Murphy bulletin 8428.

Dimensions

A20 Series Models (typical)



A25 Series Models (typical)



†Standard combinations. See Murphy bulletin 8428 for optional sensing bulb, engine adaptors and capillary combinations.

Temperature Ranges and Factory Settings

NOTES

1. Values in ( ) are mathematical conversions from °F to °C — they do not reflect actual second scale range. U.S.A. standard scale is °F/°C.
2. For models A20TE and A25TE; the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential. Only certain models are adjustable.
3. For adjustable switch models, the trip point is adjustable only over the upper half of the scale.

Ranges Available		Max Temp.	Std. Settings*		Hi/Lo Settings		A20TABS and A25TABS Settings			
					Low	High	Alarm†		Shutdown	
Dual Scale Dial °F (°C)	Single Scale °C only	°F (°C)	°F (°C)	°C only	°F (°C)	°F (°C)	°F (°C)	°C only	°F (°C)	°C only
32-120 (0-49)	----	185 (85)	110 (43)	----	32 (0)	110 (43)	100 (38)	----	110 (43)	----
32-160 (0-71)	0-70	215 (102)	150 (66)	66	32 (0)	150 (66)	140 (60)	60	150 (66)	66
130-220 (54-104)	45-100	260 (127)	210 (99)	85	160 (71)	210 (99)	200 (93)	80	210 (99)	85
130-250 (54-121)	50-120	310 (154)	210 (99)	97	160 (71)	210 (99)	200 (93)	95	210 (99)	100
140-300 (60-149)	60-140	340 (173)	275 (135)	130	200 (93)	275 (135)	265 (129)	125	275 (135)	130
160-320 (71-160)	70-160	370 (192)	300 (149)	150	200 (93)	300 (149)	290 (143)	145	300 (149)	150
180-350 (82-177)	----	400 (209)	330 (166)	----	240 (116)	330 (166)	320 (160)	----	330 (166)	----
300-440 (149-227)	----	500 (260)	400 (204)	----	300 (149)	400 (204)	390 (199)	----	400 (204)	----

* Standard setting for A20T, A25T, A20TE and A25TE models. †SPDT snap-switch is the alarm switch.

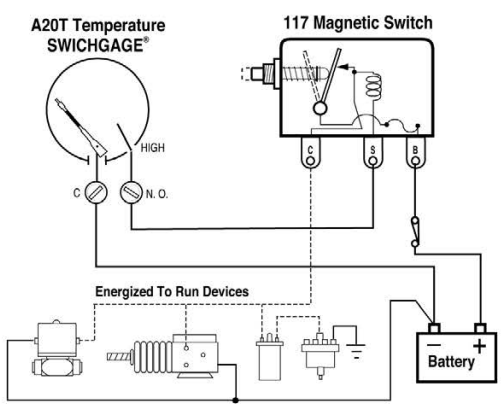
Temperature Accuracy Chart

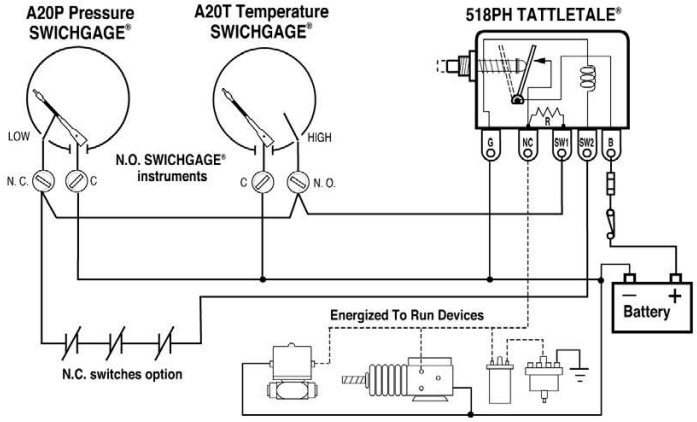
Temperature Range	Lower 1/3 of Scale	Middle 1/3 of Scale	Upper 1/3 of Scale
32° - 120°F (0° - 49°C)	±12°F (±6°C)	±5°F (±2.4°C)	±6°F (±3°C)
32° - 160°F (0° - 71°C)	±20°F (±10°C)	±8°F (±4.4°C)	±7°F (±4°C)
130° - 220°F (54° - 104°C)	±6°F (±3°C)	±3°F (±1.6°C)	±4°F (±2°C)
130° - 250°F (54° - 121°C)	±9°F (±5°C)	±5°F (±2.4°C)	±4°F (±2°C)
140° - 300°F (60° - 149°C)	±10°F (±5.2°C)	±6°F (±3°C)	±5°F (±2.4°C)
160° - 320°F (71° - 160°C)	±10°F (±5.2°C)	±5°F (±2.4°C)	±5°F (±2.4°C)
180° - 350°F (82° - 177°C)	±12°F (±6°C)	±5°F (±2.4°C)	±5°F (±2.4°C)
300° - 440°F (149° - 227°C)	±9°F (±5°C)	±5°F (±2.4°C)	±4°F (±2°C)

Magnetic Switch

INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH. The Swichgage contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the pilot-duty Swichgage limit contacts.

Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown.

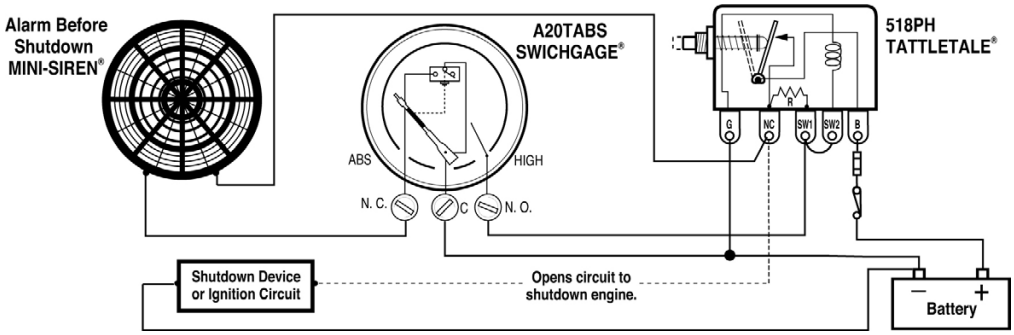




Pre-Alarm using A20/A25TABS

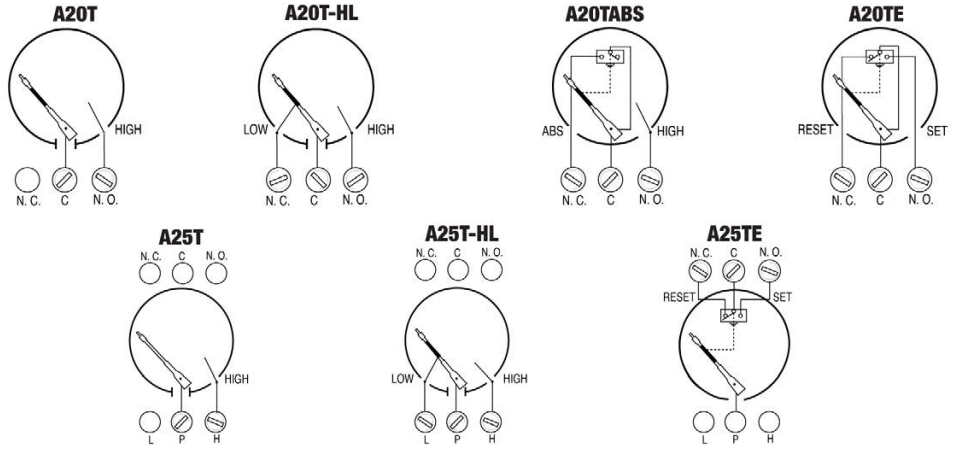
The A20TABS and A25TABS feature a standard limit contact for equipment shutdown on high temperature and an internal SPDT snap-switch to signal an alarm before shutting down. When the snap-switch trips (preset point) on rising temperature, the switch completes a circuit to activate an alarm.

If the temperature continues to increase, the face-adjustable pointer contact will make and the shutdown circuit will be completed (see the typical diagram). The front contact shutdown limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to Temperature Ranges and Factory Settings table for settings. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot-duty 2 A @ 30 VAC/VDC resistive. Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

A20T – B1 – 160 – S8M – 3/8

Base Model

- **A20T**
- **A20TE**
- **A20TABS**
- **A20TG**
- **A25T**
- **A25TE***
- **A25TG**
- *** CSA Option (-EX)**

Range

Dual Scale ° F (° C)			Single Scale ° C		
120	=	32-120 (0-49)	**70C**	=	0-70
160	=	32-160 (0-71)	**100C**	=	45-100
220	=	130-220 (54-104)	**120C**	=	50-120
250	=	130-250 (60-121)	**140C**	=	60-140
300	=	140-300 (60-149)	**160C**	=	70-160
320	=	160-320 (71-160)			
350	=	180-350 (82-177)			
440	=	300-440 (149-227)			

Consult factory for availability of dials other than (°F/°C). Select scale so your normal operating temperature is in the upper half of the scale.

Adapter Nuts

Nut Must Match the Sensing Bulb

1/8	=	1/8-27 NPT
1/4	=	1/4-18 NPT
3/8	=	3/8-18 NPT
3/8B	=	3/8-19 BSPT
3/8K	=	3/8 NPSF
–	=	1/2-14 NPT (Standard)
1/2B	=	1/2 BSPT
1/2K	=	1/2 NPSF
5/8	=	5/8-18 UNF
3/4	=	3/4-14 NPT
3/4U	=	3/4-16 UNF
7/8	=	7/8-9 UNC
M10	=	10 mm x 1.5
M12	=	12 mm x 1.5
M14	=	14 mm x 1.5
M16	=	16 mm x 1.5
M18	=	18 mm x 1.5
M20	=	20 mm x 1.5
M22	=	22 mm x 1.5
M24	=	24 mm x 1.5

Options

Options Not Available On All Models Or Configurations

B1	=	Black Bezel
EX	=	Explosion-Proofed, CSA Listed For Class I, Div. I, Groups C & D (A25TE Model Only)
EL	=	Explosion Proofed Less Case
HL	=	High and Low Contacts
K	=	Knob Adjusting Face Contact
OS	=	Oil Sealed (Silicone Oil)
UA	=	Temperature Bulb Style A (10050166)
UB	=	Temperature Bulb Style B (10050166)
UC	=	Temperature Bulb Style C (10010061)
UD	=	Temperature Bulb Style D (10000286)
UE	=	Temperature Bulb Style E (10010084)
UF	=	Temperature Bulb Style F (10000577)
UG	=	Temperature Bulb Style G (10000578)
UH	=	Temperature Bulb Style H (10002466)
UJ	=	Temperature Bulb Style J (10051153)
UK	=	Temperature Bulb Style K (10054886)

Temperature Capillary

Capillary Armor Type

Blank	=	PVC Armor, Copper Capillary
S	=	Stainless Steel Armor, Copper Capillary

Capillary Length
(Specify length after capillary type, example S8)

Feet

4 = 4 ft.

Specify Other Length = 2 feet increments available to 20 ft., thereafter 5 ft. increments only.

Meters

1.5M = 1.5 M.

Specify Other Length = 0.5 meters increments available from 1.5 to 10 meters, thereafter 2 meter increments to 34 meters only. Specify **M** following length, example S8M

Part Number	Model and Description	Notes
05702176	A20 Series Clamp Lite Assembly; 12V	
05702177	A20 Series Clamp Lite Assembly; 24V	
N/A	A25 Series	

20 and 25 Series Temperature Swichgage®
2 and 2 1/2 in. (51 and 64 mm) Dial

The 20 Series (2 inch/51 mm dial) and the 25 Series (2-1/2 inch/64 mm dial) Swichgage models are diaphragm-actuated, temperature-indicating gages with built-in electrical switches for tripping alarms and/or shut-down devices.

Ranges are available from 32°-120°F (0°-45°C) through 300°-440°F (160°-220°C).

The gage mechanism is enclosed in a steel case coated to resist corrosion. A polycarbonate, break-resistant lens and a polished, stainless steel bezel help protect this rugged, built-to-last instrument.

These vapor-actuated gages feature a sealed capillary tube and a sensing bulb. When subjected to heat, the liquid in the sensing bulb changes to vapor creating pressure against the diaphragm mechanism. The diaphragm translates this vapor pressure into a mechanical gage reading.

For series 20T and 25T, the gage pointer acts as a temperature indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contact(s) are grounded through the Swichgage case. They have a self-cleaning motion to enhance electrical continuity.

Models 20TE and 25TE have internal snap-acting SPDT switches. Gage-only models without contacts (MurphyGage® instrument) are also available.

These instruments are used on industrial engines and equipment in oil field, marine, irrigation, construction and trucking industries and for monitoring engine coolant, crankcase oil and transmission oil.

CE[1] CSA[2]

1 Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

2 Model 25TE is CSA listed for non-hazardous areas. Model 25TE-EX is CSA listed for Class I, Division 1, Groups C & D hazardous areas.

Base Models

Coolant or Oil Temperature

20T and 25T Series Swichgage

For these models the gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

20TL and 25TL Swichgage instrument

For use on Ford Worldwide engines. Supplied with special sensing bulb.

20TE and 25TE Swichgage instrument internal snap-switch

20TE (was 20ESR) and 25TE (was 25ESR)
Models with internal SPDT snap-switches, instead of the single pole/pointer contact(s). When the switch closes on rising temperature, it becomes set. As temperature decreases, the switch resets.

20TABS and 25TABS Swichgage instrument

Same as 20/25T with internal SPDT snap-switch for pre-alarm.

Cylinder Head Temperature

20TH and 25TH Swichgage instrument

20TH (was 20TL8133) and 25TH (was 25TL8133). For use on air-cooled engines.

Direct Mount Models

20TD Swichgage instrument

Same as 20T. Available ranges: 220°F (104°C) or 250°F (121°C). Includes 1/4 x 4 in. (6 x 102 mm) sensing bulb.

20SD Swichgage instrument

Same as 20T. Available ranges: 220°F (104°C) or 250°F (121°C). Includes 11/32 x 1-1/2 in. (9 x 38 mm) sensing bulb.

Gage–Only Models

20TG and 25TG MurphyGage

Gages without contact(s).

Specifications

Dial: White on black; U.S.A. standard scale is dual scale °F/°C; others available (see How to Order)
Case: Plated steel; mounting clamp included (except direct mount models)
Bezel: Polished stainless steel, standard; others available (see How to Order)
Pointer: Tempered nickel silver
Lens: Polycarbonate, high-impact
Sensing Element: Beryllium copper diaphragm
Capillary: PVC armored copper; 4 ft. (1.2 m). Stainless steel armor optional
Sensing Bulb: Copper*
Gage Accuracy: See Temperature Accuracy Chart
Maximum Temperature:
See Temperature Ranges and Factory Settings Table
Maximum Ambient Temperature:
-40°F (-40°C) through 150°F (66°C)

Adjustable Limit Contact (20T and 25T): SPST contact; pilot duty only, 2 A @ 30 VAC/ VDC; Ground path through encasement. Normally Closed (NC) when the high limit is met. Normally Open (NO) when pointer is in normal operating range. Contacts are gold flashed silver.
Limit Contact Adjustment: By a 1/16 in. hex wrench through 100% of the scale
Limit Contact Wire Leads: 18 AWG (1.0 mm) 2 x 12 in. (305 mm)
Snap-Switch Rating (20TE and 25TE):
SPDT, 3 A @ 30 VDC inductive; 4 A @ 125 VAC inductive
Snap-Switch Wire Leads: 20 AWG (0.75 mm2) x 12 in. (305 mm)
Unit Weight: 20 Series: 12.7 oz. (0.39 kg); 25 Series Models: 13.8 oz. (0.43 kg)
Unit Dimensions:
20 Series: 4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm)
25 Series Models: 4-3/4 x 4-3/4 x 3 in. (121 x 121 x 76 mm)
* For optional capillary lengths, engine adaptors, sensing bulbs and range combinations, visit www.enovationcontrols.com.

Temperature Ranges and Factory Settings

NOTES
- Values in ( ) are mathematical conversions from °F to °C – they do not reflect actual second scale range. U.S.A. standard scale is °F/°C.
- For models 20TE and 25TE, the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential. Only certain models are adjustable.
- For adjustable switch models, the trip point is adjustable only over the upper half of the scale.

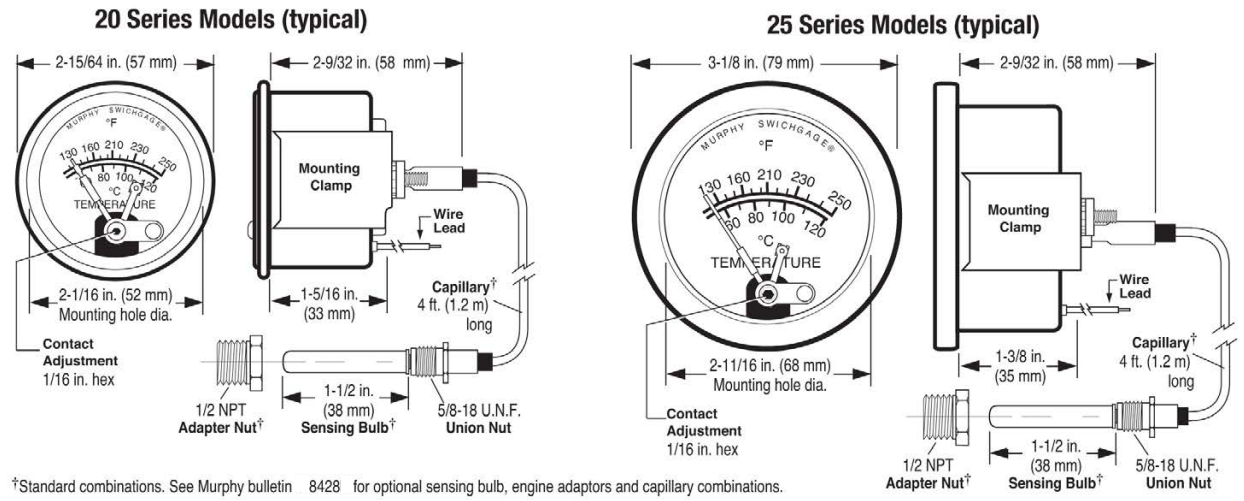
Ranges Available			Max. Temp.	Std. Settings*		Hi/Lo Settings		20TABS and 25TABS Settings			
Dual Scale Dial		Single Scale				Low	High	Alarm+		Shutdown	
°Fahrenheit	(°Celsius)	°Celsius only	°F (°C)	°F (°C)	°C only	°F (°C)	°F (°C)	°F (°C)	°C only	°F (°C)	°C only
32 – 120	(0 – 49)	—	185 (85)	110 (43)	—	32 (0)	110 (43)	100 (38)	—	110 (43)	—
32 – 160	(0 – 71)	0 – 70	215 (102)	150 (66)	66	32 (0)	150 (66)	140 (60)	60	150 (66)	66
130 – 220	(54 – 104)	45 – 100	260 (127)	210 (99)	85	160 (71)	210 (99)	200 (93)	80	210 (99)	85
130 – 250	(54 – 121)	50 – 120	310 (154)	210 (99)	97	160 (71)	210 (99)	200 (93)	95	210 (99)	100
140 – 300	(60 – 149)	60 – 140	340 (172)	275 (135)	130	200 (93)	275 (135)	265 (129)	125	275 (135)	130
160 – 320	(71 – 160)	70 – 160	370 (192)	300 (149)	150	200 (93)	300 (149)	290 (143)	145	300 (149)	150
180 – 350	(82 – 177)	—	400 (209)	330 (166)	—	240 (116)	330 (166)	320 (160)	—	330 (166)	—
300 – 440	(149 – 227)	—	500 (260)	400 (204)	—	300 (149)	400 (204)	390 (199)	—	400 (204)	—

* Standard setting for 20T, 25T, 20TE and 25TE models.
+ SPDT snap-switch is the alarm switch.

Temperature Accuracy Chart

Temperature Range	Lower 1/3 of Scale	Middle 1/3 of Scale	Upper 1/3 of Scale
32 to 120°F (0 to 49°C)	± 12°F (± 6°C)	± 5°F (± 2.4°C)	± 6°F (± 3°C)
32 to 160°F (0 to 71°C)	± 20°F (± 10°C)	± 8°F (± 4.4°C)	± 7°F (± 4°C)
130 to 220°F (54 to 104°C)	± 6°F (± 3°C)	± 3°F (± 1.6°C)	± 4°F (± 2°C)
130 to 250°F (54 to 121°C)	± 9°F (± 5°C)	± 5°F (± 2.4°C)	± 4°F (± 2°C)
140 to 300°F (60 to 149°C)	± 10°F (± 5.2°C)	± 6°F (± 3°C)	± 5°F (± 2.4°C)
160 to 320°F (71 to 160°C)	± 10°F (± 5.2°C)	± 5°F (± 2.4°C)	± 5°F (± 2.4°C)
180 to 350°F (82 to 177°C)	± 12°F (± 6°C)	± 5°F (± 2.4°C)	± 5°F (± 2.4°C)
300 to 440°F (149 to 227°C)	± 9°F (± 5°C)	± 5°F (± 2.4°C)	± 4°F (± 2°C)

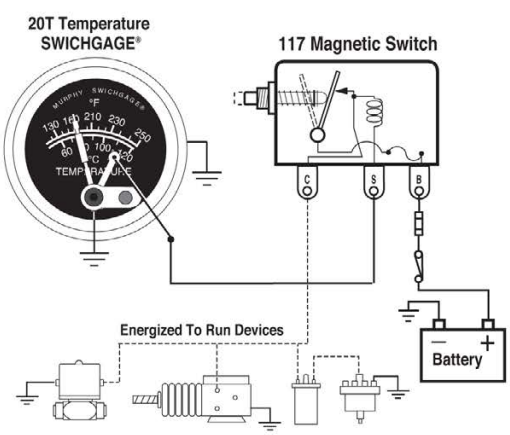
Dimensions

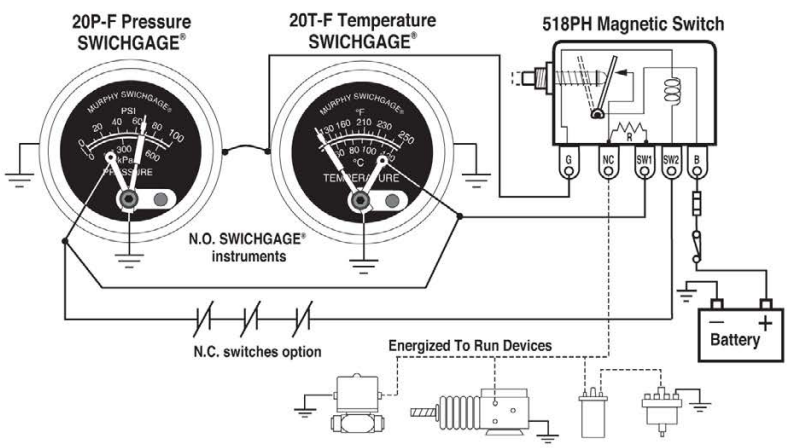


†Standard combinations. See Murphy bulletin 8428 for optional sensing bulb, engine adaptors and capillary combinations.

Magnetic Switch

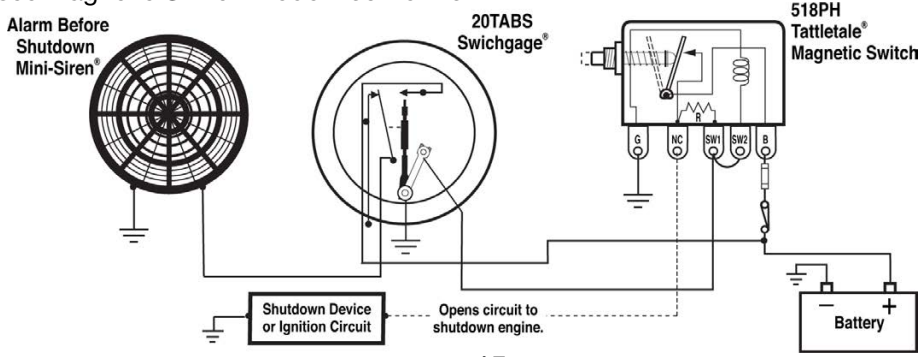
INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH. The Swichgage contacts are for light-duty electrical switching to operate alarms or control devices. Enovation Controls manufactures the Magnetic Switch for protection of the light-duty Swichgage limit contacts. Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown below.





Pre-Alarm using 20/25TABS

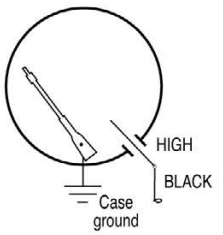
The 20TABS and 25TABS feature a standard limit contact for high temperature equipment shutdown and an internal SPDT snap-switch to signal an alarm before shutting down. When the low side of the snap-switch trips (preset point), on rising temperature, the switch completes a circuit to activate an alarm. If the temperature continues to increase, the face-adjustable pointer contact will make, and the shutdown circuit will be completed (see the typical diagram below for reference). The front contact shutdown limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to Temperature Ranges and Factory Settings table for settings. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



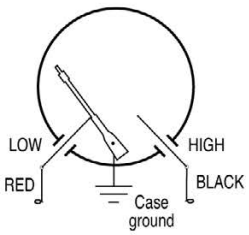
Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot duty 2 A @ 30 VAC/VDC.
Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.

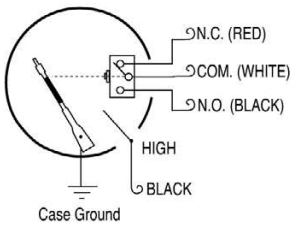
Pointer Type Contact



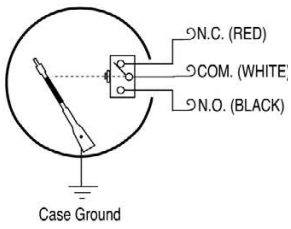
"HL" Hi-Lo Option



ABS Models



TE Models



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

20T – B1 – 120 – P2M – 3/8

Base Model

20T
20TL
20TE
20TABS
20TH
20TD
20SD
20TG
25T
25TG

Range

Dual Scale ° F (° C)	Single Scale ° C
120 = 32-120 (0-49)	**70C** = 0-70
160 = 32-160 (0-71)	**100C** = 45-100
220 = 130-220 (54-104)	**120C** = 50-120
250 = 130-250 (60-121)	**140C** = 60-140
300 = 140-300 (60-149)	**160C** = 70-160
320 = 160-320 (71-160)	
350 = 180-350 (82-177)	
440 = 300-440 (149-227)	

Consult factory for availability of dials other than (° F / ° C). Select scale so your normal operating temperature is in the upper half of the scale.

Options

Options are not available on all models or configurations.

- **A** = AGF (Argon Filled)
- **B1** = Black Bezel
- **B2** = Bezel 05051857 (was HP)
- **B3** = Bezel 05051836 (was HBB)
- **EX** = EX Proof (Explosion Proofed)
- **EL** = EX Less Case (Explosion Proofed Less Case)
- **F** = FS Contact (Includes ES as Appropriate)
- **HL** = High and Low Contacts
- **I** = Illuminations (See Illumination Options)
- **IP1** = Light Pipe Illumination, 12 VDC
- **IP2** = Light Pipe Illumination, 24 VDC
- **K** = Knob Adjusting Face Contact
- **OS** = Oil Sealed (Silicone Oil)

Specify optional bulb ONLY when not included as standard for Temperature Base Model, Scale/ Range or Capillary length.

- **UA** = Temperature Bulb Style A (10050166)
- **UB** = Temperature Bulb Style B (10050161)
- **UC** = Temperature Bulb Style C (10010060)
- **UD** = Temperature Bulb Style D (10000286)
- **UE** = Temperature Bulb Style E (10010084)
- **UF** = Temperature Bulb Style F (10000577)
- **UG** = Temperature Bulb Style G (10000578)
- **UH** = Temperature Bulb Style H (10002466)
- **UK** = Temperature Bulb Style K (10054886)

Illumination Options

	IP1 / IP2	1
20 Series	X	X*
25 Series	N/A	N/A

* Can be used with Standard Clamp Lite Assembly (12 V = 05702176; 24 V = 05702177)

Temperature Capillary

Capillary Armor Type

- **P** = PVC Armor, Copper Capillary
- **S** = Stainless Steel Armor, Copper Capillary

Capillary Length (specify length after capillary type, example S8)

Feet

- **4** = 4 ft.

Specify Other Length = 2-feet increments available to 20 ft., thereafter 5 ft. increments only.

Meters

- **1.5M** = 1.5 M.

Specify Other Length = 0.5 meters increments available from 1.5 to 10 meters, thereafter 2 meter increments to 34 meters only. Specify **M** following length, example S8M.

Adapter Nuts

Nut Must Match the Sensing Bulb

- **1/8** = 1/8-27 NPT
- **1/4** = 1/4-18 NPT
- **3/8** = 3/8-18 NPT
- **3/8B** = 3/8-19 BSPT
- **3/8K** = 3/8 NPSF
- **–** = 1/2-14 NPT (Standard)
- **1/2B** = 1/2 BSPT
- **1/2K** = 1/2 NPSF
- **5/8** = 5/8-18 UNF
- **3/4** = 3/4-14 NPT
- **3/4U** = 3/4-16 UNF
- **7/8** = 7/8-9 UNC
- **M10** = 10 mm x 1.5
- **M12** = 12 mm x 1.5
- **M14** = 14 mm x 1.5
- **M16** = 16 mm x 1.5
- **M18** = 18 mm x 1.5
- **M20** = 20 mm x 1.5
- **M22** = 22 mm x 1.5
- **M24** = 24 mm x 1.5

Direct Mount Temperature Switch

Model TSB

The TSB switch is a direct-mount switch for temperature sensing. It has one limit contact that can be used to activate an alarm, actuate indicator lights or shut down equipment.

The construction of this instrument is the same as our time-proven Swichgage®. A precision machined brass mounting plate and port captures a high quality stamped beryllium copper diaphragm. The single-pole, double-throw (SPDT) snap-switch is operated directly from the diaphragm, for quick acting and positive switching. Trip point is factory preset according to your specifications.

Housing is weather sealed to prevent entry of moisture, dust, etc. A glass-filled nylon terminal block with quick-screw terminal connections gives the TSB switch a real advantage in industrial engine applications. The TSB is ideal when reading is not desired but temperature is critical to operational efficiency.

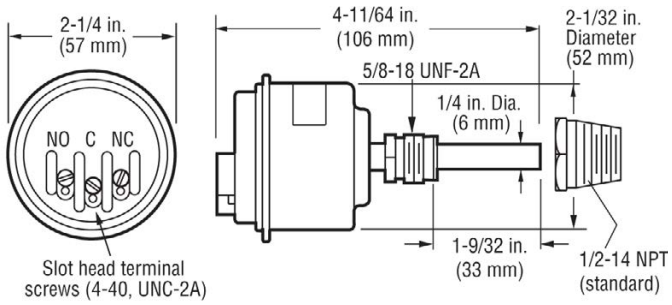
Intended for use in general purpose non-classified areas. Applications include:

- Engine coolant
- Compressors
- Engine lubrication
- Mobile equipment
- Generators
- Irrigation systems
- Oil field systems
- Construction equipment
- Marine engines
- Electric motors

CE*

*Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Dimensions



Specifications

Housing: Plated steel
Connections: Popular NPT and metric (specify)
Diaphragm: Formed beryllium copper (heat treated)
Sensing Bulb: Copper
Terminal Block: Three # 4-40 screws

Accuracy	Switch Trip Point Range 150°-295°F (66°-146°C)
Trip Point	±3° F (1.7° C)
Switch Reset Differential	±15° F (9° C)
Repeatability	±3° F (1.7° C)

Contact Rating: SPDT 3 A @ 30 VDC inductive
Maximum Temperature: See chart
Factory Trip Point Setting: 210° F (99° C) Rising. Other trip point setting must be specified at time of order.
Contact: Operates on rising or falling temperature (specify)
Approximate Shipping Weight: 10 oz. (0.31 kg)
Approximate Shipping Dimensions: 4-3/4 x 4-3/4 x 2-5/8 in. (121 x 121 x 67 mm)

NOTE: No customer replacement parts

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

TSB	–	R230	–	3/8

Standard Switch Trip Point

Specify Trip Point Value, Example: TSB-R200

Standard Switch Trip Point Values Rising*			Accuracy
R165	=	165° F (74° C)	165°-210° F @ ±5° F (±2.7° C) Accuracy Water/Glycol 10% Used for Set point
R180	=	180° F (82° C)	
R200	=	200° F (93° C)	
R205	=	205° F (96° C)	
R210	=	210° F (99° C)	
R220	=	220° F (104° C)	215°-230° F @ ±7° F (±3.8° C) Accuracy 240°-250° F @ ±10° F (±6.5° C) Accuracy Heat Transfer Fluid Used for Set point (276 viscosity @ 100° F)
R225	=	225° F (107° C)	
R230	=	230° F (110° C)	
R240	=	240° F (116° C)	
R250	=	250° F (121° C)	

*** Non Standard Trip Points Require a Minimum Quantity Order. Trip Points Must Be in 5° F Increments Between 165-250° F (74-121° C).**

Switch Reset Differential: ±15° F (±9° C)

Repeatability: ±3° F (±1.7° C)

Connection Size

Blank	=	1/2-14 NPT**	10-05-0131**
3/8	=	3/8-18 NPT	10-05-0069
M14	=	14 mm x 1.5***	10-05-0104***

** Standard Connection
*** Includes Copper Seal

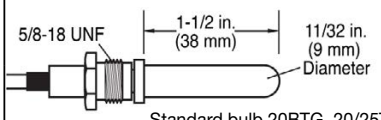
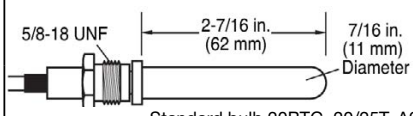
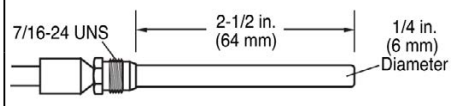
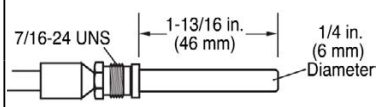
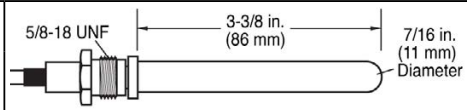
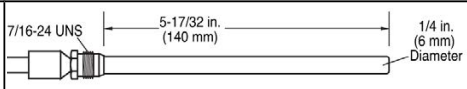
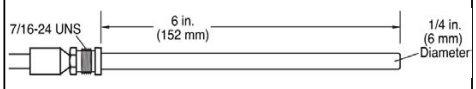
Sensing Bulb/Scale/Capillary Length Combinations

for 20, 25, A20 and A25 Series Temperature Swichgage® and MurphyGage® Instruments

APPLICATION NOTE: Murphy vapor pressure actuated temperature Swichgage and MurphyGage instruments indicate the temperature as measured at the sensing bulb. If the sensing bulb is not fully immersed in the medium being measured, an inaccurate reading will occur. This is particularly important when applying bulb types C, F and H since the attaching nut can be positioned at various depths along the length of the sensing bulb. For best results, be sure that the sensing bulb is fully immersed. For further important details see appropriate installation sheet for Murphy temperature devices or contact a representative.

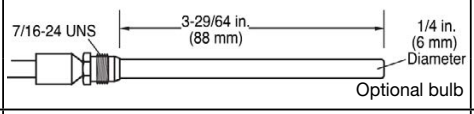
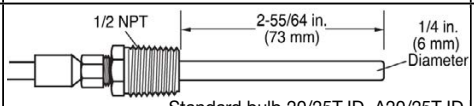
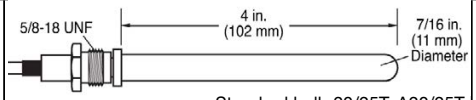
NOTES:

- Bulb Type A, B, E & K are provided as standard on T & TE series based on scale and capillary length.
- Bulb Type D is provided as standard on TL & TH series based on scale and capillary length.
- Any bulb used where it is standard, based on model, scale and capillary length, must not be specified in the model number. Any bulb used where it is not standard must be specified in the model number.

Bulb Type	Bulb Dimensions	Part Number	Adaptor Nut Group	Thermowell Group	Capillary Tube Length	Temperature Ranges °F	Temperature Ranges °C
A	 Standard bulb 20BTG, 20/25T, A20/25T	10050166	1	I	2-30 feet (0.61-9.14 meters)	130-220, 130-250, 140-300, 160-320, 180-350, 300-440	54-104, 54-121, 60-149, 71-160, 82-177, 149-227
					2-7 feet (0.61-2.13 meters)	32-120, 32-160	0-49, 0-71
B	 Standard bulb 20BTG, 20/25T, A20/25T	10010061	2	II	31-80 feet (9.45-24.39 meters)	130-220, 130-250 140-300, 160-320, 180-350, 300-440	54-104, 54-121, 60-149, 71-160, 82-177, 149-227
					8-23 feet (2.43-7.01 meters)	32-120, 32-160	0-49, 0-71
C	 Optional bulb	10010060	3	–	2-25 feet (0.61-1.21 meters)	130-220, 130-250, 140-300, 160-320, 180-350	54-104, 54-121, 60-149, 71-160, 82-177
					2-4 feet (0.61-1.21 meters)	300-440	149-227
D[1]	 Standard bulb 20/25TL, A20/25TL, 20/25TH, A20/25TH	10000286	4	IV	2-16 feet (0.61-4.88 meters)	130-220, 130-250, 140-300, 160-320, 180-350	54-104, 54-121, 60-149, 71-160, 82-177
					2-4 feet (0.61-1.21 meters)	300-440	149-227
E	 Standard bulb 20BTG, 20/25T, A20/25T	10010084	2	III	24-35 feet (7.32-10.67 meters)	32-120, 32-160	0-49, 0-71
					81-110 feet (24.69-33.53 meters)	130-220, 130-250 140-300, 160-320, 180-350, 300-440	54-104, 54-121, 60-149, 71-160, 82-177, 149-227
F	 Optional bulb	10000577	3	–	16-25 feet (4.88-7.62 meters)	130-220, 130-250, 140-300, 160-320	54-104, 54-121, 60-149, 71-160
G	 Optional Bulb	10002466	4	–	17-25 feet (5.18-7.62 meters)	130-220, 130-250, 140-300, 160-320	54-104, 54-121, 60-149, 71-160

1 Standard bulb for air-cooled engine models (example 20TH) and Ford worldwide engines (example 20TL)

Warranty — A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to www.enovationcontrols.com/warranty

Bulb Type	Bulb Dimensions	Part Number	Adaptor Nut Group	Thermowell Group	Capillary Tube Length	Temperature Ranges	
						°F	°C
H	 Optional bulb	10002466	3	IV	2-25 feet (0.61-7.62 meters)	130-220, 130-250, 140-300, 160-320, 180-350	54-104, 54-121, 60-149, 71-160, 82-177
					2-4 feet (0.61-1.21 meters)	300-440	149-227
J	 Standard bulb 20/25TJD, A20/25TJD	10051153	3 and part number 85030447	–	2-12 feet (0.61-3.66 meters)	130-250	54-121
K	 Standard bulb 20/25T, A20/25T	10004886	2	–	36-50 feet (10.97-15.24 meters)	32-120 32-160	0-49 0-71

Part Number	Description	Notes
10050167	1/4-18 NPT	Optional Adapter Group 1
10050069	3/8-18 NPT	
10050284	3/8-19 BSPT	
10050131	1/2-14 NPT	
10050330	1/2-14 BSPT	
10050068	5/8-18 UNF	
10050105	3/4-14 NPT	
10050093	7/8-9 UNC	
10002442	14 mm x 1.5	
10002444	16 mm x 1.5	
10002443	18 mm x 1.5	
10002446	20 mm x 1.5	
10002445	22 mm x 1.5	
10002449	24 mm x 1.5	
10050103	3/8-18 NPT	Optional Adapter Group 2
10050107	1/2-14 NPT	
10050827	3/4-14 NPT	
10050695	7/8-9 UNF	
10002447	22 mm x 1.5	
10010052	1/8-27 NPT	Optional Adapter Group 3
10010051	10 mm x 1.5	
10005235	10 mm x 1.0	
10050912	1/8-27 NPT	Optional Adapter Group 4
10002450	10 mm x 1.5	
10002451	12 mm x 1.5	
10010009	1/2-14 NPT, Carbon Steel, Nickel Plate	Optional Thermowells Group I
10050128	1/2-14 NPT, 304 Stainless Steel	
10050899	1/2-14 NPT, Carbon Steel, Nickel Plate	
10000425	7/8-9 UNC, Carbon Steel, Nickel Plate	
10050169	1/2-14 NPT, 304 Stainless Steel	Optional Thermowells Group II
10050900	1/2-14 NPT, Carbon Steel, Nickel Plate	Optional Thermowells Group III
10050901	1/2-14 NPT, 304 Stainless Steel	

Consult factory for non-listed options and combinations.

Exhaust Pyrometers for Diesel Engines
Models 10705146 and 10705147

Excessive exhaust temperature is a major damaging factor to all engines. The best way to monitor this temperature is with the use of a pyrometer. Excessive exhaust temperature is caused by an upset fuel/air ratio or more fuel in the engine than there is air to support it. This condition can occur as a result of over throttling, a dirty air cleaner, different fuels, a malfunctioning fuel system, change of altitude, an out-of-tune engine and many other causes. But whatever the cause, a pyrometer indicates this condition before serious damage occurs.

The Single 10705147 and Dual 10705146 Port Pyrometers monitor exhaust temperatures in all types of engines. The Dual Port Pyrometer can monitor each bank of a V-type engine allowing you to compare readings at all times. Both pyrometers feature an easy-to-read illuminated dial with scales in both Fahrenheit and Celsius. They require no outside power (except for dial lighting). Spring-loaded jewels and alloy pivots increase durability. Murphy offers pyrometer accessories such as thermocouples and wire lead assembly suitable for stationary or mobile engines, power units, agricultural and construction equipment, as well as marine and trucking.

10705146

10705147

Features

- Large sweep scales for maximum legibility
- Internal illumination for night use
- Accuracy: 2% full scale
- Sealed housing
- Ambient temperature compensation
- Calibrated permanently at 2/3 scale
- Flush type mounting on any plane

Benefits of Using a Pyrometer

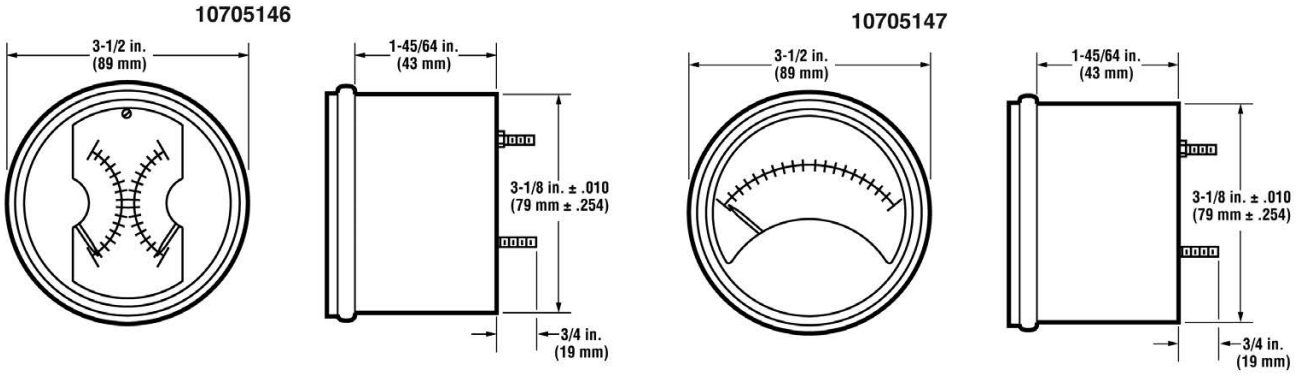
- Longer engine life
- Better fuel economy
- Less lubrication oil dilution
- Lubrication oil stays clean much longer
- Exhaust emissions drop to a minimum
- Malfunctions indicated before excessive damage occurs

Specifications

Dial Scale
Single: 300° to 1300°F (150° to 700°C)
Dual: 300° to 1200°F (150° to 649°C)*
Dial Sweep (both models): 100°
Accuracy: Full scale 2%
Illumination: Internal 12 or 24 VDC
Bezel: Polished stainless steel+
Case: PVC
Pointer(s): Fire Orange

* Celsius only dials available
+ Black Bezel available. See special order.

Dimensions



Accessories

Type K thermocouples can mount in the engine manifold or in 2 to 3-1/2 in. (51 to 89 mm) diameter exhaust ports. In turbocharged engines, a thermocouple mounts between the engine and the turbo. Thermocouple 00000818 is a grounded, type K (Chromel Alumel). Thermocouple 00003488 is ungrounded type K (Chromel Alumel).

Thermocouple Specifications

Element K: type (NiCr/Ni) solid wire
Hot Junction: fusion welded
Protecting Tube: inconel for no carbon absorption, end closed by heliarc melt down
Wire Insulation: Q-glass with stainless steel overbraid

00000818
Thermocouple

Wire Lead Assembly 00000817 is a 14 ft. (4.27 m) extension with mating plug connections for the 00000818 and 00003488 thermocouples. The wire is PVC covered, non-shielded, 18 AWG (1.0 mm^2), with heat shrinkable sleeve provided for insulating terminals after installation. Extension up to 100 ft. (30.48 m) can be made with 18 AWG (1.0 mm^2) or larger copper wire at the gage head.

00000817
Wire Lead Assembly

How to Order

Part Number	Model and Description	Notes
00000819	10705146 Dual Pyrometer	
00000956	10705147 Single Pyrometer	
00000817	14 ft. (4.27m) Wire Lead Assembly	Accessories
00000818	Thermocouple, grounded, Type K, 3/8 NPT *	
00003488	Thermocouple, ungrounded, Type K, 1/4 NPT *	
00003578	3/8 NPT Adaptor	
00003577	1/8 NPT Adaptor	
00003450	1/4 NPT Adaptor	
00003579	1/2 NPT Adaptor	

*1/8 NPT, 1/4 NPT and 1/2 NPT adaptors available.

Thermocouple, RTD and RTD Transmitter

With Thermowell – TC, RTD and RTDT Series

Enovation Controls offers a variety of highly reliable thermocouple and RTD (Resistance Temperature Detector) assemblies and 4-20 mA DC output RTD transmitters.

Their innovative features include a 304 stainless steel thermowell that provides protection to the spring-loaded element.

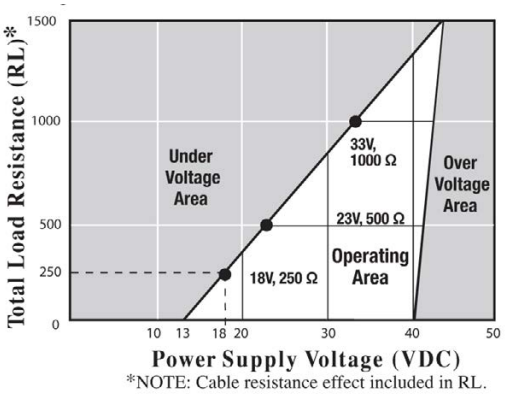
The cast aluminum connecting head meets NEMA 4 requirements and includes an RTD transmitter or a thermocouple/ RTD terminal block mounted on ceramic Steatite and rated NEC Class 2.

The complete assemblies are offered in 2-1/2, 4-1/2 or 7-1/2 in. (63, 114 or 191 mm) thermowell insertion lengths.

Specifications

Thermowell: 304 SS; 7000 psi (48.2 MPa) [482 bar] max. @ 70°F
Connecting Head: Cast Aluminum; 400°F (204°C) max. operating temp
Thermocouple: Ungrounded, Magnesium Oxide (MgO) insulated 96% purity; element sheath of 304 SS (stainless steel)
Type J operating temp.: 900°F (482°C) max
Type K operating temp.: 1800°F (982°C) max
RTD: 100 ohm @ 0°C Platinum element; 3-wire; 400 °F maximum; 0.00385 temperature coefficient; 316L stainless steel element sheath
RTD Transmitter: 100 ohms Platinum RTD; 400°F maximum; Ranges: 0° to 400°F and -60° to 140°F. Linearized 4-20 mA DC output. Loop powered typically 24 VDC, when using the Loop Resistance Graph, 13-40 VDC. For use with 100 ohms Platinum RTD elements, 0.00385 temp. coefficient
Thermocouple Accuracy (J/K): 0.5%
RTD Accuracy: ±0.12%
RTD Transmitter Accuracy: ±0.1%
Terminal block: Ceramic Steatite; thermocouples have: 4 terminals; RTDs: 6 terminals. 28 to 14 AWG wire size, (8-32 SS screws)
Shipping Weights (listed by insertion length):
2-1/2 in. (63 mm) model: 2 lb. (0.907 kg)
4-1/2 in. (114 mm) model: 2 lb. 8oz. (1.24 kg)
7-1/2 in. (191 mm) model: 3 lb. 6oz. (1.67 kg)
Shipping Dimensions (listed by insertion length):
2-1/2 and 4-1/2 in (63 and 114 mm) models:
12 x 7 x 5-1/2 in. (305 x 178 x 140 mm)
7-1/2 in. (191 mm) models:
16 x 11 x 5-1/2 in. (406 x 280 x 144 mm)
Optional Thermocouple Extension Wire:
(Sold separately–see How to Order section)
Individual Conductor Insulation: Extruded PFA
Duplex Conductor Insulation: Twisted; Extruded PFA Overall
Temperature Rating: Continuous -450° to 500°F (-267° to 260°C)
Abrasion Resistance: Good
Moisture Resistance: Excellent
Shielding: Metallic Shield
Gage: 20 AWG (0.5 mm^2)
Ohms per Double Foot Type J: 0.357
Ohms per Double Foot Type K: 0.586

Loop Resistance Graph



Supply voltage for RTDT must be within 13-40 VDC. The graph shows the minimum supply voltage (VDC) required for a given load resistance (RL).

Thermocouple Assemblies with Thermowell

Available in types J or K, the thermocouple assemblies have ungrounded elements in a 304 stainless steel spring-loaded sheath. For product compatibility see next page (replacement parts and thermocouple extension wire are available).

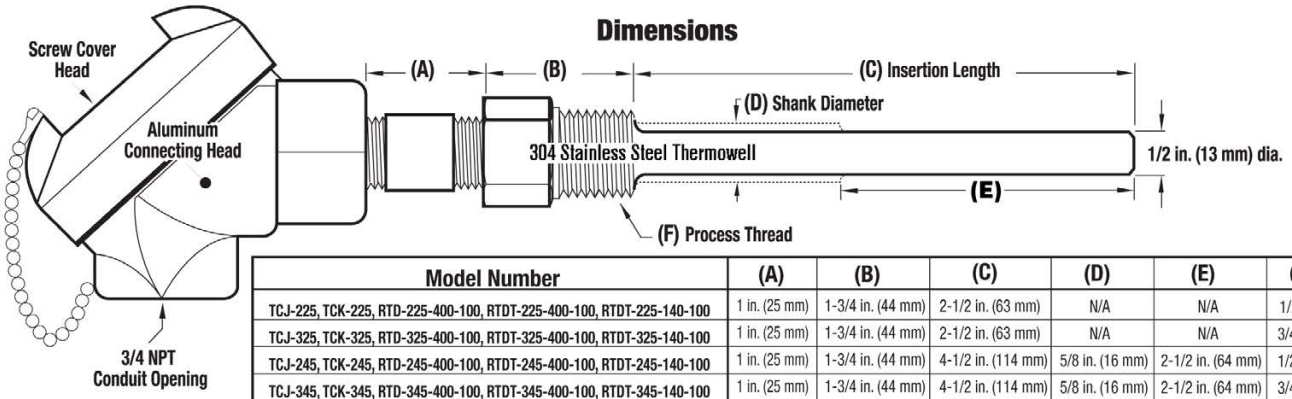
RTD Assemblies with Thermowell

Resistance temperature detector (RTD) assemblies are available with a 100 ohm platinum element, 3-wire leads and spring-loaded 316L stainless steel element sheath.

RTD Transmitter Assemblies with Thermowell

RTDT assemblies transmit process variable temperatures. Available as part of the temperature sensor assemblies or as a separate units, the RTDTs accept 2- or 3-wire, 100 ohm RTDs. The RTD transmitters are loop powered. They feature linearized 4-20 mA DC outputs and have reversed polarity protection.

Dimensions



Model Number	(A)	(B)	(C)	(D)	(E)	(F)
TCJ-225, TCK-225, RTD-225-400-100, RTDT-225-400-100, RTDT-225-140-100	1 in. (25 mm)	1-3/4 in. (44 mm)	2-1/2 in. (63 mm)	N/A	N/A	1/2 NPT
TCJ-325, TCK-325, RTD-325-400-100, RTDT-325-400-100, RTDT-325-140-100	1 in. (25 mm)	1-3/4 in. (44 mm)	2-1/2 in. (63 mm)	N/A	N/A	3/4 NPT
TCJ-245, TCK-245, RTD-245-400-100, RTDT-245-400-100, RTDT-245-140-100	1 in. (25 mm)	1-3/4 in. (44 mm)	4-1/2 in. (114 mm)	5/8 in. (16 mm)	2-1/2 in. (64 mm)	1/2 NPT
TCJ-345, TCK-345, RTD-345-400-100, RTDT-345-400-100, RTDT-345-140-100	1 in. (25 mm)	1-3/4 in. (44 mm)	4-1/2 in. (114 mm)	5/8 in. (16 mm)	2-1/2 in. (64 mm)	3/4 NPT
TCJ-275, TCK-275, RTD-275-400-100, RTDT-275-400-100, RTDT-275-140-100	1 in. (25 mm)	1-3/4 in. (44 mm)	7-1/2 in. (191 mm)	5/8 in. (16 mm)	2-1/2 in. (64 mm)	1/2 NPT
TCJ-375, TCK-375, RTD-375-400-100, RTDT-375-400-100, RTDT-375-140-100	1 in. (25 mm)	1-3/4 in. (44 mm)	7-1/2 in. (191 mm)	5/8 in. (16 mm)	2-1/2 in. (64 mm)	3/4 NPT

How to Order

Model Number	Model and Description	Notes
Thermocouple Assemblies (thermowell included)		
TCJ-225	J Type underground thermocouple, 1/2 NPT	2-1/2 in. (63 mm) insertion length
TCK-225	K Type underground thermocouple, 1/2 NPT	
TCJ-325	J Type underground thermocouple, 3/4 NPT	
TCK-325	K Type underground thermocouple, 3/4 NPT	
TCJ-245	J Type underground thermocouple, 1/2 NPT	4-1/2 in. (114 mm) insertion length
TCK-245	K Type underground thermocouple, 1/2 NPT	
TCJ-345	J Type underground thermocouple, 3/4 NPT	
TCK-345	K Type underground thermocouple, 3/4 NPT	
TCJ-275	J Type underground thermocouple, 1/2 NPT	7-1/2 in. (191 mm) insertion length
TCK-275	K Type underground thermocouple, 1/2 NPT	
TCJ-375	J Type underground thermocouple, 3/4 NPT	
TCK-375	K Type underground thermocouple, 3/4 NPT	
RTD Assemblies (thermowell included)		
RTD-225-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	2-1/2 in. (63 mm) insertion length
RTD-325-400-100	100 ohm Pt RTD 400°F (204°C) max., 3/4 NPT	
RTD-245-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	4-1/2 in. (114 mm) insertion length
RTD-345-400-100	100 ohm Pt RTD 400°F (204°C) max., 3/4 NPT	
RTD-275-400-100	100 ohm Pt RTD 400°F (204°C) max., 1/2 NPT	7-1/2 in. (191 mm) insertion length
RTD-375-400-100	100 ohm Pt RTD 400°F (204°C) max., 3/4 NPT	
RTD Transmitter Assemblies (thermowell included)		
RTDT-225-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	2-1/2 in. (63 mm) insertion length
RTDT-225-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, -60-140°F (-51.1-60°C)	
RTDT-325-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	
RTDT-325-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, -60-140°F (-51.1-60°C)	
RTDT-245-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	4-1/2 in. (114 mm) insertion length
RTDT-245-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, -60-140°F (-51.1-60°C)	
RTDT-345-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	
RTDT-345-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, -60-140°F (-51.1-60°C)	
RTDT-275-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, 0-400°F (-17.8-204°C)	7-1/2 in. (191 mm) insertion length
RTDT-275-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 1/2 NPT, -60-140°F (-51.1-60°C)	
RTDT-375-400-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, 0-400°F (-17.8-204°C)	
RTDT-375-140-100	100 ohm Pt 4-20 mA RTD Transmitter, 3/4 NPT, -60-140°F (-51.1-60°C)	

Model Number	Model and Description	Notes
Replacement Parts (order separately)		
TCHA	Cast aluminum head with terminal blocks for thermocouples	
TCJE-25	Type J elements only for 2-1/2 in wells*	all elements are spring loaded
TCKE-25	Type K elements only for 2-1/2 in wells*	
TCJE-45	Type J elements only for 4-1/2 in wells*	
TCKE-45	Type K elements only for 4-1/2 in wells*	
TCJE-75	Type J elements only for 7-1/2 in wells*	
TCKE-75	Type K elements only for 7-1/2 in wells*	
PTW-225	1/2 NTP x 2-1/2 in. thermowell	
PTW-325	3/4 NTP x 2-1/2 in. thermowell	
PTW-245	1/2 NTP x 4-1/2 in. thermowell	
PTW-345	3/4 NTP x 4-1/2 in. thermowell	
PTW-275	1/2 NTP x 7-1/2 in. thermowell	
PTW-375	3/4 NTP x 7-1/2 in. thermowell	
RTDE-25	100 ohm Pt RTD element only for 2-1/2 in. wells	all elements are spring loaded
RTDE-45	100 ohm Pt RTD element only for 4-1/2 in. wells	
RTDE-75	100 ohm Pt RTD element only for 7-1/2 in. wells	
RTDTX-400-100	100 ohm Pt RTD Transmitter only 0-400°F (-17.8-204°C)	
RTDTX-140-100	100 ohm Pt RTD Transmitter only -60-140°F (-51.1-60°C)	
Thermocouple Extension Wire		
00003271	Type J 100 ft. roll	
00003272	Type K 100 ft. roll	

Product Compatibility

Model	Power Source	Temp Sensor
MDTM89	CD Ign. 12/24 VDC,120 VAC	JK ungrounded thermocouples
TDX6	CD Ign. 12/24 VDC,120 VAC	JK grounded/ungrounded tc.
TDXM	12/24 VDC	JK grounded/ungrounded tc.

Thermocouple, Stainless Steel Tube Type

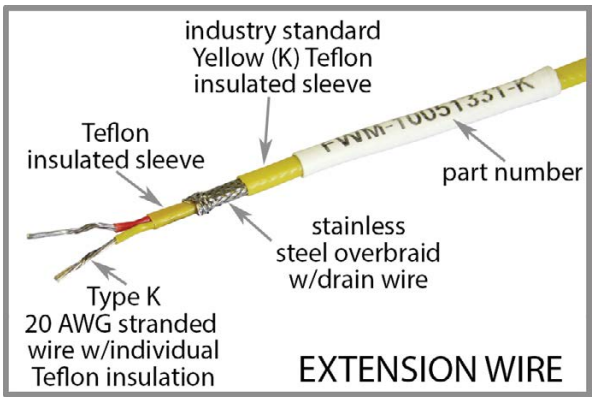
1/4 Inch Diameter

The thermocouples are encased in a 1/4 inch diameter 316 stainless steel tubing sheath with stainless steel Bell Spring for strain relief. The initial offerings are K type thermocouples with 6-inch and 10-inch long 1/4-inch diameter probes. The thermocouples are shipped straight but can be bent with standard tubing benders anywhere along its length to a 90° angle to minimize clearance required and help prevent damage due to personnel working on the unit. The thermocouple is tip sensitive to minimize ambient temperature influence and should be inserted between 25% and 75% of the piping inside diameter or enough to minimize any skin temperature affect on the tip of the probe when installed in vessels.

Features

- Stainless steel transition sealing gland with a stainless steel Bell Spring for strain relief.
- Standard bore through stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth.
- Can be inserted directly into a low-pressure application process through a standard 1/4-inch stainless steel bore through tubing compression fitting.
- Enables a run from the point of measurement to the nearest conduit entry, junction box or all the way to the panel housing the readout and monitoring instrument. Can also be installed in a cable tray.
- The thermowell assembly comes with a stainless steel bore through compression fitting and ferrule saving installation time and money.

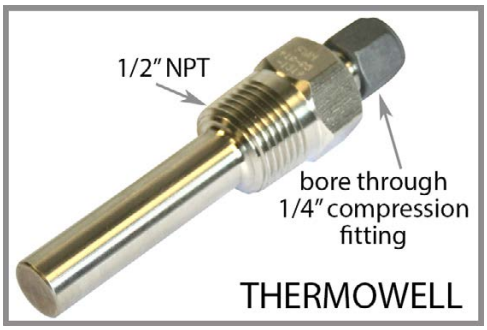
Extension Wire



The Type K, 20 AWG stranded extension wire encased in a rugged cable meets demanding environments. The industry standard yellow Teflon allows easy identification of K type thermocouple wires so they can be separated from high voltage wires following good installation practices.

Thermowell

Thermowells are available in 2-inch, 4-1/2 inch or 7-1/2 inch lengths for insertion depth and have a 1/2-inch NPT process connection. They are supplied with a standard stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth. In low pressure applications the thermocouple can be inserted directly into the process through a standard 1/4-inch SS tubing compression fitting.



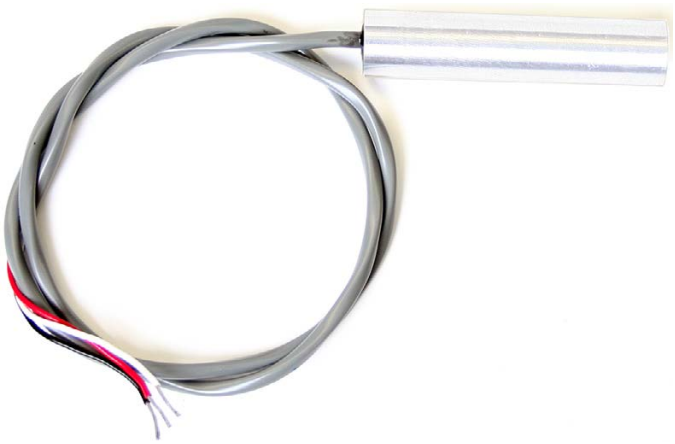
Part Number	Description	Notes
10051331	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/5 ft. Thermocouple Extension Wire
10051325	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/15 ft. Thermocouple Extension Wire
10051326	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/30 ft. Thermocouple Extension Wire
10051327	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/50 ft. Thermocouple Extension Wire
10051395	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/75 ft. Thermocouple Extension Wire
10051328	Thermocouple, Type K, 1/4 Dia. Tube x 6 in. L	w/100 ft. Thermocouple Extension Wire
10051332	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/5 ft. Thermocouple Extension Wire
10051323	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/15 ft. Thermocouple Extension Wire
10051317	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/30 ft. Thermocouple Extension Wire
10051322	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/50 ft. Thermocouple Extension Wire
10051396	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/75 ft. Thermocouple Extension Wire
10051321	Thermocouple, Type K, 1/4 Dia. Tube x 10 in. L	w/100 ft. Thermocouple Extension Wire
10707436	Thermowell, 1/2 in. NPT, 1/4 in. T, 2.0 in. L	Assembly 304SS
10707437	Thermowell, 1/2 in. NPT, 1/4 in. T, 4.5 in. L	Assembly 304SS
10707438	Thermowell, 1/2 in. NPT, 1/4 in. T, 7.5 in. L	Assembly 304SS

Air Temperature Sensor

Model 12

The Model 12 Air Temperature Sensor is intended for use in applications that monitor slowly changing temperature.

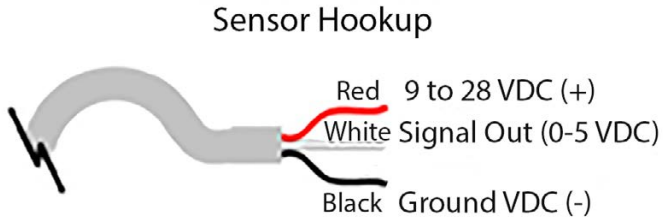
The unit gives approximately .5 ° F (.25 ° C) resolution when used with an 8-bit analog input.



Temperature Sensing Range

VDC Out	°C	°F
0.00	-18	0
0.25	-14.5	5.8
0.50	-11.4	11.5
0.75	-8.2	17.3
1.00	-5	23.0
1.25	-1.8	28.8
1.50	1.4	34.5
1.75	4.6	40.3
2.00	7.8	46.0
2.25	11	51.8
2.50	14.2	57.5
2.75	17.4	63.3
3.00	20.6	69.0
3.25	23.8	74.8
3.50	27	80.5
3.75	30.2	86.3
4.00	33.3	92.0
4.25	36.6	97.8

Wire Diagram



Specifications

Temperature Capability

Useful Operating Temperature Range:
0° F to 115° F (-18° C to 46° C)

Component Temperature Range:
-85° F to 300° F (-65° C to 150° C)

Accuracy: 2% of full scale with software offset correction.

Voltage

Power Input Voltage: 9 to 28 VDC

Current Draw: 1mA

Cable: 2 foot length, 22 AWG, stranded

Clamp: 1/2" ID, provided (P/N 00-03-0392)

How to Order

Part Number	Model and Description	Notes
10707483	Model 12: Air Temperature Sensor	

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Level Swichgage® for Engine Liquids

L150 and EL150K1 Series

The L150 Series Level Swichgage instrument is a combination liquid level gage and low-limit switch; each unit includes (1) a chamber with pivotal float, (2) an indicating dial with pointer and (3) a low-level contact. When properly installed and maintained, the float operates the pointer which, in turn, both indicates level during normal operation and closes a switching circuit if the level falls to the low-limit set point.

Applications

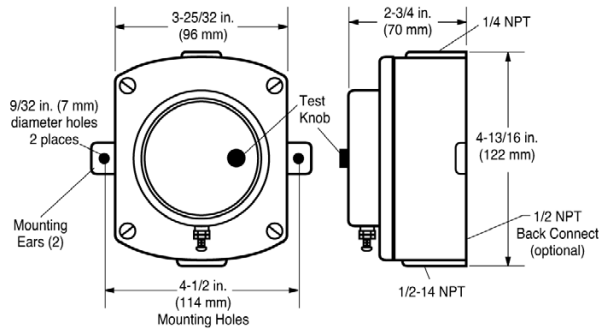
The primary use of the L150/EL150K1 is for engine cooling systems, surge or expansion tanks, condenser radiator or vapor phase systems, pressurized or atmospheric systems. The Level Swichgage instrument can also be used to monitor lube oil, hydraulic fluid or diesel fuel reservoirs and activates alarms and/or shut down at a predetermined minimum level. These instruments are built for low pressure systems with a maximum of 25 psi (172 kPa) [1.72 bar].

[1] EL150EX Models are CSA Listed for Class I, Division 1, Group C & D Hazardous Locations.

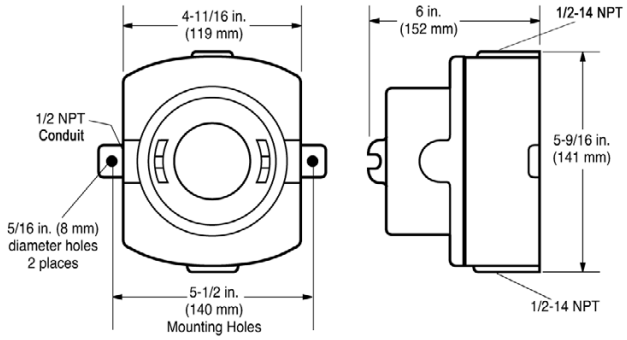
[2] Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

Dimensions

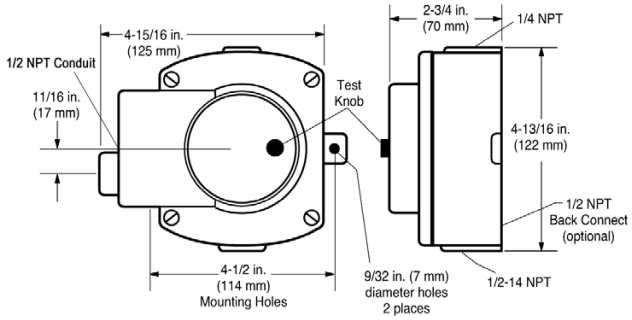
L150



EL150EX

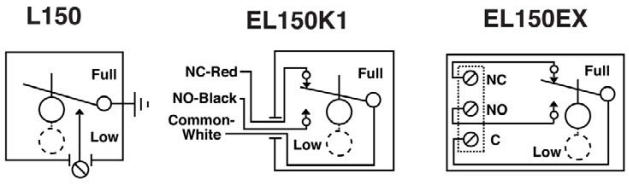


EL150K1



Standard Electrical Diagrams

WARNING: This typical wiring diagram is shown for clarity only. It is not intended for use as installation instructions.



Specifications

L150

Maximum Temperature: 250° F (121° C)
Maximum Operating Pressure: 25 PSI (172 kPa)
Case: Die cast aluminum, polyurethane coated; approximate dimensions; 4-1/2 x 4-3/4 x 2-3/4 in. (114 x 121 x 70 mm)
Mounting Holes: (2) 9/32 in. (7 mm) diameter at 4-1/2 in. (114 mm) on center
Float: Brass
Lens: Polycarbonate
O-rings: Saturated Nitrile, are suitable for coolant or hydrocarbons
Gasket: Nitrile
Vent Tube: 1/4 x 5 in. (6 x 127 mm) copper cane with 1/4 NPT x 1/4 in. (6 mm) tube fitting
Contact Rating: 2 A @ 30 VAC/DC. Wire: (1) 16 AWG x 26 in. (1.5 mm 2 x 660 mm) with terminals
Shipping Weight: 29 oz. (0.82 kg.)
Shipping Dimensions: 5-1/4 x 5-1/4 x 5-1/2 in. (133 x 133 x 140 mm)

EL150K1

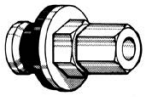
Maximum Temperature: 250° F (121° C)
Maximum Operating Pressure: 25 PSI (172 kPa)
Case: Die cast aluminum, polyurethane coated; approximate dimensions; 5 x 4-3/4 x 2-3/4 in. (127 x 121 x 70 mm)
Enclosure Rating: IP35
Mounting Holes: (2) 9/32 in. (7 mm) diameter at 4-1/2 in. (114 mm) on center
Float: Brass
Lens: Polycarbonate
O-rings: Saturated Nitrile, are suitable for coolant or hydrocarbons
Gasket: Nitrile
Vent Tube: 1/4 x 5 in. (6 x 127 mm) copper cane with 1/4 NPT x 1/4 in. (6 mm) tube fitting
Snap-Switch: SPDT rated 10 A @ 125 VAC; 0.5 A @ 125 VDC; 10 A 30 VDC
Wire: (3) 18 AWG x 14 in. (1 mm 2 x 356 mm)
Shipping Weight: 42 oz. (1.2 kg.).
Shipping Dimensions: 5-1/4 x 5-1/4 x 5-1/2 in. (133 x 133 x 140 mm)

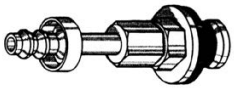
EL150EX

Maximum Temperature: 250° F (121° C)
Maximum Operating Pressure: 25 PSI (172 kPa)
Case: Sand cast aluminum, painted; approximate dimensions; 6-1/2 x 5-3/4 x 5-1/4 in. (165 x 146 x133 mm)
Mounting Holes: (2) 5/16 in. (8 mm) diameter at 5-1/2 in. (140 mm) on center
Float: 304 Stainless steel
Lens: Tempered glass
O-rings: Saturated Nitrile, suitable for coolant or hydrocarbons
Gasket: Nitrile
Vent Tube: 1/4 x 5 in. (6 x 127 mm) copper cane with 1/4 NPT x 1/4 in. (6 mm) tube fitting and 1/2 NPT to 1/4 NPT reducer fitting
Snap-Switch: SPDT rated 10 A @ 125 VAC; 0.5 A @ 125 VDC; 10 A 30 VDC
Wire: Wired to terminal block
Laboratory Approvals: CSA Listed for Hazardous Locations Class I, Division 1, Groups C & D
Shipping Weight: 5 lbs. (2.26 kg.)
Shipping Dimensions: 6-1/2 x 6-3/4 x 6-3/8 in. (165 x 171 x 162 mm)

Radiator Fittings

Murphy PS, PS Barbed and PS-D fittings allow the installation of the L150 / EL150K1 to the radiator when a fitting is not available.


15-00-0107 (PS)


15-01-0167 (PS Barbed)

How to Order

Part Number	Model and Description	Notes
15000138	All parts except case and body	L150 Repair Kits
15000101	Case/body assembly	
15000139	All parts except case and body	EL150K1 Repair Kits
15000101	Case/body assembly	
15000100	Lens/switch assembly	
15000110	Cover and float assembly	EL150EX Repair Kits
15000108	Lid assembly	
15000109	Switch/terminal assembly	
15000107	Radiator fitting (PS), thin wall, 1/4 in. (6 mm) tube fitting	Accessories
15010202	Radiator fitting (PS-D), for diesel or oil, thick wall (to 1/4 in. [6 mm]), accepts 1/2 in. (13 mm) I.D. hose or 1/4 in. (6 mm) O.D. tubing	
15010167	Radiator fitting (PS Barbed), thin wall, 1/4 in. (6 mm) tubing or hose	
15700854	Visor Kit, EL150K1 (knob guard)	

Lube Level Maintainer
LM500/LM500-TF

The LM500 maintains oil level on any size engine. It also supports installations that require a three-wire, snap-action switch. The form C (three-wire) contact allows a controller/annunciator to be wired as a closed-loop system, resulting in a reliable fault-sensitive circuit. Refer to LM500 Series Flow Rate Chart for application data.

The Murphy LM500-TF Oil Level Maintainer includes a test feature that confirms both the float and switch are operating correctly with a single press of the test button. The LM500 series maintains the crankcase oil level of an engine, pump or compressor. Adjusted to the correct running oil level, it will replenish oil as it is used. The low-level switch will alarm and/or shut-down the equipment, if supply oil is lost and the equipment continues to use oil.

As crankcase oil level drops, the LM500 float also drops and opens the Thumb-Valve™. This allows oil to flow from the supply tank through the LM500 and into the crankcase. When proper level is achieved in the crankcase, the LM500 float rises causing the Thumb-Valve to close off further oil flow.

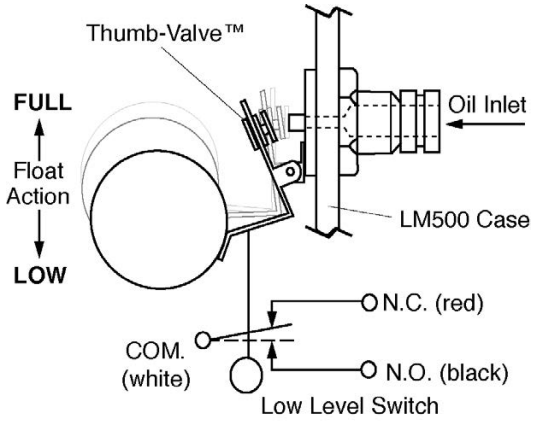
The simple and unique Thumb-Valve is non-clogging and provides a positive, leak-free seal.

If the clean oil supply is depleted and oil level continues to fall, the low-level switch will operate an alarm or equipment shutdown.

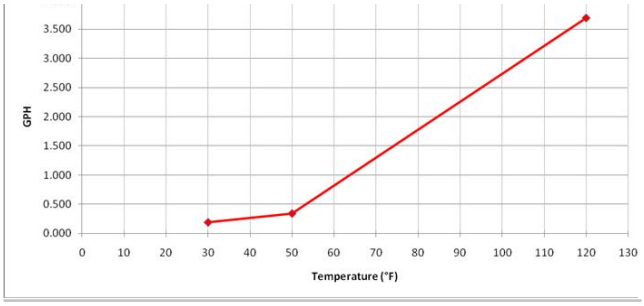
Specifications

Crankcase Balance Vent Connection: 1/2 NPTF (top)
Inlet Connection: 1/2 NPTF removable screen (side)
Outlet Connection:
2 x 3/4 NPTF (side)
1 x 3/4 NPTF (bottom)
Thumb-Valve™ Material: Viton
Snap-switch: SPDT rating 10 A, 125 VAC; 0.5 A, 125 VDC; 10 A, 30 VDC
Wire leads: 18 AWG x 14 in. ± 2 in. (355 mm) length
Conduit Connection: 1/2 inch conduit (female, top)
Case: Die cast aluminum
Lens: Clear Frog Eye non-staining, high-impact, high temperature polycarbonate; UV and heat stabilized
Dial: High visibility white background with solid green band for normal level indication
Maximum Inlet Pressure: 9.50 psi/25 ft. oil (head pressure)
Maximum Case Pressure: 15 psi (103 kPa)
Maximum Differential: 2 in. (51 mm) between running and stopped
Maximum Ambient Temperature: 250°F (121°C)
Float: 304 Stainless Steel
Flow Rates: Refer to LM500 Series Flow Rates chart for application data
Dimensions: Overall 6-9/16 in. (H) x 6-3/16 in. (W) x 3-1/2 in. (D)
LM500/LM500-TF Shipping Dimensions: 9.5 (W) x 7.5 (D) x 11 in. (H) (241.3 (W) x 190 (D) x 279.4 mm (H))
LM500/LM500-TF Shipping Weight: 3 lbs. 13.44 oz (1.74 kg)

Thumb-Valve™ Operation



LM500 Series Flow Rates

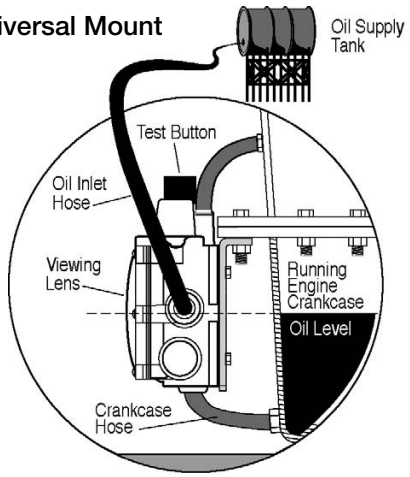


Mounting Brackets with Hardware

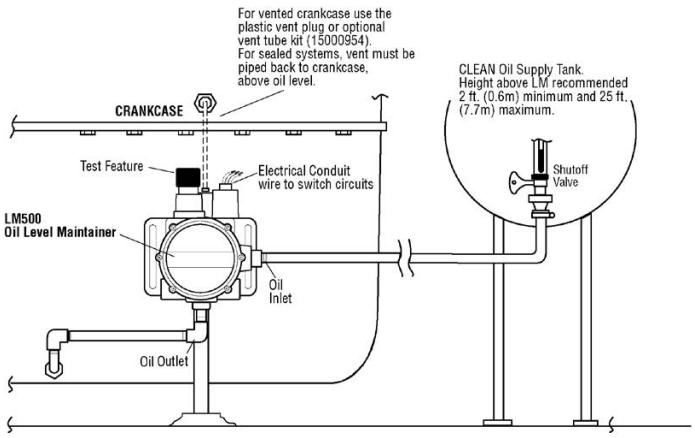
In addition to the direct mounting option, Enovation Controls offers two mounting brackets for the LM500. The pipe bracket fits a 7/8 in. (22 mm) diameter pipe (see typical installation). The Universal Flange Kit allows various mounting methods. For exact dimensions visit www.enovationcontrols.com

Typical Installations

Universal Mount

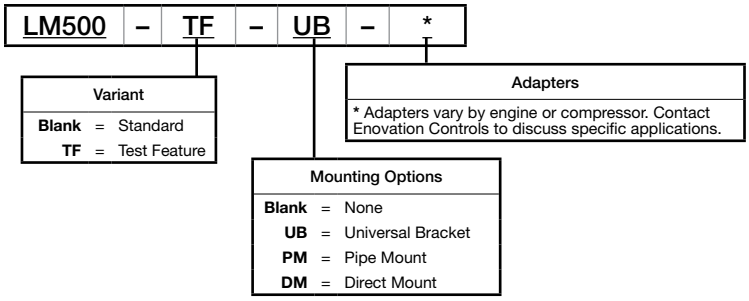


Pipe Mount



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
15000954	Vent Fittings Kit	one tubing vent, one 1/4 x 1/2 NPT connector
15000355	Hose Kit	one - 1/2 in. (13 mm) I.D. x 3 ft. (914 mm) hose one - 1 in. (25 mm) I.D. x 3 ft. (914 mm) hose two - 1/2 in. (13 mm) worm gear clamp two - 1 in. (25 mm) worm gear clamp two - 1/2 NPT x 1/2 in. (13 mm) barbed fitting two - 3/4 NPT x 1 in. (25 mm) barbed fitting
89080801	1/2 NPT x 1/2 in. Hose Barbed Fitting	
89081001	3/4 NPT x 1 in. Hose Barbed Fitting	
15000518	Pipe Bracket Kit	
15000519	Universal Flange Kit	
15000532	Bubble Lens Kit	
15000943	Fittings Kit	one tubing vent; one hose barb, 1/2 NPT to 1/2 Hose; one hose barb, 1” ID hose x 3/4 NPT; one connector, 1/4 x 1/2 NPT

Level Maintainer
LM300 Series

The LM300 Series Level Maintainer automatically adds oil to the crankcase as needed to keep the lube level normal. Most models have built-in switches that will alarm and/or shut down the equipment if the makeup supply is depleted and engine oil level falls or if overfill conditions exist. The LM300 can be used in engines, compressors, pumps and coolers.

The LM300 Series EX models (explosion-proof) are CSA certified for Class I, Division 1 Hazardous areas.

*Products covered by this bulletin comply with Directive: 2004/108/EC (European Electromagnetic Compatibility). European Harmonised standard: EN 61000-6-3:2007 (Emissions). EN 61000-6-1:2005 (Immunity)

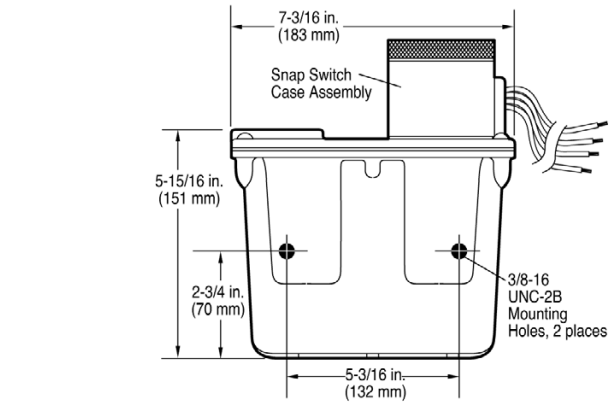
Specifications

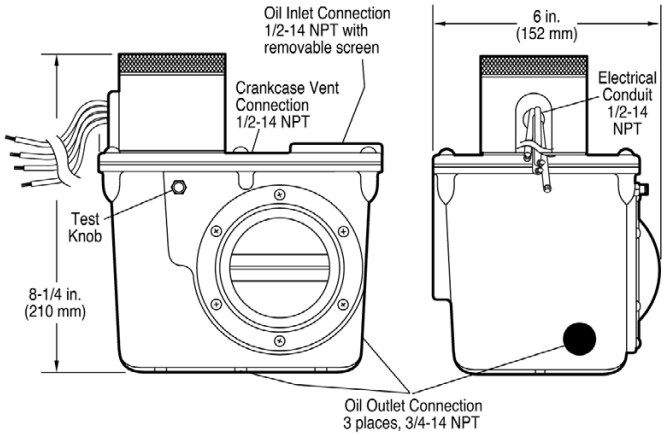
Case/Cover: Die cast aluminum
Switch Housing: Aluminum
Approval Rating: All CSA Certified with switch contacts rated at 10 A at 250 VAC (standard)
LM301 through LM305:
CSA certified for non-hazardous locations. Enclosure Type 4 certified
LM301-EX through LM305-EX:
CSA certified for Class I, Groups C and D; Class II, Groups F and G hazardous locations. Enclosure Type 4 certified.
Float: Rigid polyurethane foam; Polyurethane coated
Max. Ambient Temperature: 250° F (121° C)
Oil Inlet Connection: Top entry 1/2-14 NPT with built-in filter screen (removable for cleaning)
Inlet Orifices: 1/4 in. (6 mm) standard; 1/8 in. (3 mm) available
Wire (switch models): 18 AWG x 13 in. (1.0 mm^2 x 330 mm)
Max. Inlet Pressure (MIP):
30 psi (207 kPa) [2.07 bar] with 1/8 in. (3 mm) orifice
15 ft oil (4.6 m oil) with 1/4 in. (6 mm) orifice
Max. Differential: 2 in. (51 mm) between running and stationary oil level
Max. Case Pressure (MCP): 15 psi (103 kPa) [1.03 bar]
Orifice Seal: Buna-N Thumb-Valve
Switch Contact: Silver, SPDT snap-acting, rated at 10 A @ 125, 250 VAC; 10 A @ 30 VDC (1 only for low level; 2 only for high and low; or 2 only for low level with alarm before shutdown)
Outlet Connection: 3/4-14 NPT left side, right side and bottom
Crankcase Balance Vent Fitting: 1/2-14 NPT
Mounting: Accepts Murphy pipe or universal mounting brackets
Lens: Clear Frog Eye non-staining, high-impact, high-temperature nylon; UV and heat stabilized
Glass Lens: Available on LM301 and LM301-EX models. Specify GL as part of model number when ordering
Dial: High visibility white background with green and white index lines for normal level indication
Test Knob: Rotate to test switch operation. Turn clockwise for low level test and turn counterclockwise for high level test.

Flow Rate Test Using SAE 30 @ 32° F (0° C)		
Orifice Diameter	**Pressure**	**Flow Rates**
1/4 in. (6 mm) (Standard)	4 ft. oil – 15 ft. oil (1.2 m oil – 4.6 m oil)	4.7 GPH - 31.0 GPH (17.8 LPH - 117.3 LPH)
1/8 in. (3 mm)	10 psig – 30 psig (68.9 kPa – 207 kPa) [.69 – 2.07 bar]	16.9 GPH - 32.1 GPH (63.7 LPH - 121.5 LPH)
NOTE: Friction losses due to piping not considered		

Dimensions

Explosion-proof model shown.
Non-explosion proof models are smaller in height and width 7 in. (178 mm) H, 7-7/8 in. (200 mm) W.

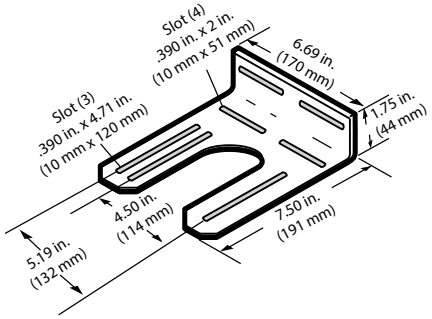




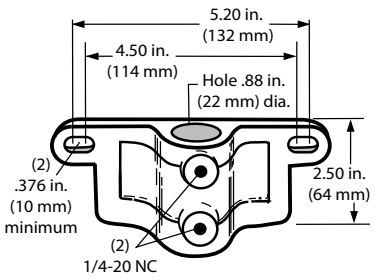
Mounting Brackets with Hardware

Universal Bracket

Universal Bracket 15000370	
QTY	Description
2	Bolt, 3/8-16 UNC x1 in.
2	Nut, 3/8-16
2	Lock Washer, 3/8 I.D.
4	Flat Washer, 3/8 I.D.



Pipe Bracket



Pipe Bracket 15000371	
QTY	Description
2	Bolt, 3/8-16 UNC x 1 in.
2	Hex Nut, 3/8-16
2	Lock Washer, 3/8 I.D.
2	Flat Washer, 3/8 I.D.
2	Screw 1/4-20 x 1 in.
2	Lock Washer 1/4 in. I.D.
2	Hex Nut 1/4-20 x 7/16 in.

Base Model Descriptions

LM300: Level Maintainer only (no switches).

NOTE: All models except LM300 are available in explosion-proof enclosure.

LM301: Low switch contacts for low-level shutdown or alarm. Four wires, SPDT.

LM302: Two switches for low-and high-level shutdown or alarm. Four wires, DPST, wired N.O. in normal operating ranges.

LM303: Two switches for low-and high-level shutdown or alarm. Four wires, DPST, wired N.C. in normal operating ranges.

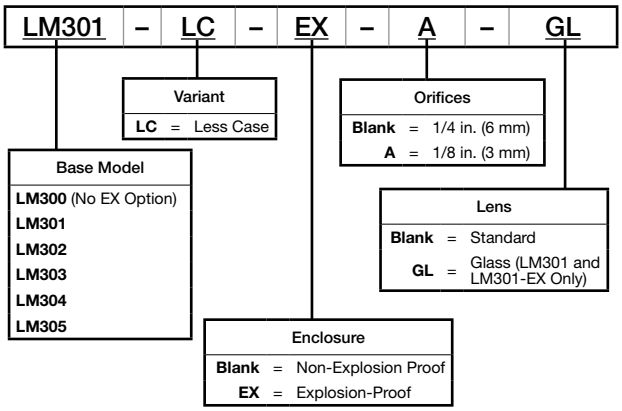
LM304: Two switches. Alarm before shutdown on low level and shutdown on low-low level. Four wires, DPST, wired N.O. in normal operating ranges.

LM305: Two switches. Alarm before shutdown on low level and shutdown on low-low level. Four wires, DPST, wired N.C. in normal operating ranges.

How to Order

Use the Model Number Chart to build a model number for your application. Call your sales representative or Enovation Controls for more information, parts availability and ordering.

Model Number Chart



Shipping Weights:
LM300 Series non-EX models: 6 lbs. 6 oz. (2.89 kg)
LM300 Series EX models: 6 lbs. 12 oz. (3.06 kg)

Shipping Dimensions (all LM300 Series):
10-5/8 x 8-7/8 x 6-3/4 in. (270 x 225 x 171 mm)

Additional Order Items

Part Number	Description
15000370	Universal Bracket Kit
15000371	Pipe Bracket Kit
15000354	Bubble Lens Assembly
15000355	Hose Kit
15000539	Glass Lens Kit (LM301 and LM301-EX only)
15000357	Regulator Float Repair Kit

15000355 Hose Kit Parts	
Quantity	Description
1	1/2 in. (13 mm) I.D. x 3 ft. (914 mm) long hose
1	1 in. (25 mm) I.D. x 3 ft. (914 mm) long hose
2	1/2 in. (13 mm) worm gear clamp
2	1 in. (25 mm) worm gear clamp
2	1/2 NPT x 1/2 in. (13 mm) barbed fitting
2	3/4 NPT x 1 in. (25 mm) barbed fitting

Float Actuated Oil Level Swichgage®

For Small Engines and Pumps

The Float Actuated Oil Level Swichgage instruments are a combination oil level sight gage and adjustable, low and/or high limit switch. The limit switches are normally open during operation — yet closed if the level drops (or rises) to where the float contacts the limit screw. The contact completes a circuit to ground a magneto or trip a Murphy magnetic switch. The magnetic switch can be used to activate alarms and/or shut down. Models are also available without limit switches.

The level instruments can be used on a variety of crankcases, pump gearcases or oil reservoirs — primarily on small engines and pumps. Installation is simple, and these instruments save on reduced downtime and repair costs.

The following list displays the model and its typical application:

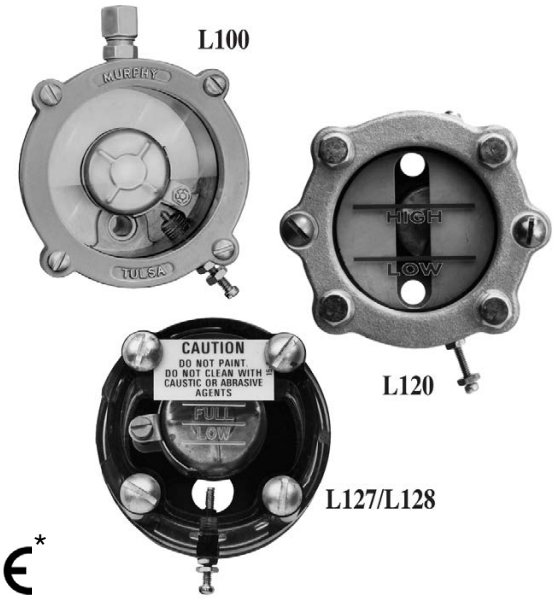
L100†: Small engines and pumps with non-vented crankcase

L100W†: Small engines and pumps with vented crankcase

L120: Machined surface on crankcase such as Witte, National-Oilwell/Garland

L127: Machined surface on crankcase, specifically, Fairbanks-Morse ZC Series and Bell Engines

L128: Machined surface on crankcase, specifically, Arrow and Continental Emsco/Climax

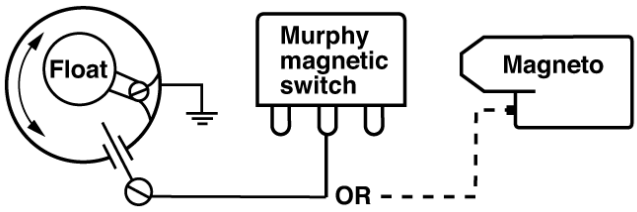


CE*

* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

Typical Wiring

Below is a typical wiring diagram for a level Swichgage instrument. A Swichgage instrument can be connected to a Murphy magnetic switch or magneto. Switch Contact Rating is 2 A @ 30 VAC/DC resistive.



† Models available with high and low options.

Specifications

Maximum Pressure Rating (all models):
30 psi (207 kPa) [2.07 bar]

L100 and L100W
- **Case:** Die cast aluminum
- **Float:** Brass
- **Rating:** 2 A @ 30 VAC/DC
- **Vent Fitting:** 1/4 in. (6 mm) tube x 1/8 NPT
- **Inlet Fitting:** Hex Nipple 1/4 NPT

Hardware (shipped loose)

L100:
- **Copper Tubing:** 1/4 x 48 in. dia. (6 mm x 1.2 m)
- **Reducer Bushing:** 1/2 NPT x 1/4 NPT
- **Close Nipple:** 1/2 NPT
- **Tee:** 1/2 NPT, black pipe
- **Wire:** 16 AWG x 24 in. (1.5 mm^{2}x 610 mm)

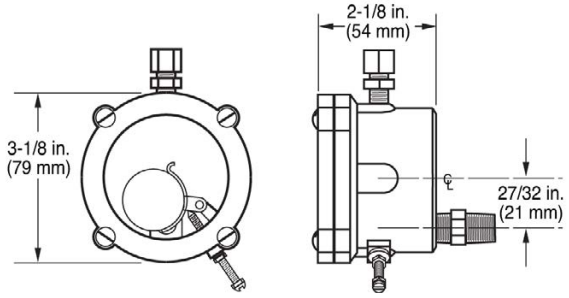
L100W:
- **Vent Tube:** 1/4 x 3-3/8 in. (6 x 86 mm)
- **Reducer Bushing:** 3/4 NPT x 1/4 NPT
- **Close Nipple:** 3/4 NPT
- **Tee:** 3/4 NPT, black pipe
- **Wire:** 16 AWG x 24 in. (1.5 mm^{2}x 610 mm)

L120
- **Case:** Cast Aluminum
- **Float:** Brass
- **Rating:** 2 A @ 30 VAC/DC
- **Mounting Bolts:** 1/4-20 UNC–2A (4 required)

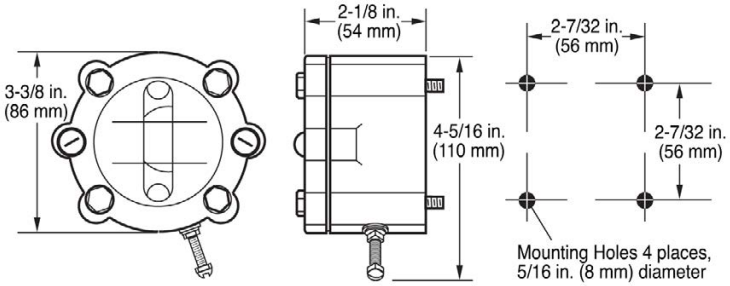
L127 and L128
- **Case:** TROGAMID Nylon
- **Float:** Brass
- **Rating:** 2 A @ 30 VAC/DC
- **Wire:** 16 AWG x 48 in. (1.5 mm^2 x 1.2 m)
- **Mounting Bolts:**
  - **L127:** 1/4-20 NC x 2 in. (4 required)
  - **L128:** 3/8-16 NC x 3/4 in. (2 required)

Dimensions

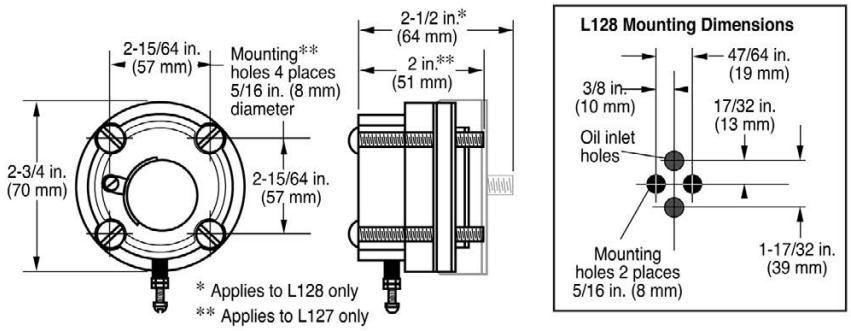
L100 and L100W



L120



L127 and L128



How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

L100 – [Options]

Base Model		
L100	=	Sight Gage with Low Limit Switch. Used with Small Engines and Pumps with Non-vented Crankcase.
L100W	=	Sight Gage with Low Limit Switch. Used with Small Engines and Pumps with Vented Crankcase.
L120	=	Sight Gage with Low Limit Switch. Used with Machined Surface on Crankcase, such as Witte, National-Oilwell/ Garland.
L127	=	Sight Gage with Low Limit Switch. Used with Machined Surface on Crankcase, specifically, Fairbanks-Morse ZC Series and Bell Engines.
L128	=	Sight Gage with Low Limit Switch. Used with Machined Surface on Crankcase, specifically, Arrow and Continental Emsco/Climax.

Options		
Blank	=	Low Contact

Shipping Weight:
L100: 2 lbs. (0.91 kg)
L100W: 2 lbs. (0.91 kg)
L120: 1 lb. 8 oz. (0.68 kg)
L127: 8 oz. (0.23 kg)
L128: 10 oz. (0.36 kg)

Shipping Dimensions:
L100: 5-1/4 x 5-1/4 x 5-1/2 in. (133 x 133 x 140 mm)
L100W: 4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)
L120: 4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)
L127 and L128: 4-3/4 x 4-3/4 x 3-1/4 in. (121 x 121 x 83 mm)

Lube Level Swichgage® Instrument

L129 Series

The L129 Series Lube Level Swichgage instrument is a combination lube level indicating gage and adjustable low and high limit switches. It provides protection against low oil level or high level caused by overfill or fuel or water seepage into the crankcase.

A 6-3/4 inch (171 mm) deep sight gage allows you to check the condition and level of your oil without shutting down the equipment.

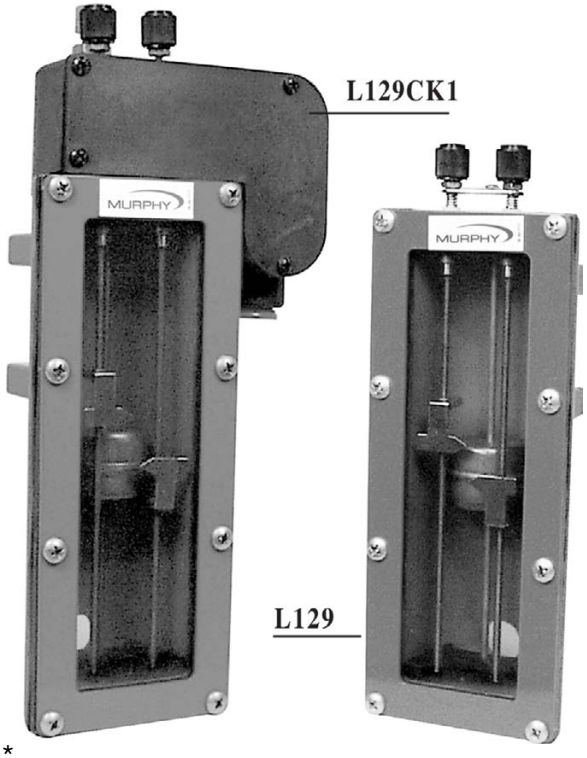
Fingertip adjustable limit contacts, through 4-7/8 inch (122 mm) range, make it simple to set high and low limit contacts. If the float touches the high or low limit contact, a normally open circuit will be completed which can activate alarms and/or shut down the equipment.

There are two models in the L129 Series: L129 and L129CK1. The L129 model is designed for grounded, low voltage electrical systems. It features a one-wire-to-ground electrical circuit. The L129CK1 was designed for applications requiring a three-wire, above ground electrical circuit. It features ungrounded contacts and a conduit hub to protect electrical wiring. Options are available for both models.

A flow restrictor plug is available that restricts oil flow from the crankcase to the L129 Series switch and vice versa. It is typically used on applications where the engine is not stationary such as marine and mobile equipment.

When properly installed and maintained, the L129 Series Lube Level Swichgage can monitor and protect engines and pumps from improper lubrication level, which can result in extensive damage.

The L129 Series is recommended for engines and pumps with larger crankcase capacity. Although designed primarily for stationary engines, the L129 Series is often used in mobile applications such as marine, rail and some large off-highway trucks.



CE*

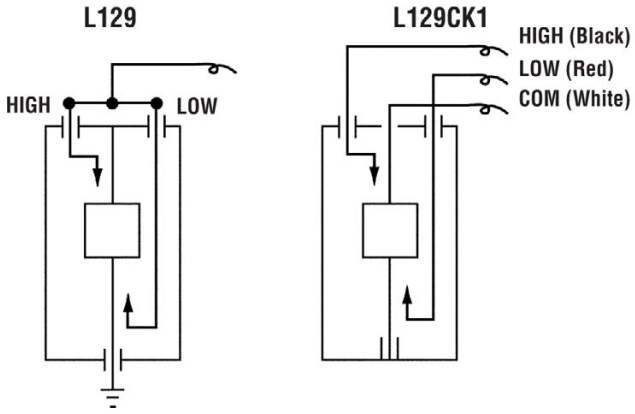
* Products covered by this bulletin comply with EMC Council directive 89/336/EMC regarding electromagnetic compatibility except as noted.

Specifications

Case: Die-cast aluminum
Lens: Tempered glass
Maximum Working Pressure: 10 psi (68.9 kPa)
Process Connection: 1/2 NPT
Float Material: Brass
Contact Rating: 2 A @ 30 VAC/DC, pilot duty
Shipping Weight:
L129: 3 lb. (1.4 kg)
L129CK1: 3 lb. 9 oz. (1.6 kg)
Shipping Dimensions (both models): 12 x 4-1/2 x 4-3/4 in. (305 x 114 x 121 mm)

Wiring

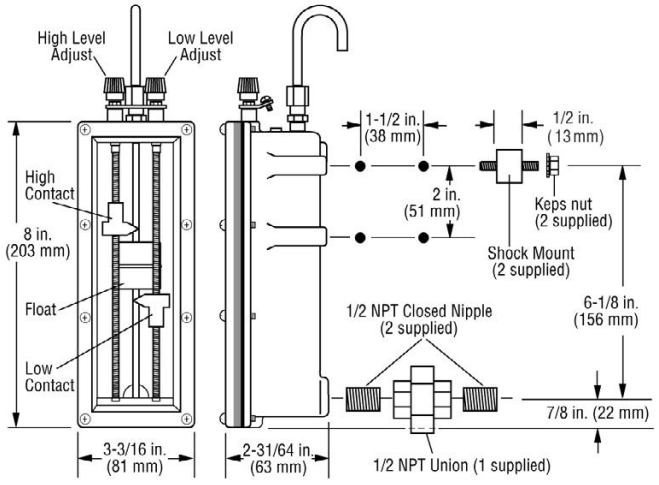
These diagrams are shown with the float in the full position.



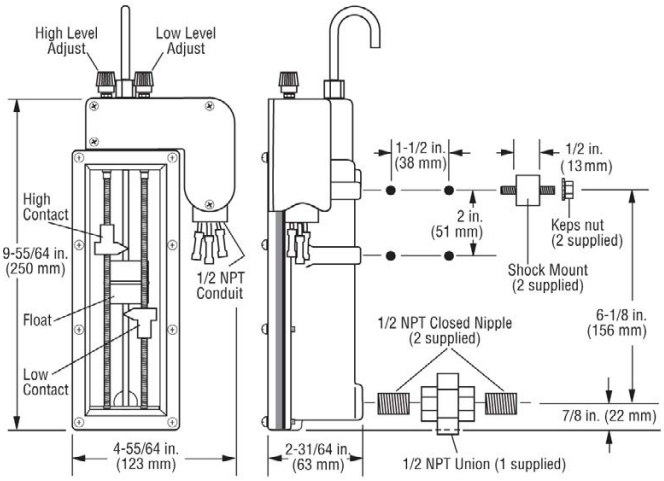
Contact Rating: 2 A @ 30 VAC/DC, pilot duty

Dimensions

L129



L129CK1



How to Order

Part Number	Description	Notes
15000888	Full repair kit (less castings and glass assembly) for date code T2 and later	For L129
15000480	Bezel, glass and gasket set for date code W7 and later	
15000485	Glass and gasket set for all date codes	
15050241	Restrictor plug for all date codes	

Crankcase Level Switch

L971 Series

The Murphy L971 Series Level Switch detects low oil level in a compressor's crankcase. As oil level in the crankcase depletes, the float on the L971 switch falls, and when reaching the predetermined limit, it will trip the internal snap-switch sounding an alarm or initiating shutdown.

The L971 is designed for Ingersoll-Rand Type 30, Type 40 and ESH compressors, yet it can be adapted to fit other compressors that have an inspection plate extending below normal operating oil level. It installs with minimal downtime and has a two-year limited warranty.

The L971 has a 1/2 NPT process connection and features an explosion-proof enclosure, durable SPDT snap-switch and rigid polyurethane foam float. A 304 stainless steel float is available on certain configurations.

* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

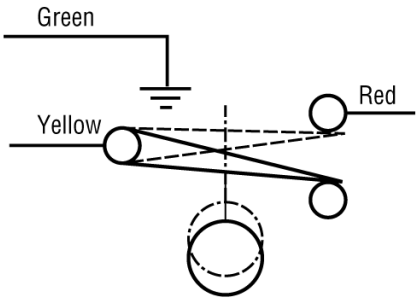
Specifications

Operating Temperature Range: -15 to 275°F (-26 to 135°C)
Maximum Working Pressure: 30 psi (206 kPa) [2.06 bar]
Switch Rating: 4 A @ 250 VAC
Case: Aluminum (explosion-proof)
Mounting Adaptor: Brass
Floats: Rigid polyurethane. 304 stainless steel available on L971-C only
Other Wetted Parts: 303, 304, and 316 stainless steel
O-Ring Seals: Viton and Buna
Process Connection: 1/2 NPT
Hazardous Location Rating: UL and CSA listed for Class I, Groups C & D; Class II, Groups F & G.
Enclosure Type / Ingress Protection Rating: IP66 per IEC 60529.
Conduit Connection: 1/2 NPT
Wire: 18 AWG (0.75 mm^2)
Shipping Weight: 1 lb. 10 oz. (0.7 kg)
Shipping Dimensions: 8-1/4 x 4-1/4 x 4-1/2 in. (210 x 108 x 114 mm)

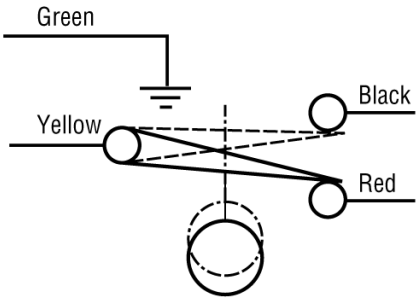
Wiring

Diagrams are shown in the shelf position with no force acting upon float.

L971-A



All Other Models

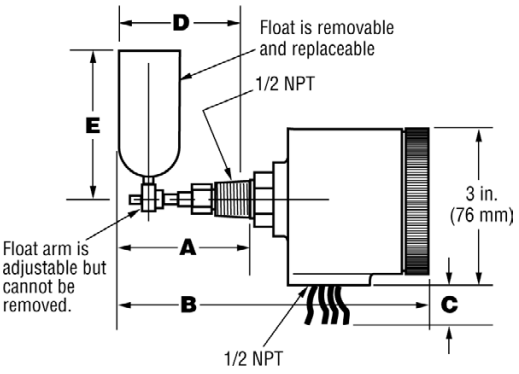


Warranty — A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to www.enovationcontrols.com/warranty

Dimensions

Dimensions are inches (millimeters).

Model	A	B	C	D	E
L971	2-5/8 (67)	5-7/8 (149)	30 (762)	2-1/2 (64)	2-27/32 (72)
L971-A	2-5/8 (67)	5-7/8 (149)	30 (762)	2-1/2 (64)	2-27/32 (72)
L971-B	4-13/16 (122)	8-1/16 (205)	30 (762)	4-5/8 (117)	2-27/32 (72)
L971-C	2-13/16 (71)	6-1/16 (154)	30 (762)	2-7/8 (73)	3-1/8 (79)
L971-D	3-7/8 (98)	7-1/8 (181)	30 (762)	3-3/4 (95)	2-27/32 (72)
L971-E	4-13/16 (122)	8-1/16 (205)	30 (762)	5-1/8 (130)	2-27/32 (72)
L971-F	2-5/8 (67)	5-7/8 (149)	40 (1016)	2-1/2 (64)	2-27/32 (72)
L971-G	2-5/8 (67)	5-7/8 (149)	40 (1016)	2-1/2 (64)	2-27/32 (72)



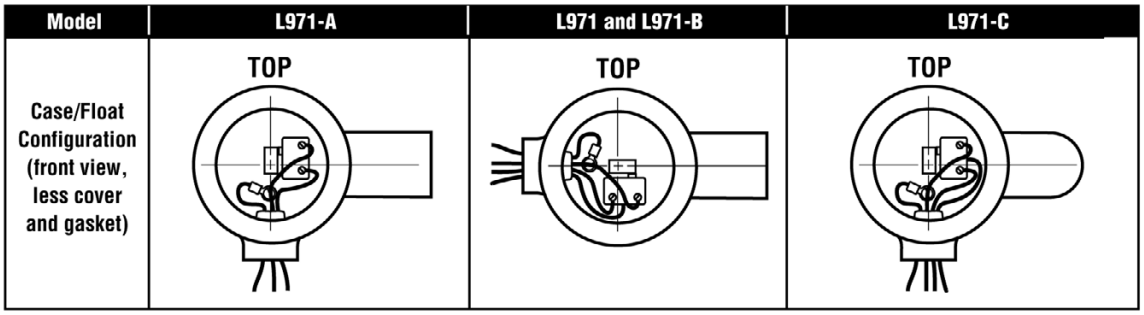
How to Order

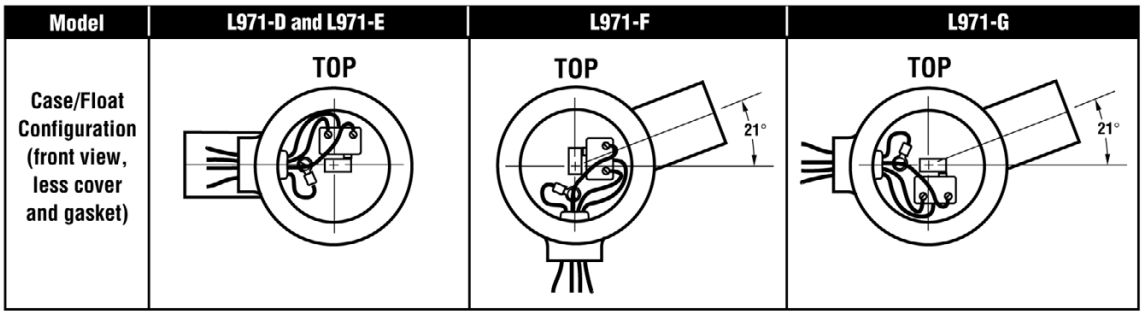
Options are ordered by Case/Float Configurations. Please reference the Case/Float Configuration Diagram and the Dimensions for each model. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

L971 – A

Case/Float Configuration					
Blank	=	Standard Configuration	**D**	=	Configuration D
A	=	Configuration A	**E**	=	Configuration E
B	=	Configuration B	**F**	=	Configuration F
C	=	Configuration C	**G**	=	Configuration G

Case/Float Configuration Diagram for L971 Models





NOTE: Switches shown tripped on falling level.

Part Number	Description	Notes
15000449	Float kit for L971	Accessory

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Selectronic® Digital Tachometer

MT90 Model

The Murphy Selectronic MT90 digital tachometer offers high accuracy and dependability resulting from use of a quartz crystal time-base and digital, solid-state electronics.

Tachometer power is supplied by either a Murphy magnetic pickup mounted at the flywheel ring-gear of an engine or by a 12-, 24- or 32-volt DC battery system.

RPM data is supplied by either a Murphy magnetic pickup or by the alternator in your battery charging circuit. The MT90 tachometer also has backlighting for easy readings in low-lit areas. This lighting requires a battery power source.

The MT90 is calibrated to engine RPM by setting a series of calibration rotary switches on the back of the tachometer. The proper switch sequence for the engine is determined by (1) the number of ring gear teeth for the magnetic pickup or (2) by the ratio of alternator to engine pulley diameter and the number of poles of the alternator.

Typical applications include: generators, compressors, industrial engines, oil field equipment, marine vessels, vehicles, farm equipment and construction equipment.

Specifications

Signal Input Voltage: 4 to 35 Vrms from a magnetic pickup or alternator*

Pulses per Revolution: 3 to 999

Power Requirements

Pickup Power: 4-35Vrms*

Battery Power: 8-40 VDC (12, 24, 32 volt)

Current:

Tach backlight Off, 4mA @ 40 VDC

Tach backlight On, 25 mA @ 40 VDC

Case: 1018 polycarbonate/polyester blend

Lens: Polycarbonate

Bezel: #430 Stainless Steel

Display: LCD, 4-digit, seven segment

Operating Temperature: -4° to 158° F (-20° to 70° C)

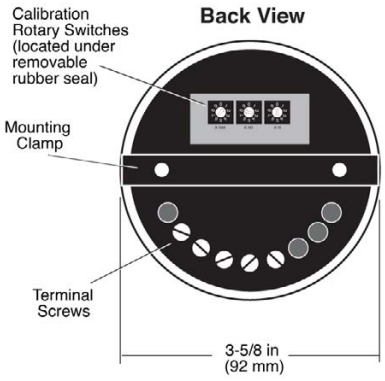
Storage Temperature: -13° to 185° F (-25° to 85° C)

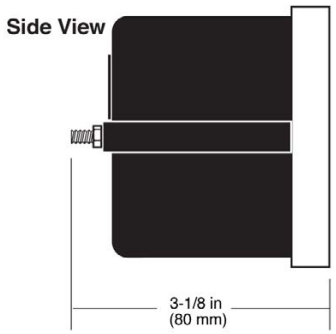
Mounting Hole: 3-7/16 in. (87 mm)

Shipping Weight: 14 oz. (0.4 kg)

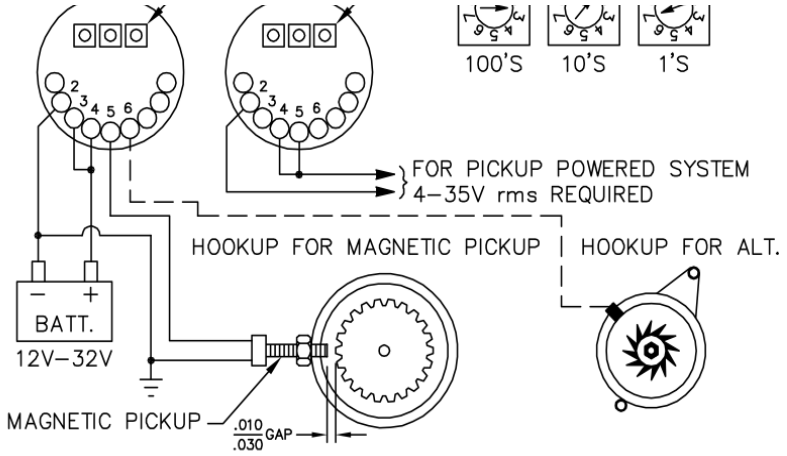
Shipping Dimensions: 5-1/2 x 5-1/2 x 5-1/2 in. (140 x 140 x 140 mm)

Dimensions





Connection Diagram

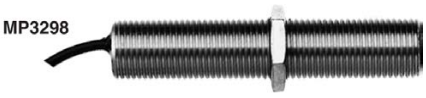


DIGITAL TACHOMETER

TO READ RPM:
SET SWITCHES FOR TEETH/
PULSES PER REVOLUTION

TO READ HERTZ:
SET AT 60

Magnetic Pickups



Pickup Models	Total Length	Threaded Length	Thread Size
MP3298*	3 in. (76 mm)	3 in. (76 mm)	5/8-18 UNF
MP7906+	3 in. (76 mm)	3 in. (76 mm)	3/4-16 UNF
MP7905±	4-1/2 in. (114 mm)	4-1/2 in. (114 mm)	3/4-16 UNF

* Replaces 20-01-0080 and MP100. Lead wire hookup (12 in. [305 mm])
\+ Replaces 20-01-0081. Lead wire hookup (12 in. [305 mm])
± Replaces 20-01-0082. Lead wire hookup (12 in. [305 mm])

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

MT90	–	1	–	A

Face Plate	
1	= White Background

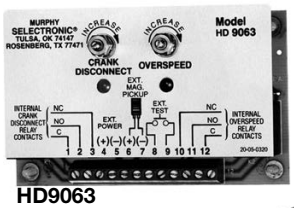
Bezel	
Blank	= Bright Stainless
B	= Black Stainless

Electronic Speed Switches

HD9063, OS77D and SS300 Series

Murphy Electronic Speed Switches are available in various configurations to cover a wide variety of applications. These compact devices receive their input signal from various sources depending upon the particular speed switch model and application. They are available in single or dual switch point models, and the switch point(s) are field adjustable.

Models are available in self-contained enclosures and as PC-board design for inclusion in your control cabinet. All Murphy speed switches are designed to operate in harsh environments and have high electrical noise immunity.



HD9063


SS300


OS77D

Series Models Available

SS300 Series: Single set point speed switch with SPDT relay dry contact output.

OS77D Series: Single set point speed sensing module with a transistor output.

HD9063 Series: Dual set point speed switch in a PC board configuration and relay outputs.

Applications

Murphy speed switches applications include operating alarms and equipment shutdown. They are ideal for disconnecting starter cranking on auto start systems or overspeed switching:

- Generators
- Compressors
- Industrial Engines
- Pumps
- Vehicles
- Farm Equipment

Selecting a Speed Switch

In selecting the best Speed Switch for your application, the following factors should be considered:

- **Number of Switch Points**
  How many switch points are needed to perform the speed switching function you require?
- **Available Signal Sources**
  The signal source must provide a minimum frequency and a minimum, but less than maximum, voltage as required by the selected speed switch.
- **What Is the Frequency Output of the Signal Source?**
  The following signal sources can be used with most Murphy Electronic Speed Switches.
  Note: they may additionally provide the signal and/or power source for some Murphy Tachometer/ Tachswich™ instruments.

Magnetic Sensor: The sensor is usually mounted through the flywheel housing so that the sensor tip is in close proximity to the ring gear teeth. Output voltage is dependent upon the amount of the gap between the sensor tip and the gear tooth.

$$\text{Set Point Frequency in Hz} = \frac{\text{No. Gear Teeth} \times \text{RPM Set Point}}{60}$$

Alternator Output: Most industrial engine alternators have an auxiliary or tachometer tap. This tap can provide the signal source for speed switches and tachometers.

$$\text{Set Point Frequency in Hz} = \frac{\text{Pulley Ratio} \times \text{No. of Alternator Poles} \times \text{RPM Set Point}}{120}$$

Ignition Output: This battery ignition signal is commonly used on gasoline and natural gas fueled type engines. The tap is usually located either on the distributor or on the ignition coil. The ignition can be breaker point type or all electronic.

$$\text{For 2 Cycle: Set Point Frequency in Hz} = \frac{\text{No. of Cylinders} \times \text{RPM Set Point}}{60}$$

$$\text{For 4 Cycle: Set Point Frequency in Hz} = \frac{\text{No. of Cylinders} \times \text{RPM Set Point}}{120}$$

Signal Generators: Add-on signal generators produce a voltage and frequency output. Match this output to the requirements of the speed switch selected.

SS300 Series

The SS300 Series are single set point speed switches with SPDT relay dry contact output. The trip point is set by a potentiometer. An LED indicates when the signal source is present. A second LED turns on when the trip point is reached. See Table 1 for available models and requirements. An optional time delay is on board to delay operation of the relay for 2-6 seconds after the set point has been reached.

The SS300 Series speed switch is intended for installation within a weatherproof enclosure to protect it from rain, dust, etc.

Application

Overspeed shutdown. Shuts down the engine if RPM exceeds the preset limit.

Speed sensitive pull-in/drop-out. Engage or disengage PTOs, four-wheel drives, other switch points, etc. according to the engine speed being monitored.

Engine and transmission alarms/shutdowns. Oil pressure in some engines and transmissions varies widely between running and idle speeds. The SS300 Series can select between two pressure switch set points according to speed of the engine or transmission and thus give maximum protection to the equipment while at operating RPM and eliminate nuisance alarms when at idle.

Adjustable differential model. The AD can be adjusted to change the speed range over which the pull-in and drop-out differential of the relay will operate. A typical application is to ensure that engine speed is above a minimum RPM before applying a load but allows a drop in speed of several hundred RPM without disconnecting the load.

Table 1: Models Available and Input Signal

Model No.	Distributor Ignition	Magnetic Pickup	Alternator	Voltage	
				12	24
SS300 (std. model)		X		X	X
SS300-LF (low frequency)	X		X	X	X
SS300-AD (adjustable differential)		X		X	X
SS300-AD-LF (low frq. & Adjst. diff.)	X		X	X	X

Specifications

Power Requirements:
12 VDC (9-16 VDC)
24 VDC (18-30 VDC)

Frequency Signal:

Voltage (all models):
Minimum Input Voltage Signal: 4.5 Vrms
Maximum Input Voltage Signal: 50 Vrms

Maximum Current	12V	24V
Pull In	46 mA	46 mA
Pickup Only	10.5 mA	16 mA

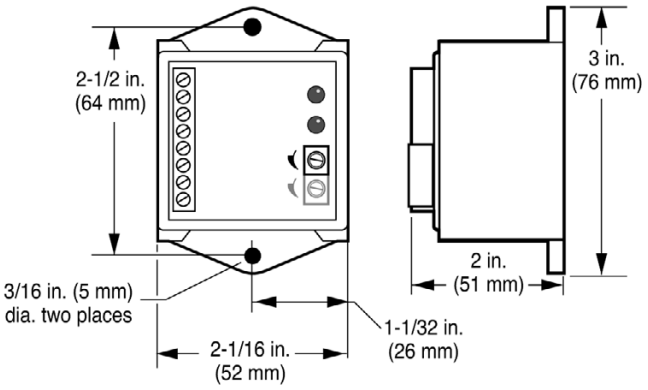
Frequency Range in Hz	Model Number
25-2000	SS300-LF, SS300-AD-LF
625-9000	SS300-AD, SS300

Reset Differential Magnetic Pickup Signal Models:
Standard Models: 2 Hz Differential
AD Models (Adjustable Differential): 650-8900 Hz Adjustable

Reset Differential Alternator Models:
LF Models (Low Frequency): 2 Hz Differential
AD-LF Models (Adjustable Differential Low Frequency): 50-1900 Hz Adjustable

Output: Relay contact, SPDT, resistive load, 6 A, 30 VDC
Time Delay: When terminal 7 is grounded, the relay operation is delayed for 2-6 seconds after RPM set point is reached.
Adjustment: 20–turn potentiometer(s)
Temperature Range: -4° to 185°F (-20° to 85°C)
Relative Humidity: 0 to 95% Non-condensing
Case: Black, ABS plastic

Dimensions



HD9063 Series

The HD9063 Series is a unitized two set point speed switch with SPDT relay outputs. HD9063 is a PC-board configuration with standoffs for mounting in a control panel or cabinet.

The HD9063 provides crank disconnect and overspeed functions. Trip points can be field adjusted on all models. LEDs next to the set point potentiometers indicate that the trip point has been reached and the relay(s) have operated. An overspeed test circuit is built-in. It will actuate the output relay at a point 10 percent below the actual overspeed set point.

Application

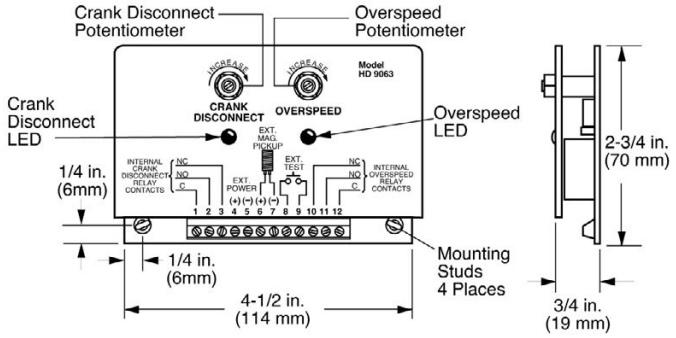
Crank disconnect/overspeed are functions where the HD9063 is used to disconnect the starter on automatic start engine applications and to shut down the engine if an overspeed situation occurs. Re-engagement of the starter is inhibited until RPM returns virtually to zero. Typical applications include: standby generator sets, pumps and compressors.

Specifications

Power Supply: Voltage: 8-30 VDC
Maximum Current: 150 mA
Frequency Signal: (Voltage, Magnetic Pickup Signal Models):
Minimum: 0.35 Vrms
Maximum: 60 Vrms
Maximum Signal: 4.8 µA
Adjustment Range:
Crank Disconnect: 250-6,000 Hz
Overspeed: 1,100-10,000 Hz
Reset Differential, Magnetic Pickup Signal Models
Crank Disconnect: Dropout 160 Hz ± 5%
Overspeed: 200 Hz Differential
Output: Relay Contact, SPDT, Resistive Load: (2) 5 A 30 VDC
Adjustment: (2) 270°–turn potentiometer
Temperature Range: 14° to 158°F (-10° to 70°C)

Mounting Dimensions / Wiring

HD9063



OS77D Series

The OS77D Series single set point speed switch is a compact all-electronic speed sensing module. It can be panel mounted via its trip set point potentiometer. It is field adjustable and gives a transistor output when tripped. Relay models available.

Models are available with Normally Open or Normally Closed circuit and with or without re-crank feature, which inhibits starter re-engagement until the engine speed is near zero RPM.

Application

Overspeed shutdown. Activates engine shut-down circuit on engine overspeed.

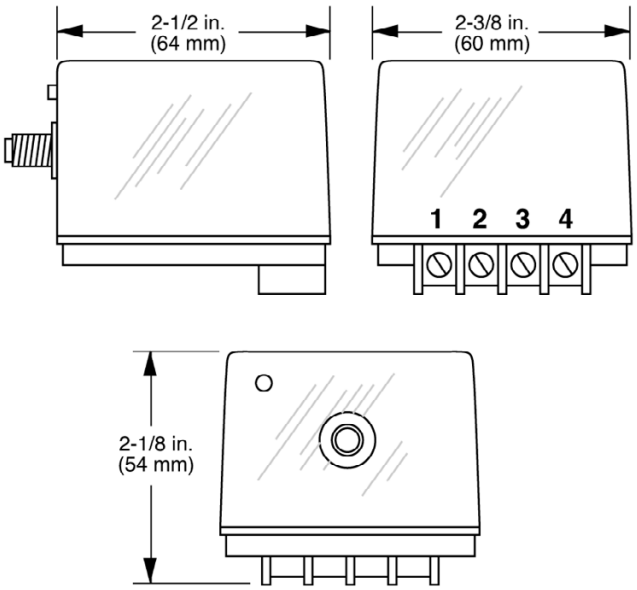
Operate PTOs or drive circuits. Engage or disengage engine PTO, four-wheel drives or other control circuits according to RPM monitored.

Disconnect engine cranking when engine starts.

Specifications

Power Supply: Voltage: 7-28 VDC
Maximum Current: 100 mA
Frequency Signal:
Voltage, Magnetic Pickup Signal Models
Minimum: 1.2 Vrms
Maximum: 30 Vrms
Voltage, Distributor Ignition Models
Minimum: 6 Vrms
Maximum: 30 Vrms
Maximum Signal Current, Magnetic Pickup Signal Models: 0.12 mA
Maximum Signal Current, Distributor Ignition Models: 0.12 mA
Adjustment Range, Magnetic Pickup Signal Models: 1000-10,000 Hz
Adjustment Range, Distributor Ignition Models: 40-400 Hz
Reset Differential, Magnetic Pickup Signal Models
Non-recrank model: 10 Hz Differential
Recrank model: dropout 54 Hz
Reset Differential, Distributor Ignition Models
Non-recrank model: 10 Hz Differential
Recrank model: Dropout 2.4 Hz
Output: Transistor Sink to Ground Resistive Load: 2 A, 28 VDC
Adjustment: 270°–turn potentiometer
Temperature Range: -13° to 185°F (-25° to 85°C)

Dimensions



How to Order

Part Number	Model and Description	Notes
Specify Model Number and Voltage	SS300 Series	See Table 1
Specify Model Number	HD9063 Series	Two set points, PC board mounting, crank disconnect and overspeed
	OS77D-900NTO	Normally Open; 1000- 10,000 Hz, magnetic sensor input
	OS771-040NTO	Normally Open; 40-400 Hz, distributor ignition input

MURPHY by ENOVATION CONTROLS

Hourmeters
TM Series

The TM Series hourmeters record the operating time of vehicles or powered equipment. They are electromechanical and have a quartz base time counter that ensures accuracy (better than ±0.02% over the entire range). They can record up to 99,999.9 hours (9,999.9 for TM612/624) and include an automatic recycle to zero hours feature. The TM Series models have a shock-proof and tamper-proof, totally sealed case made of an engineered plastic. These small, lightweight time meters are rugged and durable. They are the answer to applications requiring a low DC power and reliable hourmeter. The TM612/624 model includes a three-hole mounting shock ring for extreme shock protection.

These hourmeters can be used on any engine where operating time needs to be recorded. All it requires is a DC power source (refer to Specifications).

CE*

* Products covered by this bulletin conform with European Council electro-magnetic compatibility directive 89/336/EEC, except as noted.
The CE mark does not apply to the TM612 and TM624 models

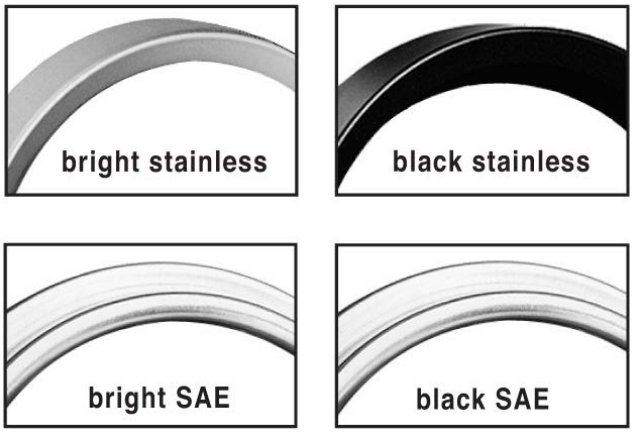
Outstanding Features

- Solid-State Electronic Drive Circuit
- Quartz-Crystal for Accurate Timing
- Quiet Operation – Permanently Lubricated
- High-Impact, Tamper-proof Plastic Case
- Sealed Against Moisture and Dirt
- Indicates Operating Time in Hours and Tenths
- No Battery Back Up Required
- Made in the U.S.A.

Specifications

Power Input: 12 to 24 VDC
Power Consumption: Less than 0.03 W @ 12 VDC; 0.4 W @ 24 VDC
Accuracy: ±0.02% over entire range
Temperature Range: -40° to 185°F (-40° to +85°C)
Dial (Face Plate): White numerals (over black background)
Time Scale:
TM4592-95 models: 6-digits 99,999.9 hours
TM612/624 models: 5-digits 9,999.9 hours
Automatic recycle to zero
Vibration Resistance: Withstands 10 to 75 Hz@ 1 to 8 Gs
Case Material: Plastic
Bezel: Stainless Steel
Terminations: 1/4 in. (6 mm) male blade terminals
TM4592/4595 Shipping Weight: 5 oz. (140 g)
Shipping Dimensions: 3-1/8 x 3 x 3 in. (79 x 76 x 76 mm) approximately
TM612/624 Shipping Weight: 8 oz. (230 g)
TM612/624 Shipping Dimensions: 5 x 5 x 3-1/4 in. (127 x 127 x 83 mm) approximately

Available Bezels



Basic Models

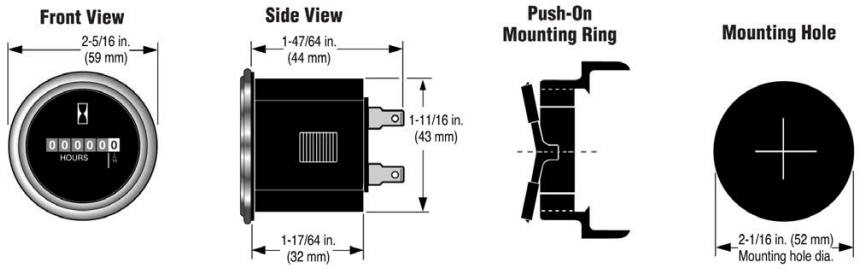
6-Digits Hourmeters

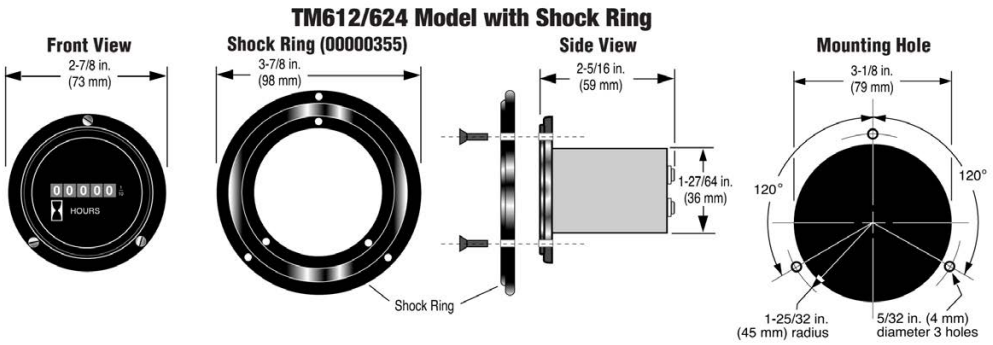
Model	Bezel Type
TM4592	Bright Stainless Steel Bezel
TM4593	Black Stainless Steel Bezel
TM4594	SAE Bright Stainless Steel Bezel
TM4595	SAE Stainless Steel Black Bezel

5-Digits Hourmeter with Shock Ring Mounting

TM612/624	3-Hole Mount, Black Bezel

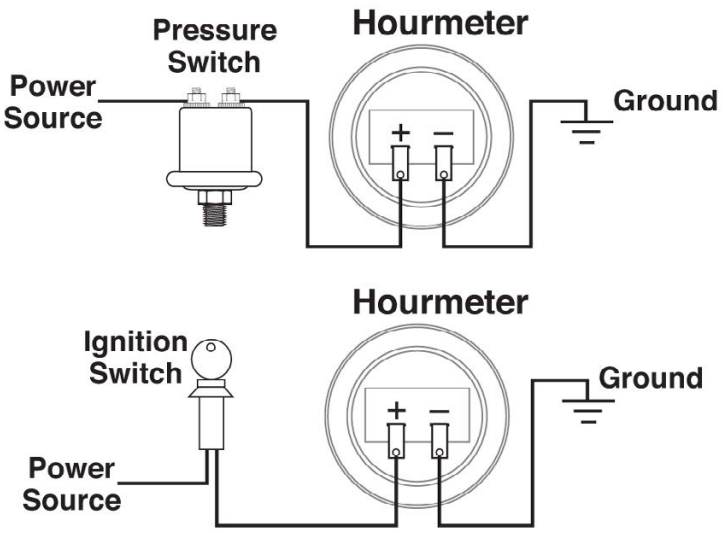
Dimensions





Typical Wiring Diagram

WARNING:
Turn the power source OFF before wiring.



How to Order

Part Number	Model and Description	Notes
20700192	TM4592 6 digits w/Bright Stainless Steel Bezel	Bezel
20700193	TM4593 6 digits w/Black Stainless Steel Bezel	
20700194	TM4594 6 digits w/SAE Bright Stainless Steel Bezel	
20700195	TM4595 6 digits w/SAE Stainless Steel Black Bezel	
20700144	TM612/624 5 digits w/Shock Ring Mount Black Bezel	
00000355	Shock Ring only for TM612/624	Shock Ring

Shock and Vibration Switch

VS2™ Series

The VS2 Series switches are shock-sensitive mechanisms for shutdown of engine or electric motor powered equipment. It is designed to detect shock/vibration in three planes of motion.

These fully adjustable switches use a magnetic latch to ensure reliable operation. Explosion-proof EX models for hazardous locations are available.

Ideal for use on engines, pumps, compressors, heat exchangers and pumping units, the VS2 Series can be used where shut-down protection from damaging shock/vibration is desired. Switches are field adjustable to the sensitivity required in each application.

* Selected configurations are third-party listed.

Specifications

Normal Operating Temperature: -40° to 185°F (-40° to 85°C); For UL and CSA applications, applicable temperature specification is de-rated to -40° to 140°F (-40° to 60°C)

VS2 and VS2C
Case: Environmental Protection: Ingress protected to IP54 (when mounted on a horizontal surface with drain holes down). Suitable for non-hazardous areas. VS2C: C-clamp mount, includes 45 ft. (13.7 m) 2-conductor cable and 5 cable clamps
Contacts: SPDT-double make leaf contacts, 3A @ 240 VAC; 10A @120 VAC; 10A @ 32 VDC
Shipping Weight: VS2: 2 lb. 8 oz. (1.1 kg); VS2C: 7 lb (3.2 kg)
Shipping Dimensions: VS2: 8-1/4 x 9-1/4 x 5 in. (210 x 235 x 127 mm); VS2C: 12 x 7 x 5-1/2 in. (305 x 178 x 140 mm)

VS2EX
Case: Base mount, explosion-proof aluminum alloy housing; meets IP54 specifications; Class I, Division 1, Groups C & D; UL and CSA listed
Certification: CSA, UL
Snap switches: 2-SPDT snap switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC
Shipping Weight: 4 lb. 8 oz. (2 kg)
Shipping Dimensions: 8-1/4 x 9-1/4 x 5 in. (210 x 235 x 127 mm)

VS2EXR
Case: Same as VS2EX
Certification: CSA, UL
Snap switch: 1-SPDT snap switch and reset coil; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC
Remote Reset: 115 VAC or 24 VDC (specify)
Shipping Weight: 5 lb. 8 oz. (2.2 kg)
Shipping Dimensions: 8-1/4 x 9-1/4 x 5 in. (210 x 235 x 127 mm)

VS2EXRB
Case: Explosion-proof aluminum alloy housing; designed to meet Class I, Division 1, Group B hazardous areas
Certification: No third-party certification
Snap switch: 1-SPDT snap switch with reset coil (option available for 2-SPDT switches); 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC
Remote Reset: 115 VAC or 24 VDC (specify)
Shipping Weight: 17 lb. 8 oz. (7.9 kg)
Shipping Dimensions: 12 x 12 x 10 in. (305 x 305 x 254 mm)

Basic Operation

Pushing the reset button moves the tripping latch into a magnetically held position. A shock/vibration will move the magnet beyond this holding position, thus freeing the spring loaded tripping latch to transfer the contacts and shut down the machinery (see dimensional diagrams or visual representation of parts).

Remote Reset Operation (VS2EXR and VS2EXRB)

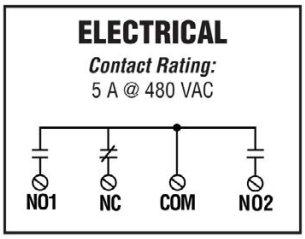
The remote reset option includes a built-in electric solenoid which allows reset of tripped unit from a remote location. Available for 115 VAC or 24 VDC.

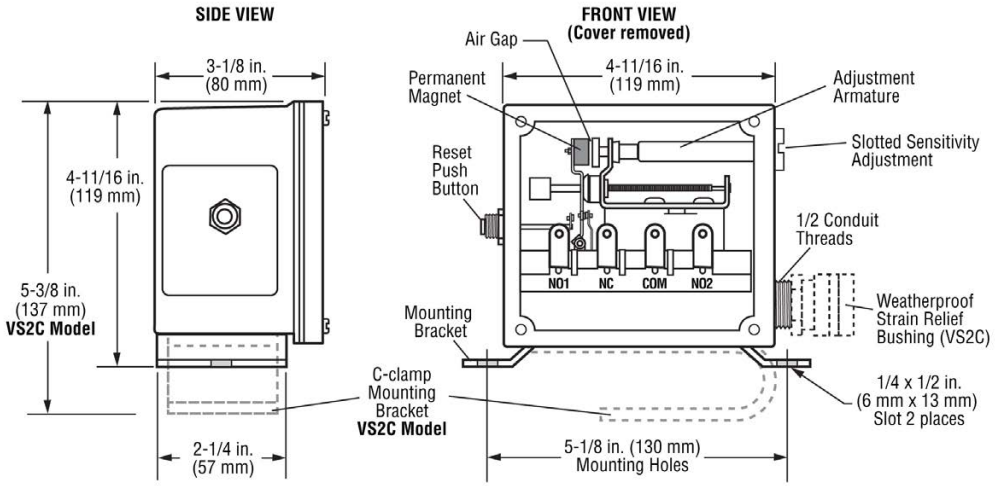
Dimensions

Environmental Protection: Ingress protected to IP54 (when mounted on a horizontal surface with drain holes down).

VS2 and VS2C

The VS2 and VS2C are designed for use in non-hazardous locations. They have leaf type SPDT, double make contacts that can be used for shutdown and/or alarm. They have a slotted sensitivity adjustment located on the side of the case (see drawing).

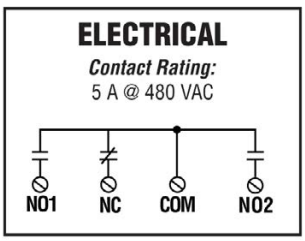


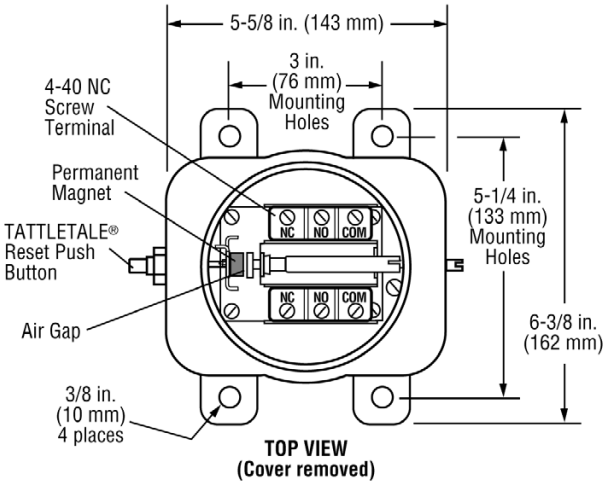


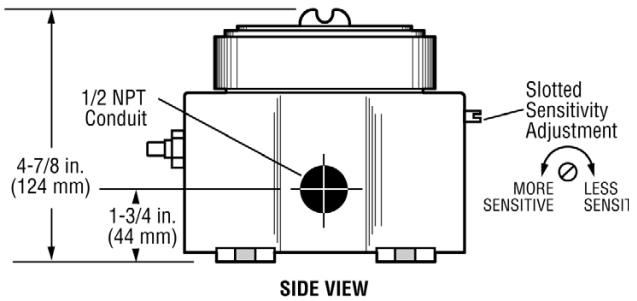
VS2EX

- IP54 Specifications
- Snap switch Contacts
- Tattletale® Reset Button

Model VS2EX is housed in an explosion-proof enclosure with threaded cover. This enclosure is CSA and UL listed for Class I, Division 1, Groups C & D hazardous locations. In place of the leaf type contacts, 2-SPDT snap-switches are used in this model. Sensitivity is externally adjustable, and when tripped, the VS2EX gives a Tattletale indication on the reset button. It is constructed to meet IP54 specifications.







VS2EXR

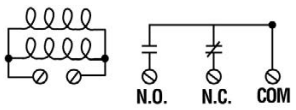
- Remote Reset Feature
- IP54 Specifications
- Snap-switch Contacts
- Tattletale® Reset Button

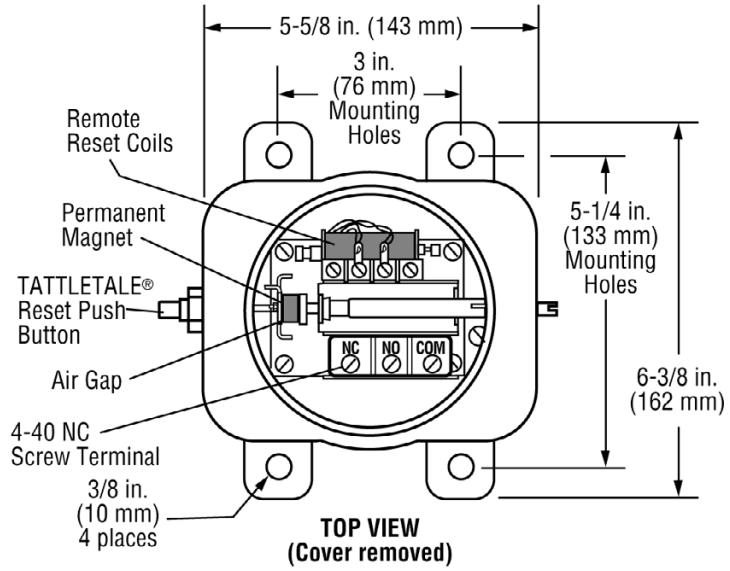
Model VS2EXR features an electric remote reset feature in addition to the Tattletale reset button. The VS2EXR uses only one SPDT snap-switch and is CSA and UL listed for Class I, Division 1, Groups C & D hazardous locations. It is constructed to meet IP54 specifications.

ELECTRICAL

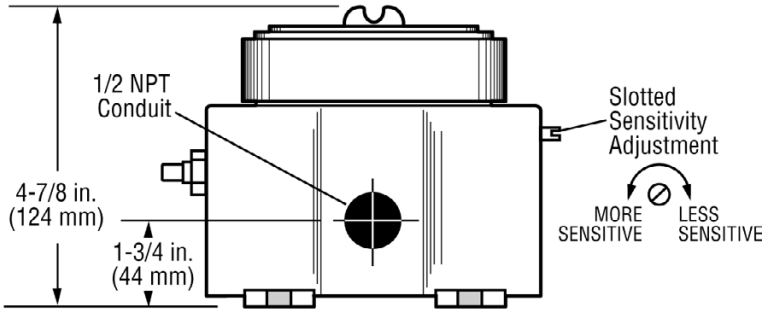
Contact Rating:
5 A @ 125–480 VAC
1/2 A @ 125 VDC
1/4 A @ 250 VDC
2 A Resistive 30 VDC
1 A Inductive 30 VDC

Remote Reset Rating:
115 VAC or 24 VDC (Specify)
350 mA AC/DC





TOP VIEW (Cover removed)



SIDE VIEW

VS2EXRB

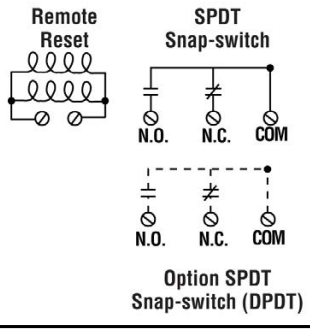
- For Group B Locations (not certified)
- Snap-switch Contacts
- DPDT Feature Optional

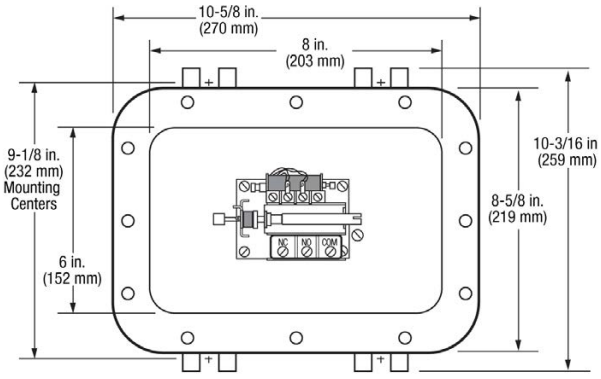
Model VS2EXRB is constructed for use in Class I, Division 1, Group B, hazardous locations. It has as standard a SPDT snap-switch and an electric remote reset. Option is available for DPDT snap-switch

ELECTRICAL

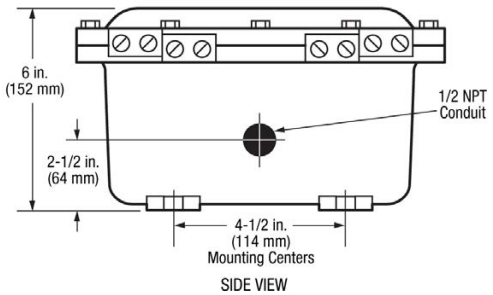
Contact Rating:
5 A @ 125–480 VAC
1/2 A @ 125 VDC
1/4 A @ 250 VDC
2 A Resistive 30 VDC
1 A Inductive 30 VDC

Remote Reset Rating:
115 VAC or 24 VDC (Specify)
350 mA AC/DC





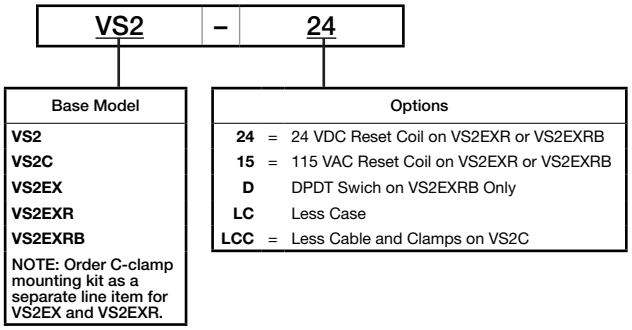
TOP VIEW (Cover removed)



SIDE VIEW

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Service Part Number	Description	Notes
20000030	Movement assembly	VS2 and VS2C
20000031	Glass and gasket assembly	
20000032	Reset push button assembly	
20050021	Mounting clamp	VS2C
20000261	Cable clamp assembly (1 each)	
20050465	2-Conductor electrical cable, 45 feet (13.7 meters)	
20000137	5 clamps and 45 feet (13.7 meters) of cable	
20010091	Movement assembly	VS2EX
20050087	Cover	
00000309	Cover gasket	
20010090	Snap-switch and insulator kit (1 switch per kit) prior to Sept. 1, 1995.*	
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured after Sept. 1, 1995.*	
20000289	C-clamp conversion mounting kit	
20000262	Movement assembly	VS2EXR
20050087	Cover	
00000309	Cover gasket	
20010090	Snap-switch and insulator kit (1 switch per kit) prior to Sept. 1, 1995.*	
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured after Sept. 1, 1995.*	
20000049	Reset solenoid assembly (115 VAC)	
20000234	Reset solenoid assembly (24 VDC)	
20000289	C-clamp conversion mounting kit	
20010090	Snap-switch and insulator kit (1 switch per kit) prior to Sept. 1, 1995.*	VS2EXRB
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured after Sept. 1, 1995.*	
20000057	Inside snap-switch and insulator kit (1 switch per kit) for model VS2EXRB-D prior to Sept. 1, 1995.*	

* Models with date 0895 and before use old switch. Dated 0995 and after, use straight snap-switch arm, no rollers.

Shock and Vibration Switch

VS94 Model

VS94 Series is an electro-mechanical device designed to protect equipment from damaging shock or vibration. This sensitive mechanism can detect excessive shock or vibration and shut down the equipment before further damage occurs. A set of contacts is held in a latched position through a magnetic latch mechanism. As the level of shock or vibration increases, an inertia mass exerts force against the latch arm and forces it away from the magnetic latch causing the latch arm to separate and to operate the contacts. Sensitivity is obtained by adjusting the amount of air gap between the magnet and latch arm plate.

The VS94 Series is housed in a NEMA 4/4X glass-filled polyester enclosure and has a base mount. It is for applications in non-hazardous locations.

VS94 models are rated up to 480 VAC. (See How to Order for models and options available.)

Applications for the VS94 include all stationary types of machinery or equipment where excessive shock/vibration can be damaging or poses a threat to normal operations in:

- Cooling fans
- Pump jacks
- Pumps
- Engines
- Compressors
- Rotating and Reciprocating Machinery

Specifications

Case: Polyester fiberglass reinforced; NEMA type 4X; IP66; CSA types 4 and 12
Conduit Fitting: 3/4 NPT conduit fitting connection
Normal Operating Ambient Temperature: 0° to 140°F (-18° to 60°C)
Snap-switches: 2-SPDT snap acting switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC
Range adjustment: 0 - 7 Gs; 0 - 100 Hz /0.100 in. displacement
Space Heater (optional):

Option	Operating Current
H15	.023 A @ 115 VAC
H24	.12 A @ 24 VDC

Remote Reset (optional):

Option	Operating Current
R15	.17 A @ 115 VAC
R24	.36 A @ 24 VDC

Time Delay (optional):

Option	Operating Current	Standby Current
T15	.360 A @ 115 VAC	.01 A @ 115 VAC
T24	1.15 A @ 24 VDC	.01 A @ 24 VDC

Time Delay/Remote Reset: Adjustable 20-turn potentiometer from 5 seconds to 6-1/2 minutes (15 seconds per turn approximately)
Shipping Weight: 4.35 lb. (2 kg)
Shipping Dimensions: 9 x 8 x 4-11/16 in. (229 x 203 x 119 mm)

Features

- Electromechanical Design
- Detects Shock or Vibration in Three Planes of Motion
- NEMA 4/4X (CSA types 4 and 12) Weatherproof Enclosure
- Reliable Magnetic Latch Feature
- Micro Fine, Easy-to-Adjust Sensitivity Adjustment
- Manual Reset (Standard)
- Remote Reset (Optional)
- Adjustable Start-up Time Delay (Optional)
- Space Heater Circuit to Prevent Housing Moisture Condensation (Optional)
- Two versatile SPDT snap-switches rated up to 480 VAC

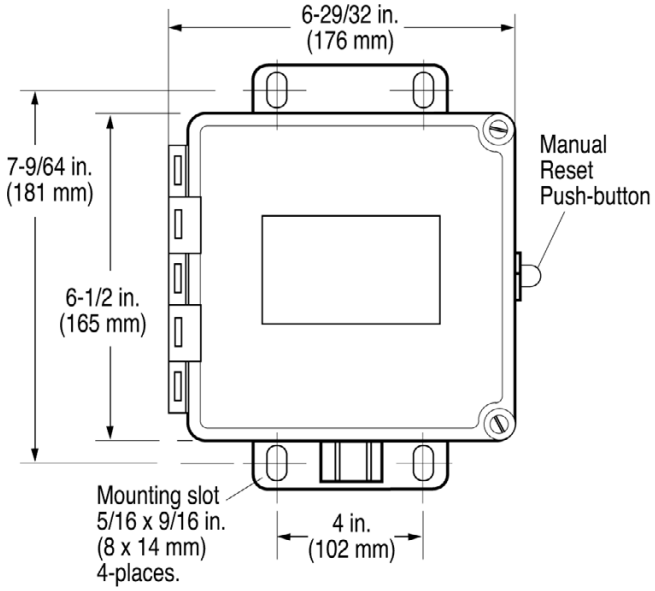
Options

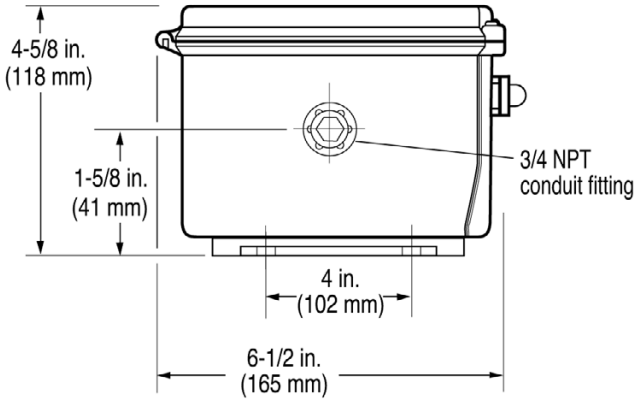
Remote Reset
This option of the VS94 includes a built-in electric solenoid which allows reset of tripped unit from a remote location. Available for 115 VAC or 24 VDC.

Time Delay
Overrides trip operation on start-up. The time delay option is field-adjustable from 5 seconds up to 100 seconds with an easy-to-adjust 20-turn potentiometer. Available for 115 VAC or 24 VDC.

Space Heater
This optional circuit prevents moisture condensation inside the VS94 housing.

Dimensions





How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

VS94	–	H15	–	T15	–	R15

Space Heater

Blank	=	No Space Heater
H15	=	115 VAC
H24	=	24 VDC

Time Delay

Includes Remote Reset Feature

Blank	=	No Time Delay
T15	=	115 VAC
T24	=	24 VDC

Remote Reset

Blank	=	No Remote Reset
R15	=	115 VAC
R24	=	24 VDC

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Tattletale®

Annunciators and Magnetic Switches

Tattletale annunciators and magnetic switches are the nerve centers that translate Swichgage® contact operations into decisions and operate the alarm or shutdown device. These switches are the electrical load carrying devices for the alarm or shutdown device. Tattletale annunciators indicate which monitored function failed leading to the alarm or shutdown; magnetic switches do not. Magnetic switches operate basically as a latching relay.

Application

Magnetic switches and Tattletale annunciators are available for use with engines or electric motors. Various circuits, time delays and contact configurations are available to match the power source and mode of operation required for alarm only, alarm before shutdown or shutdown only.

For distributor ignition engines, the magnetic switch opens the distributor coil circuit to cause shutdown. For magneto or CD ignitions the magnetic switch grounds the ignition output. Some models can also trip fuel valves instead of or in addition to grounding the ignition. Diesel engines are shut down by either closing off the fuel or air supply. Magnetic switches and Tattletale annunciators can make or break circuits for these engines.

For electric motor application, various magnetic switches are available to operate the motor starter, holding coil directly or in conjunction with appropriate Murphy Transformer-Relay assembly.

Features

Magnetic switches and Tattletale annunciators described in this bulletin are electrically tripped relay type devices. Models are available to operate from battery power, 120 VAC, conventional magnetos and capacitor discharge type ignitions.

Energized to run models allow Closed Loop circuitry. Others draw momentary power to trip. Configurations are available for contact make or contact break to cause shutdown. Some models have both make and break contacts.

All models have a weather-resistant case with screw terminals for ease of customer hookup. Manually reset models have a face mounted reset push button which also serves as a fault indicator in the Tattletale version. In this application, one or more Tattletale/magnetic switches are used to advise operating personnel which monitored function caused shutdown.

Only the Tattletale connected to that function sensor trips causing the reset push button to pop out.

Electrically reset models perform the same functions as the manually reset models and are reset by cycling the power supply off and then on.

Time delay models use reliable solid state time circuits to lockout operated switch contacts for start-up and/or to allow operation of alarms before shutdown occurs. Specific models allow application of power to a shutdown circuit and automatic disconnect of power after a given time delay.

Specifications

	117	117PH	MS2100	MS2110	MS2111	MS2120	518PH	518APH	518E	520APH	521PH	760A ‡	761APH	822PH	M4264-1	R129A
Coil Voltage																
12 volt							●	●	●	●	●	●	●			●
24 volt							●	●		●	●	●	●			●
12/24 volt*	●	●		●	●									●		
120 VAC			●													
Magneto ignition						●								●		
CD ignition			●											●		
Coil (see Note 6 below)	2	2	6	2	4	1	7	7	7	8	7	5	2	3		5
Contacts (see Note 2 below)																
NCH	●	●	A	A	A		●	●	●	●		●	●	●		
NOH			A	A	A			●	●	●		●	●	●		
NCG						B									B	B
NOG						B					●				B	B
Latch Type																
Energize to trip	●	●	●	●	●	●						●	●	●	●	●
Energize to latch							●	●	●	●	●					
Reset Type																
Manual indicating		●	●	●	●	●	●	●	●	●	●		●	●	●	
Manual non-indicating	●															
Electric non-indicating												●				●
Time Delay																
Before shutdown										●		●	●			
Start only												●	●			
After shutdown																

* Multi-voltage AC or DC systems. See circuit descriptions below and on next page.

A: Dry contacts normally wired in hot circuit.
B: Dry contacts normally wired in ground circuit.

‡ Does not latch after shutdown signal clears, automatically resets.

NOTES

This chart indicates features/configurations available for each model.

1. Coil Voltage — Coils are specific voltage rated or multiple voltage rates.

2. Contacts — This is the control circuit output. In the latched position, the NCH contact has a hot output. In the tripped position, the NOH contact has a hot output. In the latched position, the NCG has a grounded output. In the tripped position, the NOG has a grounded output.

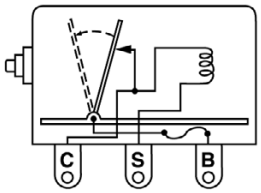
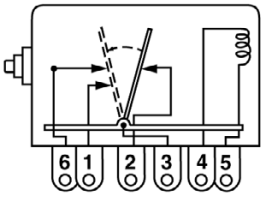
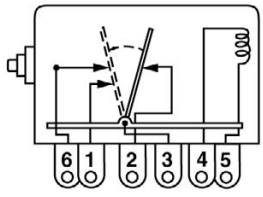
3. Latch Type — Refers to whether the magnetic coil is momentarily energized to trip or requires continuous power in the operating mode and de-energizes to trip.

4. Reset Type — Refers to manual or electric reset; manual indicating type is a Tattletale.

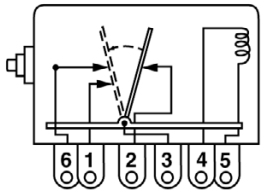
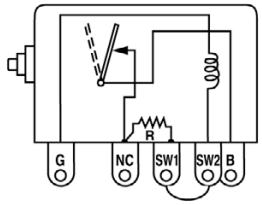
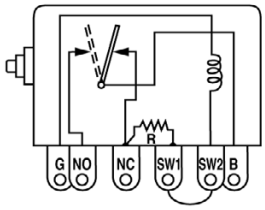
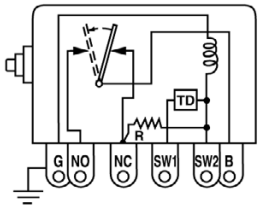
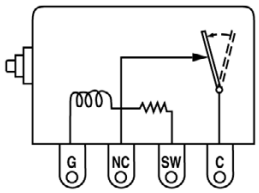
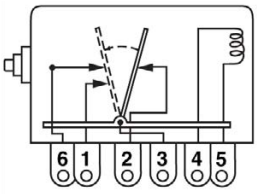
5. Time Delay — Indicates operation of the time delay.

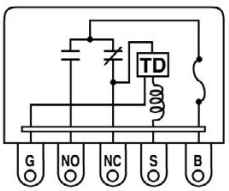
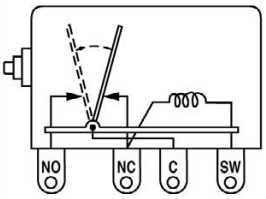
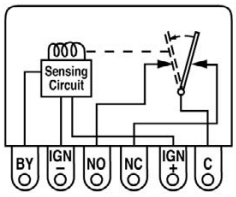
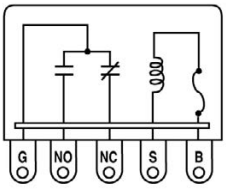
6. Coil Resistances — In OHMS or coil and resistor
1.) 0.5 2.)18 3.)30 4.)72 5.)90/190 for 12/24 6.)288 7.)339/678 for 12/24 8.)339/618 for 12/24

Models

Model	Description	Illustration
117/117PH	Use to shutdown 12V through 32V distributor ignition or diesel engines. Breaks circuit when tripped. Opens distributor coil circuit or power circuit to diesel run device. Automatically disconnects from battery after trip. Contacts 10 amps 32 VDC. 14 amp fuse.	
MS2100	Multipurpose Tattletale with dry contacts that can be used to make two circuits and break another when tripped. Operates from 120 VAC or capacitor discharge ignition. The operating coil is intermittent duty and must be disconnected by an external circuit when tripped. The MS2100 is a replacement for 100PH, 307CD, 307PHCD and 224CD.	
MS2110	Multipurpose Tattletale with dry contacts that can be used to make two circuits and break another when tripped. Operates from 12 or 24 VDC or 24 VAC. The operating coil is intermittent duty and must be disconnected by an external circuit when tripped. The MS2110 is a replacement for 221PH, 169PH, 274 and 274PH.	

Warranty — A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to www.enovationcontrols.com/warranty

Model	Description	Illustration
MS2120	Multipurpose Tattletale with dry contacts that can be used to make two circuits and break another when tripped. Operates from magneto ignition. The operating coil is intermittent duty and must be disconnected by an external circuit when tripped. The MS2120 is a replacement for 307, 307PH and 224.	
518PH	Allows for Swichgage and/or N.C. contacts to be wired closed loop (in series). Any contact open or Swichgage contact close in the circuit shunt trips the 518PH. Specify 12 or 24 VDC. Contacts 10 amps 24V. 14 amp fuse.	
518APH	Allows for Swichgage and/or N.C. contacts to be wired closed loop (in series).Any contact open or Swichgage contact close in the circuit trips the 518APH. Specify 12 or 24 VDC. Contacts 10 amps 24V. 14 amp fuse.	
518E	Same as 518APH but recommended for high vibration application where nuisance shutdowns typically occur due to higher than normal vibrations (i.e. wood chippers). 12 Volt only.	
520APH	Same as 518PH except with 30 second time delay before trip on one Swichgage contact input but immediate trip on the second Swichgage contact input. Typical use is for immediate stop of engine from oil pressure or coolant temperature but delayed shutdown from alignment switches on center pivot irrigation system. Specify 12 or 24 VDC and length of time delay. Time delays are available from 5 to 120 seconds. Contacts 10 amps 24 V. 14 amp fuse.	
521PH	Use with N.C. Swichgage or switches to ground magneto or CD ignition when tripped. Trip coil energized to shutdown when N.C. contacts open. Specify 12 or 24 VDC. Contacts 10 amps 24V.	
MS2111	Replaces 221PH with 72 ohm coil. Used with NICS-78 non-incendive control system. Service part only.	

Model	Description	Illustration
760A/ 760AF/ 761APH	Use for distributor ignition or diesel. Time delay lockout of Swichgage contacts on start up only. Customer wired for delay or immediate trip on shutdown. Breaks and makes circuits when tripped. 760A resets automatically when the shutdown signal is removed or power is removed. 761APH has manual reset. 760AF is 760A with in-line fuse. Must specify 12 or 24 VDC and length of time delay. Option time delays: 15, 30 (standard) or 60 seconds. Contacts 10 amps 24 V. 14 amp fuse. Models 760A and 761APH carry the CE mark. *Note: The 760A cannot be adequately protected by a circuit breaker in a dead short condition with a battery as the power source. The circuit breaker will take a finite amount of time to react, during which time the circuit board of the 760A will be damaged beyond repair. Fuses are the optimal method for protecting 760A.*	
822PH	Used in Murphy TR assemblies as master disconnect. 24VAC coil energizes when Swichgage contact closes to ground; breaks and makes circuit when tripped. Manual reset	
M4264 Series	Detects loss of magneto/CD ignition output and transfers contacts for customer use. Contacts 10 amps; 48 VAC/ VDC. M42641CS transfers SPDT dry contacts when tripped.	
R129A	A SPDT relay with 10 amp dry contacts. Specify 12 or 24 VDC. Contacts 10 amps 24 VDC. 14 amp fuse.	

Always provide proper circuit protection with fuses or circuit breakers.

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

760AF – 15 – 12 – EL

Base Models

117*	=	In-line fuse available
117PH*	=	In-line fuse available
518PH		
518APH		
518E	=	12-Volt Neg Ground version only
520APH		
521PH		
760A*	=	In-line fuse available
761APH*	=	In-line fuse available
822PH		
M42641CD		
ETS30S		
MS2100		
MS2111		
MS2110		
MS2120		

*** Add letter F to base model to indicate an in-line fuse instead of a base-mounted fuse.**

Time Delay

(Where applicable)

15 = 15 Seconds
30 = 30 Seconds
60 = 60 Seconds
Specify other

Voltage Ground

(Where applicable)

12 = 12 VDC
24 = 24 VDC

Options

AS = Auxiliary SPDT Switch
ES = Environmentally Sealed
EL = Explosion-Proof Less Case

Not all options are available on all models in combination with other options. **See Configurations Available** chart.

Models	Configurations Available		
Base Number	Non-PH	PH	PH-ES
117	X, AS	X, AS	X
MS2110		X, AS	X
MS2120		X, AS	X
MS2111		X, AS	X
517/517A		X	X
518/518A/518E		X	
520A		X	
521		X	
760A	X		
760AF	X		
761A		X	
822		X	
M4264-1	X		

X = Available / AS = Auxiliary SPDT Switch

Part Number	Description	Notes
25050016	Weather cap	Accessories
25050547	Clear, flexible dust boot for push button	
30050323	Single unit mounting plate	
65010026	In-line fuse holder with 14 amp fuse	

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WHB Series Swichgage® Shutdown Panels
for High Plains and Other Irrigation Engines

The WHB Series open type panels are the industry standard for High Plains irrigation engines. These panels bolt directly to the engine flywheel housing. They include Swichgage protection for low engine oil pressure and high coolant or high oil temperature and have provision to add additional Swichgage instruments, such as a pump discharge pressure, voltage regulator, throttle cable and start button or switch.

For diesel engines without shut-down solenoid in the injection pump, add a Murphy SV Series solenoid fuel shut-off valve or RP2300 series rack puller solenoid (for details visit www.enovationcontrols.com).

Swichgage products are two instruments in one: (1) an accurate indicating gage with (2) a built-in, adjustable limit switch.

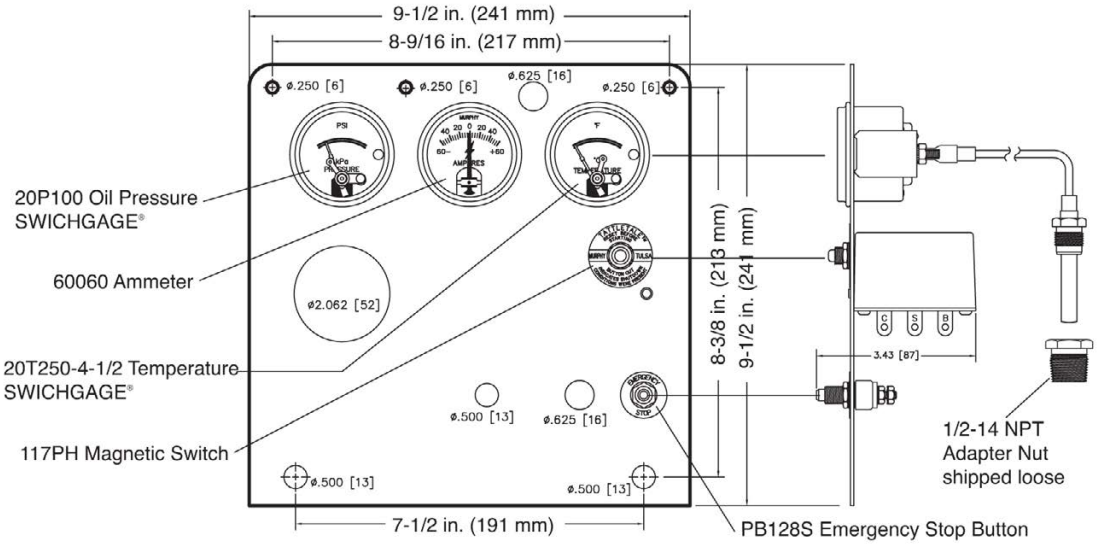
Panel Kits include:

- Low Lube Oil Pressure Swichgage instrument
- High Coolant/ Temperature Swichgage instrument
- 117PH Magnetic Switch
- PB128S Emergency Stop Push Button
- Ammeter 60-0-60

Specifications

Low Lube Oil Pressure Swichgage instrument:
0-100 psi (0-689 kPa) [0-6.89 bar]
1/8 NPT process connection
High Coolant/Oil Temperature Swichgage instrument:
130°-250° F (54°-121° C)
48 in. (1.2 m) capillary
1/2 NPT process connection
117PH Ammeter: 60-0-60
Shipping Weight: 8 lbs. 8 oz. (3.9 kg)
Shipping Dimensions: 9.5 x 9 x 5 in. (241 x 229 x 127 mm)

Dimensions

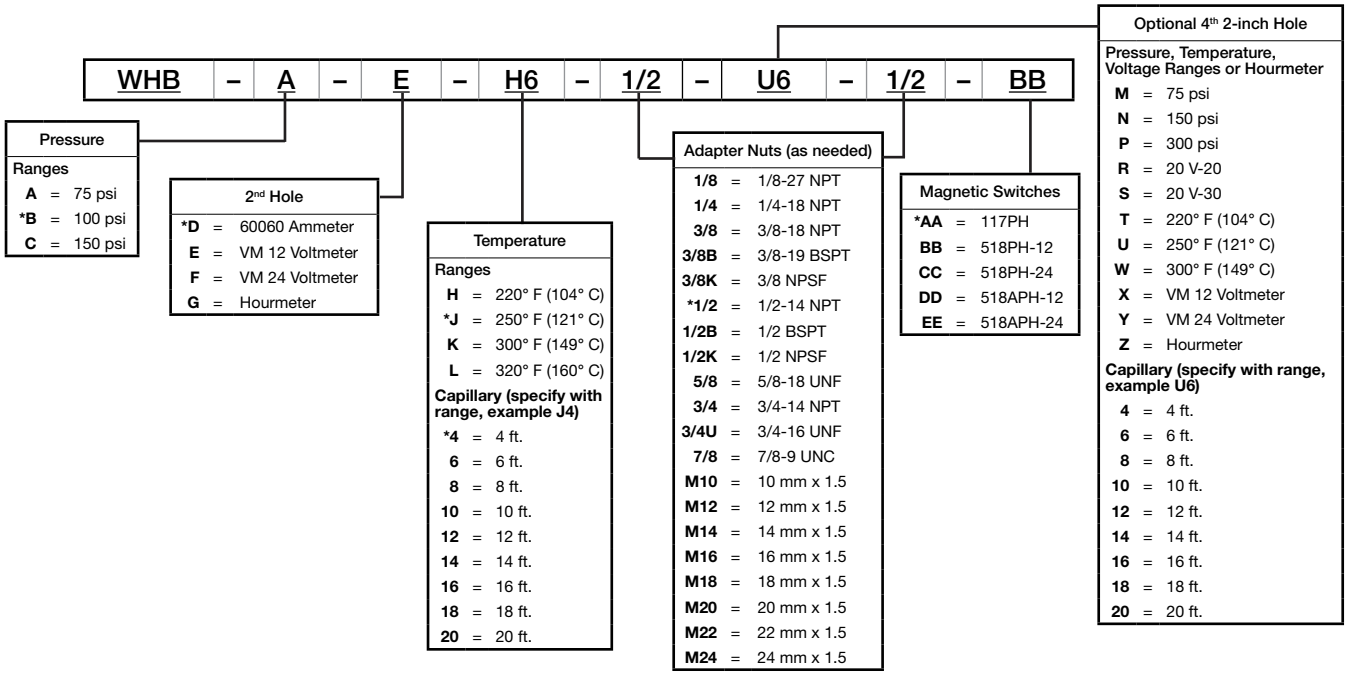


How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

Notes:

- The asterisk * = Standard Component or Range and is not required for ordering.
- Always specify the Range with the Capillary choice in the same matrix box, unless they are both marked with an asterisk *, in which case you can leave the matrix box blank.
- If requirements are outside of the matrix below, order the panel with free-formed text and use the 3050xxxx product number of the base model.



Ready To Run Panels

RTR READYTORUN

MLC380 **TEC-10** **ML1000** **ML2000**

Get running in minutes with Murphy's Ready To Run Panels. The panels have everything you need in one plug-and-play solution. Match your needs with the best option whether you need engine monitoring or a more sophisticated full engine control system. With several levels of panel options, it will be easy to find the solution right for you.

The Ready to Run Panels are engineered to manufacturers' requirements and work out of the box with minimal set-up time. These panels put control at your fingertips allowing operators to monitor and change settings easily in the field.

Let Murphy's Ready to Run Panels maximize your investment.

For more information on the Ready to Run offerings refer to, www.enovationcontrols.com/rtr.

Supported Engines	
Manufacturer	**Engine Model**
Doosan	FT4 D10 - 4500
	FT4 D10 - 4800
	FT4 D18
	FT4 D24
	FT4 D34
	FT4 D34 SCR
Isuzu	FT4 4LE2
	FT4 4JJ1T
MTU	FT4 LPR Series 1000, 1100, 1300, 1500

See the How to Order section for availibility and limitations.

NOTE: The Isuzu engine panel styles are different than pictured on this page. Refer to www.enovationcontrols.com/rtr to see panels.

Specifications

PowerView® MLC380:
Display: 3.8-inch (97 mm) QVGA monochrome transflective LCD; 320 x 240 pixels
Keys: 5 tactile push buttons
LEDs: red, shutdown; amber, warning
Start Type: Manual Start
Throttle Type: Manual

PowerCore® TEC-10:
Display: 2.7-inch (68 mm) WQVGA monochrome HR-TFT; 400 x 240 pixels
Keys: 11 tactile feedback buttons
LEDs: red, shutdown; amber, warning; green, auto mode or running loaded state
Start Type: Manual and Auto Start
Throttle Type: Manual and Auto Throttling

PowerCore® ML1000:
Display: 2.7-inch (68 mm) WQVGA monochrome HR-TFT; 400 x 240 pixels
Keys: 11 tactile feedback buttons
LEDs: red, shutdown; amber, warning; green, auto mode or running loaded state
Start Type: Manual and Auto Start
ThrottleType: Manual and Auto Throttling

PowerCore® ML2000:
Display: 3.8-inch (97 mm) QVGA monochrome transflective LCD; 320 x 240 pixels
Keys: 11 tactile feedback buttons
LEDs: red, shutdown; amber, warning; green, auto mode
Start Type: Manual and Auto Start
Throttle Type: Manual and Auto Throttling

Doosan Ready To Run Panels		Doosan is a trademark of its owner.
Part Number	**Model and Description**	**Notes**
	Panels	
32090059	MLC380-Doosan STD, G2 Engines	Panel for D18/D24/D34 Engines
40090066	ML1000-4X, RTR Doosan, G2 Engines	
40090067	ML2000-4X, Doosan STD, G2 Engines	
40090073	TEC-10, Doosan RTR Controller	
	Harnesses	
32000197	MIH-DO-56P-T4F-D18/D24	Engine Harness for D18/D24 Engines
32000173	MIH-DO-56P-T4F-D34-6	Engine Harness for D34 LHP Engines
32000201	MIH-DO-56P-T4F-D34SCR-6	Engine Harness for D34 SCR Engines
32000220	Harness with PV380, On/Off Switch, ECU/ Relay Bracket for D10-4500 controller	PV380 and On/Off Switch supplied with harness can be mounted by customer or Enclosure kit 78001276 (sold separately) (D10 Engines only)
32000223	Harness with PV380, On/Off Switch, ECU/ Relay Bracket for D10-4800 controller	
	Accessories	
78001276	D10 Enclosure Kit to mount PV380 and Toggle	Kit mounts PV380, On/Off Switch to ECU/Relay Bracket supplied with Harness
78001180	I/O Harness, MLC380, Doosan RTR	10’ long
40000603	I/O Harness, ML1000 and TEC-10	10’ long
40000565	I/O Harness, ML2000	10’ long
78700046	31 Position Connector Kit (I/O)	I/O Connector Kit
05705669	ES2F-Fuel Sender	Fuel Level Sender

Isuzu Ready To Run Panels		Isuzu is a trademark of its owner.
Part Number	**Model and Description**	**Notes**
	For 4LE2 Engines	
32090053	ML380-4LE2-FT4	
40090054	ML1000-4LE2-FT4	
40090059	ML1000-4LE2-FT4-Door Option*	
40090050	ML2000-4LE2-FT4	
40090058	ML2000-4LE2-FT4-Door Option*	
	For 4JJ1T Engines	
32090058	ML380-4JJ1T-FT4	
40090055	ML1000-4JJ1T-FT4	
40090061	ML1000-4JJ1T-FT4-Door Option*	*Must purchase door option if door is needed. No Kit Option available.
40090053	ML2000-4JJ1T-FT4	
40090062	ML2000-4JJ1T-FT4-Door Option*	*Must purchase door option if door is needed. No Kit Option available.
	Accessories	
40000619	I/O Whip harness for ML1000 panel	10’ long, 31 position
40000618	I/O Whip harness for ML2000 panel	10’ long, 31 position
65090020	Potentiometer kit (adjustment knob for speed setup limit)	ML380 only
78700046	I/O connector kit	31 position
32090057	Remote panel for ML380	Uses PV380 controller
78001143	Extension harness for 32090057 ML380 remote panel	20’ long

MTU Ready To Run Panels		MTU is a trademark of its owner.
Part Number	**Model and Description**	**Notes**
Panels		
40700519	ML2000-MTU RTR	Pre-packaged full control solution to connect all engine control modules and house the CPC4
Accessories		
78001311	Remote PV380 Display Kit	Plug and Play Kit for ML2000 MTU Panel

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ML25 Panels
MurphyLink® Series

The MurphyLink Series ML25 Panels feature the PowerView® PV25, an engine and diagnostic display in an economical and compact package. This J1939-compliant device provides electronic engine parameter data, is simple to install and matches the PowerView line of rugged displays. The PV25 can be powered by 12- or 24-volt systems.

The PV25 is equipped with two push buttons to quickly access a convenient menu. In addition, a back lit graphic display and two LEDs indicate Active-fault Alarm or Shutdown status.

Active and Stored Fault messages display the SPN (Suspect Parameter Number), FMI (Failure Mode Indicator) and the OC (Occurrence Count) using the SAE J1939 protocol.

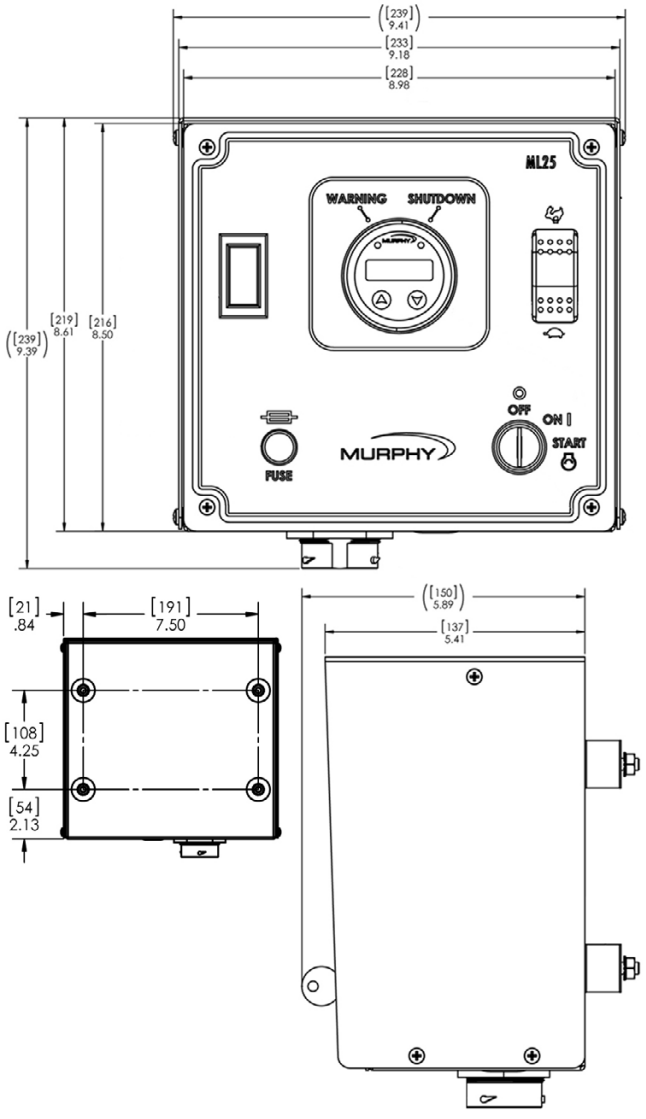
Features

- Tier 4/Stage IIIB/IV Compliant/Ready
- Compact J1939-compliant device for electronically controlled engines
- Displays up to 20 standard J1939 parameters
- Active and stored diagnostic trouble codes
- Provides enhanced visual alarm indication using bright alarm and shutdown LEDs

Specifications

Operating Voltage:
12/24 VDC (6.5-32VDC Minimum and Maximum Voltage)
Operating Current: 850mA MAX
Mounting: 4-.75" Rubber Isolated Shockmounts
Starting Method: KeySwitch
Stopping Method: KeySwitch
Display: PowerView Model 25
Indication Lamps: One red, One Amber via PV25 Display
Enclosure Material: Powder-Coated Cold Rolled Steel
Wiring Interface: 1-Deutsch HDP 21pin Connector
Throttle Method: Rocker Switch (Digital Inputs to ECU)
Tier 4 Regeneration: CAN Enabled (via PV25) or Rocker Switch (via Digital Input to ECU)
Operational Temperature: -40° to +158°F (-40° to +70°C)
Storage Temperature: -67° to +185°F (-55° to +85°C)
Box Dimensions: 15.4 X 13.4 X 8.5 (340.6 mm X 215.9 mm)
Shipping Weight: 9.5 lbs (4.3 kg)

Dimensions



How to Order

Part Number	Model and Description	Notes
32700190	**ML25-FP:** PV25 flat only, PTO Ramp throttle method, 12/24 VDC	Flat panel
32700191	**ML25:** PV25 enclosed, PTO Ramp throttle method, 12/24 VDC	Enclosed panel
32700192	**ML25-T4-FP:** PV25 flat only w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Flat panel
32700193	**ML25-T4:** PV25 enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Enclosed panel

ML50 Panels
MurphyLink® Series

The MurphyLink Series ML50 Panels feature PVCAN gages and the PowerView® PV25, an engine and diagnostic display in an economical and compact package. This J1939-compliant device provides electronic engine parameter data, is simple to install and matches the PowerView line of rugged displays. The PV25 can be powered by 12 or 24 volt systems.

The PV25 is equipped with two push buttons to quickly access a convenient menu. In addition, a back lit graphic display and two LEDs indicate Active-fault Alarm or Shutdown status.

Active and Stored Fault messages display the SPN (Suspect Parameter Number), FMI (Failure Mode Indicator) and the OC (Occurrence Count) using the SAE J1939 protocol.

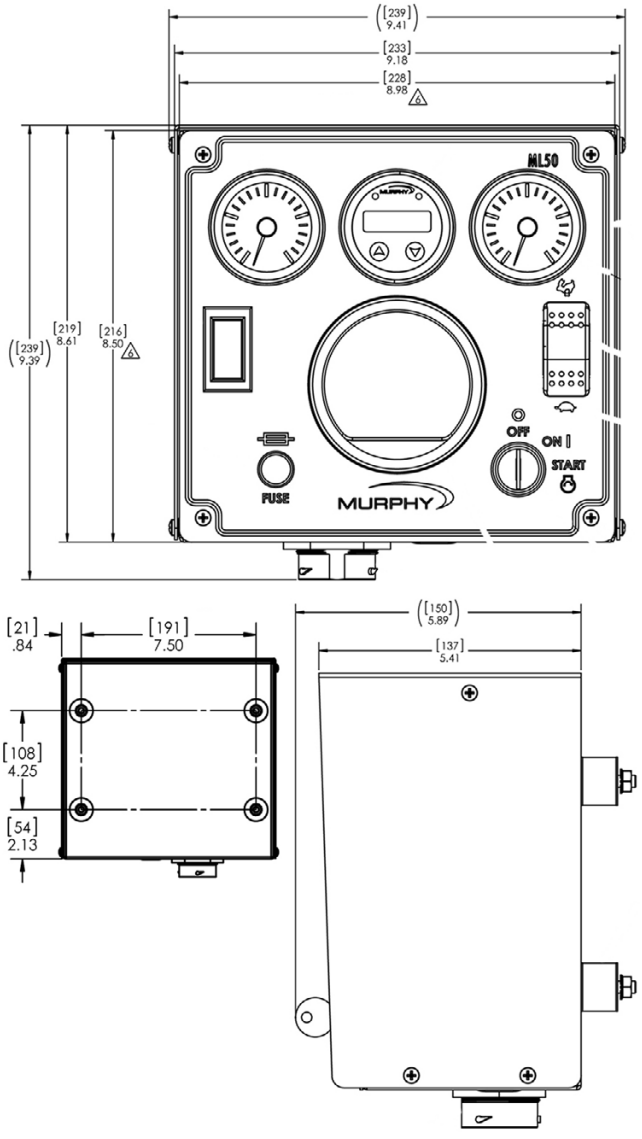
Features

- Stage IIIB/IV Compliant/Ready
- Compact J1939-compliant device for electronically controlled engines
- Displays up to 20 standard J1939 parameters
- Active and stored diagnostic trouble codes
- Analog gages
- Provides enhanced visual alarm indication using bright alarm and shutdown LEDs

Specifications

Operating Voltage:
12/24 VDC (6.5-32VDC Minimum and Maximum Voltage) Operating
Current: 1.2A MAX
Mounting: 4-.75 in. Rubber Isolated Shockmounts
Starting Method: KeySwitch
Stopping Method: KeySwitch
Display: PowerView Model 25 Indication Gages
1) Engine Temperature
2) Engine Oil Pressure
3) Engine Speed (Analog Tachometer)
Indication Lamps: One red, One Amber via PV25 Display
Enclosure Material: Powder-Coated Cold Rolled Steel
Wiring Interface: 1-Deutsch HDP 21pin Connector
Throttle Method: Rocker Switch (Digital Inputs to ECU)
Tier 4 Regeneration: CAN Enabled (via PV25) or Rocker Switch (via Digital Input to ECU)
Operational Temperature: -40° to +158°F (-40° to +70°C)
Storage Temperature: -55° to +185°F (-67° to +85°C)
Box Dimensions: 15.4 X 13.4 X 8.5 (391 X 340.4 X 216 mm)
Shipping Weight: 10.5 lbs (4.8 kg)

Dimensions



How to Order

Part Number	Model and Description	Notes
32700212	**ML50-FP**: PV25 with gages flat only, PTO Ramp throttle method, 12/24 VDC	Flat panel
32700213	**ML50**: PV25 with gages enclosed, PTO Ramp throttle method, 12/24 VDC	Enclosed panel
32700214	**ML50-T4-FP**: PV25 with gages flat only w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Flat panel
32700215	**ML50-T4**: PV25 with gages enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle method, 12/24 VDC	Enclosed panel

ML100 Panels
MurphyLink® Series

The MurphyLink® Series ML100 Panel features the PV101-C display, which was developed to meet the needs for instrumentation and control on electronically controlled engines communicating using the SAE J1939 Controller Area Network (CAN).

This basic panel contains a key switch, increment/decrement throttle and the PowerView® display. This standard panel can be ordered with or without an enclosure, because all of the components are assembled to a stand-alone flat panel. Optional mounting kits are offered for the enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications. Panel designs are offered to meet the needs of specific engine models. In addition, Murphy offers standard wiring harnesses for quick plug-and-go operation that interface with all the second-generation MurphyLink PowerView panels.

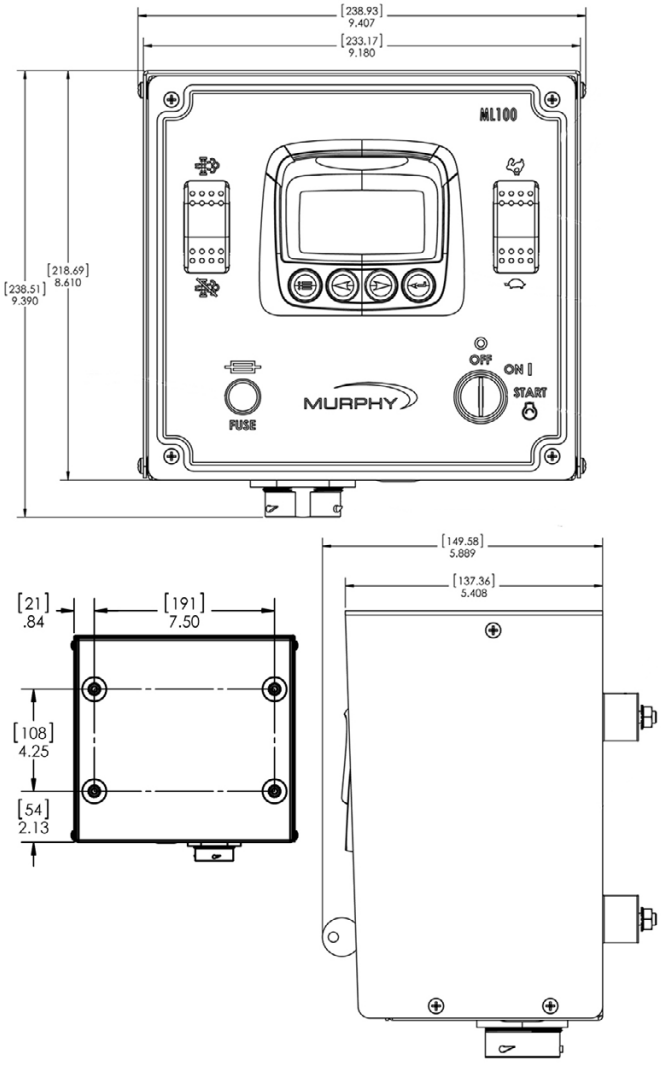
The PV101 Display is a multifunction tool that enables equipment operators to view many different engine or transmission parameters and service codes. The PowerView display includes a graphical, backlighted LCD screen. It has excellent contrast and viewing from all angles. The display can show either a single parameter or a quadrant display for viewing four parameters simultaneously. Diagnostic capabilities include fault codes with text translation for the most common fault conditions.

The PowerView display has four buttons using touch-sensitive technology, which eliminates the concern for push button wear and failure. In addition, operators can navigate the display with ease. Enhanced alarm indication uses ultra bright alarm and shutdown LEDs (amber and red). The PowerView display has a wide operating temperature range of -40° to185° F (-40° to +85° C), display viewing -20° to185° F (-29° to +85° C) and environmental sealing to +/- 5 PSI.

Features

- Tier 4/Stage IIIB/IV Compliant/Ready
- Standard Panel Designed for Modern Electronic Engines and Equipment Applications Using SAE J1939 Controller Area Network (CAN)
- PowerView Model 101 Displays More Than 50 Standard SAE J1939 Parameters Broadcast by Major Engine and Transmission Manufacturers ECUs
- Display Active Faults and ECU-Stored Faults with Text Description on Most Common Faults for Diagnosing Equipment Malfunctions
- Standard Harnesses Available for Most Major Engine Manufacturers ECUs
- Enclosed Design or Flat Panel Option

Dimensions



Specifications

Operating Voltage:
12/24 VDC (6.5-32VDC Minimum and Maximum Voltage)
Operating Current: 1A MAX
Mounting: 4-.75" Rubber Isolated Shockmounts
Starting Method: KeySwitch
Stopping Method: KeySwitch
Display: PowerView Model 101-C
Indication Lamps: One red, One Amber via PV101-C Display
Enclosure Material: Powder-Coated Cold Rolled Steel
Wiring Interface: 1-Deutsch HDP 21pin Connector

Throttle Method:
Rocker Switch (Digital Inputs to ECU)
TSC1 CAN Throttling (via PV101)
Tier 4 Regeneration:
CAN Enabled (via PV101) or Rocker Switch (via Digital Input to ECU)
Operational Temperature: -40° to +185°F (-40° to +85°C)
Viewable Temperature: -20° to +185°F (-29° to +85°C)
Storage Temperature: -40° to +185°F (-40° to +85°C)
Box Dimensions: 15.4 X 13.4 X 8.5 (391 X 340.4 X 216 mm)
Shipping Weight: 9.5 lbs (4.3 kg)

How to Order

Part Number	Model and Description	Notes
32700198	ML100-FP: PV101 Flat only, PTO Ramp throttle	Flat panel
32700199	ML100: PV101 Enclosed, PTO Ramp throttle	Enclosed panel
32700200	ML100-T4-FP: PV101 Flat only w/ T4 switch, PTO Ramp T4 Rocker throttle	Flat panel
32700201	ML100-T4: PV101 Enclosed w/ T4 switch, PTO Ramp T4 Rocker throttle	Enclosed panel

ML150 Panels
MurphyLink® Series

The MurphyLink® Series ML150 Panels include the PowerView® PV101-C display and the PowerView Analog gages. They are part of the J1939 MurphyLink Family developed to meet the needs for instrumentation and control on electronically controlled engines communicating using the SAE J1939 Controller Area Network (CAN).

The PV101 display is a multifunction tool that enables equipment operators to view many different engine or transmission parameters and service codes. The panels provide a window into modern electronic engines. The PowerView display includes a graphical backlighted LCD screen. It has excellent contrast and viewing from all angles. The display can show either a single parameter or a quadrant display for viewing four parameters simultaneously. Diagnostic capabilities include fault codes with text translation for the most common fault conditions.

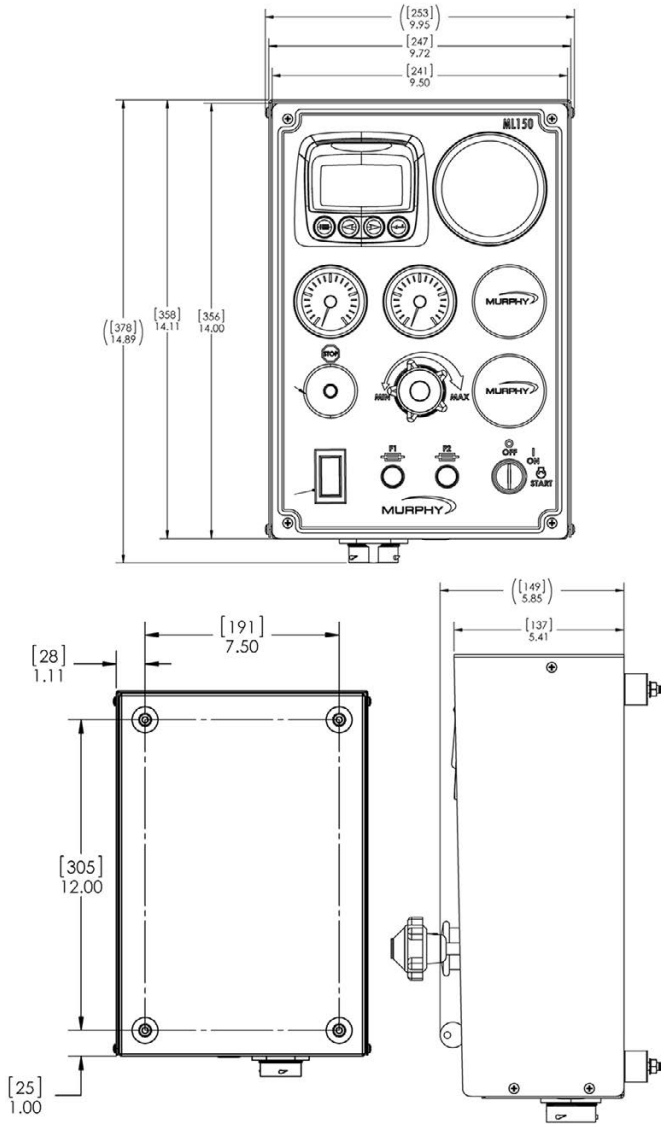
Other components in the panels are microprocessor-based PowerView Analog Gages for displaying critical engine data broadcast by an electronic engine: engine RPM, oil pressure and coolant temperature.

The ML150 Series panels are available in an enclosure or stand-alone flat panel option that can be dropped into a dash or console. This standard panel can be ordered with or without an enclosure. Optional mounting kits are offered for the enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications.

Features

- Standard Panel Designed for Modern Electronic Engines and Equipment Applications Using SAE J1939 Controller Area Network (CAN)
- PowerView Model 101 Displays More Than 30 Standard SAE J1939 Parameters Broadcast by Major Engine and Transmission Manufacturers' ECUs
- Display Active Faults and ECU-Stored Faults with Text Description on Most Common Faults for Diagnosing Equipment Malfunctions
- Standard Harnesses Available for Most Major Engine Manufacturers ECUs
- Enclosed Design or Flat Panel Option

Dimensions



Specifications

Operating Voltage:
12/24 VDC (8-32VDC Minimum and Maximum Voltage)
Operating Current: 1.4A MAX
Mounting: 4-.75" Rubber Isolated Shockmounts
Starting Method: KeySwitch
Stopping Method: KeySwitch
Display: PowerView Model PV101-C
Indication Lamps: One red, One Amber via PV101-C Display
Enclosure Material: Powder-Coated Cold Rolled Steel
Wiring Interface: 1-Deutsch HDP 21pin Connector

Throttle Method:
Rocker Switch (Digital Inputs to ECU) or Hand Throttle (PWM or 0-5V)
TSC1 CAN Throttling (via PV101)
Tier 4 Regeneration:
CAN Enabled (via PV101) or Rocker Switch (via Digital Input to ECU)
Operational Temperature: -40° to +185°F (-40° to +85°C)
Viewable Temperature: -29° to +185°F (-20° to +85°C)
Storage Temperature: -40° to +185°F (-40° to +85°C
Box Dimensions: 21.5 X 13.5 X 8.5 (546 X 343 X 216 mm)
Shipping Weight: 16.0 lbs (7.3 kg)

How to Order

Part Number	Model and Description	Notes
32700202	**ML150-FP:** PV101 Flat only, PTO Ramp throttle	Flat panel
32700203	**ML150:** PV101 Enclosed, PTO Ramp throttle	Enclosed panel
32700204	**ML150-iT4-FP:** PV101 Flat only w/ T4 switch, PTO Ramp iT4 Rocker throttle	Flat panel
32700205	**ML150-iT4:** PV101 Enclosed w/ iT4 switch, PTO Ramp iT4 Rocker throttle	Enclosed panel
32700216	**ML150-ES-MT5V-FP:** PV101 Flat only Stop Button, Morse 5V, PWM Morse & E-Stop throttle	Flat panel
32700217	**ML150-ES-MT5V:** PV101 Enclosed Stop Button, Morse 5V, PWM Morse & E-Stop throttle	Enclosed panel
32700206	**ML150-iT4-ES-MT5V-FP:** PV101 Flat only Stop Button, Morse 5V w/ iT4 switch, PWM Morse & E-Stop throttle	Flat panel
32700207	**ML150-iT4-ES-MT5V:** PV101 Enclosed Stop Button, Morse 5V w/ iT4 switch, PWM Morse & E-Stop throttle	Enclosed panel
32700218	**ML150-ES-MTPWM-FP:** PV101 Flat only Stop Button, Morse PWM, 0-5V Morse & E-Stop throttle	Flat panel
32700219	**ML150-ES-MTPWM:** PV101 Enclosed Stop Button, Morse PWM, 0-5V Morse & E-Stop throttle	Enclosed panel
32700208	**ML150-iT4-ES-MTPWM-FP:** PV101 Flat only Stop Button, Morse PWM w/ iT4 switch, 0-5V Morse & E-Stop throttle	Flat panel
32700209	**ML150-iT4-ES-MTPWM:** PV101 Enclosed Stop Button, Morse PWM w/ iT4 switch, 0-5V Morse & E-Stop throttle	Enclosed panel

ML300 Panels
MurphyLink® Series

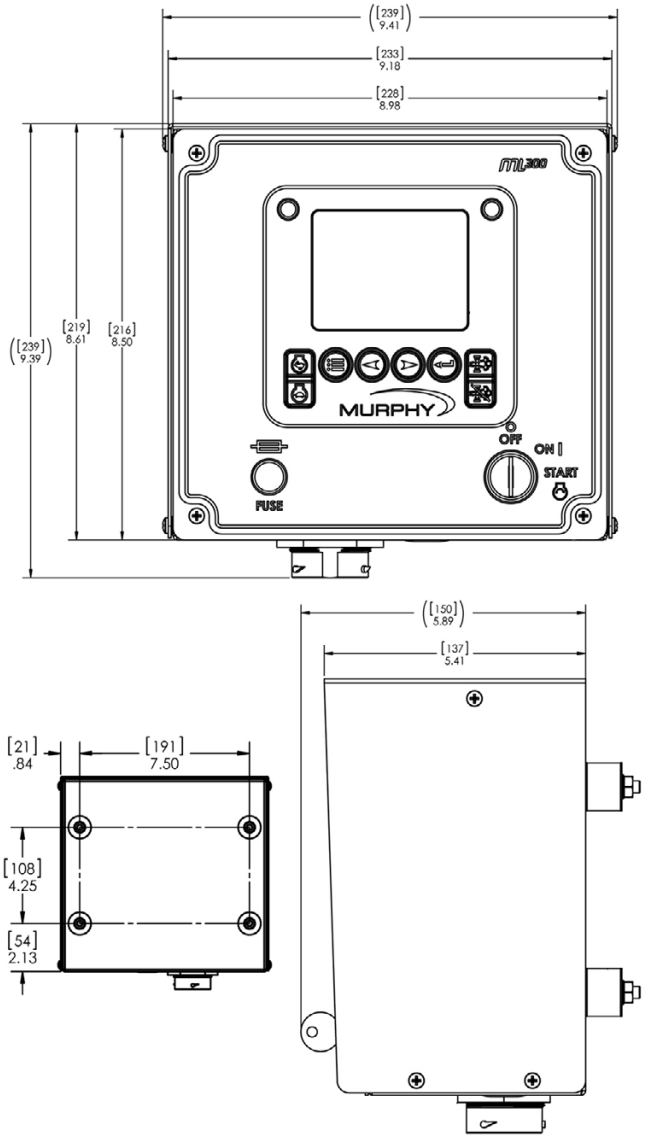
The MurphyLink® Series ML300 Panels include the new PowerView® PV300, a robust, multifunction control panel that provides advanced monitoring of electronic engines designed to meet Tier 4/Euro Stage IV emissions requirements. The model PV300-P monitors multiple engine and machine parameters on an easy-to-read 3.8-inch (97 mm) QVGA monochrome LCD.

The panel is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown with integrated throttle control. The PV300 provides monitoring of Tier 4/Euro Stage 4 compliant electronic engines, monitors multiple J1939 parameters and provides basic engine alarm/shutdown with integrated throttle control. Throttling communicates through TSC1 on the J1939 CAN network. The regeneration commands for inhibit and forced-regeneration communicate through J1939 CAN protocol.

Features

- Tier 4/Euro Stage IV ready
- Superior Display Visibility Even in Bright Sunlight
- Back-Mounted Display for Seamless Panel Integration
- Integrated CAN Communication Using SAE J1939
- Rugged Enclosure Using Industry Standard Deutsch Connectors
- Circuit Protection and Diagnostics

Dimensions



Specifications

Operating Voltage:
12/24 VDC (9-32VDC Minimum and Maximum Voltage)
Operating Current: 1.2A MAX
Mounting: 4 - .75" Rubber Isolated Shockmounts
Starting Method: KeySwitch
Stopping Method: KeySwitch
Display: PowerView Model 300
Indication Lamps: One red, One Amber via PV300 Display
Enclosure Material: Powder Coated Cold Rolled Steel
Wiring Interface: 1-Deutsch HDP 21pin Connector

Throttle Method: TSC1 CAN Throttling (via PV300 Tactile Rocker)
- Increment/Decrement
- Idle/Run
- Idle, Run 1, Run 2

Tier 4 Regeneration: CAN Enabled (via PV300 Tactile Rocker)
Operational Temperature: -40° to +185°F (-40° to +85°C)
Storage Temperature: -40° to +185°F (-40° to +85°C)
Box Dimensions: 15.4 X 13.4 X 8.5 (391 X 340.4 X 216 mm)
Shipping Weight: 10.0 lbs (4.5 kg)

How to Order

Part Number	Model and Description	Notes
32700210	ML300: 12/24-Volt	Enclosed panel

MLC380 Panel
MurphyLink® Series

The MurphyLink Series MLC380 Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering that includes the powerful, yet simple-to-configure PV380[1] display. This display is part of the Murphy PowerView® family and provides monitoring of Tier 4/Euro Stage 4 compliant electronic engines. The PV380 monitors multiple J1939 parameters and provides basic engine alarm/shut-down information.

The MLC380 panel has the ability for the software to be fully configured from the front user interface. If the factory default parameters are not the desired set points, the packager or operator has the ability to change these settings. The configuration tool also allows for the splash screen to incorporate a company logo.

The flexibility of the MLC380 allows for the same panel to be used across many applications. This provides the operator familiarity with the display and panel in any application. The panel utilizes industry standard Deutsch connectors and is compatible for use on the simplest to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness[2] or John Deere OEM engine harnessing.

MLC380 Electronic Panel

MLC380 Mechanical Panels, Mounting Bracket Optional

This panel is available in a rugged, powder-coated galvannealed enclosure that can be mounted on or near the engine.

[1]Please see www.enovationcontrols.com/PV380 for additional information regarding this display model.
[2]Please see www.enovationcontrols.com/MIH for additional information regarding harnessing.

Specifications

PV380 Display

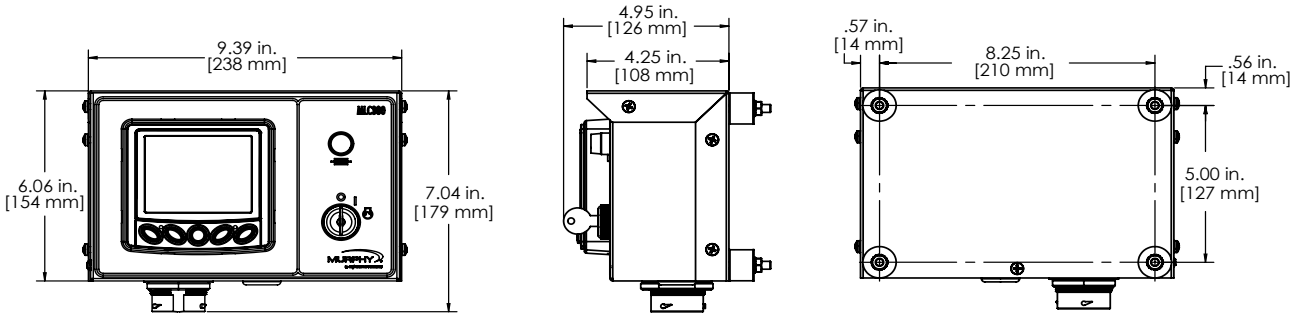
Operating Voltage: 6-36 VDC; reverse polarity protected (display only)
Operating Temperature: -40° to 185° F (-40° to 85° C)
Storage Temperature: -40° to 185° F (-40° to 85° C)

Total Current Consumption: 10 W Max (display only)
Viewing Area: 3.8" (97 mm) QVGA (320 x 240 pixels); mono-chrome transflective LCD with white LED backlight and heater
Viewing Angle: ±50° horizontally; +45° / -60° vertically
Panel Enclosure: Powder-coated galvanneal
Alarms: Red and amber warning LEDs; Set point triggered output for external piezo buzzer or shut-down relay
Mating Connectors:
21 Position, Deutsch HDP26-24-21SE, Electronic Engine
15 Position, AMP 77023-1, Mechanical Engine
Sealing: IP66 and 67 (Display only)
Vibration and Shock: 7.86 g random vibe (5-2000 Hz) and ±50 g shock in 3 axes (Display only)

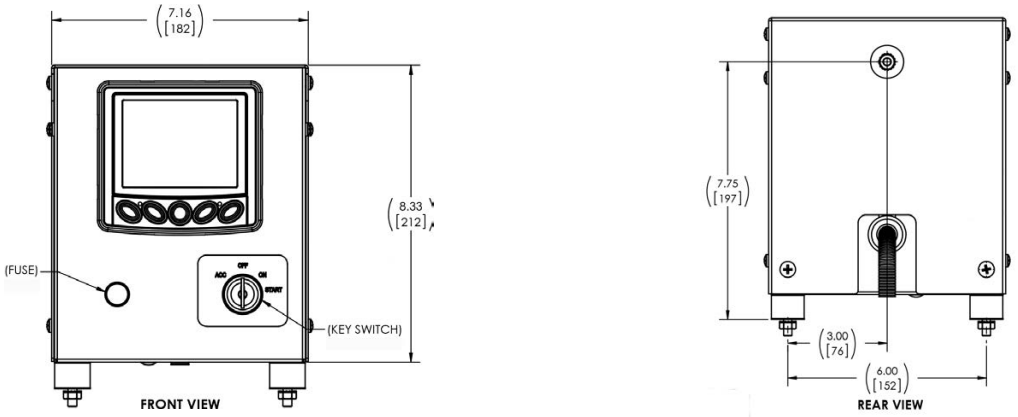
Communications: CAN (SAE J1939) and RS-485 Modbus
Languages: English, Spanish, French, Italian and German
Outputs (2):
(2) 500 mA; switched low-side
Inputs (8):
(4) Resistive Analog
(3) Analog: 0-5 V, 4-20 mA (analog or digital)
(1) Frequency (2 Hz - 10 KHz, 3.6 VAC-120 VAC)
EMC/EMI: 2004/108/EC and 2006/95/EC directives
EN61000-6-4:2001 (emission)
EN61000-6-2:2001 (immunity)
EN50121-3-2 and EN12895
SAE J1113/2, 4, 11, 12, 21, 24, 26 and 41

Product and Mounting Dimensions

MLC380 Electronic Panel



MLC380 Mechanical Panel



How to Order

Part Number	Model and Description	Notes
32700227	MLC380 Electronic 12V - R2	Panel for Electronic Engines
32700228	MLC380 Electronic 24V - R2	
32700233	MLC380 Mechanical - R2	Panel for Mechanical Engines
32700234	MLC380 Mechanical - R2 with Engine Harness	
32700235	MLC380 Mechanical - R2 WDU for Deutz Engines	
32700237	MLC380-24V-MECH-R2-15 Pos	
32700238	MLC380-24V-MECH-R2 W/Harness	
30000855	WDU Mounting Bracket	Accessory
05705669	ES2F Fuel Level Sender	
78001061	I/O Harness for PV380 (12 pos)	
65000457	Mechanical Sender Kit - includes 05701858 ES2P-100 Pressure Sender 10702013 ES2T-250/300-1/2 Temperature Sender 20700162 MP3298 Magnetic Speed Sensor 05705669 ES2F Fuel Level Sender	
65000462	Pre-Heat Kit	

Murphy Industrial Harnesses

MurphyLink® Series

The MurphyLink Series ML Panels are universal to all engines. The adaptation to the engines will be through the MIH Harness, which is built to the specifications of each engine manufacturer and customer. When requesting the MIH Harness, specific information will be obtained so that the correct harness may be built for your engine.

Features

- Connect any MurphyLink Panel to major engine manufacturers' engines
- Customizable per specific customer application and requirement
- Standard 21-pin Deutsch connector interface
- Manufactured in the USA
- Built to strict quality standards for long-term reliability

How to Order

Part Number	Model	Description
Caterpillar Engine		
32000137	**MIH-CA-40P-T2-ADEM3-6**	CAT W/PTO
32000138	**MIH-CA-64P-T3-A4E2-6**	Works with C4.4 & 6.6
32000160	**MIH-CA-70P-IT4-A4E4-6**	Works with CAT C18-32
32000148	**MIH-CA-70P-IT4-A4E4-6-12 VDC**	Works with IT4 C9.3, C13, C15, C18 (<750 hp)
32000150	**MIH-CA-70P-IT4-A4E4-6-24 VDC**	Works with IT4 C9.3, C13, C15, C18 (<750 hp)
32000159	**MIH-CA-70P-IT4-C4.4-12 VDC**	Works with IT4 C9.3, C13, C15, C18 (<750 hp)
32000151	**MIH-CA-70P-IT4-C7.1-6-12 VDC**	Works with IT4 C9.3, C13, C15, C18 (<750 hp)
32000171	**MIH-CA-70P-T3-A4-6**	Works with C series tier 3 except 4.4 and 6.6
32000170	**MIH-PK-94P-IT4/T4-C3.4**	Works with 3.4 IOPU engine
32000155	**MIH-CA-86P-T4-C4.4-6**	Works with FT4 C4.4
32000188	**MIH-CA-70P-FT4-C7.1-6**	Works with FT4 C7.1
32000189	**MIH-PK/CA-70P-T4F-C4.4-W/CIC-6**	FT4 C4.4 position customer interface connector only
32000167	**MIH-CA-70P-T4-C9.3-C18**	Works with FT4 C9.3-18
Cummins Engine		
32000149	**MIH-CU-50P-T2-CM570-12**	Works with QSM/QSX
32000134	**MIH-CU-50P-T2-CM570-6**	Works with QSM/QSX
32000195	**MIH-CU-60P-T3-CM2150C-6**	QSB 3.3
32000147	**MIH-CU-50P-T3-CM850-12**	Works with QSB, QSC, QSL
32000152	**MIH-CU-60P-IT4-CM2250-6**	Works with QSB6.7, QSL9, QSX11.9, QSX15

How to Order, cont.

Part Number	Model	Description
Detroit Diesel Engine		
32000168	**MIH-DD-30P-T3-DDECIII/DDECIV-6**	Works with DDEC III/IV ECM
32000139	**MIH-DD-68P-T3-DDECV-6**	Works with 50/60 Series, DDEC V ECM
JCB Engine		
32000196	**MIH-JCB-29P-FT4-IPU**	Final Tier 4 Industrial Power Unit Engines
32000154	**MIH-JCB-62P-T4-DCM3.3-6**	Works with iT4 and FT4
Perkins Engine		
32000138	**MIH-CA-64P-T3-A4E2-6**	Works with 1104 and 1106
32000159	**MIH-CA-70P-IT4-C4.4-12 VDC**	Works with IT4 1204 only
32000151	**MIH-CA-70P-IT4-C7.1-6-12 VDC**	Works with IT4 1206 only
32000155	**MIH-CA-86P-T4-C4.4-6**	Works with FT4 1204 only
32000188	**MIH-CA-70P-FT4-C7.1-6**	Works with FT4 1206 only
32000170	**MIH-PK-94P-IT4/T4-C3.4/P854F**	Works with 854 IOPU engine
PSI Engine		
32000194	**MIH-PSI-16P-GAS-4**	GM engine with Econtrols ECU
Scania Engine		
32000166	**MIH-SCANIA-8P/6P-DC-13-24 V**	Works with iT4
32000132	**MIH-SCANIA-8P-FT4-EMS-XPI-6**	Works with FT4
Volvo Engine		
32000200	**MIH-VO-8P-T4-6**	Works with Volvo T4 engine
All Engines - IOPU Harnesses		
32000190	**MIH to IOPU Jumper Harness**	MIH to IOPU Jumper Harness
32000191	**MIH-IOPU-CA-70P-FT4-C7.1**	IOPU Harness for CAT 7:1
32000192	**MIH-IOPU-CA-86P-FT4-C4.4**	IOPU Harness for CAT 4:4
32000170	**MIH-PK-94P-IT4/T4-C3.4/P854F**	Works with 854 IOPU engine
All Engines - Extension Harnesses		
78001035	**MIH, Extension**	Harness, 6-feet long
78000294	**MIH, Extension**	Harness, 12-feet long
78000293	**MIH, Extension**	Harness, 20-feet long
78000933	**MIH, Extension**	Harness, 40-feet long

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Keystart 9620 Series
Engine/Generator Controls

Keystart 9620 and 9621 control modules provide manual start/stop and automatic fault protection for generators, pumps and other engine-driven applications. Outputs allow control of engine fuel (energized to run), starter motor and preheat. The Keystart also has an alarm output for remote or audible warning of faults.

Six LEDs and icons indicate engine status and faults. Four switch inputs (closing to negative on fault) enable automatic shutdown on engine low oil pressure, high coolant temperature and auxiliary faults. Model 9621 has a fully adjustable engine overspeed shutdown feature, configurable for either generator AC or magnetic pickup speed signals. Charge alternator excitation and a charge fail warning LED are standard.

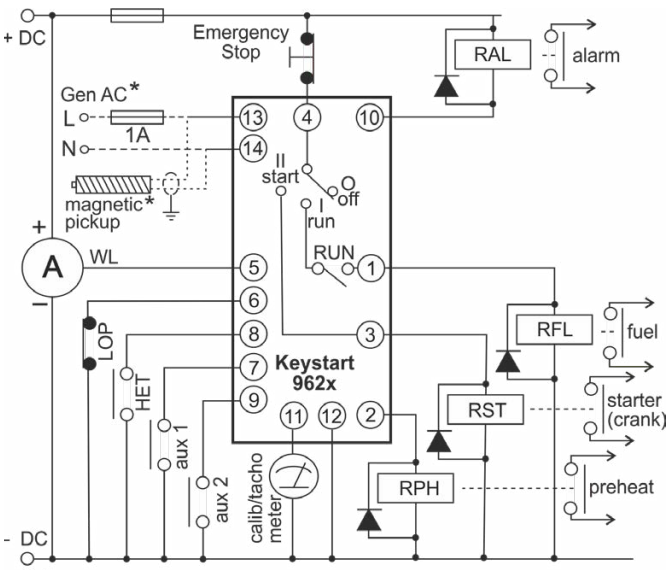
Electrical connection is by quick-connect, spring-clamp terminal blocks. A universal 7 to 30 VDC power supply permits operation with 12 or 24 VDC engine batteries, with standard engine crank-dip voltage protection.

Keystarts are mounted in the front through a standard cutout and secured at the rear with quick-fit clips. Epoxy resin case encapsulation gives superior vibration/shock resistance and environmental protection.

Specifications

Power Supply
Operating voltage, steady state: 7 to 30 VDC
Operating voltage, brown out/cranking: 5 VDC minimum
Current consumption: <100 mA
Inputs
Fault switch inputs: close to negative DC during fault
Generator AC input (model 9621 only):
70 - 270 VAC rms, <50 to >60 Hz nominal
Magnetic pickup input (model 9621 only):
3.5 - 21 VAC rms, <2000 to >6500 Hz nominal
Outputs (all ratings non-reactive)
Run (fuel): positive DC, NO relay contacts, 10 A max @ 24 VDC
Start (crank): positive DC, keyswitch contacts, 10 A max @ 24 VDC
Alarm: negative DC (open collector transistor), 300 mA max
Speed calibration: to suit 0-1 mA, 75 Ohm meter, output=0.75 mA at rated engine speed.
Adjustable settings
Preheat timer: 0 or 10 secs, default = 0 secs
Fault override timer: 2 to 20 secs (VR1), default = 10 secs
Overspeed trip level (model 9621 only): 100 to 130% (VR3) of nominal calibrated speed, default = 110% (of 50 or 60 Hz)
Physical
Case material: polycarbonate / polyester
Overall dimensions: (w x h x d): 3.8 x 3.8 x 3.7 in. (96 x 96 x 95 mm)
Panel cut-out size: DIN 3.6 x 3.6 in. (92 x 92 mm)
Weight: approx 0.7 lb. / 300g
Operating temperature: -31° to 131° F / -35° to 55° C
Electromagnetic compatibility: EN55022, class B

Typical Connections



Notes:
*Overspeed models 9621 only. Select generator AC or magnetic pickup speed sensing using configuration links (see rear view diagram). Factory default setting is for generator AC sensing.

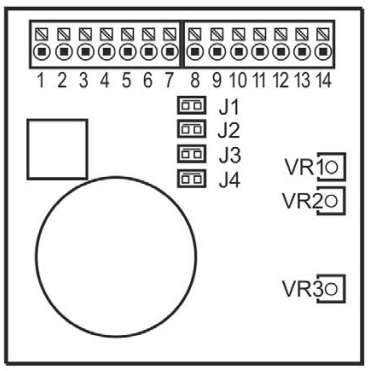
Front View and Operation

LED Indication
run (fuel) on - green preheat on - amber
low oil pressure fault shutdown - red
high engine temperature fault shutdown - red
overspeed/aux 2 fault fault shutdown - red
charge fail warning - red
aux 1 fault shutdown - red

4 Position Keyswitch

O	Off/Reset. Removes power, stops the engine and resets any latched shut-down fault. Key is only removable in this position.
I	Run. Activates the run output and (if enabled) the timed preheat output. Once the engine is fully running, and after the override time, keystart immediately shuts down the engine on detection of a fault.
II	Start/crank. Maintains the run output, and activates the start (crank) output. Shut-down fault inputs are disabled and the fault override timer is reset. This position spring returns to I (run) on release.
III	Auxiliary. Keyswitch auxiliary output, positive DC

Rear View, Connection & Settings



This applies to models manufactured from April 2015.
Please refer to installation instructions for earlier models.

Connection:

1 run (fuel) output: +DC, 10A
2 preheat output: +DC, 10A
3 start (crank) output: +DC, 10A
4 + DC power supply
5 charge fail (WL)
6 oil pressure fault input
7 aux. 1 fault input
8 engine temp fault input
9 aux. 2 fault input
10 alarm output: –DC, 250mA
11 speed calibration output
12 – DC power supply

Speed input, model 9621 only. Check rear configuration links before connection, either:
13 L, 14 N ┐ Generator AC, 70-270 VAC, 50/60Hz
or
13 +, 14 – ┐ magnetic pickup, 3.5-21 VAC, 2000-6500Hz

Configuration

Use a 3 mm/0.1 in. flat head screwdriver for potentiometers VR1-VR3

Models 9620 and 9621

J3 & J4: preheat output timing
- J4 ON: no preheat
- J4 OFF, J3 OFF: preheat 10 secs fixed, unaffected by cranking
- J4 OFF, J3 ON: preheat 10 second max, de-activated by cranking

VR1: Fault override, 2-20 secs, clockwise to increase.

Model 9621 only

J1 & J2: speed sensing source (pins 13 and 14):
- both links ON for generator AC, 50/60Hz
- both links OFF for magnetic pickup, 2000 - 6500Hz

VR2: Speed calibration. Set J1 and J2 correctly, run engine to nominal speed, adjust VR2 to give (pin 11) calibration output of 0.75mA

VR3: Overspeed, 100 - 130% of VR2 setting, clockwise to increase

How to Order

Part Number	Model / Description	Notes
41700141	KEY9620 (without overspeed protection)	Only available from our UK office. Keyswitch Type K2, rubberized
41700143	KEY 9621 calibrated for 50Hz, (with overspeed protection, selectable AC generator or magnetic pickup sensing)*	Only available from our UK office
41700142	KEY 9621 calibrated for 60Hz, (with overspeed protection, selectable AC generator or magnetic pickup sensing)*	Keyswitch Type K2, rubberized
41700157	Spare mounting clips (pack of 4)	Accessories / Spares
65700148	Spare keyswitch (K2 type), includes key	
65000460	Spare key (K2 type)	
00020657	Keystart 9620/9621 Installation Instructions	Further information
*Factory default setting is for AC generator sensing, 50 or 60 Hz nominal. Non-standard (NS) setting options are available to order.		

CANstart™ 9631
Engine/Generator Control

CANstart 9631 module provides operator start/stop control, panel gage driving, fault indication and auxiliary shut-down protection for ECU-controlled, CAN bus SAE J1939 compatible engines. This compact controller can be used with generators, pumps and other engine-driven applications.

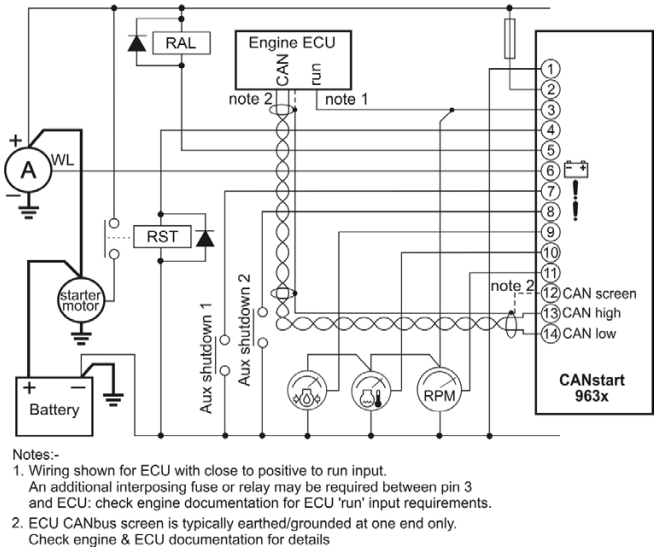
Operator control is through a four-position keyswitch. The key is removable only in the stop/reset position. Six LEDs and icons indicate engine/ECU status and faults. Two of these LEDs (with associated inputs) provide for auxiliary fault shutdown and charge alternator fail excitation. In addition, CANstart provides optional engine overspeed shutdown protection for variable speed or fixed speed engines.

CANstart has two protected (positive DC) FET outputs for the control of ECU engine run and starter motor. Three additional outputs drive analog panel gages (Murphy, VDO or Datcon) based on ECU-transmitted data for engine speed, oil pressure or coolant temperature.

DIP switches at the rear allow set up of control and gage output options. Electrical connection is by two-part screw terminal blocks, including a universal 8-32 VDC power supply for operation with 12 or 24 VDC engine batteries. Engine cranking supply brownout protection is standard.

The CANstart panel is front-mounted through a standard cutout and secured at the rear with quick-fit clips. The epoxy resin case gives superior vibration/ shock resistance and environmental protection.

Typical Connection



Notes:-
1. Wiring shown for ECU with close to positive to run input. An additional interposing fuse or relay may be required between pin 3 and ECU: check engine documentation for ECU 'run' input requirements.
2. ECU CANbus screen is typically earthed/grounded at one end only. Check engine & ECU documentation for details

Specifications

Power Supply
Operating Voltage, steady state: 8 to 32 VDC
Operating Voltage, brownout / cranking: 5 VDC minimum
Current consumption: < 100 mA

Inputs
CAN bus: SAE J1939 protocol, switchable 120 Ohm terminating resistor
Auxiliary Shutdown (x2): close to negative DC during fault

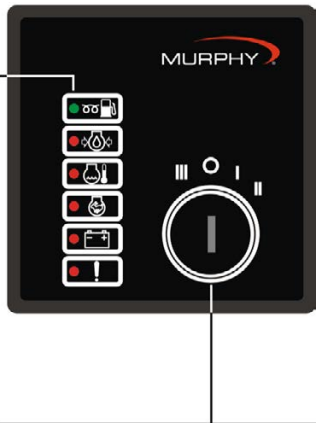
Outputs (all ratings non-reactive)
Run (ECU), start (crank): positive DC (protected FET), 6 A max @ 32 VDC
Alarm: negative DC (open collector transistor), 250 mA max @ 32 VDC
Oil pressure gage: suitable for Murphy, VDO 5 or 10 Bar, Datcon 7 or 10 Bar
Engine temperature gage: suitable for Murphy, VDO or Datcon
Tachometer: for use with charge alternator driven tachometers

Adjustable Settings
Model 9631 (variable speed engines)
Overspeed level:
1250 - 2800 RPM (50 RPM increments) or OFF

Physical
Electromagnetic capability: 2004/108/EC
Case Material: polycarbonate / polyester
Overall dimensions (w x h x d):
3.8 x 3.8 x 5.2 in. (96 x 96 x 131 mm)
Panel cutout size: DIN 3.6 x 3.6 in. (92 x 92 mm)
Weight: approx. 0.6 lb / 240 g
Operating Temperature: -4° to 167° F / -20° to 75° C

Front View and Operation

LED indication
flashing constant
Green. ECU status:
CAN inactive CAN active.
Red. Oil pressure fault:
warning shutdown.
Red. Coolant temperature fault:
warning shutdown.
Red. Engine speed fault:
overspeed shutdown.
Red. Charge fail warning.
Red. ECU/auxiliary fault:
ECU shutdown fault.
(50/50 on/off) ECU warning fault.
(1 on pulse) aux. 1 shutdown.
(2 on pulses) aux. 2 shutdown.

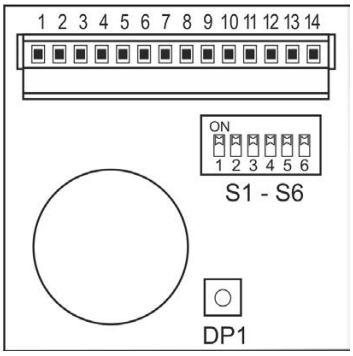


4 Position Keyswitch

	Off/Reset. Removes power, stops the engine and resets any latched shut-down fault.
	Run. Activates the run output and (if enabled) the timed preheat output. Once the engine is fully running, and after the override time, Keystart immediately shuts down the engine on detection of a fault.
	Start/crank. Maintains the run output and activates the start (crank) output. Shut-down fault inputs are disabled and the fault override timer is reset. This position spring returns to I (run) on release.
	Auxiliary. Keyswitch auxiliary output, positive DC

Rear View, Connection and Settings

Connection	
1	-DC power supply
2	+DC power supply
3	run (ECU) output, +DC, 6A max
4	start (crank) output, +DC, 6A max
5	alarm output, -DC, 250 mA max
6	charge fail (alternator WL)
7	aux 1 input, -DC to activate
8	aux 2 input, -DC to activate
9	oil pressure gage output
10	coolant temp gage output
11	tachometer output
12	CAN screen
13	CAN high
14	CAN low



S1 - S5 DIP Switch Settings

Note: switch S6 reserved for future use.

switch position ▲ on (up) ▼ off (down)					options (* default settings)
S1	S2	S3	S4	S5	
▲	▲	▲			Murphy temp. and pressure gauges *
▼	▲	▲			Datcon temp. and 0 – 7 bar pressure gauges
▼	▲	▼			Datcon temp. and 0 – 10 bar pressure
▲	▼	▲			VDO temp. and 0 – 5 bar pressure gauges
▲	▼	▼			VDO temp. and 0 – 10 bar pressure gauges
			▲		CAN 120 Ohm terminating resistor in circuit *
			▼		CAN 120 Ohm terminating resistor removed
				▲	Sets speed nominal or range for DP1 below: see installation instructions for full details.
				▼	

DP1 digital potentiometer setting (with S5 above)
Overspeed shut-down set point: see installation instructions for details.

How to Order

Part Number	Model and Description	Notes
41700147	CST9631: Keyswitch K2 (Type 2, rubberized) Default overspeed setting is 1250 RPM. (For variable speed engines, overspeed setting range 1250 - 2800 RPM.)	Non-standard (NS) settings/options are available to order.
41700157	Spare mounting clips (pack of 4)	Accessories and spare parts
65700148	Spare keyswitch (K2 type), includes key	
65000460	Spare key (K2 type)	

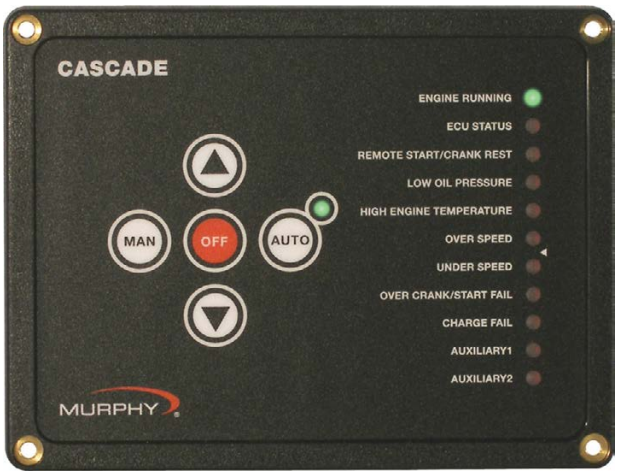
Cascade Controller
Auto-Start/Stop

The Cascade controller offers automatic start and stop control with easy configuration for a broad number of applications.

This auto-start controller is designed to fit any engine-driven application requiring a simple and robust automatic start and stop sequence. Pumps, compressors, grinders, power units and generators are just a few of the industrial applications for the controller.

The Cascade controller is fully compatible with all major engine types. Whether you are running mechanical or J1939 engines, the controller will work with your application.

Murphy offers unique features at a competitive price with the Cascade controller.

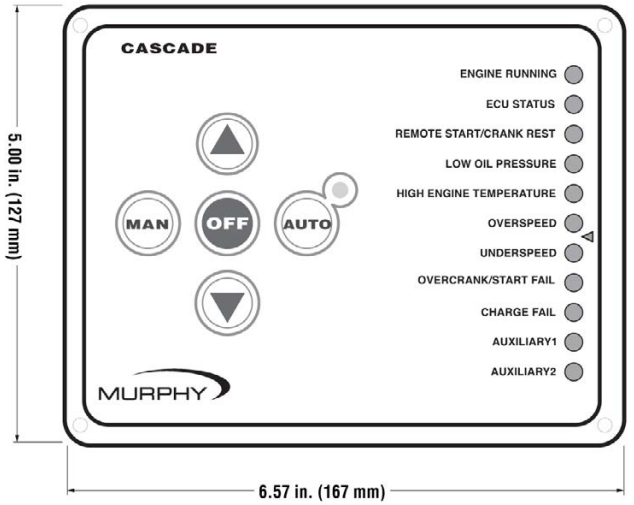


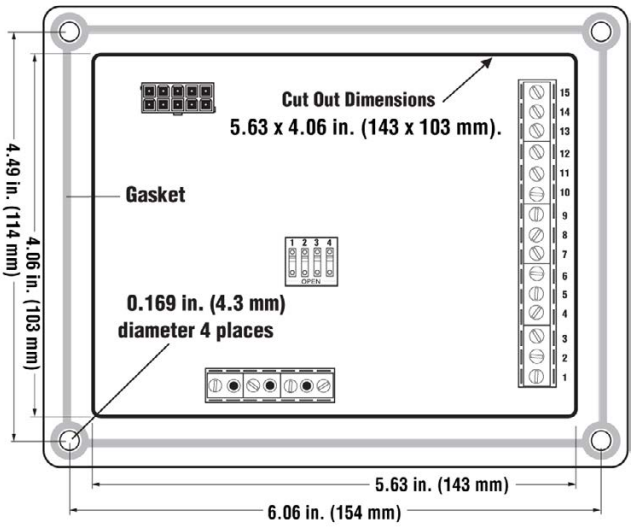
CE c UL us LISTED E236550 c UL us LISTED E323186 CL1 DIV 2 GRP A, B, C, D HAZARDOUS LOCATIONS

Features

- Durability: Encapsulated to protect it against dirt, water and dust, along with a compression gasket to fully seal it to the panel. Cascade is rated NEMA4 and IP65.
- Low Battery Blackouts: Operates in total blackout for a minimum of two seconds.
- Compatibility: Accepts MPU, AC Frequency and ECU speed signals and can operate with standard and J1939 engines.
- Inputs and Outputs: The Cascade Inputs and Outputs are ruggedly protected and fault tolerant.
- J1939 Ready: Works directly with Murphy's J1939-ready PowerView® gages, just plug and go. No sender is required.
- CD101 Cascade Configuration Tool: Allows quick setup and loading of parameters into a Murphy standard Cascade via a PC software tool.

Dimensions





Specifications

Power input: 9-35VDC continuous - operates during total black out for 2 seconds minimum.
Power consumption: Sleep Mode (Manual): 1mA typical; Sleep mode (Automatic): 4mA typical. Running mode (manual): 20mA typical; Running mode (Automatic): 24mA typical.
Operating/Storage temperature: -40 to 185°F (-40 to 85°C)
Humidity: 0-100%, non-condensing
Housing: UV stabilized black polycarbonate and epoxy encapsulation. Weather tight and includes sealing gasket to keep moisture and debris out of enclosure. Properly mounted controller will maintain NEMA4 / IP65 rating of enclosure.
Vibration: Rated to 6G
Impact: Rated to 10G
Inputs: Dedicated digital inputs for low oil pressure, high engine temperature, remote start, DC charge fail/alternator fail. Two auxiliary inputs are configurable for multiple functions.
Outputs: 7 – 4 auxiliary, configurable (1A DC protected). 3 dedicated outputs for crank, fuel/ECU, alternator excitation
Crank attempts: 3, 5, 10, Continuous
Crank Rest: 5-60 seconds, adjustable
Shutdown lockout time delay: 5, 10, 15, 20, 25, 30 seconds
Crank disconnect speed setting: Field settable 0-9999 RPM (16-60Hz AC freq input).
Overspeed/underspeed trip point setting: ±5 to 50% of nominal.
Speed sensing inputs: Magnetic pickup (5-120VAC RMS / 0-10 kHz) and AC frequency (30-600VAC RMS / 16-80 Hz)
CAN bus interface: Directly reads engine speed and engine status data from SAE-J1939 enabled engines
MODBUS interface: In J1939 applications, drives PVA series analog gages
Shipping Weight: 1 lb. (453 g) approximately
Shipping Dimensions: 5.1 x 6.7 x 1.6 inch (130 x 10 x 41 mm) approximately

How to Order

Part Number	Model and Description	Notes
40700259	CD101 Cascade Controller	Controller
40090045	CD101 Cascade Configuration Kit	Accessories

PowerCore® MPC-10

The Murphy PowerCore MPC-10 Controller is a general, all-purpose manual/auto start and manual/auto throttling engine controller designed with rental applications in mind. The controller is purposed primarily for applications where a wide array of inputs and outputs are not required. This is a powerful and rugged controller that supports J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety shutdowns.

While reprogrammable, the MPC-10 follows a standard operating sequence. This operating sequence is a set of 22 machine states that happen in a predetermined order. Machine states can be set to zero if not needed or adjusted to fit the application. The menu structure is incredibly versatile, with the ability to change many parameters and settings from the face without the need of a PC tool, if desired.

The MPC-10 is flexible in many aspects, with the ability to:

- use the same controller on 12VDC or 24VDC systems;
- assign multiple levels of passcode protection to the menu using the free of charge PC Configuration Tool;
- change the input sensor type for the analog inputs;
- use analog inputs as digital ground inputs;
- be mounted in all weather environments;
- be customer mounted in panel of choice.

*Approved by CSA for non-hazardous locations (Group Safety Publication IEC 61010-1 Third Edition.
Products covered in this document comply with European Council electromagnetic compatibility directive 2014/30/EU and electrical safety directive 2014/35/EU.

Specifications

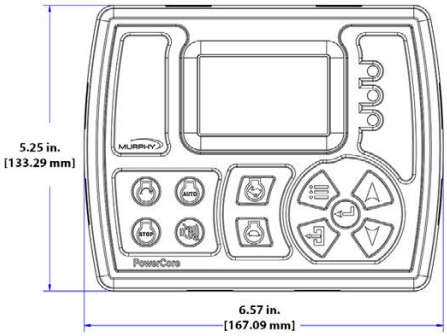
Interface:
Display:
Monochrome HR-TFT, 2.7 in. / 68mm, WQVGA (400 x 240 pixels)
(3) LEDs: green (mode), yellow (warning) and red (shutdown)
Operator Controls:
(11) Raised silicon keypads, tactile feedback

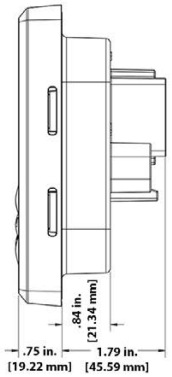
Power Supply:
Operating Voltage: 8-32 VDC, reverse battery polarity and load-dump protected
Cranking Power Holdup: 0 VDC up to 50mS (also good for brownout / blackout instances)
Power Consumption:
18W max without two 1A High-side FETs active
146W max with two 1A HIgh-side FETs active

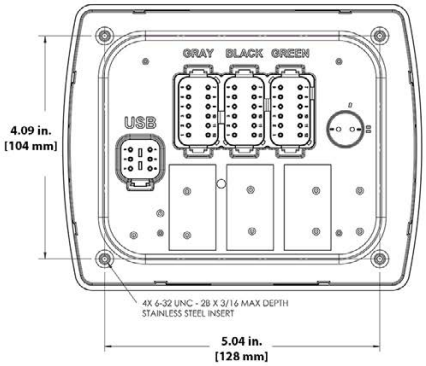
Inputs:
(5) Digital, configurable (active on High, Low, Open)
(3) Analog, configurable (4-20mA, 0-5V, resistive or digital ground)
(1) Frequency, supporting:
Magnetic Pickup (30 Hz - 10 kHz, 2.0 VAC - 120 VAC) and
Engine Alternator (30Hz 10 kHz, 4.5 VRMS - 90 VRMS)

Outputs:
(3) Relay, Form C (dry / volt-free), 10A
(2) Low-side FET (-DC), 1A
(2) High-side FET (+DC), 1A
(1) Dedicated Alternator Excitation, +DC, 1A

Dimensions







Specifications (continued)

Physical / Environmental:

Enclosure Material: Polycarbonate / ABS
Dimensions (WxHxD):
9.59 x 7.34 x 5.20in. (243.48 x 186.5 x 132.23 mm)
Weight: 4 lbs (1.8 kg)
IP Rating: IP67and IP69K front and back, IP66 panel seal when used with accessory gasket
Operating & Storage Temperature: -40° to +85° C (-40° to +185° F)
Vibration: 7.86 Grms (5-2000 Hz), 3-axes random
Shock: ±50G, 3-axes
Emissions & Immunity: SAE J1113

Communications:

(1) CAN: J1939
(1) RS485: Modbus RTU
(1) USB: 2.0B (Supported for Programming)

Mating Connectors:

12 Position, DT06-12SA PO12 (Gray)
12 Position, DT06-12SB-PO12 (Black)
12 Position, DT06-12SC-PO12 (Green)

Connectors

Deutsch 12 pin Connector Gray	
PIN	Function
1	Battery (+)
2	RS485 (+)
3	RS485 (-)
4	Relay 3 NC
5	Relay 3 COM
6	Relay 3 NO
7	Analog In 3
8	Digital In 3
9	Digital In 4
10	Digital In 5
11	Not Used
12	Battery (-)

Deutsch 12 pin Connector Black	
PIN	Function
1	Battery (+)
2	Not Used
3	Digital Out 2 +DC (1A)
4	Digital Out 1 +DC (1A)
5	Digital Out 4 -DC (1A)
6	Digital Out 3 -DC (1A)
7	Analog In 1
8	Analog In 2
9	Digital In 1
10	Digital In 2
11	Frequency In
12	Battery (-)

Deutsch 12 pin Connector Green	
PIN	Function
1	Battery (-)
2	Battery (+)
3	Battery (+) Switched
4	Alt Excite +DC (1A)
5	CAN (H)
6	CAN (L)
7	Relay 1 NO
8	Relay 1 COM
9	Relay 1 NC
10	Relay 2 NO
11	Relay 2 COM
12	Relay 2 NC

Deutsch 6 pin Connector USB	
PIN	Function
1	USB1_VBUS
2	USB_DP_OUT
3	USB_DM_OUT
4	USB_ID_OUT
5	USB_SHLD
6	USB_GND

How to Order

Part Number	Model/Description
40700494	MPC-10 Controller
40051142	Panel Gasket, IP66, MPC-10
40700506	PowerCore 3X12 Position Connector Kit
40000598	PowerCore 3X12 Position 3’ Conn Whip Harness (1m approx.)
78000668	USB Programming Harness

PowerCore® TEC-10

Turnkey Electronic Controller

A superior turnkey electronic controller, the PowerCore® TEC-10 panel provides full control of your engine including auto start/stop, auto throttling and display of engine parameters along with critical faults from the engine/application. The TEC-10 supports SAE J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety warnings/shutdowns.

The TEC-10 follows a standard operating sequence of 22 machine states that happen in a predetermined order. These machine states may be set to zero if not needed or adjusted to fit the application. The incredibly versatile menu structure allows parameters and settings to be changed from the face without the need of a PC tool, if desired. This flexibility allows for the same controller panel to be used across many applications and provides the operator familiarity with the controller panel in a variety of uses.

The controller panel features molded connectors that utilize industry-standard Deutsch connectors and are compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines.*

Designed as a plug-and-play solution, the TEC-10 can also utilize a free PC configuration tool that allows customers to change default settings as well as provide three levels of passcode protection, if needed.

The rugged TEC-10 panel can be mounted directly to the engine or engine/application cover. Built to endure industrial environments from full sun to wide temperature ranges, the panel features a high degree of sealing for dust and water as well as the ability to withstand higher vibration with exposure.

CE

Products covered in this document comply with European Council electromagnetic compatibility directive 2014/30/EU and electrical safety directive 2014/35/EU.

*Direct connect with Murphy Industrial Harness or John Deere OEM engine harnessing.

Specifications

TEC-10 Panel

Operating Voltage: 8-32 VDC, reverse battery polarity and load dump protected
Operating Temperature: -40° to +85° C (-40° to 185° F)
Storage Temperature: -40° to +85° C (-40° to 185° F)

Cranking Power Holdup: 0 VDC up to 50 mS (also good for brownout/blackout instances)

IP Rating: IP67

Total Current Consumption:
Power on in stopped state; 117 mA at 12 VDC. Power on in standby mode; 52 mA at 12 VDC.

Mating Connectors:
21 Position, Deutsch HDP26-24-21SE
31 Position, Deutsch HDP26-24-31SE

Communications:
(1) CAN: J1939
(1) RS485: Modbus RTU

Inputs (9):
(5) Digital, configurable (active on High, Low, Open)
(3) Analog, configurable (4-20 mA, 0-5V, resistive or digital ground)
(1) Frequency, supporting:
Magnetic pickup (30 Hz - 10 kHz, 2.0 VAC-120 VAC) and
Engine Alternator (30 Hz - 10 kHz, 4.5 VRMS - 90 VRMS)

Outputs (8):
(3) Relays:
(2) +DC (10A)
(1) Form C (10A)
(2) Low-side FET: -DC (1A)
(2) High-side FET: +DC (1A)
(1) Dedicated Alternator Excitation +DC (1A)

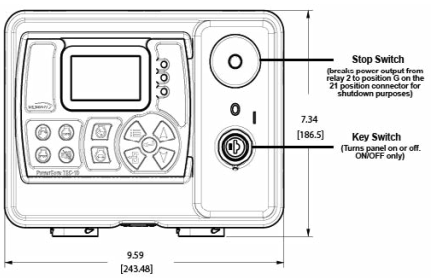
Languages: English, Spanish, German, French, Italian

Dimensions: 9.59 x 7.34 x 5.20 in. (243.48 x 186.5 x 132.23 mm) (WxHxD)

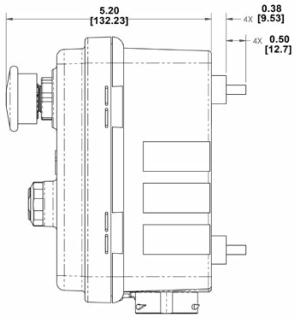
Enclosure: Polycarbonate

PowerCore TEC-10 and Mounting Dimensions

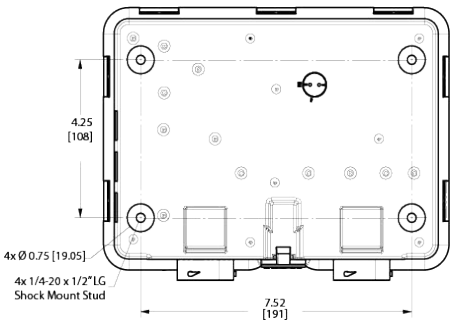
Front View



Side View



Back View



Connectors

Deutsch 21 pin Connector Engine	
PIN	Function
A	Unavailable
B	Battery (positive)
C	Unavailable
D	Relay 1, +DC (10A), Default Setting: Crank
E	Battery (negative)
F	J1939 CAN Shield
G	Relay 2, +DC (10A), Default Setting: ECU Enable
H	Unavailable
J	Alternator Excite Output, +DC (1A)
K	Unavailable
L	Unavailable
M	Unavailable
N	Unavailable
P	Unavailable
R	Digital Output 3, -DC, (1A), Default Setting: Throttle Decrease
S	Digital Ouput 4, -DC, (1A), Default Setting: Throttle Increase
T	Frequency Input
U	J1939 CAN Low (includes terminating resistor, Default to ON)
V	J1939 CAN High (includes terminating resistor, Default to ON)
W	Analog Input 2, Default Setting: Not Used
X	Analog Input 1, Default Setting: Not Used

Deutsch 31 pin Connector I/O	
PIN	Function
1	Unavailable
2	Unavailable
3	Unavailable
4	Unavailable
5	Unavailable
6	Unavailable
7	Unavailable
8	Unavailable
9	Analog Input 3, Default Setting: Not Used
10	Unavailable
11	Unavailable
12	Unavailable
13	Digital Output 1, +DC, (1A), Default Setting: Not In Auto
14	Digital Input 3, Default Setting: Dual Contact Stop, -DC
15	Unavailable
16	Unavailable
17	Relay 3 Common (RLY 3 Defaulted to Not Used) 10A Max
18	Relay 3 NC (RLY 3 Defaulted to Not Used) 10A Max
19	Relay 3 NO (RLY 3 Defaulted to Not Used) 10A Max
20	Digital Input 5, Default Setting: Low Lube Oil Level, -DC
21	Digital Input 1, Default Setting: Not Used
22	Unavailable
23	Digital Input 2, Default Setting: Dual Contact Start, -DC
24	Digital Output 2, +DC, (1A) Default Setting: Engine Running)
25	Unavailable
26	Battery (negative)
27	Unavailable
28	Unavailable
29	Digital Input 4, Default Setting: Low Coolant Level, -DC
30	RS485 (positive)
31	RS485 (negative)

How to Order

Part Number	Model and Description	Notes
40700495	PowerCore TEC-10 Panel	
40000602	Engine Harness, 21 Position Connector 10’ Whip Harness (3m approx.)	
40000603	I/O Harness, 31 Position Connector 10’ Whip Harness (3m approx.)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	
40000625	TEC-10 Programming Kit	
40051073	Replacement Fuse Door	
40051143	Replacement Fuse Door Pad	
40000601	Replacement Shock Mount Kit	
40000636	Replacement Key Set	
40000626	TEC-10 Programming Harness	

ML1000-4X Panel

MurphyLink® Series

The MurphyLink Series ML1000-4X Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering which includes the powerful, yet simple-to-configure MPC-10 Controller. The MPC-10 is a general, all-purpose manual/auto start and manual/auto throttling engine controller designed with rental applications in mind. The controller is purposed primarily for applications where a wide array of inputs and outputs are not required. The MPC-10 supports J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety shutdowns.

The MPC-10 follows a standard operating sequence of 22 machine states that happen in a predetermined order. Machine states can be set to zero if not needed or adjusted to fit the application. The menu structure is incredibly versatile, with the ability to change many parameters and settings from the face without the need of a PC tool, if desired.

The flexibility of the MPC-10 controller allows for the same control panel to be used across many applications. This provides the operator familiarity with the controller and control panel in any application.

The Control Panel utilizes industry-standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness[1] (MIH) or John Deere OEM engine harnessing.

A free-of-charge PC Configuration tool is available to allow customers to change default settings and provide three levels of passcode protection.

The ML1000-4X panel can be mounted directly to the engine or engine/application cover. The enclosure has a clear door for protection from foreign debris contacting the face of the controller when desired.

[1]Please contact Industrial Panel Sales for application specifics and MIH harnessing.

Specifications

MPC-10 Controller

Operating Voltage: 8-32 VDC, reverse polarity and load dump protected

Operating Temperature: -40° to +85° C (-40° to 185° F)

Storage Temperature: -40° to +85° C (-40° to 185° F)

Total Current Consumption:
Power on in stopped state; 117 mA at 12 VDC. Power on in standby mode; 52 mA at 12 VDC.

Enclosure: Polycarbonate NEMA 4X

Mating Connectors:
21 Position, Deutsch HDP26-24-21SE,
31 Position, Deutsch HDP26-24-31SE

Communications:
(1) CAN J1939
(1) RS485, Modbus RTU
(1) USB 2.0B for Programming

Outputs (8):
(3) Relays: 10A, SPDT, Form C (30 VDC @ 10A max.), 30A max aggregate @ 85C
(2) Low-side (1A)
(2) High-side (1A)
(1) Dedicated Alternator Excite (provides Charge Fail Fault if unable to excite alternator)

Inputs (9):
(5) Digital, configurable (high/low)
(3) Analog, configurable (4-20 mA, 0-5V, resistive)
(1) Frequency, supporting Magnetic pickup (30 Hz - 10 kHz, 2.0 VAC-120 VAC) and Engine Alternator (30 Hz - 10 kHz, 4.5 VRMS - 90 VRMS)

Languages: English, Spanish, German, French, Italian

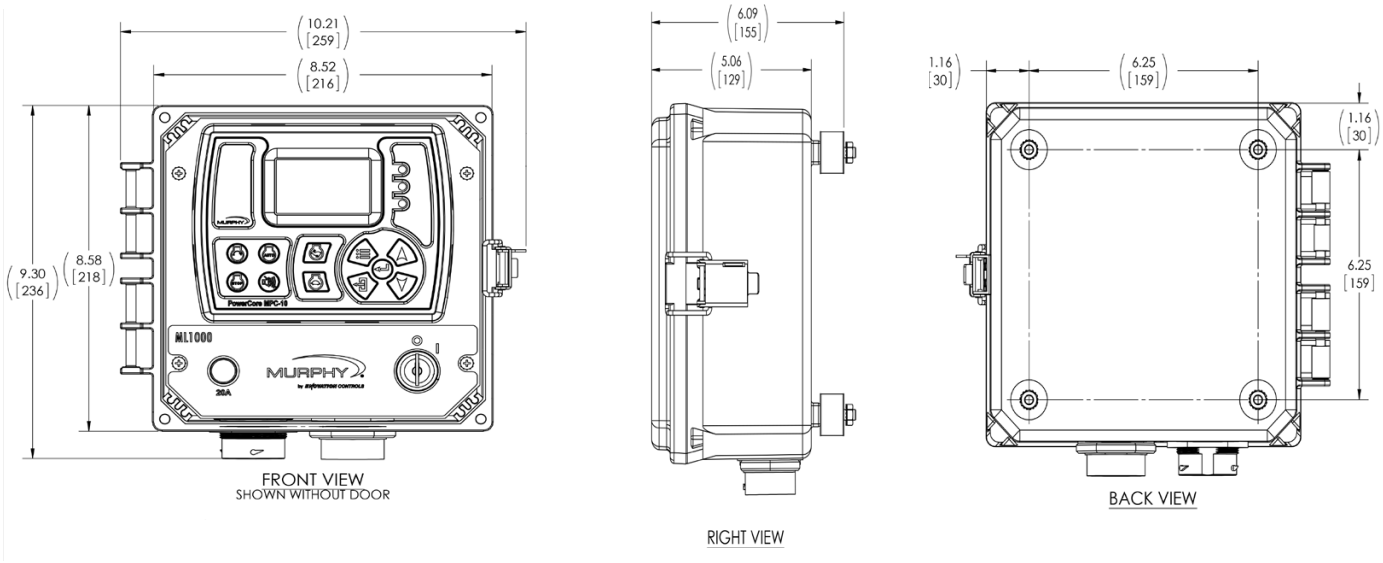
Dimensions: 10.21 x 9.30 x 6.09 in. (259 x 236 x 155mm) (WxHxD)

How to Order

Part Number	Model and Description	Notes
40700503	ML1000-4X, Polycarbonate, NEMA 4X Control Panel	
40000602	Engine Harness, 21 Position Connector 10' Whip Harness (3m approx.)	
40000603	I/O Harness, 31 Position Connector 10' Whip Harness (3m approx.)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	
78000668	USB Programming Harness	

Product and Mounting Dimensions

ML1000-4x



Connectors

Deutsch 21 pin Connector Engine	
PIN	Function
A	
B	Battery +
C	
D	Starter Solenoid
E	Battery -
F	
G	Fuel/ECU
H	
J	Alternator Excite
K	
L	
M	
N	
P	
R	Throttle Decrement
S	Throttle Increase
T	Frequency Input
U	J1939 CAN LO
V	J1939 CAN HI
W	Temperature Sender
X	Pressure Sender

Deutsch 31 pin Connector I/O	
PIN	Function
1	Ignition Signal
2	
3	
4	
5	
6	
7	
8	
9	Analog Input 3
10	
11	
12	
13	Not in Auto
14	Float Stop (Digital Input 3)
15	
16	
17	Relay 3 (Common)
18	Relay 3 (NC)
19	Relay 3 (NO)
20	Oil Level (Digital Input 5)
21	Digital Input 1
22	
23	Float Start (Digital Input 2)
24	Engine Running Signal
25	
26	Aux battery negative
27	
28	
29	Coolant Level (Digital Input 4)
30	RS485+
31	RS485-

PowerCore® MPC-20

Murphy's PowerCore MPC-20-R2 is an all-purpose industrial controller that stands up to some of the harshest environments. This powerful controller is targeted for engine-driven pumps and irrigation, with the versatility to work in most engine-driven applications. The controller can be mounted in a sealed control box but is entirely sealed to meet and/or exceed an IP67 rating.

Easily viewable in full-sun conditions, the MPC-20 has a large 3.8-inch monochrome transflective LCD. Interim and Final Tier 4 ISO symbols appear with engine and application information without the appearance of a cluttered screen.

The MPC-20 is configurable by the user to meet the most versatile applications. The ease of initial setup of the I/O does not leave the user feeling paralyzed when an input is needed for a specific function. This allows for quicker uptime and less headache while on the manufacturing floor or in the field.

Although a configuration tool is not required, it provides the ability to configure the controller's set points on the PC and save them in a file for future loading. A standard set point configuration tool is included as a free download to allow customized default settings for building application- or customer-specific configurations.

The MPC-20's design has been proven through internal and external testing including HALT (Highly Accelerated Life Testing) and third-party approvals.

C US *

CE

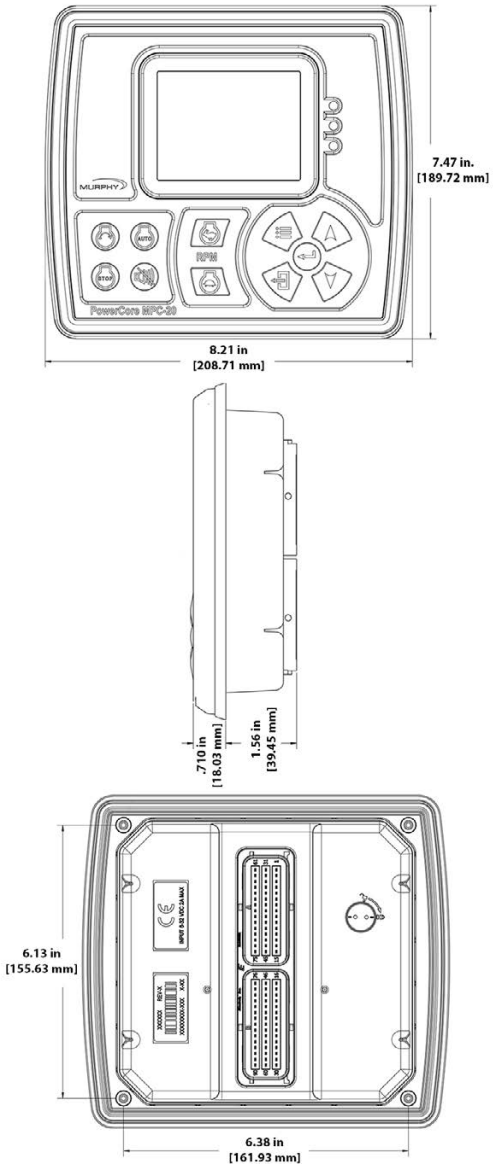
*Approved by CSA for non-hazardous locations (Group Safety Publication IEC 61010-1 Third Edition.

Products covered in this document comply with European Council electromagnetic compatibility directive 2014/30/EU and electrical safety directive 2014/35/EU.

Specifications

Display: 3.8" Monochrome LCD, Transflective, 320 x 240 QVGA with White Backlight
Keypad: 11 Tactile Feedback Buttons
LEDs: (1) Red, Shutdown, (1) Amber, Warning, (1) Green, Auto Mode
Outputs:
(2) 1A Max Low-side
(2) 2A Max High-side
(2) 200mA Max 5 VDC
(1) 0-5 VDC Analog
(6) 10 A Max Form C Relays
Inputs:
(8) Analog, Configurable as Resistive, 0-5VDC, 4-20mA or Digital Ground
(6) Digital, Configurable as Battery or Ground
(1) Frequency, (2 Hz - 10 K Hz, 3.6 VAC-120 VAC)
Communications:
(1) CAN 2.0B, 250 kbps, J1939
(1) RS485, MODBUS RTU
(1) USB, Programming
Power Input: 8-32 VDC, Reverse Polarity & Load Dump Protection

Dimensions



Specifications (continued)

Total Current Consumption:
18W Max without 2 2A High-sides active
146W Max with 2 2A High-sides active
Dimensions:
Width: 8.2 in. (208.7 mm)
Height: 7.5 in. (189.7 mm)
Depth: 2.3 in. (57.5 mm)
Mass: 0.9 kg (2.0 lb)
Operating Temperature: -40°F to 185°F (-40°C to 85°C)
Storage Temperature: -40°F to 185°F (-40°C to 85°C)
EMI/RFI: SAE J1113
Shock: 50G in X, Y, Z Axes
Vibration: Random, 7.86 Grms (5-2000Hz), 3 Axes
Sealing: IP67 Complete Controller, IP66 Panel Mount with Gasket (Minimum 14 Ga Metal Plate)
Case: Polycarbonate
Mating Connector: Delphi, SICMA 90 Position
Shipping Weight: 2lbs. 7.1 oz (1.11 kg)
Shipping Dimensions: 9.5 x 9 x 5 in. (241 x 229 x 127 mm)

How to Order

Part Number	Model/Description
40700504	MPC-20-R2 Controller
40051031	Panel Gasket, IP66, MPC-20
40700496	PowerCore 90 Position Connector Kit
40000554	PowerCore 90 Position 3 ft. Conn Whip Harness
40000567	Hand Crimper for PowerCore 90 Position Connector

Connectors

Delphi SICMA 90 Way Connector 1-30	
PIN	Function
1	Switched Battery (positive)
2	Battery (negative)
3	Analog Input 1 (Resistive,0-5V,4-20mA)
4	Analog Input 2 (Resistive,0-5V,4-20mA)
5	Analog Input 3 (Resistive,0-5V,4-20mA)
6	Analog Input 4 (Resistive,0-5V,4-20mA)
7	Analog Input 5 (Resistive,0-5V,4-20mA)
8	Analog Input 6 (Resistive,0-5V,4-20mA)
9	Analog Input 7 (Resistive,0-5V,4-20mA)
10	Analog Input 8 (Resistive,0-5V,4-20mA)
11	Reserved
12	RS485 (negative)
13	RS485 (positive)
14	Reserved
15	Reserved
16	USB D+
17	USB Ground
18	Relay 4 Normally Closed
19	Relay 4 Common
20	Relay 4 Normally Open
21	Reserved
22	Relay 5 Normally Closed
23	Relay 5 Common
24	Relay 5 Normally Open
25	Reserved
26	Relay 6 Normally Closed
27	Relay 6 Common
28	Relay 6 Normally Open
29	Low-side FET 1 (1A Max) -DC
30	Low-side FET 2 (1A Max) -DC

Delphi SICMA 90 Way Connector 31-60	
PIN	Function
31	Battery (positive)
32	Battery (negative)
33	Digital Input 1 (+DC or -DC)
34	Digital Input 3 (+DC or -DC)
35	Digital Input 5 (+DC or -DC)
36	Reserved
37	Reserved
38	Reserved
39	Reserved
40	Analog Output (0-5VDC)
41	Reserved
42	Reserved
43	Reserved
44	Reserved
45	Reserved
46	USB D-
47	USB Shield
48	Reserved
49	Reserved
50	Reserved
51	Reserved
52	Reserved
53	Reserved
54	Reserved
55	Reserved
56	Reserved
57	Reserved
58	Reserved
59	Reserved
60	Reserved

Delphi SICMA 90 Way Connector 61-90	
PIN	Function
61	Battery (positive)
62	Battery (negative)
63	Digital Input 2 (+DC or -DC)
64	Digital Input 4 (+DC or -DC)
65	Digital Input 6 (+DC or -DC)
66	High-side FET 1 (2A Max) +DC
67	High-side FET 2 (2A Max) +DC
68	Reserved
69	Frequency Input
70	Battery (negative)
71	Reserved
72	CAN Low
73	CAN High
74	Reserved
75	Reserved
76	USB VBUS
77	USB ID
78	Relay 1 Normally Closed
79	Relay 1 Common
80	Relay 1 Normally Open
81	Reserved
82	Relay 2 Normally Closed
83	Relay 2 Common
84	Relay 2 Normally Open
85	Reserved
86	Relay 3 Normally Closed
87	Relay 3 Common
88	Relay 3 Normally Open
89	5VDC Output 1 (200mA Max) +DC
90	5VDC Output 2 (200mA Max) +DC

ML2000 Panel

MurphyLink® Series

The MurphyLink Series ML2000 Panel, engineered and built by Enovation Controls' Industrial Panel Division, is a superior panel offering which includes the powerful, yet simple-to-configure MPC-20 Controller. This controller is part of the Murphy PowerCore® family and was developed to meet the need of manual or automatic control whether it's starting/stopping, throttling or both. This controller also has the flexibility to be used on either mechanically or electronically governed engines supporting SAE J1939 CAN communications.

The ML2000 panel has the ability for the software to be fully configured from the front user interface or PC configuration tool. If the default parameters set by Enovation Controls are not the desired set points for a factory default reset, the packager or operator has the ability to change these settings with the PC configuration tool then load with a USB thumb drive[1] and USB programming harness[1]. The configuration tool also allows for the splash screen to incorporate a company logo when powered on.

The flexibility of the MPC-20 controller allows for the same control panel to be used across many applications. This provides the operator familiarity with the controller and control panel in any application. The Control Panel utilizes industry standard Deutsch connectors and is compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines, when used with the correct Murphy Industrial Harness[2] (MIH) or John Deere OEM engine harnessing.

The ML2000 Series panels are available in two rugged enclosures or a stand-alone flat panel option that can be dropped into an existing panel or engine surround/ dog house. The enclosure types to choose from are powder-coated cold rolled steel or polycarbonate NEMA 4X. Optional mounting kits are offered for the sheet-metal enclosure, which provide packagers and operators numerous mounting solutions to meet multiple applications.

[1]USB thumb drive and programming harness sold separately from the control panel.

[2]Please contact Industrial Panel Sales for application specifics and MIH harnessing.

Specifications

MPC-20 Controller

Operating Voltage: 8-32 VD
Operating Temperature: -40° to +85° C (-40° to 185° F)
Storage Temperature: -40° to +85° C (-40° to 185° F)

Total Current Consumption:

18 W Max without 2 2 A High-sides active
146 W Max with 2 2 A High-sides active

Enclosure: Powder-coated cold rolled steel or polycarbonate

Mating Connectors:

21 Position, Deutsch HDP26-24-21SE
31 Position, Deutsch HDP26-24-31SE

Shipping Weights:

ML2000: 13 lbs (5.9 kg)
ML2000-FP: 7 lbs (3.17 kg)
ML2000-4X: 11 lbs (4.99 kg)

Communications: CAN (SAE J1939) and RS-485 Modbus

Outputs (13):

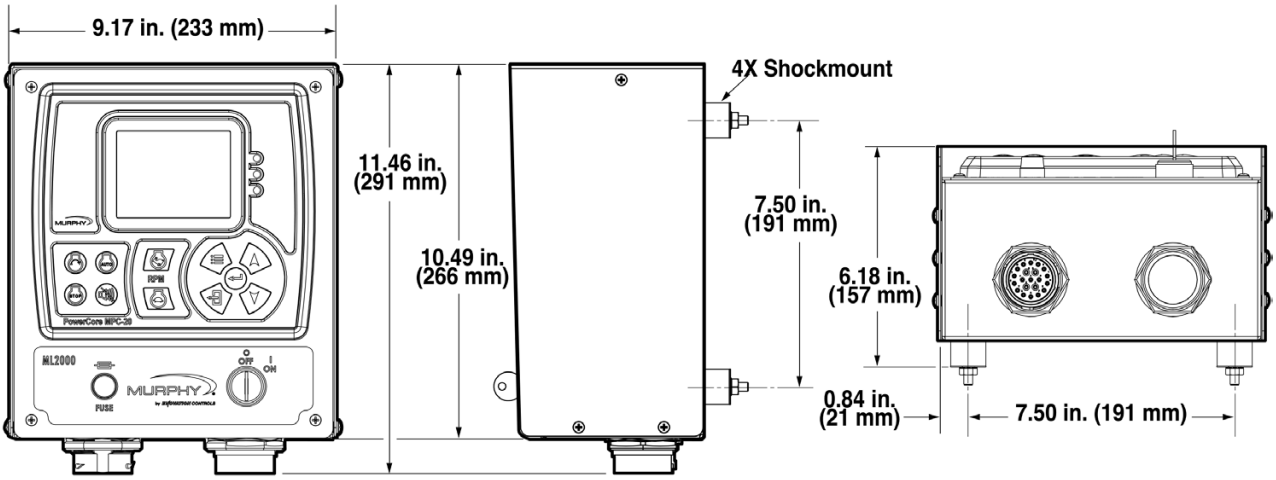
(2) 1 A Max Low-side
(2) 2 A Max High-side
(2) 200 mA Max 5 VDC
(1) 0-5 VDC Analog
(6) 10 A Max Form C Relays

Inputs (15):

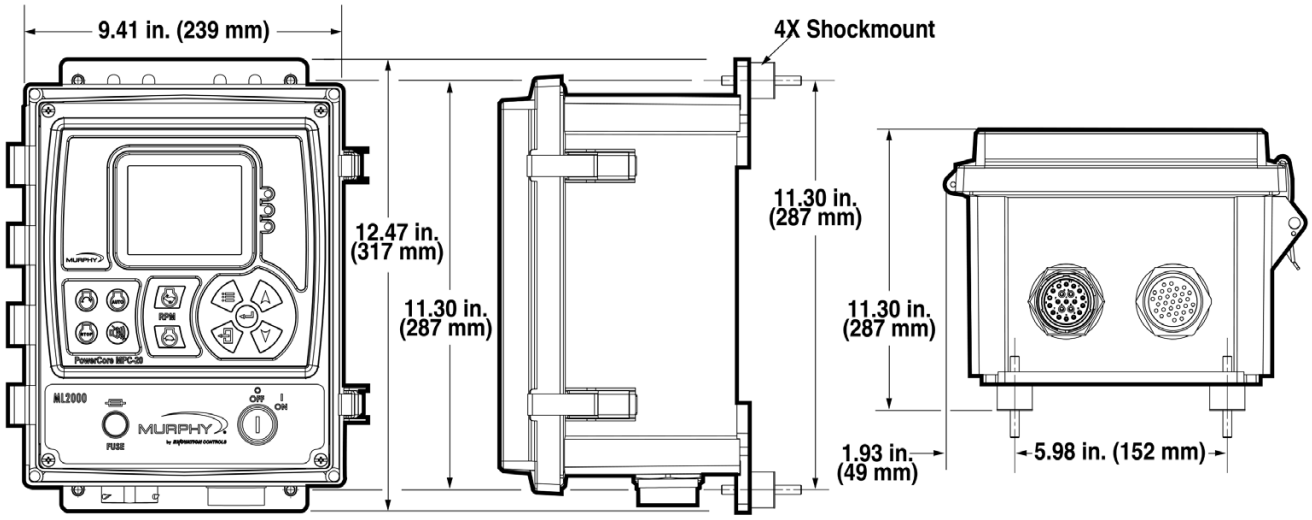
(8) Analog, configurable as Resistive, 0-5 VDC or 4-20 mA
(6) Digital, Configurable as Battery or Ground
(1) Frequency, (2 Hz - 10 KHz, 3.6 VAC-120 VAC)

Product and Mounting Dimensions

ML2000



ML2000-4X



How to Order

Part Number	Model and Description	Notes
40700499	ML2000, Metal Control Panel	
40700500	ML2000-4X, Polycarbonate, NEMA 4X Control Panel	
40700501	ML2000-FP, Flat Control Panel	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector Kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector Kit, 31-pin, Panel Connector Kit, I/O Only	
40000553	Harness, ML2000, Mechanical, 10’ Blunt, 21 Pos, 10’ Mechanical Engine Whip Harness	
40000565	Harness, ML2000, I/O, 10’ Blunt, 31 Pos, 10’ I/O Whip Harness	
40000566	ML2000 USB Programming Harness, 6-pin to USB Programming Harness	

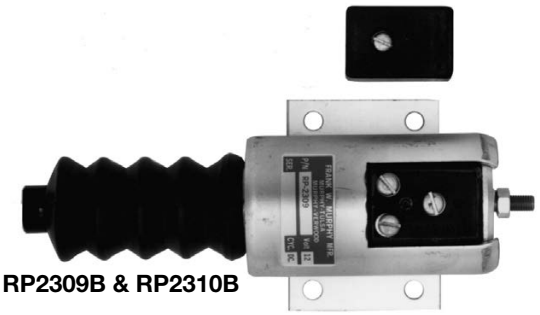
Pull/Push DC Solenoids for Diesel Engines

RP Series

The Murphy Push/Pull DC Solenoids provide single unit versatility for engine applications, such as shutdown. One solenoid offers pull/push operation. The RP Series has no internal switches, reduces coil burnout and reduces adjustments while boosting reliability. The solenoid offers high force in its small size. It can be used with most engines' start systems.

A choice of two models and two voltages is available. All models come complete with return spring and rubber seal boot.

An SD85 Solenoid Drive Time Delay is also available to greatly reduce possibility of coil burnout and to facilitate low current-piloted operation.



RP2309B & RP2310B

RP2307B & RP2308B

Basic Models

Models RP2307B and **RP2308B** give a full 1 in. (25 mm) stroke at 11 pounds (49 N) and hold up to 27 pounds (120 N) at full voltage, continuous duty. They will operate at any stroke less than maximum; see chart below.

Models RP2309B and **RP2310B** can pull 17 pounds (75 N) with a 1-1/2 in. (38 mm) stroke. They hold up to 35 pounds (155 N) at full voltage, continuous duty. See chart below for holding force at any stroke less than maximum.

SD85 Solenoid Drive Time Delay

The SD85 is used when the solenoid is duty cycled for short time periods such as two-position throttle operation. It also provides enhanced operational control for normal on-off applications. Using the SD85 ensures the energize coil is only powered for one to two seconds with each operation. If the plunger does not seat in that time, it is highly unlikely it will seat. The SD85 activates both coils of the solenoid for a short time then de-energizes the Energize coil. The Hold-in coil is energized as long as the signal to the SD85 is active. This ensures long life of the RP solenoid.

Input voltage: 8 to 30 VDC. See chart below for current ratings.

Watts Power/Cold Force in Pounds at 100% Voltage/Inches Stroke

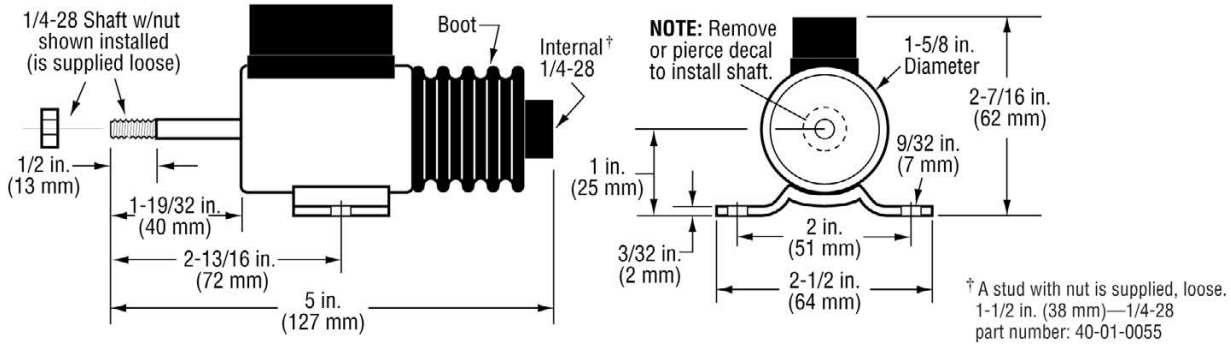
Solenoid Model Number	Max Stroke In. (mm)	Power in Watts		Force* in Pounds [Kilograms] at 100% Voltage† Stroke in Inches (Millimeters)							
		Hold Coil	Energize Coil	Hold Continuous	1/8 (3)	1/4 (6)	1/2 (13)	3/4 (19)	1 (25)	1-1/4 (32)	1-1/2 (38)
RP2307B	1 (25)	18	624	25 [11.34] <13> [5.90]	22 [9.98] <12> [5.44]	21 [9.53] <11> [4.99]	17 [7.71] <10> [4.54]	14 [6.35] <8> [3.63]	10 [4.54] <6> [2.72]	____ ____	____ ____
RP2308B	1 (25)	12	696	27 [12.25] <15> [6.80]	25 [11.34] <14> [6.35]	23 [10.43] <13> [5.90]	19 [8.62] <12> [5.44]	15 [6.80] <9> [4.08]	11 [4.99] <7> [3.18]	____ ____	____ ____
RP2309B	1-1/2 (38)	18	1029	32 [14.52] <19> [8.62]	30 [13.61] <18> [8.16]	27 [12.25] <16> [7.26]	22 [9.98] <14> [6.35]	18 [8.16] <11> [4.99]	13 [5.90] <9> [4.08]	8 [3.63] <6> [2.72]	6 [2.72] <4> [1.81]
RP2310B	1-1/2 (38)	12	960	35 [15.88] <20> [9.07]	34 [15.42] <19> [8.62]	31 [14.06] <17> [7.71]	26 [11.79] <15> [6.80]	22 [9.98] <12> [5.44]	17 [7.71] <9> [4.08]	12 [5.44] <7> [3.18]	7 [3.18] <4> [1.81]

* Forces shown are without return spring. Forces shown < > are with return spring. Forces shown in [ ] are in kilograms.

† To determine the operating current, divide the power (watts) indicated in the above table by the applied voltage. Solenoids will operate at any stroke less than maximum.

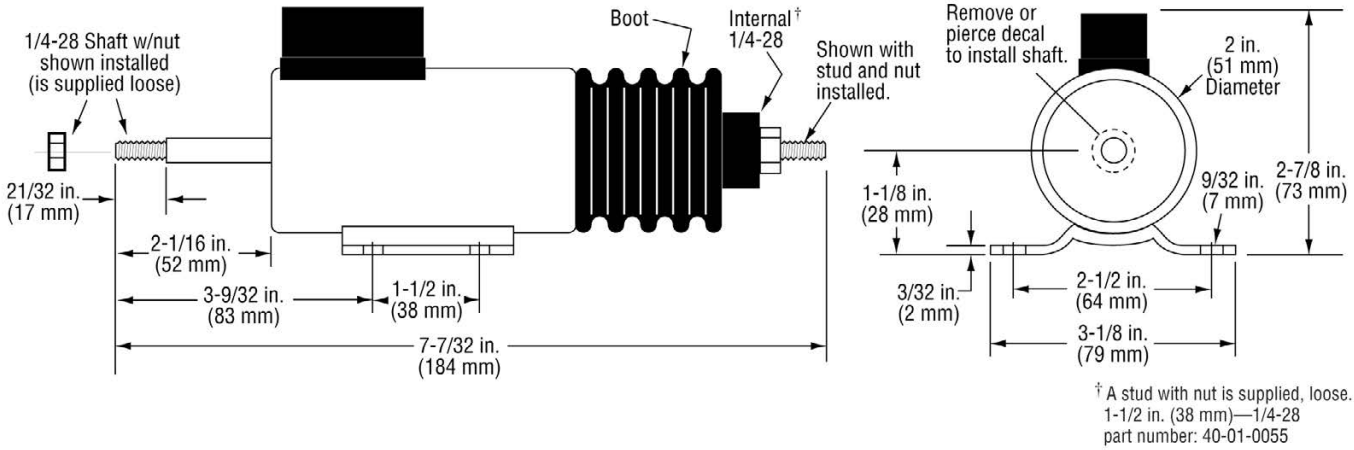
Dimensions

RP2307B & RP2308B



Solenoid Shown with Plunger Seated (Coil Energized)

RP2309B & RP2310B



NOTES:

1. Typical operating temperature for single 15 second operation of the energize coil is less than:
   140° F (60° C) ± 10° F (6° C) for 1 in. (25 mm) Stroke Solenoids (70° F/21° C rise above ambient)
   120° F (49° C) ± 10° F (6° C) 1-1/2 in. (38 mm) Stroke Solenoids (50° F/10° C rise above ambient)

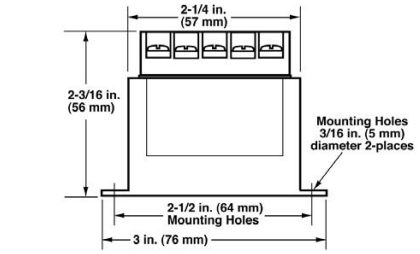
See CAUTION statement in Operations section on previous page and note maximum housing temperature is 185° F (85° C).

2. The energize coil should not be activated for more than 15 seconds. Longer energize coil activation times will damage the solenoid.

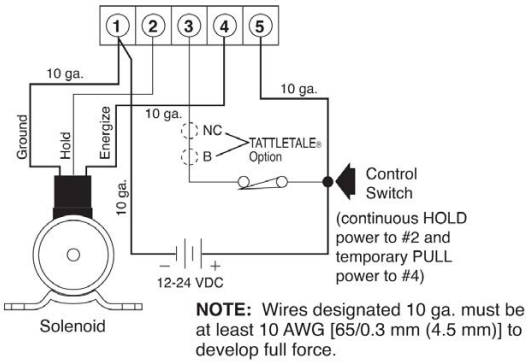
3. Allow minimum 15 minutes for cooling between activations of energize coil to avoid damaging the solenoid. (Depends on length of time energize coil is energized.) Contact Enovation Controls for high cycle rate applications.

4. The energize coil must fully seat the plunger to allow the hold-coil to function properly.

SD85



SD85 Terminal Block

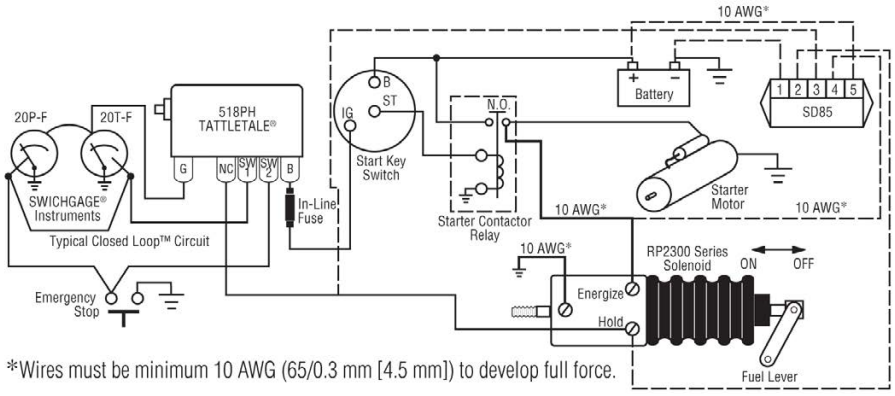


NOTE: Wires designated 10 ga. must be at least 10 AWG [65/0.3 mm (4.5 mm)] to develop full force.

NOTE: In either application if the starter hangs on starters with integral solenoids, the energize coil remains energized.

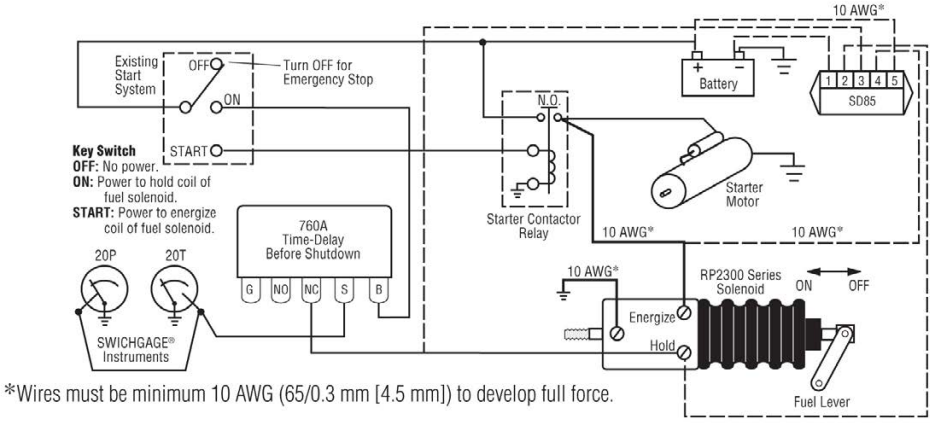
CAUTION: On certain starter solenoids/ contactor relays, current can feed back through the energize terminal from the hold coil and provide a parallel path to ground through the device connected to the energize terminal.

Typical time-delayed shutdown using a 518PH magnetic switch (SD85 is optional)



*Wires must be minimum 10 AWG (65/0.3 mm [4.5 mm]) to develop full force.

Typical time-delayed shutdown using a 760A magnetic switch (SD85 is optional)



*Wires must be minimum 10 AWG (65/0.3 mm [4.5 mm]) to develop full force.

Mechanical Installation

1. Bolt the solenoid securely to the mounting bracket.
2. Connect linkage and check for binding. Plunger should move freely throughout the complete stroke and be allowed to bottom at the internal stop of the solenoid.

DO NOT MOUNT WITH BOOT DOWN. DO NOT APPLY ANY GREASE OR LUBRICATION TO PARTS.

IMPORTANT: If the plunger does not seat, it will release prematurely when shifted to the holding mode of operation. Re-adjust linkage to lengthen the plunger stroke. Adjust the yoke in increments of 1/2 turn until plunger will remain in hold position.

Electrical Installation

1. Refer to the diagrams above for typical electric wiring.
2. Use minimum 10 AWG [65/0.3 mm (4.5 mm)] wire size, as noted in the wiring diagrams. A smaller wire will reduce the current available and thus the pulling force. Wire length must be kept to a minimum.

Operation

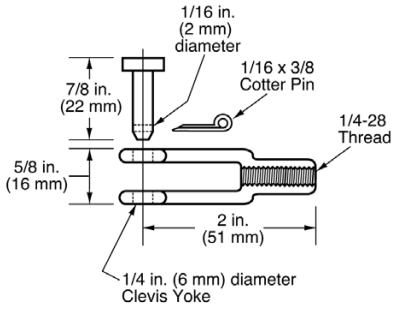
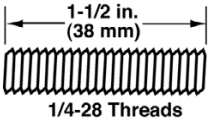
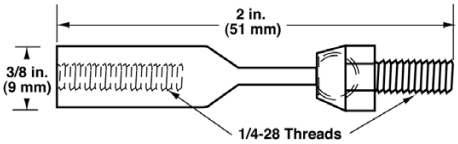
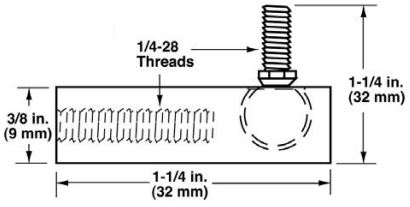
The solenoid coil is connected to the existing engine starter system or an equivalent circuit. A SD85 is recommended. At starting, both the Energize and Hold-in coils are energized. In the run mode, the Hold-in coil is continuously energized while the Energize coil has to be disconnected, reducing the heating effect and power consumption and avoiding damage to the device.

NOTE: Coils that burn out due to improper electrical hookup, misadjustment or improper operation are not covered by Murphy factory warranty.

CAUTION: The solenoid housing is hot to the touch. A temperature rise to 185° F (85° C) is permissible.

NOTE: A cool down period of 15 minutes minimum should be allowed between energized pull in cycles.

* Always provide proper circuit protection with fuses or circuit breakers.

Part Number	Model and Description	Notes
40700092	RP2307B — 12VDC, 1 in. (25 mm) stroke, 10 lbf (44 N) pull, 25 lbf (111 N) hold	DC Solenoids
40700093	RP2308B — 24VDC, 1 in. (25 mm) stroke, 11 lbf (49 N) pull, 27 lbf (120 N) hold	
40700094	RP2309B — 12VDC, 1-1/2 in. (38 mm) stroke, 13 lbf (58 N) pull, 32 lbf (151 N) hold	
40700095	RP2310B — 24VDC, 1-1/2 in. (38 mm) stroke, 17 lbf (75 N) pull, 35 lbf (155 N) hold	
40700067	SD85 Solenoid Drive Time Delay	
65010108	Clevis yoke assembly	
65010110	Clevis yoke chain assembly	
40050315	Threaded rod (1-1/2 in.)	
00002457	RPS in-line ball joint	
00002458	RPS 90° ball joint	

Shipping Weights:

RP2307B: 24oz. (0.7 kg)
RP2308B: 24 oz. (0.7 kg)
RP2309B: 48 oz. (1.4 kg)
RP2310B: 48 oz. (1.4 kg)
SD85: 6.4 oz. (0.2 kg)

Clevis yoke: 1 oz. (.03 kg)
Clevis yoke chain assembly: 2 oz. (.04kg)
Threaded rob (1-1/2 in.): .05 oz. (.001 kg)
RPS in-line ball joint: .05 oz. (.001 kg)
RPS 90° ball joint: 1 oz. (.03 kg)

Rack Puller for Diesel Engines

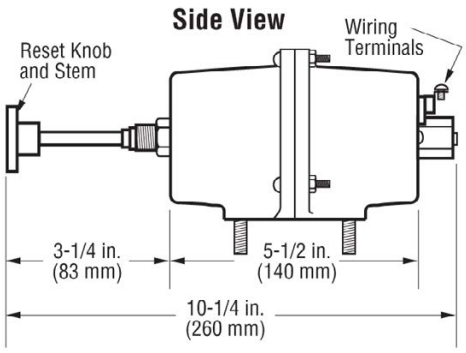
Model RP75

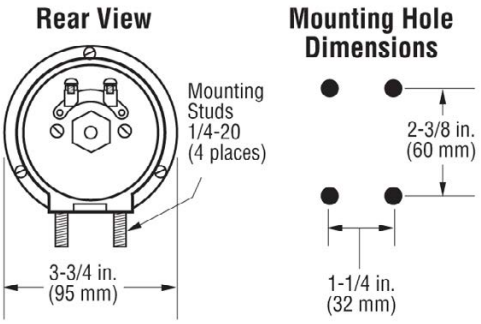
The RP75 Rack Puller is a semiautomatic device that provides a pulling force to initiate shut down of diesel engines and equipment.

The RP75 connects to the injection pump or air intake shut-off lever via a cable (chain optional). A coil spring, within the RP75, is reset manually and is held in place by an electromagnet. When the Swichgage® detects a malfunction, the electromagnetic circuit is interrupted through a magnetic switch — releasing the coil spring thus pulling the cable/chain to actuate shutdown. When fully compressed, the spring exerts a pull of 30 lbf (133 N).

The RP75 is available for 12- or 24-VDC applications and is compatible with all Swichgage instruments.

Dimensions





Specifications

Operating Force:
30 lbf (133 N) maximum, 10 lbf (44 N) minimum

Coil Voltage:
Specify 12- or 24-VDC

Coil Resistance:
RP75-12: 32.2 ohms; RP75-24: 129.8 ohms

Length of Travel:
1-7/8 in. (48 mm)

Control Linkage:
Cable: 4ft. (1.22 m); Optional 8 ft. (2.43 m) or 12 ft. (3.65 m) available
Chain (optional): 30 in. (762 mm)

Shipping Weight:
5 lbs 3 oz. (2.4 kg)

Shipping Dimensions:
9-1/4 x 8-1/4 x 5-1/4 in. (235 x 210 x 133 mm)

WARNING Before beginning installation of this Murphy product:
- **Disconnect ALL electrical power to the machine.**
- **Make sure the machine CANNOT operate during installation.**
- **Follow all safety warnings of the machine manufacturer.**
- **Read and follow all installation instructions.**

Mounting

1. Mount the RP75 using the 40-05-0161 mounting bracket or similar (see Figure 1). If installing the RP75 to an engine compartment firewall, go to Step 2.
2. If installing the RP75 to an engine compartment firewall, drill a 37/64 in. (15 mm) diameter hole in the firewall (see Figure 2).
3. Remove the reset knob on the RP75 by loosening the Allen-head screw on the knob.
4. Remove the mounting nut and insert the RP75 reset stem through the hole from the back of the firewall.
5. Replace the mounting nut and tighten. Reinstall the reset knob.

Typical Wiring Diagrams

Wire the RP75 appropriately (see Figure 3).

NOTE: RP75 is voltage rated; do not apply 24-VDC to 12-VDC model and vice versa. Also, the 117PH Magnetic Switch is rated for both 12- and 24-VDC circuits but voltage must be specified when ordering the 518PH or 761APH Magnetic Switches.

Installing Cable or Chain

1. To install the control linkage (cable or chain), apply voltage to the RP75. Push in the reset knob. If installing the cable, insert the cable attaching nut into the RP75 and tighten snugly (see Figure 1). DO NOT OVER TIGHTEN or threads may strip. Attach and tighten outer cable securing nut. If installing the chain, attach the S hook to the RP75 (see Figure 1).
2. Attach the other end of the cable or chain to the injection pump or air intake shutoff lever so it moves freely without sharp bends and without binding.

Operation Test

NOTE: Some method must be provided to disconnect (lockout) all normally closed Swichgage® circuits when starting (such as through the appropriate Magnetic Switch).

1. Reset magnetic switch.
2. Push in RP75 reset stem until coil latches the trip mechanism.
3. Start engine and observe that all locked out contacts clear.
4. With engine running, ground Swichgage contact. The Magnetic Switch will trip thus removing voltage to RP75. The engine should shutdown immediately. If the engine does shutdown, adjust control linkage (cable or chain) to ensure that shutoff lever travels the full length in both directions.

CAUTION: Shut-off lever should not pull hard against the stop in the OFF position.

WARNING: The firewall must be capable of withstanding the push and pull force of the RP75.

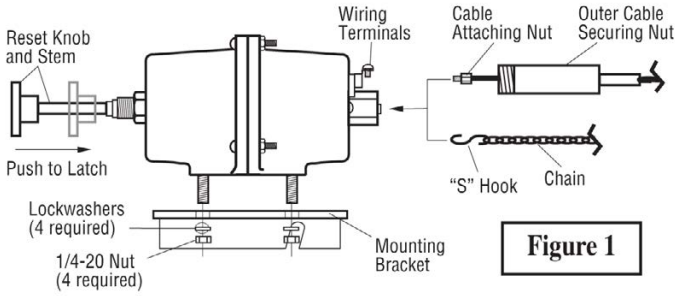


Figure 1

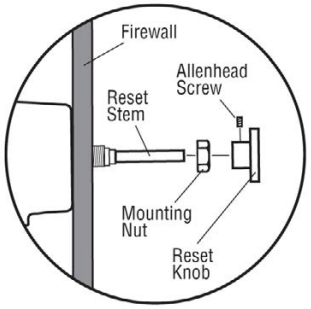


Figure 2

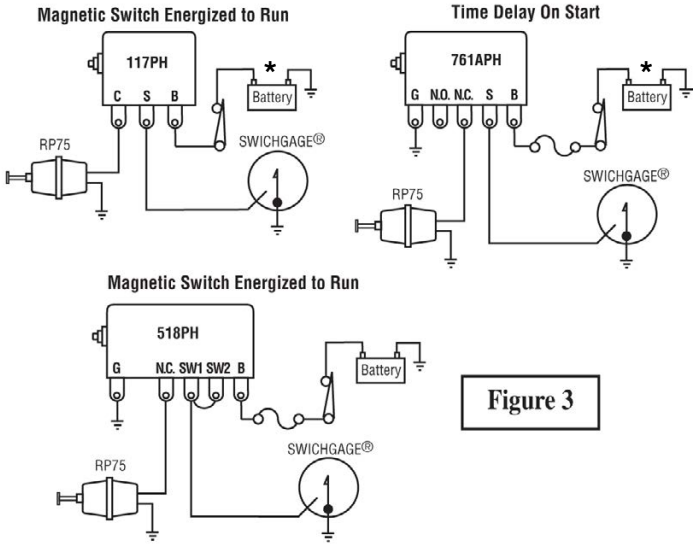
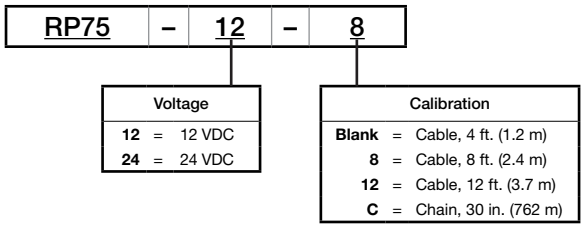


Figure 3

* Always provide proper circuit protection with fuses or circuit breakers.

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.



Part Number	Description	Notes
40050161	Mounting Bracket	Mounting bracket is sold separately from RP75.
40000021	12 VDC core assembly	Service parts
40000044	Shaft solenoid assembly	
40010050	Bushing shaft assembly	
40010053	Case repair kit	
40040054	Cocking rod, bushing and knob repair kit	
40050136	Spring, main actuating	
40050149	Spring, cocking rod return	
80041030	2 screw, machined #10-24 x 3/8 pan HD steel CAD II	
40000024	24 VDC core assembly	

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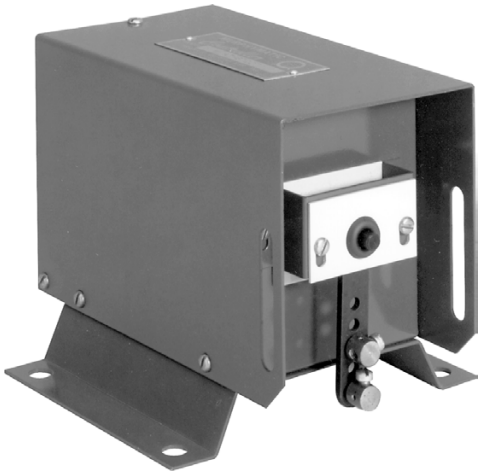
MurphyMatic® Engine Throttle Controller
Model AT03069



The AT03069 is a completely reliable heavy-duty device developed specifically to automatically control engine speed to meet system demand. Low current, high torque, solid-state switching and an electronic clutch make it ideal for all automatic and semiautomatic engine systems. Used with the appropriate Murphy Swichgage® near constant pressure, level and load can be maintained. Speed changes are made slowly and smoothly. The device saves fuel, engine wear, horsepower and labor. One model can be used with both 12- and 24-VDC systems. Check with our engineers for help with other applications where speed control can improve your system.

Applications include:

Pressure
- City water systems
- Water flood injection
- Sprinkler lateral changes
- Make-up if a gang pump stops
- Multiple hose-reel irrigation systems

Level
- Water or oil storage tanks
- Waterflood tanks
- Sewer disposal systems
- Flood control catch basins

Temperature
- Multi-engine cooling systems
- Air conditioned chilled water systems

Engine load
- Empty or fill reservoirs with a lower horsepower engine — fast when head is high — slow when head is low

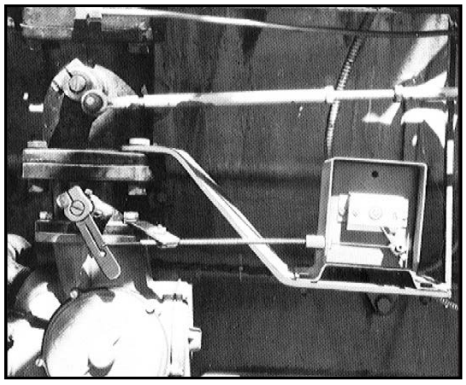
The AT03069 can enhance features of our Selectronic® Microcontroller units by allowing features such as:
- Warm-up RPM set point
- Minimum RPM set point
- Maximum RPM set point
- Preset operating RPM set point
- Auto throttling to match flows (as needed in flood control applications)
- Maintaining system pressure (as needed in booster station application)
- Adjustable rate of change in RPM (allowing fine tuning of overall system).

For more information, recommendations and quotations contact our engineering department.

Specifications

Voltage: 11-28 VDC negative ground
Maximum Current: 500 mA (1/2 amp)
Standby Current: Approx. 7 mA
Increase and Decrease: Inputs float at approx. 8.4 VDC. Grounding inputs causes 8-18 mA of current to flow from either.
Torque: 25 inch pounds
Sealed limit switches: Factory adjusted, controls maximum travel
Linkage adjustment on lever arm—5 holes: Adjusts travel: 1-3/16 in. (30 mm); 1-11/16 in. (43 mm); 2 in. (51 mm); 2-1/4 in. (57 mm) approximately. Travel Time: 11 to 20 seconds depending on the voltage and force applied.
Net Weight: 5 lb. (2.27 kg)

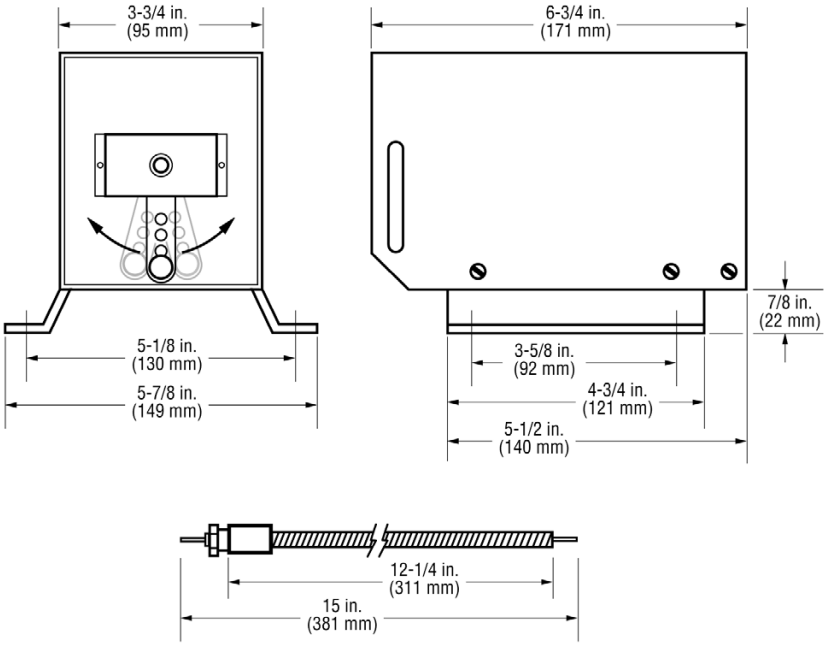
Operation



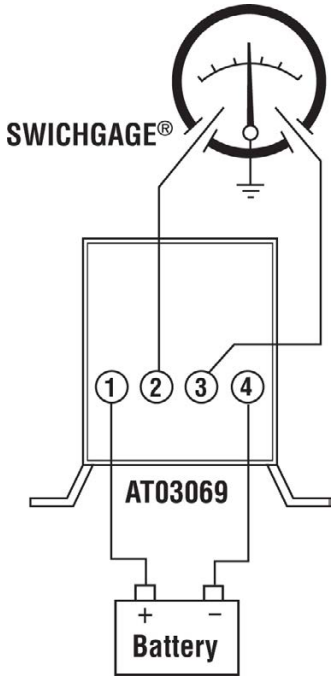
A Murphy Swichgage®* constantly monitors pressure, level, temperature or load. Adjustable high and low contacts on Swichgage are set slightly above and below desired operating point. When demand changes, the pointer touches appropriate high or low contact and signals speed change. The AT03069 controller responds only as long as contact is made. The controller stops immediately when contacts separate. Slow, smooth action prevents hunting or surging on normal applications.

*Mercury tube or snap-action switches are not suitable for this type of control. For more information, recommendations and quotations, contact our engineering department.

Dimensions



Typical Wiring



How to Order

Part Number	Description	Notes
40700249	Murphymatic Engine Throttle Controller Model AT03069	
40000362	PCB Circuit Board Assembly	Repair Parts
00004630	Cable Assembly	

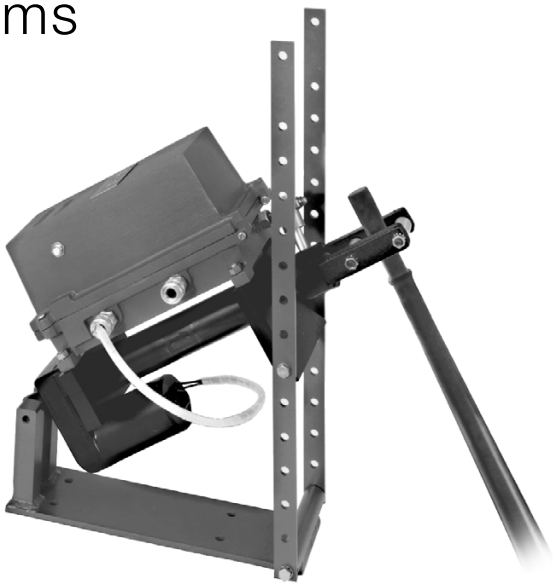
Electric Motor Driven Clutch Operator

for Engine Automation Systems

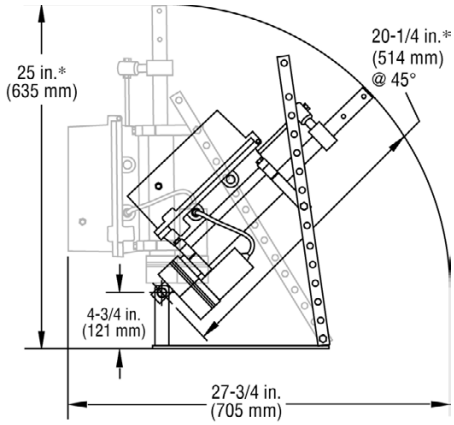
The CO3 is an electrically controlled and driven actuator for automatic operation of two position, lever action equipment. Primarily designed to engage and disengage over-center clutches on engines, the CO3 has a wide variety of applications such as opening and closing of pipeline valves, engagement and disengagement of pumps, fixture positioning in automated process control, etc. The positive action screw-type actuator is fully adjustable for length of stroke up to 6 inches (152 mm). The CO3 motor is equipped with an overload clutch that slips if overloaded. In addition, the motor is protected with an automatic reset thermal overload. The CO3 is available for 12- or 24-VDC applications and is compatible with MurphyMatic® start-stop engine controllers.

Applications include:

- Engine disc clutches
- Butterfly and ball valves
- Brakes
- Two position lever-action equipment



Dimensions



*These dimensions are given with the CO3 disengaged. When CO3 is engaged, add 6 in. (152 mm).

Basic Operation

When the CO3 receives a signal to engage, the heavy-duty DC motor operates to extend the actuator shaft and yoke a predetermined length. Length of extension is controlled by the adjustable cams in the control housing. When disengaging, the motor reverses and retracts the actuator shaft. At engagement end of the stroke, the actuator backs off from its maximum travel to relieve pressure on the clutch or other device.

Refer to Figure 4.

Specifications

Voltage:
CO3-12: 12-VDC, negative ground
CO3-24: 24-VDC, negative ground
Travel (adjustable): 6 in. (152 mm) max
Case Material: Cast aluminum
Built-in Circuit Breaker: 20 A
Operating Force:
CO3-12: 250 lb-f (1112N) max
CO3-24: 500 lb-f (2224N) max
Duty Cycle @ 77° F (25° C):
CO3-12: 40% max. @ 125 lb-f (556N) to 25% @ 250 lb-f (1112N)
CO3-24: 100% max. @ 75 lb-f (334N) to 25% @ 500 lb-f (2224N)
Speed:
CO3-12: 1.2 in./sec. (3 cm/sec.) @ 0 lb-f to 1.00 in./sec. (1 cm/sec.) @ 250 lb-f (1112N)
CO3-24: 2.4 in./sec. (6 cm/sec.) @ 0 lb-f to 1.35 in./sec. (3 cm/sec.) @ 500 lb-f (2224N)
Drive: Self-locking ACME screw
Current:
CO3-12: 20 amp max
CO3-24: 14 amp max
Operating Temperature: -15 to 150° F (-26 to 66° C)
Shipping Weight: 40 lb (18.1 kg)
Shipping Dimensions: 25 x 14-1/2 x 12 in. (635 x 368 x 305 mm)

How to Order

Part Number	Model and Description
Specify Model	CO3-12
	CO3-24

1. Disengage clutch lever on the engine.
2. Remove the clutch lever and reposition it approximately 45 degrees from vertical, toward the rear of the clutch (Figure 4).
3. Locate and remove outer roller of the CO3 operating yoke (Figure 1).
4. Place the CO3 in direct line with the clutch lever until the inner roller touches the clutch lever at an approximate 90 degree angle (See detail in Figure 4).

NOTE: Reposition clutch lever so it does not bind between rollers when actuator is fully extended and fully retracted.

5. Bolt the CO3 to the stabilizer arm to hold the angle of incidence to the clutch arm (Figure 4).
6. Temporarily attach the CO3 mounting plate to the engine skid or base, or mark its location on the skid or base. (See Figure 2 for dimensions.)
7. Open control housing cover and locate Cam A (Figure 1). Loosen the two set screws on Cam A and slide the cam all the way to Cam B.

NOTE: Do not disturb setting of Cam B. It is factory adjusted for proper operation.

8. Temporarily wire Battery Negative to terminal #5, Positive to terminal #4 of the CO3 (Figure 3).
9. Apply a momentary N.O. push button between terminals #1 and #3. When the push button is pressed the CO3 actuator will extend (Figure 3).

CAUTION: Be ready to release the push button when the clutch arm is fully engaged. Damage to the clutch or the CO3 can occur if the actuator is allowed to continue to push against the clutch arm.

NOTE: This is best done by energizing the CO3 for short intervals as the clutch arm approaches full engagement. Disconnect battery and remove push button from terminals #1 and #3.

10. Firmly affix the CO3 mounting plate to the engine or skid or pad.
11. Move Cam A back toward the front end of the CO3 so that it fully depresses the roller of limit switch SW-2. Re-tighten both set screws.
12. Reconnect battery and the temporary push button across terminal #1 and #3. The actuator should back-off a short distance until clutch lever is between both rollers to insure removal of load from throw out bearings. If minor adjustment is necessary, move SW-2 forward to reduce back-off or aft to increase back-off. Maximum adjustment is 1/2 in. (13 mm). Remove momentary push button.
13. Place a N.O. momentary push button across terminals #2 and #3 (Figure 3). Press push button. Actuator should retract and disengage clutch. Actuator will back-off and stop when clutch is fully disengaged.

Disconnect battery and remove push button from terminals #2 and #3.

14. Reconnect battery. The CO3 is now ready for operation. A maintained contact closure across terminals #1 and #3 will engage clutch. A maintained contact closure across terminals #2 and #3 will disengage clutch.

NOTE: Readjust CO3 after any clutch repair.

WARNING Before beginning installation of this Murphy product:

- **Disconnect ALL electrical power to the machine.**
- **Make sure the machine CANNOT operate during installation.**
- **Follow all safety warnings of the machine manufacturer.**
- **Read and follow all installation instructions.**

Figure 1: CO3 Top View

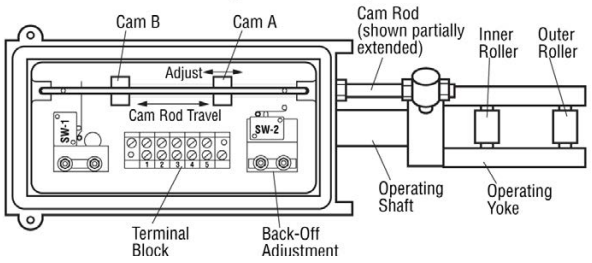


Figure 2: Mounting Plate Dimensions

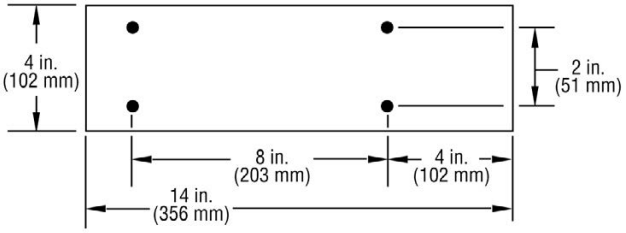


Figure 3: Customer Wiring

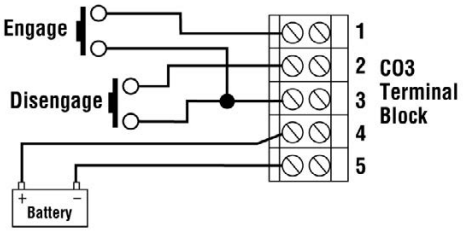
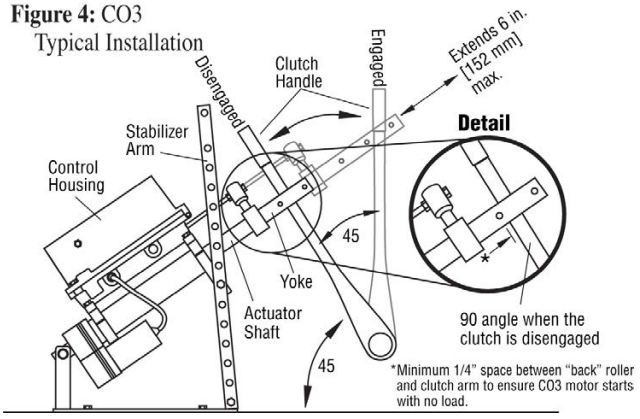


Figure 4: CO3 Typical Installation



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Diesel Fuel Check Valves

CKV and PRV Series

Murphy offers two types of diesel fuel line valves: check valves and pressure relief valves.

The **CKV series** check valves are in-line, one-way valves that prevent fuel from being siphoned back into an injector or injection pump which could delay a shutdown.

There are two types of check valves: CKV2336 and CKV1WPS. The CKV2336 has a 1/4 NPT threaded male connection on each end for connecting to fuel line fittings or hoses. The CKV1WPS check valve is typically mounted in the fuel bypass line of the last fuel injector. The CKV1WPS features a hollow bolt connection and a barbed 1/8 NPT connection for flex hose or fitting.

The **PRV series** pressure relief valves relieve overpressure in a fuel system usually caused by closing of a solenoid fuel valve. The PRV50 and PRV70 have a 1/4 NPT threaded connection on each end for connecting to fuel line fittings or hoses.

Specifications

Materials

	Body	Seal	Spring
CKV2336	Brass	Poppet	SS
CKV1WPS	Brass	SS	SS
PRV50/PRV70	Brass	SS	SS

Note: SS=Stainless steel

Opening Pressure

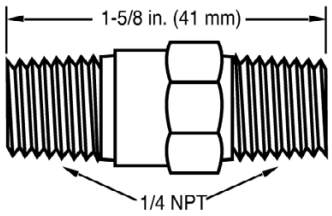
CKV2336	4 psi (27)
CKV1WPS	2 psi (14)
PRV50	25 psi (172)
PRV70	70 psi (483)

Note: metric (kPa) equivalents in parentheses

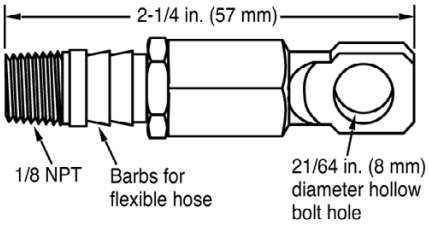
Static Pressure (all): 150 psi (1.03 MPa) maximum
Weight (all): 1.3 oz. (40.5 g)

Dimensions

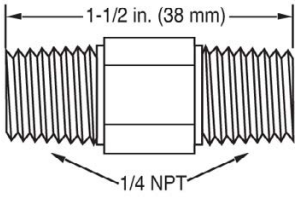
CKV2336



CKV1WPS



PRV50 and PRV70



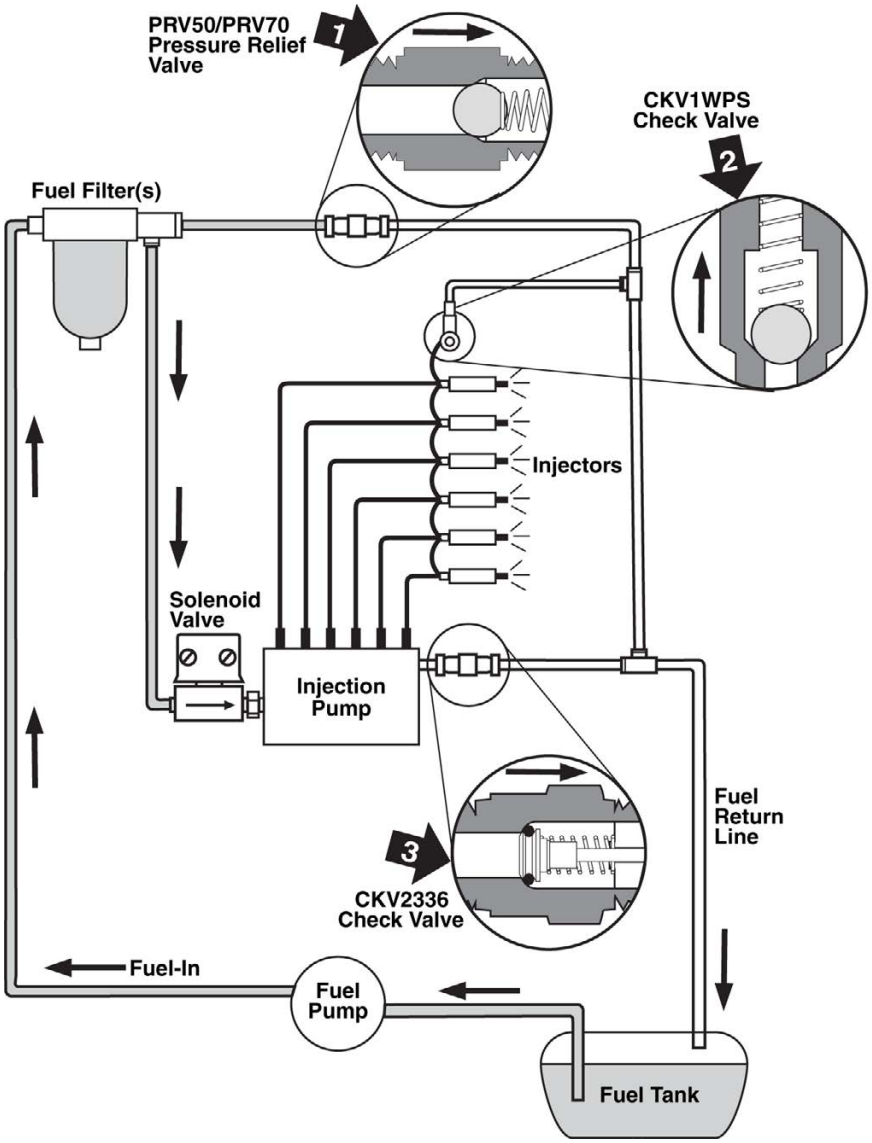
Basic Operation

Murphy Check Valves and Pressure Relief Valves enhance the operation of diesel engine shut-down valves by reducing the time required for complete engine shutdown after the solenoid valve closes. The diagram at right shows a typical installation using CKV check valves and PRV pressure relief valves.

All valves are shown closed.

Check Valves close off the fuel return line(s) to prevent fuel or air from re-entering the injection system through the bypass line(s). Models **CKV2336** (**3**) is an in-line valve. Model **CKV1WPS** (**2**) has a 21/64 in. (8 mm) banjo fitting that attaches to the return line of the final injector. All check valves allow fuel to flow away from the injectors but close to prevent fuel from flowing in the reverse direction.

The **PRV50** and **PRV70** (**1**) relieve pressure buildup in the fuel system that can cause fuel filter canisters to burst. When the solenoid valve closes to stop the engine, the fuel transfer pump will continue to produce pressure as the engine slows down to stop. This pressure buildup, if not relieved, can cause fuel filter canisters or gaskets to leak. PRVs are installed in the bypass line from the fuel filter(s) to the fuel return line.



How To Order

Part Number	Description	Notes
Specify Model Number	CKV2336	Valves
	CKV1WPS	
	PRV50	
	PRV70	

Note: There are no replacement parts.

Diesel Fuel Shutoff Valve
SV Series

The SV series valve, which is solenoid operated, is a normally closed valve that opens when current is supplied from the battery through a magnetic switch. Temperature, level or pressure Swichgage® instruments installed on the diesel engine and pump or compressor trip the magnetic switch breaking the circuit from the battery which closes the valve and stops the engine.

The SV-12 valve operates on 12-VDC, has a 1/4 NPT inlet and outlet and a full 3/16 in. (5 mm) orifice. A 24-VDC (SV-24) is optional. The SV valves open against 30 psi. (207 kPa) [2.07 bar] inlet pressure.

For a greater flow rate valve, we offer the special series SV valve with a 1/4 in. (6 mm) orifice which opens against maximum pressure of 15 psi (103 kPa) [1.03 bar]. This valve is recommended where greater flow is required and only static head or low transfer pump pressures are encountered.

The Murphy SV-HP series valves open against diesel fuel transfer pump pressure up to 60 psi (414 kPa) [4.14 bar]. Models are available for 12- or 24-volt DC systems. The orifice is 1/4 in. (6 mm) using the same inlet/outlet and options as standard SV.

The SV Series fuel shutoff valve is for use with diesel engines with externally accessible fuel injection pumps. The volume of fuel required for the engine to operate must be able to pass through the 3/16 in. (5 mm) or 1/4 in. (6 mm) orifice of the valve. You must be able to attach the fuel valve directly onto or in close proximity to the fuel injection pump in order to close off fuel flow to the pump.

The SV series is **NOT** intended for use with engines having unit injectors or distributor type injection pumps. Use only with diesel.

Specifications

Electrical Rating: 12- or 24-VDC, 10 watts
Orifice: 3/16 in. (5 mm) diameter (optional 1/4 in. [6 mm] diameter). See chart below.
Body Connections: 1/4 NPT inlet/outlet
Maximum Opening Pressure:
3/16 in. (5 mm) orifice: 30 psi (207 kPa) [2.07 bar]
1/4 in. (6 mm) orifice: 15 psi (103 kPa) [1.03 bar]
Shipping Weight: 1 lb. 6 oz. (0.68 kg)
Shipping Dimension: 3 x 2-3/4 x 2-3/4 in. (76 x 70 x 70 mm)

SV-HP (High Pressure model)

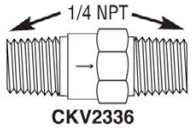
Orifice: 1/4 in. (6 mm) diameter. See chart below.
Maximum Opening Pressure: 60 psi (414 kPa) [4.14 bar].

	3/16 Orifice						1/4 Orifice				
Differential Pressure	1	2	5	10	20	30	1	2	5	10	15
Gallons per Minute	.48	.68	1.1	1.5	2.2	2.6	.72	1.05	1.65	2.35	2.70
Liters per Minute	2.01	2.85	4.62	6.3	9.24	10.92	3.02	4.41	6.93	9.87	11.34

Auxiliary Fuel Valves

Fuel Return Line Check Valve

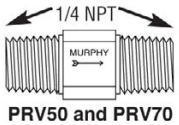
The CKV series is an in-line, one-way valve for the prevention of fuel siphoning from the diesel return line by an injection pump. In engine shutdown systems using a Murphy SV valve, the CKV is necessary to ensure a rapid shutdown of the engine by fuel starvation of the injection system. For details see bulletin 7867.



CKV2336

Fuel Line Pressure Relief Valve

The PRV50 is an in-line, one-way valve for the prevention of overpressure damage to fuel filters and their housings. This pressure relief valve operates in conjunction with a Murphy SV series shutdown valve. After the SV closes, a rapid high pressure build-up caused by the fuel pump can occur. The PRV, mounted in a fuel return line after the filter, will open to relieve pressure buildup.



PRV50 and PRV70

Typical SV Valve Installation

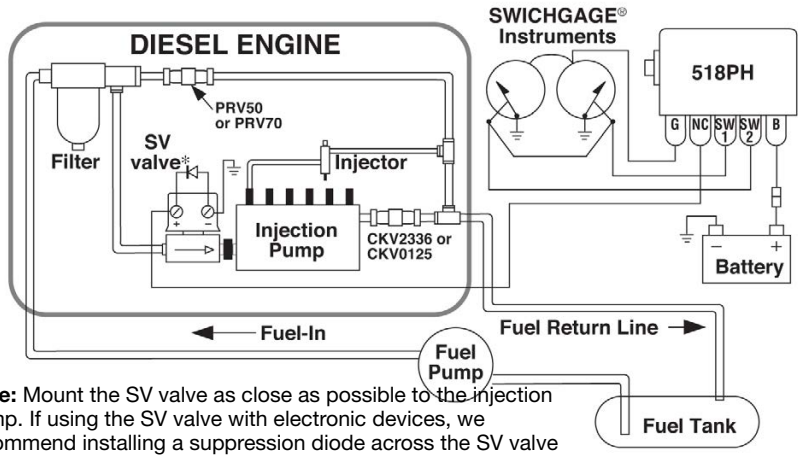
Installation and Service Suggestions

1. Make sure the valve is the same voltage as the battery. Under continuous duty, the coil will normally be hot; however, incorrect voltage can cause smoking and burned coils.
2. The valve will not operate if the flow arrow on the side of the valve does not indicate the correct direction of flow.
3. Do not apply pipe dope to female valve threads. Dope inside the valve will foul the seat and prevent proper seal.
4. Install the valve as close as possible to the injection pump.

Troubleshooting the SV Series Valves

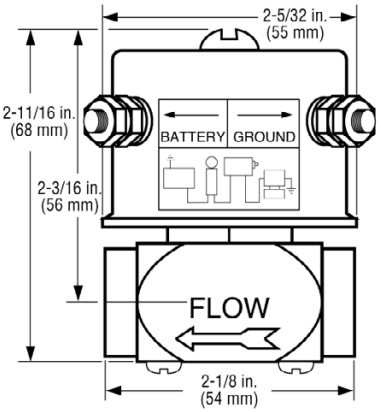
Check Control Circuit: To determine if the electrical system is energizing the solenoid, listen for a metallic click signifying the solenoid is operating. Absence of the click indicates loss of power supply. Check for blown or loose fuses, for an open circuit or a grounded coil, for broken lead wires or open splice connections.
Coil Burnout: Check for open-circuit coil. Replace coil if necessary.
High or Low Voltage: Check voltage across the coil with a voltmeter. Voltage must be in 85 percent to 110 percent of nameplate rating.
Incorrect Pressure: Check fuel line pressure. Pressure on the valve must be within the specific range of the SV in use.
Fuel Leak Through Valve: Disassemble the valve and clean parts. Replace any parts that are worn or damaged (see How To Order for repair parts).
Slow Shutdown: Due to the internal fuel capacity of some injection pumps, engine shutdown will not occur until that fuel is used up

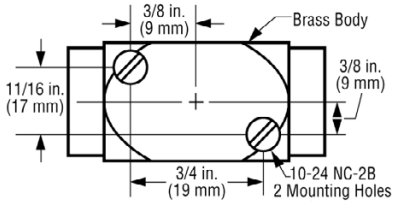
Note: *If engine continues to run after the valve closes, install a check valve such as CKV2336 in the return line.*



Note: Mount the SV valve as close as possible to the injection pump. If using the SV valve with electronic devices, we recommend installing a suppression diode across the SV valve coil.

Dimensions





How To Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

SV – 12 – HP – ____

Coil Voltage	
12	= 12 VDC
24	= 24 VDC

Model	
HP	= High Pressure
Blank	= Non-High Pressure

Orifice	
Blank	= 3/16" (5 mm) dia. (Non-HP Only)
Blank	= 1/4" (6 mm) dia. (HP Only)
4	= 1/4" (6 mm) dia. (Non-HP Only)

Part Number	Description	Notes
80-04-1412	Screw	Repair Parts
55010141	Coil Replacement 12-volt kit	
55010145	Coil Replacement 24-volt kit	
55010155	Core Repair Kit (Std. model)	
55010156	Core Repair Kit (HP model)	
55050194	Valve Body: 3/16 Orifice 1/4 NPT x 1/4 NPT (std.)	
55050193	Valve Body: 1/4 Orifice 1/4 NPT x 1/4 NPT	

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EG Series
Electric Gage & Swichgage® Instrument

The EGS21 Series Swichgage instrument has all of the features of the EG21 Series Gage plus an adjustable set point Power Hall Effect switch output for operating alarms or equipment shutdown. The trip point is adjustable over 90 percent of the scale and has a set point indicator visible from the gage face. Now you can have both the ease of electric gage installation and the reliable switching of Murphy's famous Swichgage instrument.

Features of the EG Series include:

- EG Air Core Movement design
- Technological improvements in lighting, accuracy in reading and wiring installation
- Environmentally sealed design
- Exceeds the rigid SAE J1810 standard
- Corrosion-resistant materials
- Desirable for marine and other environmentally sensitive applications
- Soft, non-glare dial and pointer illumination by cold light LED

Specifications

Power Input: For Gage, Swichgage instrument and sender, 12 VDC or 24 VDC

NOTE: EG21 Series gage and EGS21 Series Swichgage instrument MOVEMENT and ILLUMINATION require 12 VDC to function. For 24-volt systems, voltage converters are built into the electrical wire/connector assembly and supplied with instrument. Specify voltage when ordering.

Case: Polyester (PBT), impact and weather resistant with convenient screw-on mounting clamp

Bezel: Polished 316 stainless steel bezel is supplied as standard; Available in black. SAE style optional.

Lens: Clear polycarbonate and UV stabilized

Air Core Movement: Silicon dampened pointer

Dial: Black background and white markings; behind dial lighting (white marking becomes red when illuminated); dual scale with mirror band to reduce parallax reading errors

Swichgage Instrument Sensor: Outputs ground signal (sinking output) rated 300 mA continuous (EGS21 Series only). Pressure, fuel, volts set on decreasing scale. Temperature and amps set on increasing scale.

Output saturation voltage (voltage drop across switch): 1.3-2.3 Volts @ 77° F (25° C) (May require some conditioning to work with logic inputs)

Swichgage Instrument Set Point Indicator: Visible on mirror band (scale); adjustable from the back of the unit (1/16 in. hex type wrench)

Wiring: Plug connector with wire leads, 18 AWG (1.0 mm^2) x 8 in. (203 mm) length

Operating Temperature: -40° to 185° F (-40° to 85° C)

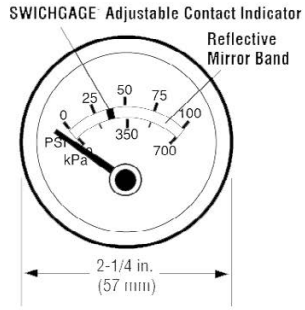
Storage Temperature: -77° to 185° F (-60° to 85° C)

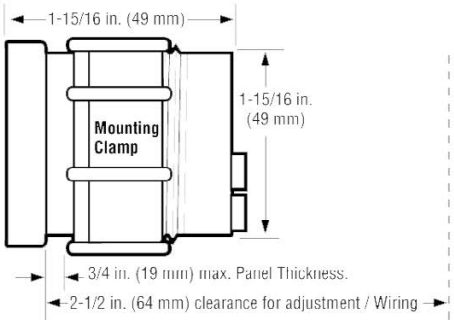
Over Voltage (Gage Movement): Withstands a voltage of 200% of nominal system voltage for 5 minutes. (Meets SAE J1810 standards)

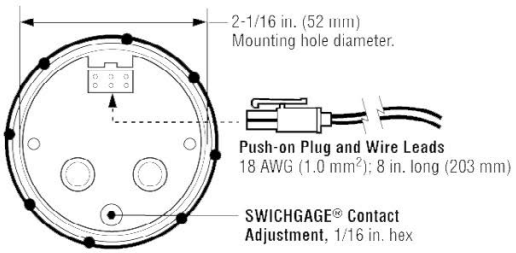
Reversed Polarity (Gage Movement): Withstands reversed battery terminal polarity indefinitely within operating temperatures

Environment and Test: Meets SAE J1810 standards

Dimensions





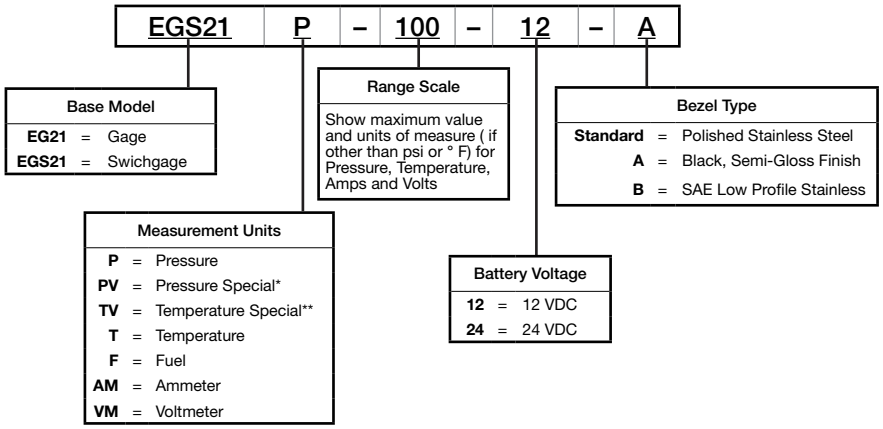


	Pressure	80 psi	552 kPa	5.52 bar
		100 psi	689 kPa	6.89 bar
		200 psi	1.38 MPa	13.80 bar
		300 psi	2.07 MPa	20.70 bar
		400 psi	2.76 MPa	27.60 bar
	Temperature	250° F	121° C	
		300° F	149° C	
	Fuel Level	Empty — 1/4 — 1/2 — 3/4 —Full		
	Ammeter	60 — 0 — 60 amps (internal shunt)		
	Voltmeter	12 VDC: 8-18 Volts		
		24 VDC: 16-36 Volts		

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

EG Series Gage and Swichgage Instrument



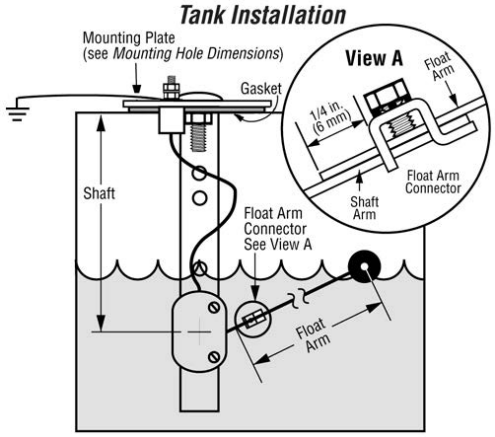
NOTE: EG21 and EGS21 are designed for use with 12-volt systems. For 24-volt systems, voltage reducing resistors are included in the wire/connector assembly. No designator required for Standard configurations.

***** The **EG21PV-80-**12 or 24 is designed to read senders with a resistance curve of 9.5 to 182 Ohms, which are commonly supplied as standard senders on Deutz and VW engines.

******The **EG21TV-300-**12 or 24 is designed to read senders with a resistance of 240 to 18 Ohms, which are commonly supplied as standard senders on Deutz and VW engines.

Fuel Senders

These Fuel Senders are designed to be used in conjunction with our EG Series Swichgage® Instruments as well as CAN I/O modules. See the bulletin 95090 EG Series – Electric Gage and Swichgage Instrument for more information.



Specifications

Tank Cutout Hole: Ø 1.750 in. (44 mm)
Materials:
- **Float:** Foamed Buna N
- **Float Arm:** Stainless Steel
- **Resistor Housing:** Glass Filled Polyacetal
- **Flange & Shaft:** Steel, Zinc-Plated
- **Gaskets:** Buna N, 70 Durometer (48% Acrylonitrile)
- **Hardware:** Brass & Phosphor Bronze
- **Mounting Hardware:** Zinc-Plated Steel

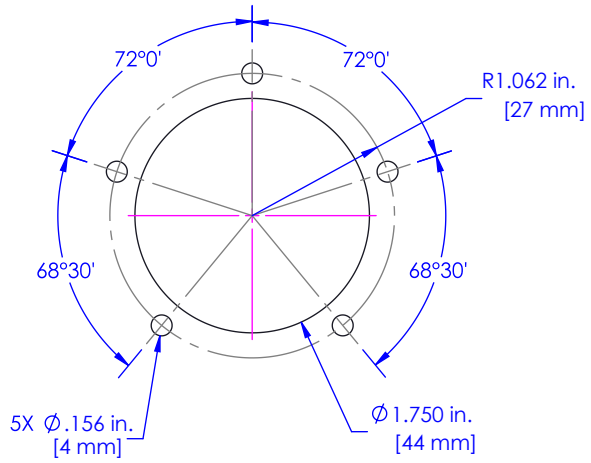
Resistance Range:
ESF and ES2F Model: 240 Ohms to 33 Ohms
ESDF Model: 120 ohms to 17 ohms
Operating Temperature: -40° to 185°F (-40° to 85°C)
Storage Temperature: -76° to 185°F (-60° to 85°C)

Resistance Values

ESF, ES2F Senders:
E = 240 ohms (falling level) (primary calibration point)
1/4 = 153 ohms (falling level)
1/2 = around 100 ohms (falling level)
3/4 = 67 ohms (falling level)
F = 33 ohms (rising level) (secondary calibration point)

Dimensions

Mounting and Cutout Layout

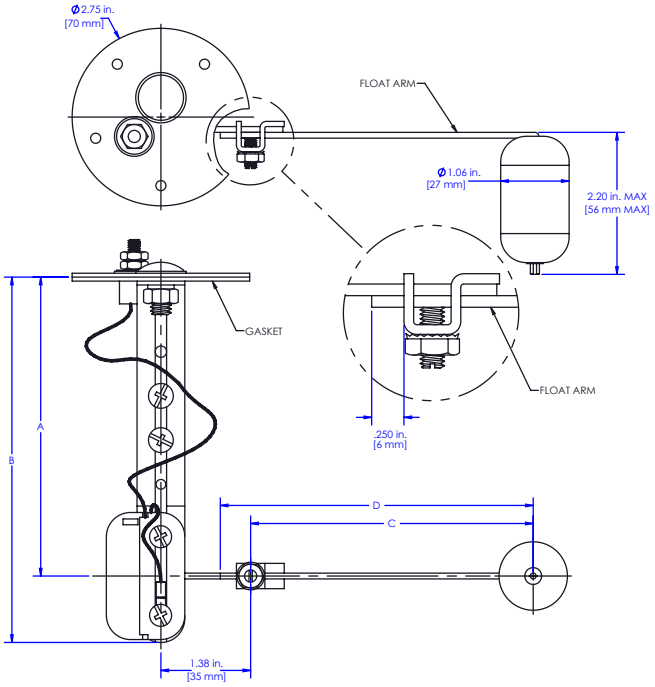


Resistance Table for ES2F Fuel Sender

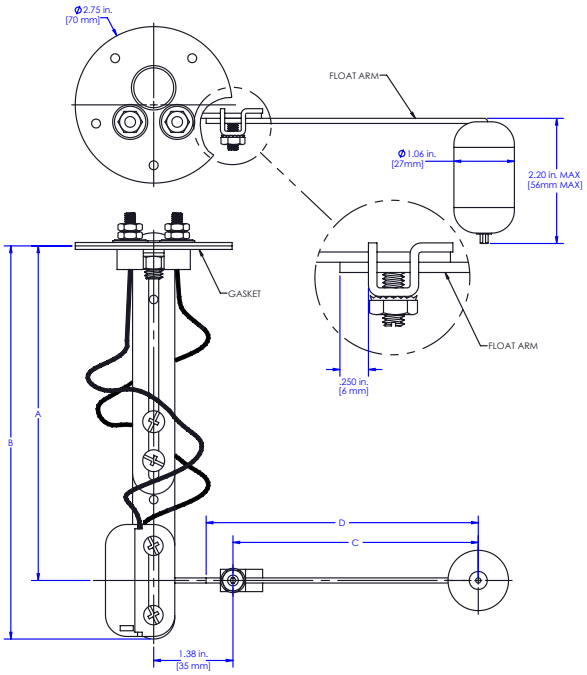
Resistance tables for ES2F Fuel Sender (resistance verses % of scale) Murphy Fuel Sender (0% - 100%)

% of Scale	0	10	20	30	40	50	60	70	80	90	100
R(Ohm)	244	205	171	143	123	103	88	74	60	47	33

Model ESF Series



Model ES2F and ESDF Series



Fuel Sender Table

Tank Depth		D Cut Float Arm Length		A Shaft Length Adjustment	
inch	mm	inch	mm	inch	mm
6.00	152	2.31	59	3.06	78
6.50	165	2.69	68	3.31	84
7.00	178	3.00	76	3.56	90
7.50	191	3.38	86	3.81	97
8.00	203	3.75	95	4.06	103
8.50	216	4.06	103	4.31	110
9.00	229	4.38	113	4.56	116
9.50	241	4.75	121	4.81	122
10.00	254	5.12	130	5.06	129
10.50	267	5.44	138	5.31	135
11.00	279	5.81	148	5.56	141
11.50	292	6.19	157	5.81	148
12.00	305	6.50	165	6.06	154
12.50	318	6.88	175	6.31	160
13.00	330	7.19	183	6.56	167
13.50	343	7.56	192	6.81	173
14.00	356	7.88	200	7.06	179
14.50	368	8.25	210	7.31	186

Tank Depth		D Cut Float Arm Length		A Shaft Length Adjustment	
inch	mm	inch	mm	inch	mm
15.00	381	8.56	217	7.56	192
15.50	394	8.949	227	7.81	198
16.00	406	9.31	237	8.06	205
16.50	419	9.62	244	8.31	211
17.00	432	10.00	254	8.56	217
17.50	445	10.31	262	8.81	224
18.00	457	10.69	271	9.06	230
18.50	470	11.00	279	9.31	237
19.00	483	11.38	289	9.56	243
19.50	495	11.75	298	9.81	249
20.00	508	12.06	306	10.06	256
20.50	521	12.44	316	10.31	262
21.00	533	12.75	324	10.56	268
21.50	546	13.12	333	10.81	275
22.00	559	13.44	341	11.06	281
22.50	572	13.81	351	11.30	287
23.00	584	14.12	359	11.56	294
23.50	597	14.50	368	11.81	300
24.00	610	14.88	378	12.06	307

B = A + 1.03125

C = D - .46875

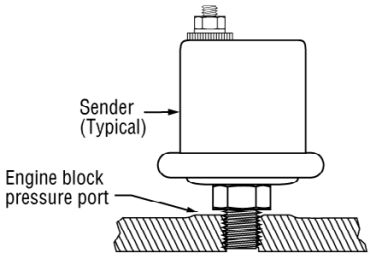
How to Order

Part Number	Model and Description	Notes
05705668	ESF: 1-wire-to-ground Fuel sender	
05705669	ES2F: 2-wire ungrounded Fuel sender	
05705670	ESDF: 2-wire ungrounded Fuel sender, drives 2 gages	

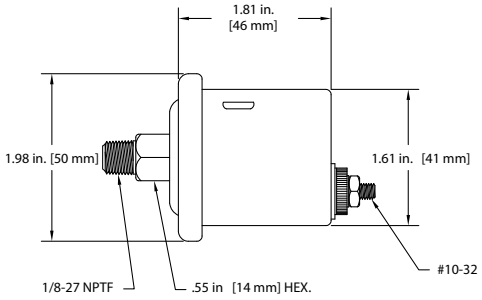
Pressure Senders

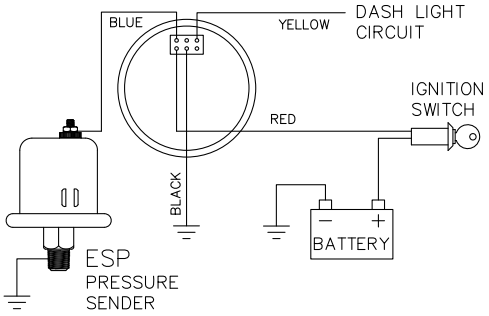
These Gage Pressure Senders are designed to be used in conjunction with our EG Series Swichgage® Instruments as well as CAN I/O modules. See the bulletin 95090 EG Series – Electric Gage and Swichgage Instrument for more information.

NOTE: Always provide proper circuit protection with fuses or circuit breakers.

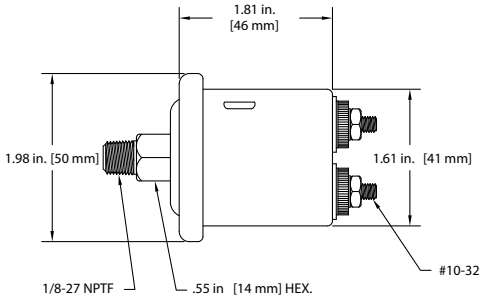


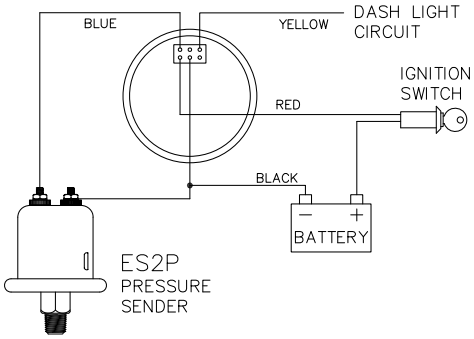
Model ESP Series



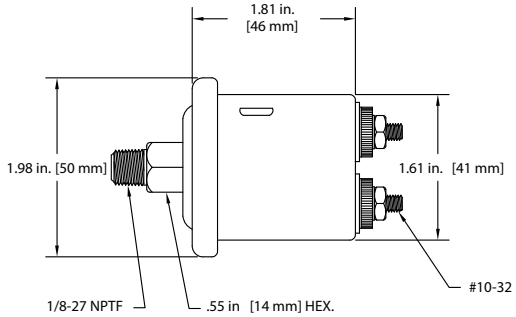


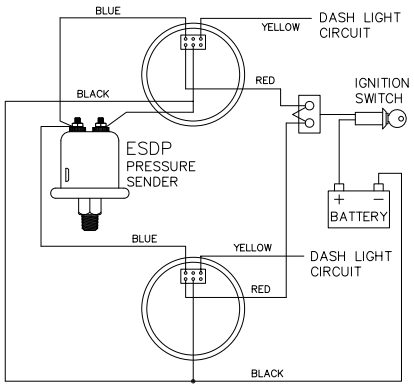
Model ES2P Series

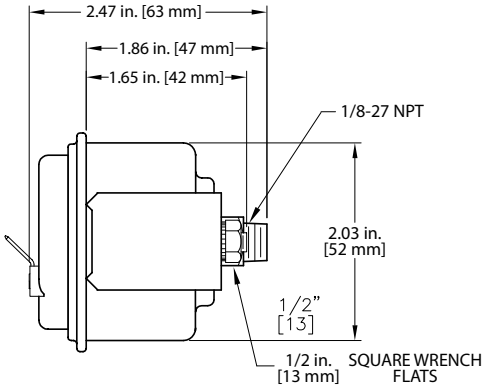


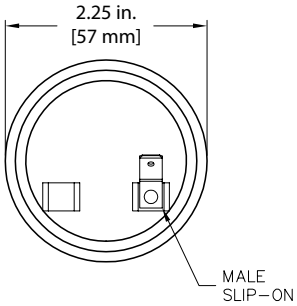


Model ESDP Series









Resistance Values

ESP-80, ES2P-80 Senders:
0 PSI = 240 ohms (falling pressure)
20 PSI = 153 ohms (falling pressure) (primary calibration point)
40 PSI around 100 ohms (falling pressure)
60 PSI = 67 ohms (falling pressure) (secondary calibration point)
80 PSI = 33 ohms (rising pressure)
ESP-100, ES2P-100 Senders:
0 PSI = 240 ohms (falling pressure)
25 PSI = 153 ohms (falling pressure) (primary calibration point)
50 PSI around 100 ohms (falling pressure)
75 PSI = 67 ohms (falling pressure) (secondary calibration point)
100 PSI = 33 ohms (rising pressure)
ESPM-200, ES2PM-200 Senders:
0 PSI = 240 ohms (falling pressure)
50 PSI = 153 ohms (falling pressure) (primary calibration point)
100 PSI around 100 ohms (falling pressure)
150 PSI = 67 ohms (falling pressure) (secondary calibration point)
200 PSI = 33 ohms (rising pressure)
ESPM-300, ES2PM-300 Senders:
0 PSI = 240 ohms (falling pressure)
75 PSI = 153 ohms (falling pressure) (primary calibration point)
150 PSI around 100 ohms (falling pressure)
225 PSI = 67 ohms (falling pressure) (secondary calibration point)
300 PSI = 33 ohms (rising pressure)
ESPMK-400, ES2PMK-400 Senders:
0 PSI = 240 ohms (falling pressure)
100 PSI = 153 ohms (falling pressure) (primary calibration point)
200 PSI around 100 ohms (falling pressure)
300 PSI = 67 ohms (falling pressure) (secondary calibration point)
400 PSI = 33 ohms (rising pressure)

Resistance Table for Pressure Sender

The voltage generated when excited by a 10mA DC constant current

PSI	0	10	20	30	40	50	60	70	80	90	100
R(Ohm)	240	205	171	143	123	103	88	74	60	47	33
V (mV)	2.40V	2.05V	1.71V	1.43V	1.23V	1.03V	(880)	(740)	(600)	(470)	(330)

How to Order

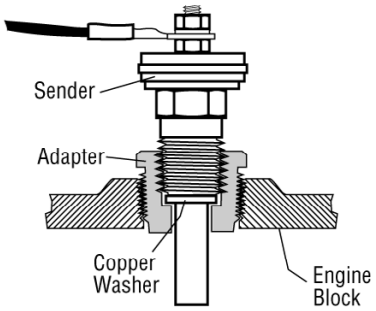
Part Number	Model and Description	Notes: Available Ranges
05701860	ESP-80: 1-wire-to-ground Pressure sender	0-80 psi (0-500 kPa)
05701867	ES2P-80: 2-wire ungrounded Pressure sender	
05701857	ESP-100: 1-wire-to-ground Pressure sender	0-100 psi (0-700 kPa)
05701858	ES2P-100: 2-wire ungrounded Pressure sender	
05701859	ESDP-100: Dual Gage, 2-wire ungrounded Pressure sender	
05701753	ESPM-200: 1-wire-to-ground Pressure sender †	0-200 psi (0-1380 kPa)
05701748	ES2PM-200: 2-wire ungrounded Pressure sender †	
05701751	ESPM-300: 1-wire-to-ground Pressure sender †	0-300 psi (0-2070 kPa)
05701750	ES2PM-300: 2-wire ungrounded Pressure sender †	
05702566	ESPMK-400: 1-wire-to-ground Pressure sender †	0-400 psi (0-2760 kPa)
05702565	ES2PMK-400: 2-wire ungrounded Pressure sender †	

† Mounting off-equipment recommended.
NOTE: The ESPMK-400 & ES2PMK-400 are not recommended for use with digital I/O modules – use PXT-K pressure transmitter.

Temperature Senders

These Temperature Senders are designed to be used in conjunction with our EG Series Swichgage® Instruments as well as CAN I/O modules. See the bulletin 95090 EG Series – Electric Gage and Swichgage Instrument for more information.

NOTE: Always provide proper circuit protection with fuses or circuit breakers.



Specifications

Housing Material: Brass
Temperature Range:
100°-250°F (40°-120°C) or 140°-300°F (60°-150°C)

Resistance Values

EST-250/300, ES2T-250/300 Senders:
100 F = 1050 ohms (rising temperature)
150 F = around 330 ohms (rising temperature)
180 F = 174 ohms (rising temperature) (secondary calibration point)
210 F = 100 ohms (rising temperature) (primary calibration point)
250 F = 54 ohms (rising temperature)
EST-250/300, ES2T-250/300 Senders:
140 F = 410 ohms (rising temperature)
180 F = 176 ohms (rising temperature)
210 F = 100 ohms (rising temperature) (secondary calibration point)
240 F = 63 ohms (rising temperature) (primary calibration point)
300 F = 26 ohms (rising temperature)

Resistance Table for Temperature Sender

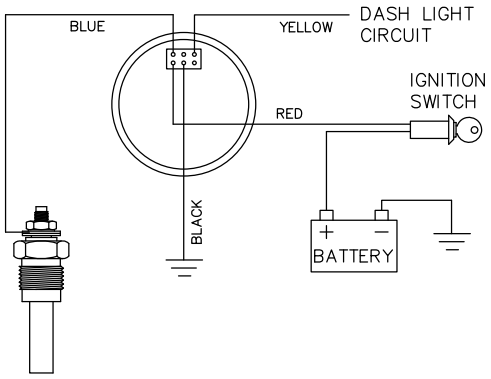
The voltage generated when excited by a 2.5mA DC constant current

°C	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
R(Ohm)	7208	4115	2529	1594	1029	680	460	321	227	164	120	89	74	52	40
V (mV)	18.0V	10.3V	6.32V	3.98V	2.57V	1.70V	1.15V	(0.80)	(0.57)	(0.41)	(300)	(222)	(185)	(130)	(100)

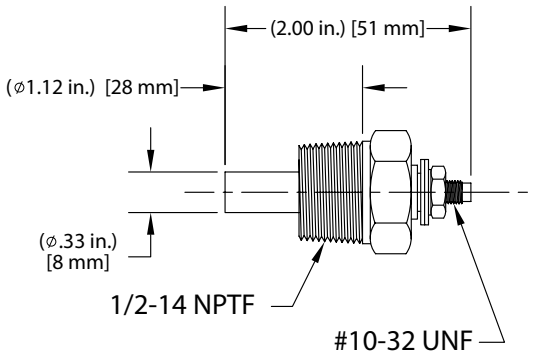
Resistive Range Table (Nominal OHMS)							
100–250°F		40–120°C		140–300°F		60–150°C	
Temp.	OHMS	Temp.	OHMS	Temp.	OHMS	Temp.	OHMS
100	1050	40	1050	140	410	60	410
150	330	60	410	180	176	80	189
180	176	80	193	210	100	100	97
210	103	100	100	240	63	120	55
250	54	120	55	300	26	150	25

Model EST Series

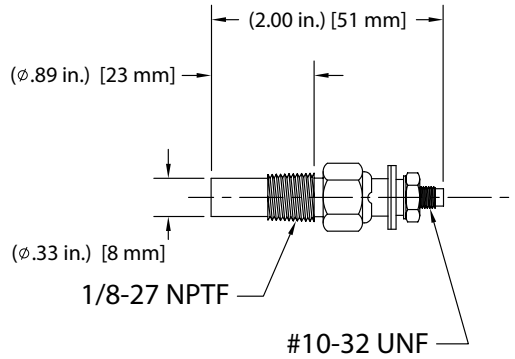
EST Wiring



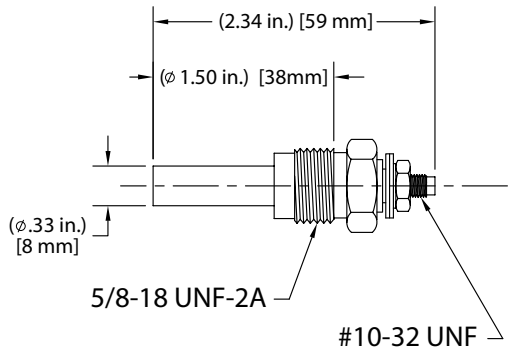
EST 250/300 1/2-14 NPT



EST 250/300 1/8-27 NPT

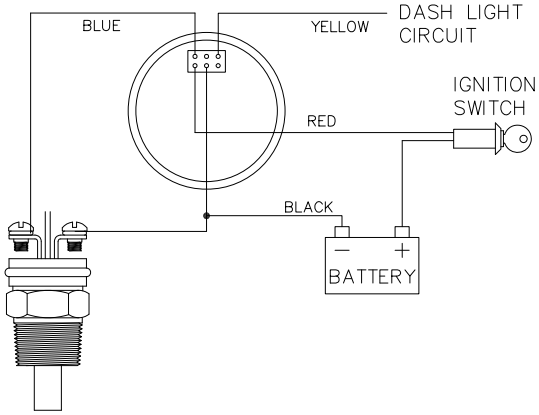


EST 250/300-X 5/8-18 UNF

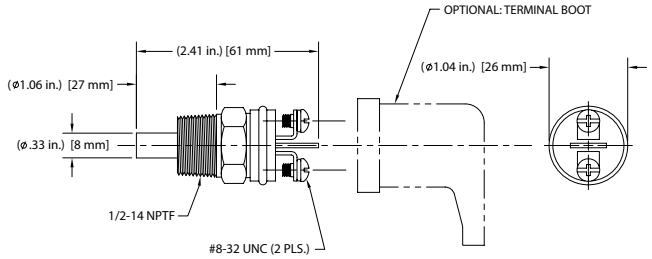


Model ES2T Series

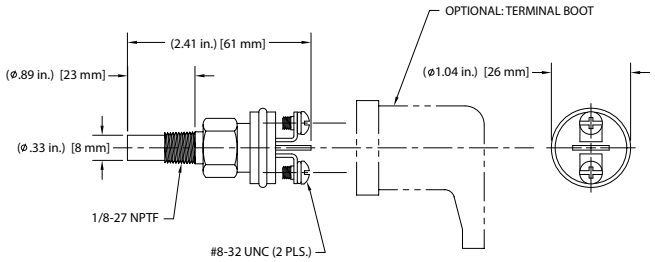
ES2TWiring



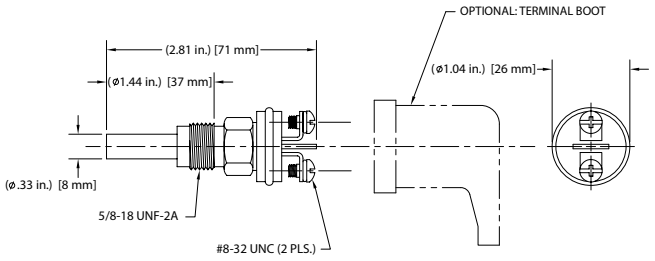
ES2T 250/300 1/2-14 NPT



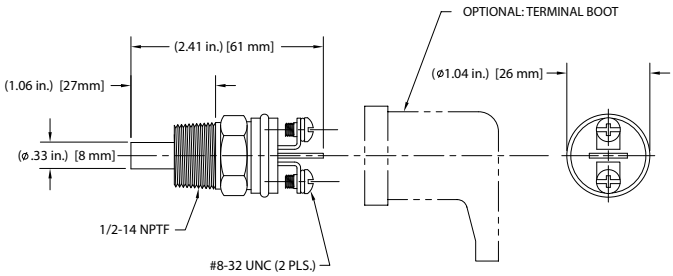
ES2T 250/300 1/8-27 NPT



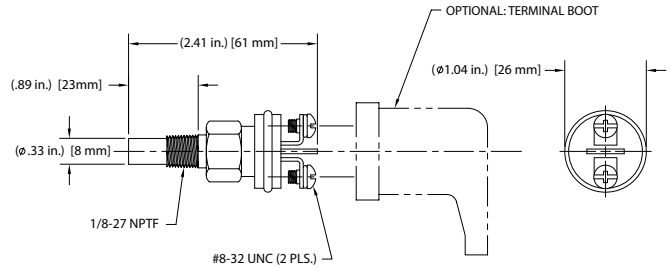
ES2T 250/300-X 5/8-18 UNF



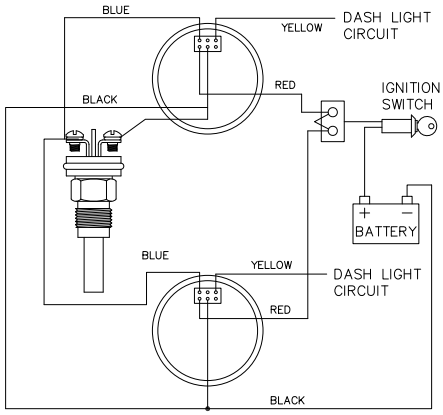
ESDT 250/300 1/2-14 NPT



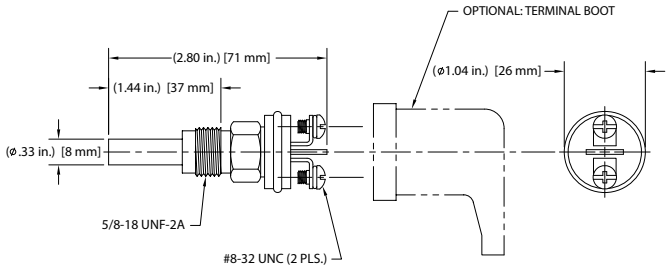
ESDT 250/300 1/8-27 NPT



ESDT Wiring



ESDT 250/300-X 5/8-18 UNF



How to Order

Part Number	Model and Description	Notes
10702010	EST-250/300-1/8: 1-wire-to-ground Temperature sender	Thread 1/8 - 27 NPT
10702014	ES2T-250/300-1/8: 2-wire ungrounded Temperature sender	
10702017	ESDT-250/300-1/8: 2-wire ungrounded Temperature sender	
10702009	EST-250/300-1/2: 1-wire-to-ground Temperature sender	Thread 1/2 - 14 NPT
10702013	ES2T-250/300-1/2: 2-wire ungrounded Temperature sender	
10702016	ESDT-250/300-1/2: 2-wire ungrounded Temperature sender	
10704691	EST-250/300-X: 1-wire-to-ground Temperature sender	Thread 5/8 - 18 UNF
10706175	ES2T-250/300-X: 2-wire ungrounded Temperature sender	
10704690	ESDT-250/300-X: 2-wire ungrounded Temperature sender	
00003624	EST Boot	Optional

NOTE: X = 5/8-18 thread for adaptors.
NOTE: See bulletin 8428 for avalable adaptors (Group 1).
NOTE: Always provide proper circuit protection with fuses or circuit breakers.

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Tachometers and Tach/Hourmeters

AT and ATH Series

Features

- Improved quality
- New, easy one-button calibration procedure
- Every model will accept all signal sources: alternator, magnetic pickup or ignition
- Easy ring clamp for installation
- LED backlight

The AT Series tachometer is a rugged instrument with solid-state circuitry for indication of engine RPM. It is equipped with a ring nut for mounting into a standard 3-3/8 in. (86 mm) dash mounting hole. A full 240° sweep of the pointer gives an accurate indication on a large easy–to–read scale, and the dial can be illuminated for night reading. The ATH Series model is also equipped with hourmeter to record the elapsed running time of an engine.

These instruments are designed to function with Alternator, Magnetic Pickup or Ignition signals from:

- pulses generated by an alternator with 4, 8, 12, 14 or 16 poles on the rotor (3 - 52 PPR);
- pulses obtained from the ring gear of an engine by means of an electromagnetic sensor (magnetic pickup). The instrument is designed to function with flywheels having anywhere from 50 to 300 teeth;
- 2 - 10 cylinder, 4 cycle spark-ignited engines. Not intended for use with Capacitive Discharge (CD) ignitions or magnetos, only for inductive, automotive-type ignitions.

The tachometers are powered by a 12- or 24-volt battery and are reverse polarity protected. These units are for negative ground or isolated electrical systems. They are specially designed for use on truck, marine, industrial or stationary engines.

CE* RoHS

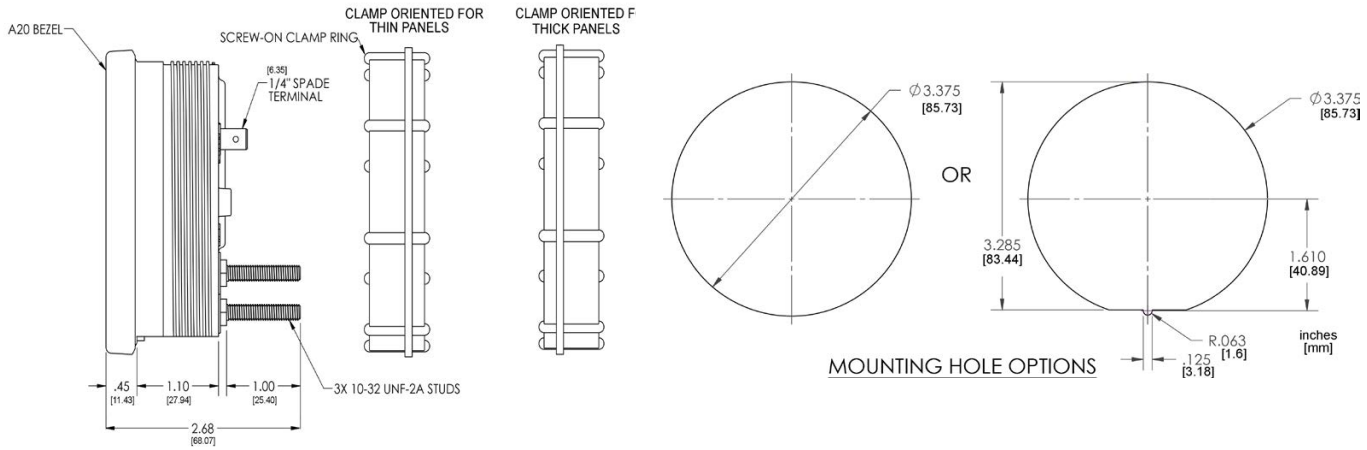
Specifications

Power Input: 10-32 VDC (100 mA max at 32 VDC, does not include backlight)
Backlight: LED, Red (75 mA max at 32 VDC)
Accuracy:
Tachometer: +2% full scale
Hourmeter: +/- 0.02%
Temperature Range: -40 to 185° F (-40 to 85° C)
Dial (Face Plate): 240° sweep with white numerals
Bezel: 304 stainless steel
Scale: 0-3000 RPM
Case Material: Nylon, 12% glass filled
Hourmeter Range: 99999.9 hours in 0.1 increments.
Electromagnetic Compatibility: 2014/30/EU
RoHS Conformance: 2011/65/EU

*Products covered in this document comply with European Council electromagnetic compatibility directive 2014/30/EU and hazardous substances directive 2011/65/EU.

Bezel Styles

Dimensions



Previous Model Reference

Old/Discontinued Model		New Model Replacement	
Part Number	**Model**	**Part Number**	**Model**
20700134	ATA-40	20700245	AT-30
20700135	ATA-40-A	20700246	AT-30-A
20700136	ATA-40-B	20700247	AT-30-B
20700137	ATHA-40	20700249	ATH-30
20700141	ATHA-40-A	20700250	ATH-30-A
		20700254	ATH-40-A
20700139	ATHA-40-B	20700251	ATH-30-B
20700140	ATHA-40-C	20700252	ATH-30-C
20700142	ATHS-40	20700249	ATH-30
20700143	ATHS-40-A	20700250	ATH-30-A
20700225	ATHS-40-B	20700251	ATH-30-B
20700226	ATHS-40-C	20700252	ATH-30-C
20700228	ATS-40-A	20700246	AT-30-A
20700229	ATS-40-B	20700247	AT-30-B
20700230	ATS-40-C	20700248	AT-30-C
20700231	ATHI-40-A	20700254	ATH-40-A

How to Order

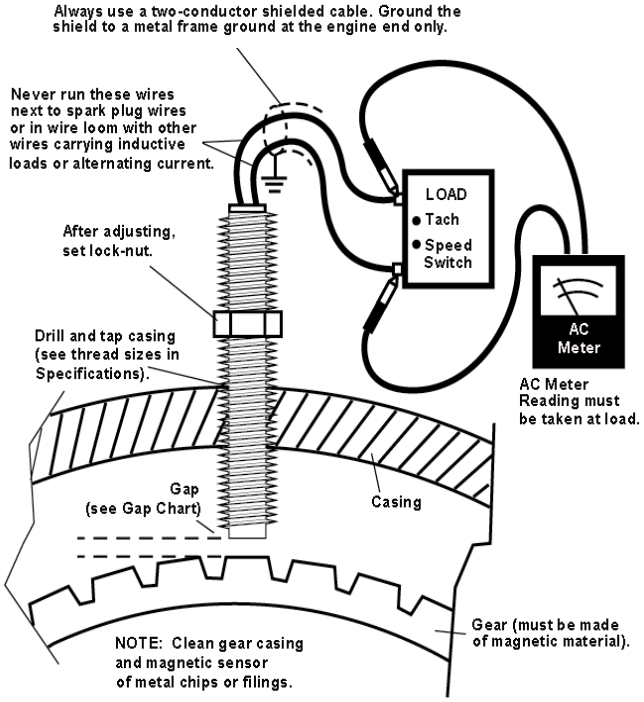
Part Number	Model	Notes with Bezel Description
Without Hourmeter		
20700245	AT-30 Tachometer	Bright Stainless Steel Bezel
20700246	AT-30-A Tachometer	Black Stainless Steel Bezel
20700247	AT-30-B Tachometer	SAE Bright Stainless Steel Bezel
20700248	AT-30-C Tachometer	SAE Black Stainless Steel Bezel
With Hourmeter		
20700249	ATH-30 Tach/Hourmeter	Bright Stainless Steel Bezel with Hourmeter
20700250	ATH-30-A Tach/Hourmeter	Black Stainless Steel Bezel with Hourmeter
20700251	ATH-30-B Tach/Hourmeter	SAE Bright Stainless Steel Bezel with Hourmeter
20700252	ATH-30-C Tach/Hourmeter	SAE Black Stainless Steel Bezel with Hourmeter
20700254	ATH-40-A Tach/Hourmeter	4000 RPM Black Stainless Steel Bezel with Hourmeter

Magnetic Pickups
Models MP3298, MP7905 and MP7906

A magnetic pickup is an AC generator. It is normally installed into the flywheel housing of an internal combustion engine. The starter ring gear acts upon it to generate a voltage pulse each time a gear tooth passes the end of the sensor.

Magnetic Pickup Installation

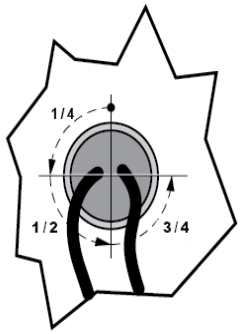
Drill and tap a hole in the flywheel housing (See Specifications for model and thread size). IMPORTANT: Drilling too deep may damage ring gear teeth. Blow chips with air hose when drilling and tapping hole.



Gap Adjustment

Insert magnetic pickup and turn until it stops at the face of the gear. Back off the gear by turning the pickup counter clockwise 1/4, 1/2 or 3/4 turn. See Gap Chart to determine gap distance based on the turn. Check gap clearance by rotating the gear completely around.

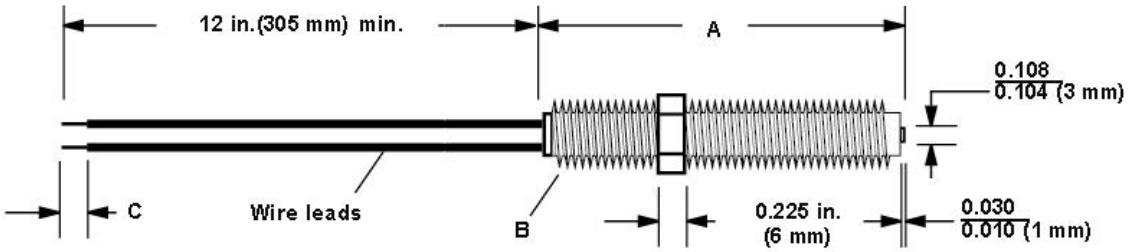
NOTE: Magnetic pickup gap should be adjusted so that the minimum voltage required is attained at the engine's lowest RPM. The voltage will increase as the speed increases. If erratic readings occur, remove the magnetic pickup and check the magnetic tip for metal chips.



WARNING

BEFORE BEGINNING INSTALLATION OF THIS PRODUCT
- ✓ Disconnect all electrical power to the machine
- ✓ Make sure the machine cannot operate during installation
- ✓ Follow all safety warnings of the machine manufacturer
- ✓ Read and follow all installation instructions

Dimensions



A. MP3298 and MP7906 = 3 in. (76 mm)
MP7905 = 4.5 in. (114 mm)

B. MP3298 = 5/8-18 UNF-2A
MP7905 and MP7906 = 3/4-16 UNF-2A

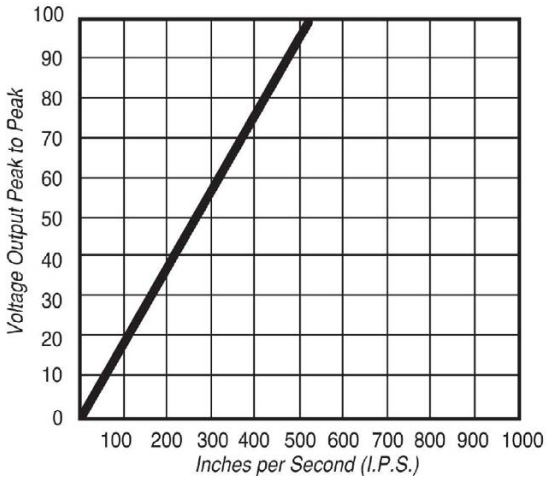
C. MP3298 = 0.250 in. (6 mm)
MP7905 and MP7906 = 0.370 in. (9 mm)

Polarity: White lead is positive with respect to Black lead upon approach of ferrous metal.

Specifications

Housing Material:
MP3298: Type 300 Stainless Steel, Locknut: Type 300 Stainless Steel
MP7905 and MP7906: Type 6061 Aluminum/Anodize Class 1
Locknut: steel nickel plated
Output Leads (all models): Two insulated leads, 20AWG, STR/TEF insulated per MIL-W-16878D Type E, 1 White and 1 Black
Output Voltage (all models): 200 V.P.P. TYP (tested at 1000 I.P.S. 20 Pitch gear, 0.005 Gap., and 100K OHM Load)
Coil Resistance:
MP3298: 975 Ohms TYP
MP7905 and MP7906: 2500 Ohms TYP
Potting (all models): Internal portion of pickup is filled with epoxy resin, making the magnetic pickup oil- and moist-resistant
Temperature (all models): -65° to +225°F (-54° to 107°C)
Coil Induction:
MP3298: 800 mH max, @ 1 KHz
MP3298: 400 mH TYP @ 1 KHz

Output Voltage Operating Chart



Note: Tested at 1000 I.P.S. 20 pitch gear, 0.005 gap and 100K OHM load.

Gear Pitch/Voltage Output

Gear Pitch	% Output Std. Volts
6	187
8	172
10	162
12	157
16	118
20	100
24	85
32	23
48	-
64	-
72	-

Note: Dash indicates not recommended.

$$\text{I.P.S.} = \frac{\text{R.P.M. x dia. x 3.14}}{60}$$

Gap Chart

TURN	GAP	
1/4	.013 in. (0.33 mm)	.015 in. (0.38 mm)
1/2	.028 in. (0.71 mm)	.030 in. (0.76 mm)
3/4	.035 in. (0.88 mm)	.045 in. (1.14 mm)
1	.055 in. 1.39 mm)	.062 in. (1.57 mm)

How to Order

Part Number	Model	Total Length	Threaded Length	Thread Size	Notes
20700162	MP3298	3 in. (76mm)	3 in. (76mm)	5/8-18 UNF	
20700161	MP7906	3 in. (76mm)	3 in. (76mm)	3/4-16 UNF	
20700160	MP7905	4-1/2 in. (114 mm)	4-1/2 in. (114 mm)	3/4-16 UNF	

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Murphy Generator
Control Panels

Our Murphy Generator Control line features standard panels for all levels of use, from basic manual start to full-featured auto-start.

Each standard panel is designed for maximum flexibility, allowing you to customize the instrumentation to fit your specific application. You get plenty of options but with the short delivery time of a pre-engineered panel.

MGC100

AUTO START
- Cascade controller
- Gages for oil pressure and water temperature (mechanical or electric), compatible with Murphy or VDO senders
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter
- Power on-off switch (toggle)

MANUAL START
- Start method (select one)
  - Key start module with first out annunciation (removes power switch)
  - Key switch & 518 Tattletale
  - Key switch w/pre-heat & 518 Tattletale
  - Push button & 518 Tattletale
- Gages for oil pressure and water temperature (mechanical or electric), compatible with Murphy or VDO senders
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter
- Power on-off switch (toggle)

OPTIONS
- DC voltmeter
- Relays for alarm outputs
- Electric senders – 100 PSI & 250°F 1/2 inch port
- Electric senders – 100 PSI & 320°F M14 port (Deutz engines)
- Energized to stop (auto start only)
- E-stop (mushroom style)
- Phase selector switch (single phase applications)
- Current transformers

MGC150

AUTO START
- Cascade controller
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter
- Power on-off switch (toggle)

MANUAL START
- Start method (select one)
  - Key switch & 518 Tattletale
  - Key switch w/pre-heat & 518 Tattletale
  - Push button & 518 Tattletale
- PowerView
- AC metering – volts, amps, hertz
- Phase selector switch (3 phase)
- Hourmeter

OPTIONS
- PowerView
- Relays for alarm outputs
- E-stop (mushroom style)
- Phase selector switch (single phase applications)
- Current transformers

**Some panels shown with optional equipment installed. All models include fuses, fuse block and wiring.*

How to Order

Part Number	Model and Description	Notes
Specify Model Number	MGC100: Generator control panel unit	Auto and manual start
	MGC150: Generator control panel unit	

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Sentinel 150P Series

Automatic Switch Mode Battery Charger

The Sentinel 150P is a range of highly efficient, high performance battery chargers designed for continuous float charge and standby power applications. Switch Mode technology improves efficiency and low heat dissipation, wide supply voltage tolerance and low output ripple all within a compact and lightweight construction design.

The chargers are configured for fast, accurate charging to give optimum battery life and reliability. Each charger's output can be OEM-configured for optimal charging of different cell types: vented/wet lead acid, Calcium-Calcium, sealed VRLA (AGM or Gel), NiCd or custom requirements. The very smooth output (< 1% ripple) allows charging of sealed or vented batteries or use as a standalone power supply.

All models feature an intelligent, multi-stage charge regime: during charge recovery mode, the Sentinel gives a constant (maximum) current output; as the battery approaches peak charge, the output reverts to float charge mode, maintaining an optimum cell voltage and supplying additional standing load current up to the rated maximum. Output current is always limited to the rated maximum, even during high load (e.g. engine cranking), short-circuit or reverse polarity connection.

AutoBoost: AutoBoost provides a temporary increase in output voltage, equalizing the charge between cells and maximizing battery life and capacity. AutoBoost is triggered automatically when the battery falls below a preset voltage and reverts to float mode automatically at the end of the boost cycle, preventing battery over-charge and gassing.

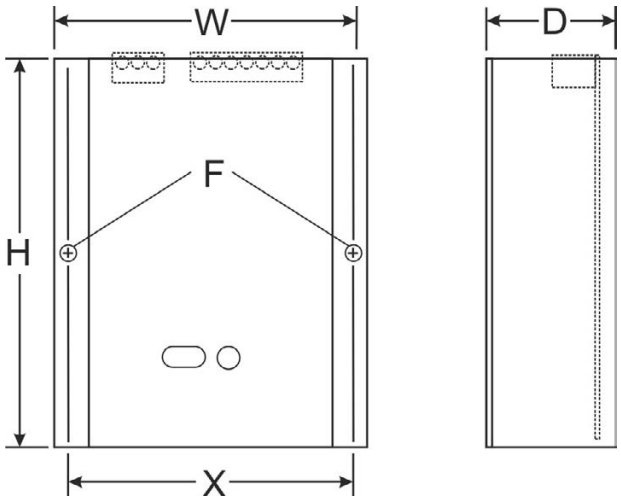
Alarm output and control input (A option): A option models include a control input and alarm output, both with configurable functions. The input can be configured for use with panel relay circuits or operator switches, giving additional control over the output, e.g. AutoBoost initiation and termination. The alarm relay output can be configured to operate during a one or more (up to 7) fault conditions: mains fail, DC connection error, battery missing, temp sensor short, low battery volts, high battery volts and charge fail.

Temperature compensation: The optimum charge voltage for lead acid and NiCd batteries varies with ambient temperature. Sentinel can be configured to sense battery temperature from a remote sensor and automatically compensate the output charge voltage.

Versatile: Sentinel 150P can be configured and monitored using a PC-based software tool, model SNTL150P-PCSUITE. The tool offers a number of standard profiles for different battery types but also allows OEM-customization of all parameters for fine control in any application. The tool also enables real-time monitoring and metrics for both charger and battery.

Installation and connection: The Sentinel 150P uses an open circuit board construction with an aluminum protective cover for surface mounting in an existing control panel. Electrical connection is by quick-connect, two-part type terminal blocks.

Dimensions



Dimensions for reference only. Use actual product for mounting template. For safe heat dissipation, mount product in orientation shown, with minimum air-gap clearance of 1.5 in. (40 mm) above and below and 1.0 in. (25 mm) at each side.

	12 Volt Model	24 V Model
Overall:		
W	4.28 in. (108.6 mm)	
H	5.31 in. (135 mm)	
D	1.77 in. (45 mm)	2.17 in. (55 mm)
Fixing Holes:		
X	3.90 in. (99 mm)	
F	Ø 0.22 in. (5.65 mm)	
Weight:		
	1.45 lb. (0.65 kg)	1.65 lb. (0.75 kg)

Specifications

Power Supply

Operating Voltage: 95 to 265 V AC

Operating Frequency: 47 - 63 Hz.

DC Charge Output

Nominal voltage: 12 or 24 VDC

Float/boost voltage: See Output Calibration table

Maximum current limit: 5 A

Voltage ripple: <1%

Line regulation: <2%

Load regulation: <2%

Input/Output

Control input:

Digital (switch) input, close to –DC to activate, programmable function

Alarm output:

Relay switched +DC, 1A max @ 30 VDC, programmable function

Physical

Protective cover: 1050 aluminum, 1.2 mm

Operating temperature: –22° F to 140° F (–30° C to 60° C)

Storage temperature: –40° F to 140° F (–40° C to 60° C)

Humidity: 20% to 90% RH

Dimensions: See Dimensions section

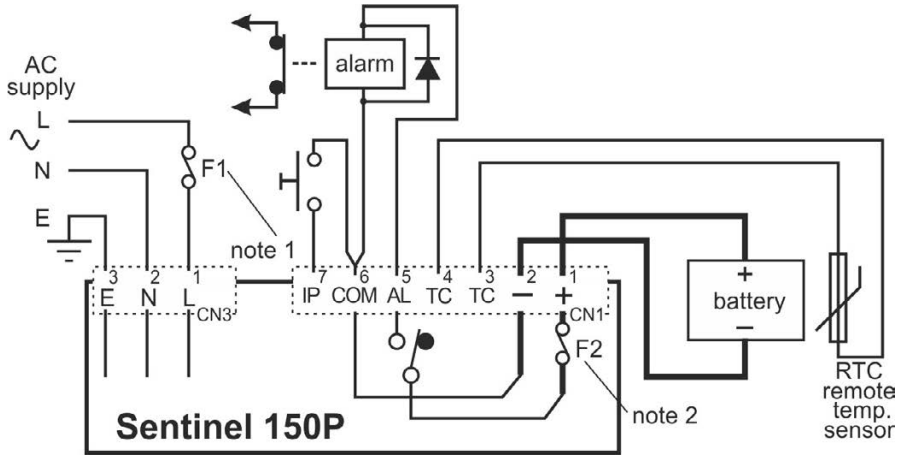
Weights: See Dimensions section

Electrical safety: 2006/95/EC (EN 60065)

Electromagnetic compatibility:

2004/108/EC (EN 61000-6-2, EN 61000-6-4)

Electrical Connections



Notes:

1) External AC fuse (F1) required: see AC Input (power supply) section
2) Internal, self-resetting DC fuse (F2): see DC Output section
3) Battery output is isolated from chassis.
4) Alarm output (pin 5) relay shown in de-energized state. Output function is software configurable.
5) Control input (pin 7) shown with momentary-action operator panel switch. Input function is software configurable.

Output Calibration

Standard and custom output calibrations are selected using the SNTL150P-PCSUITE software tool. Calibration figures shown below are at 20° C. If temperature compensation is enabled and remote SNTL-RTC temperature sensor connected, output voltage automatically varies by 3 mV per cell per 1° C deviation from 20° C, within the range –10° C to 50° C. Increasing temperatures give decreasing outputs; decreasing temperatures give increasing outputs.

Standard Calibrations (Battery Type)		Float Volts (V DC)	Boost Volts (V DC)
12 V	Vented lead acid (6 cells)	13.5	14.1
	Calcium-Calcium (6 cells)	13.8	15.6
	Lead acid antimony (6 cells)	13.5	14.7
	VRLA, AGM (6 cells)	13.5	14.4
	VRLA, Gel (6 cells)	13.5	13.8
	NiCd (10 cells)	14.1	14.5
	Power supply	12.0	n/a

Standard Calibrations (Battery Type)		Float Volts (V DC)	Boost Volts (V DC)
24 V	Vented Lead acid (12 cells)	27.0	28.2
	Calcium-Calcium (12 cells)	27.6	31.2
	Lead acid antimony (12 cells)	27.0	29.4
	VRLA, AGM (12 cells)	27.0	28.8
	VRLA, Gel (12 cells)	27.0	27.6
	NiCd (18 cells)	25.6	26.1
	NiCd (20 cells)	28.2	29.0
	Power supply	24.0	n/a

How to Order

Part Number	Model	Description
42703810	SNTL150P1205CDLA	Sentinel 150P, 12 V / 5 A nominal output
42703811	SNTL150P2405CDLA	Sentinel 150P, 24 V / 5 A nominal output
42703820	SNTL150P1205CDALA	As 42703810, plus alarm output and control input (programmable functions)
42703821	SNTL150P2405CDALA	As 42703811, plus alarm output and control input (programmable functions)

NOTE: All part numbers above are supplied with output calibrated for vented lead-acid cells. Output calibration can be optimized for different battery types by using the SNTL150P-PCSUITE software tool.

Accessories for Sentential 150P Series	
Part Number	**Description**
42703900	42703900 SNTL-RTC sensor for remote temperature compensation feature, complete with 3 m / 9.8 ft lead assembly. Non standard lengths available to special order.
42703825	SNTL150P-PCCONN programming kit. Includes SNTL150P-PCSUITE software tool (PC compatible), USB-TTL interface and power/data connection leads.

Warranty: A two-year limited warranty on materials and workmanship is given with the Sentinel 150P product. Details available on request.

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Sentinel 300P Series
Programmable Switch Mode Battery Chargers

Sentinel 300P battery chargers provide new levels of DC power control, monitoring and protection for stationary engine starting and standby battery applications.

Advanced Sentinel charging features included as standard:

• Switch mode charging technology: high power efficiency and low heat dissipation, plus wide supply voltage tolerance, in a compact and lightweight package.

• Multistage charging: float, bulk, absorption and AutoBoost stages ensure no compromise between rapid charge recovery and long-term battery capacity and life.

• Low output ripple: <1% ripple, beneficial for vented lead acid and NiCd cells, essential for VRLA, and configurable for use as a standalone DC power supply.

• AutoBoost: triggered automatically on low charge levels or manually by remote switch, AutoBoost temporarily increases the charge voltage before returning to float mode. Equalizing battery cell charge without overcharge and gassing, AutoBoost maximizes cell capacity and life.

• Temperature compensation: ensures batteries are charged at the optimal voltage, which varies significantly with ambient temperature. Sentinel can measure temperature with a battery-mounted sensor and adjusts output voltage to prevent under or over charging.

In addition, the Sentinel 300P includes:

• Flexible configuration: microprocessor programmability for automatic or manual configuration of charge output voltages (12 V or 24 V nominal), cell types/numbers and application – all in one standard model. Programming is by circuit board links or PC-based software configuration and monitoring tool.

• Inputs and outputs: for remote charger control and signaling of charge fail, high/low battery volts and mains fail faults. Standard output functions are NFPA 110 compliant. Non-standard input/output functions available to special order.

• Display, instrumentation and communication: options for backlit LCD readout, analog metering and CAN 2.0B / SAE J1939 data communication; all models include RS485 communication for configuration and control.

The Sentinel 300P is available either as an open-frame, UL-recognized module for mounting in existing control panels or as a UL-listed, wall-mounted stainless steel enclosure with LCD and analog metering options. Electrical connection is by screw terminal blocks. On enclosed models, wiring harness access is by knock-out cable gland holes in the case side.

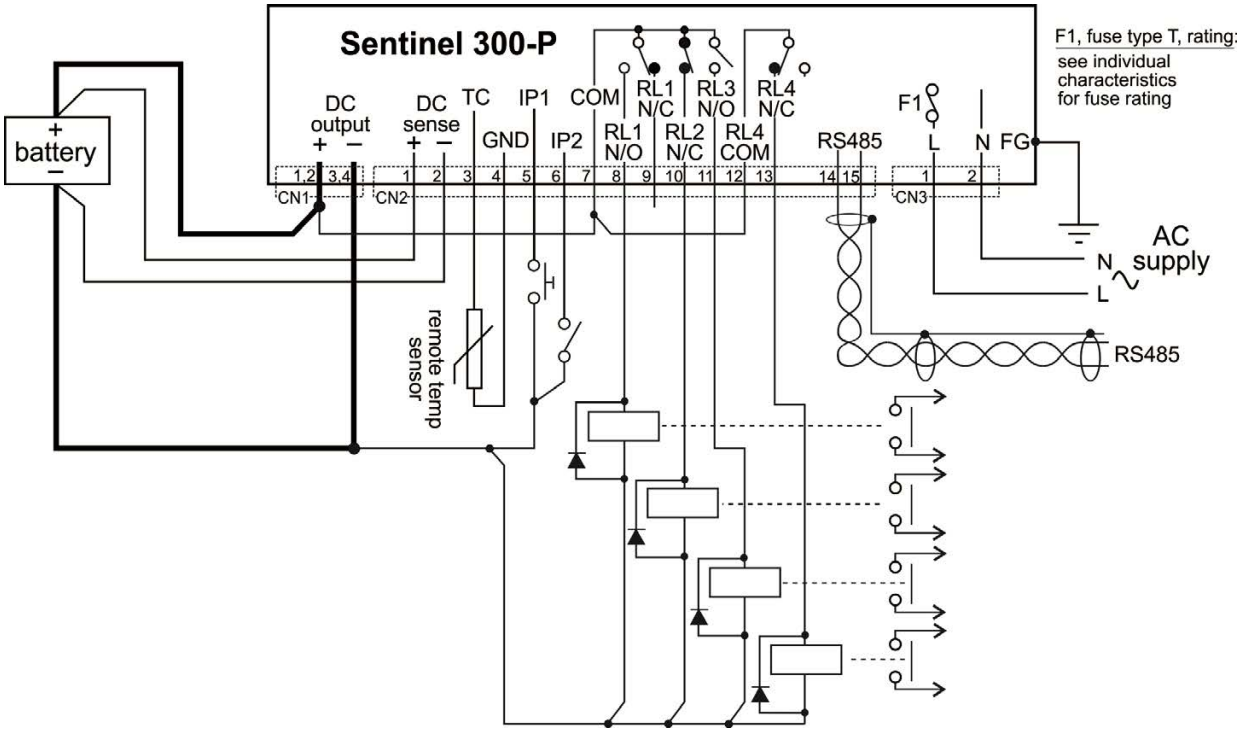
NFPA 110 compliant

* Tested and approved by UL to: UL1236 – Battery chargers for charging engine-starting batteries, and CSA22.2 No. 107.2 – Battery chargers

Specifications

Power supply
Operating voltage: 95 – 250 V AC
Operating frequency: 47 – 63 Hz.
DC Charge Output
Nominal voltage: programmable 12 or 24 V DC
Float/boost voltage: programmable, see output calibration table
Maximum current limit: 10 A
Voltage ripple: <1%
Line regulation: <2%
Load regulation: <2%
Outputs x3 (x4 for non-CAN configurations):
All models:
1 x SPCO (RL1), 1 x SPNC (RL2), 1 x SPNO (RL3),
dry/volt-free contacts (common feed for RL1, RL2 & RL3)
Standard models (non-CAN configurations):
1 x SPNC (RL4), dry/volt-free contacts
standard output functions (charge fail, AC fail, low battery volts, high battery volts) are NFPA 110 compliant
Rating (all relays): 1A max @ 30 VDC (resistive load), UL class 2
Inputs x2:
Closed to negative DC to activate, configurable function
Physical
Operating temperature: –40° F to 140° F / –40° C to 60° C
Display view-ability (LCD models): 32° F to 122° F / 0° C to 50° C
Humidity: 20% to 90% RH
Electrical safety: 2006/95/EC
Electromagnetic compatibility:
2004/108/EC, EN 55022 class B
(EN 61000-6-1, EN 61000-6-3)
UL approvals
All standard (E)SNTL300P models:
BBGQ: UL1236, CSA22.2 no. 107.2
BBHH: UL1236 SE

Electrical Connection



Notes:
1) AC input fusing (F1): replaceable, circuit board mounted fuse, rating as shown on the product label.
2) DC output fusing: all models include a self-resetting electronic output fuse.
3) DC output is isolated from chassis.
4) connection shown for standard configurations with output RL4. (RL4 is not available on units configured for CAN communication.)

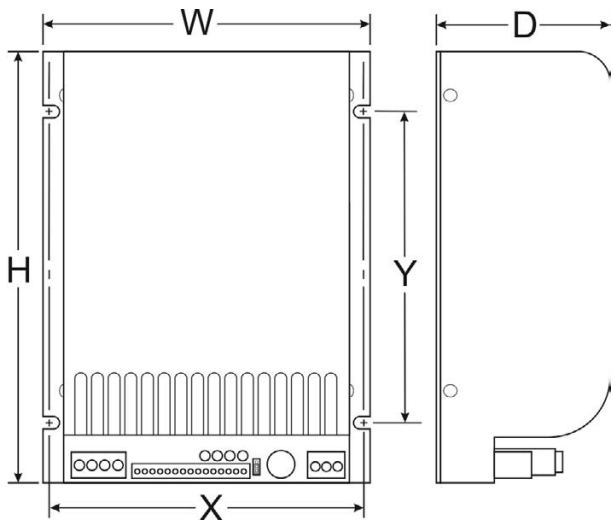
Output Calibration

Battery type is selected by circuit board DIP switches or SNTL300P-PCSUITE configuration software.

Calibration figures at 20° C. If temperature compensation is enabled and remote SNTL-RTC temperature sensor connected, output voltage automatically varies by 3 mV per cell per 1° C deviation from 20° C, within the range –10° C to 50° C. Increasing temperatures give decreasing outputs; decreasing temperatures give increasing outputs.

Battery Type		float volts (V DC)	boost volts (V DC)
12V	Wet (vented) lead acid, 6 cells	13.5	14.1
	Calcium-Calcium, 6 cells	13.8	15.6
	Lead acid hybrid Sb-Ca (Antimony-Calcium), 6 cells	13.5	14.7
	VRLA, AGM, 6 cells	13.5	14.4
	VRLA, Gel, 6 cells	13.5	13.8
	NiCd, 10 cells	14.1	14.5
24V	Wet (vented) lead acid, 12 cells	27.0	28.2
	Calcium-Calcium, 12 cells	27.6	31.2
	Lead acid hybrid Sb-Ca (Antimony-Calcium), 12 cells	27.0	29.4
	VRLA, AGM, 12 cells	27.0	28.8
	VRLA, Gel, 12 cells	27.0	27.6
	NiCd, 18 cells	25.6	26.1
	NiCd, 20 cells	28.2	29.0

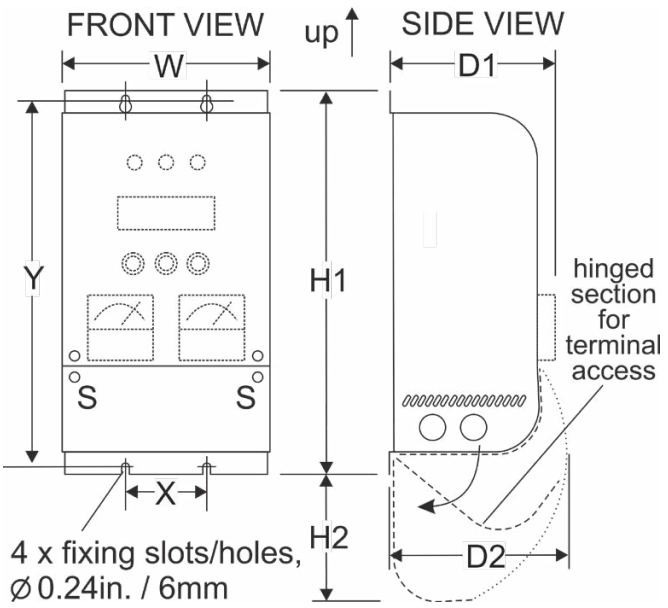
Open-frame SNTL300P



Optional clip for DIN rail mounting
(2 required for each charger)
part number 045-0001

Overall	
W	6.22 in. / 158 mm
H	8.19 in. / 208 mm
D	3.31 in. / 84 mm
Fixing holes	
X	5.91 in. / 150 mm
Y	5.91 in. / 150 mm
Weight	
	2.5 lb. / 1.1 kg

Enclosed ESNTL300P



Overall	
W	6.50 in. / 165mm
H1	11.81 in. / 300 mm
H2	3.15 in. / 80 mm
D1	4.92 in. / 125 mm
D2	5.12 in. / 130 mm
Fixing holes:	
X	2.50 in. / 63.5 mm
Y	11.25 in. / 285.5 mm
Weight:	
	4.4 – 4.6 lb. / 2.0 – 2.1 kg

Dimensions for reference only. Use actual product for mounting template. For safe heat dissipation, mount product in orientation shown, with minimum air gap clearance of 1.5 in. / 40 mm above/below and 1.0 in. / 25 mm at each side.

Part Number	Model and Description	Notes
42703850	SNTL300P: Open-frame (protective cover) Sentinel 300P Input supply 110/120/220/240 VAC (50 Hz / 60 Hz) Output 10 A @ 12/24 V	 NFPA 110 CE
42703852	SNTL300PC: As above, plus CAN/J1939 communication	
42703879	ESNTL300PM: Enclosed Sentinel 300P Input supply 110/120/220/240 VAC (50 Hz / 60 Hz) Output 10 A @ 12/24 V Analog ammeter and voltmeter	 NFPA 110 CE
42703875	ESNTL300PCLM: As above, plus LCD for readout and configuration	 NFPA 110 CE
42703900	42703900 SNTL-RTC: Remote temperature sensor with 9.8 feet / 3.0 meter lead assembly, for automatic charge output temperature compensation	
42703898	SNTL300P-PCSUITE: Windows®-based software suite for all (E)SNTL300P models. Request by email with company name, details and valid email address	
42703899	SNTL300P-PCCONN: PC connection suite for all (E)SNTL300P models. Includes SNTL300P-PCSUITE software on CD-ROM, charger RS485 lead (6.5 feet / 2 meter), RS485/USB converter and USB lead (3.2 feet / 1 meter)	

Sentinel 300P-FP Series

Programmable Switch Mode Battery Chargers for Diesel Fire Pumps

Sentinel 300P-FP battery chargers provide new levels of DC power control, monitoring and protection for standby diesel-driven fire pump applications.

Advanced Sentinel charging features included as standard:

• Switch mode charging technology: high power efficiency and low heat dissipation, plus wide supply voltage tolerance, in a compact and lightweight package.

• Multistage charging: float, bulk, absorption and AutoBoost stages ensure no compromise between rapid charge recovery and long-term battery capacity and life.

• Low output ripple: <1% ripple, beneficial for vented lead acid and NiCd cells, essential for VRLA, and configurable for use as a standalone DC power supply.

• AutoBoost: triggered automatically on low charge levels or manually by remote switch, AutoBoost temporarily increases the charge voltage before returning to float mode. Equalizing battery cell charge without overcharge and gassing, AutoBoost maximizes cell capacity and life.

• Temperature compensation: ensures batteries are charged at the optimal voltage, which varies significantly with ambient temperature. Sentinel can measure temperature with a battery-mounted sensor and adjusts output voltage to prevent under or over charging.

In addition, the Sentinel 300P-FP includes:

• Flexible configuration: microprocessor programmability for automatic or manual configuration of output voltages (12 or 24V nominal), cell types/numbers and charging applications – all in one standard model. Programming is by circuit board links or PC-based software configuration and monitoring tool.

• Inputs and outputs: for remote charger control and signaling of charge fail, high/low battery volts and mains fail faults. Standard output functions are NFPA 110 compliant. Non-standard input/output functions available to special order.

• Display, instrumentation and communication: options allow LCD readout, analog metering plus RS485 / CANbus control and transmission of battery and charge data.

The Sentinel 300P-FP is available either as an open-frame module (UL-recognized and conforming to FM fire-pump controller standards) for mounting in existing control panels or as a wall-mounted (UL-listed) stainless steel enclosure with LCD and analog metering options.

Electrical connection is by screw terminal blocks. On enclosed models, wiring harness access is by knock-out cable gland holes in the case side.

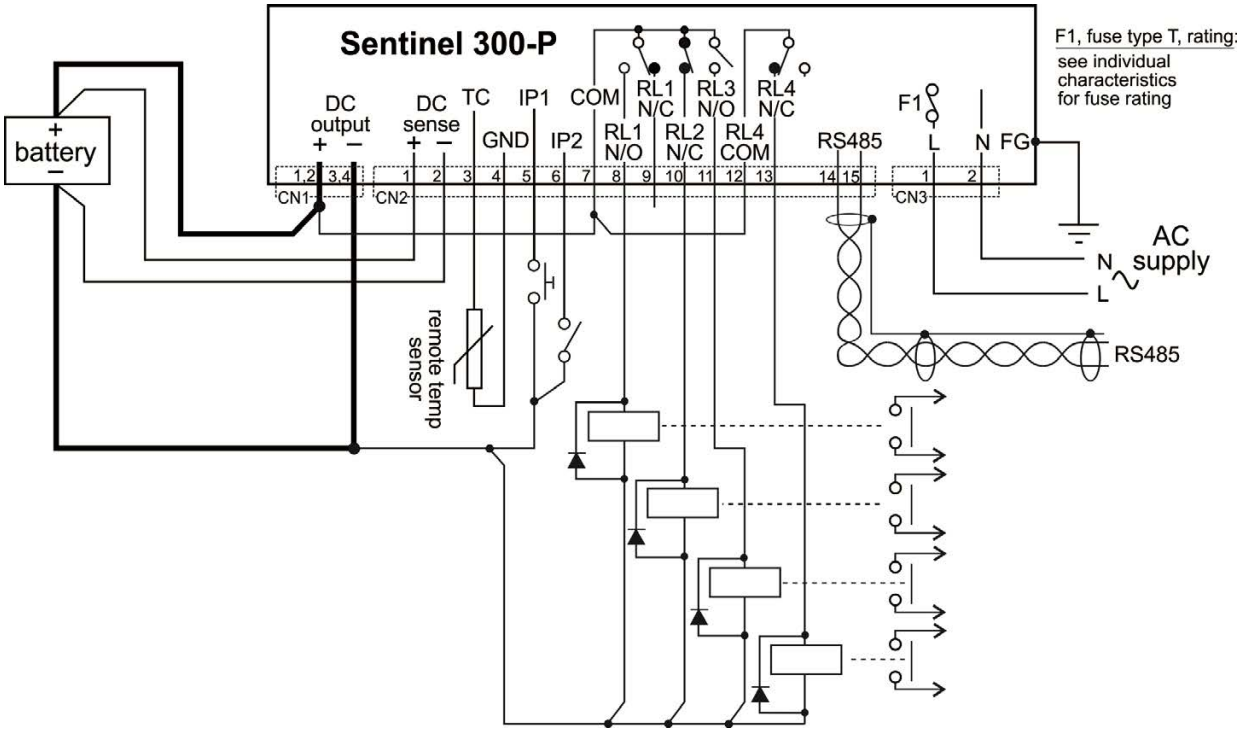
NFPA 110 compliant

* Tested and approved by UL to: UL1236 – Battery chargers for charging engine-starting batteries, and CSA22.2 No. 107.2 – Battery chargers. Open frame SNTL300P-FP models are FM specification tested for use on FM Approved controllers for Diesel Engine Driven Fire Pumps.

Specifications

Power supply
Operating voltage: 95 – 250 V AC
Operating frequency: 47 – 63 Hz.
DC Charge Output
Nominal voltage: programmable 12 or 24 V DC
Float/boost voltage: programmable, see output calibration table
Maximum current limit: 10 A
Voltage ripple: <1%
Line regulation: <2%
Load regulation: <2%
Outputs x3 (x4 for non-CAN configurations):
All models:
1 x SPCO (RL1), 1 x SPNC (RL2), 1 x SPNO (RL3), dry/volt-free contacts (common feed for RL1, RL2 & RL3)
Standard models (non-CAN configurations):
1 x SPNC (RL4), dry/volt-free contacts
standard output functions (charge fail, AC fail, low battery volts, high battery volts) are NFPA 110 compliant
Rating (all relays): 1A max @ 30 VDC (resistive load), UL class 2
Inputs x2:
Closed to negative DC to activate, configurable function
Physical
Operating temperature: –40° F to 140° F / –40° C to 60° C
Display viewability (LCD models): 32° F to 122° F / 0° C to 50° C
Humidity: 20% to 90% RH
Electrical safety: 2006/95/EC
Electromagnetic compatibility:
2004/108/EC, EN 55022 class B
(EN 61000-6-1, EN 61000-6-3)
UL approvals
All standard (E)SNTL300P-FP models:
UL listed (enclosed models) or recognized (open frame)
BBGQ: UL1236, CSA22.2 no. 107.2, BBHH: UL1236 SE
QWIR: UL1236 SC (vented lead acid only)
Open Frame SNTL300P-FP models only:
FM specification tested for use on FM Approved controllers for Diesel Engine Driven Fire Pumps.

Electrical Connection



Notes:
1) AC input fusing (F1): replaceable, circuit board mounted fuse, rating as shown on the product label.
2) DC output fusing: all models include a self-resetting electronic output fuse.
3) DC output is isolated from chassis.
4) connection shown for standard configurations with output RL4. (RL4 is not available on units configured for CAN communication.)

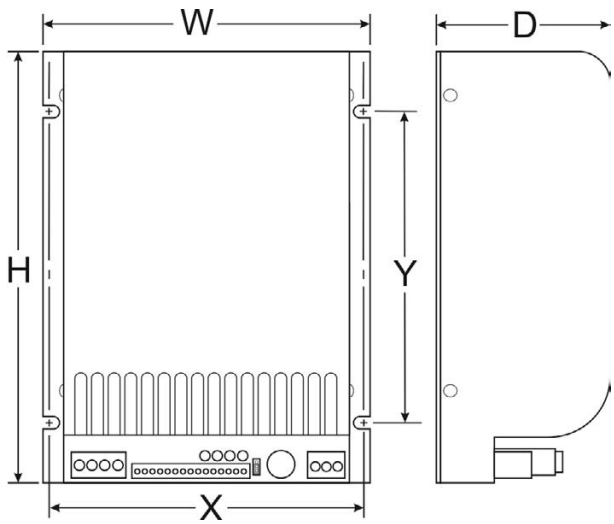
Output Calibration

(E)SNTL300P-FP models are intended for fire pump applications only. Battery type is selected by circuit board DIL switches or SNTL-PCSUITE configuration software.

Calibration figures at 20° C. If temperature compensation is enabled and remote SNTL-RTC temperature sensor connected, output voltage automatically varies by 3 mV per cell per 1° C deviation from 20° C, within the range –10° C to 50° C. Increasing temperatures give decreasing outputs; decreasing temperatures give increasing outputs.

Battery Type		float volts (V DC)	boost volts (V DC)
12V	Wet (vented) lead acid, 6 cells	13.7	15.6
	Calcium-Calcium, 6 cells	13.8	15.6
	Lead acid hybrid Sb-Ca, 6 cells	13.5	14.7
	VRLA, AGM, 6 cells	13.5	14.4
	VRLA, Gel, 6 cells	13.5	13.8
	NiCd, 10 cells	14.1	14.5
24V	Wet (vented) lead acid, 12 cells	27.4	31.2
	Calcium-Calcium, 12 cells	27.6	31.2
	Lead acid hybrid Sb-Ca, 12 cells	27.0	29.4
	VRLA, AGM, 12 cells	27.0	28.8
	VRLA, Gel, 12 cells	27.0	27.6
	NiCd, 18 cells	25.6	26.1
	NiCd, 20 cells	28.2	29.0

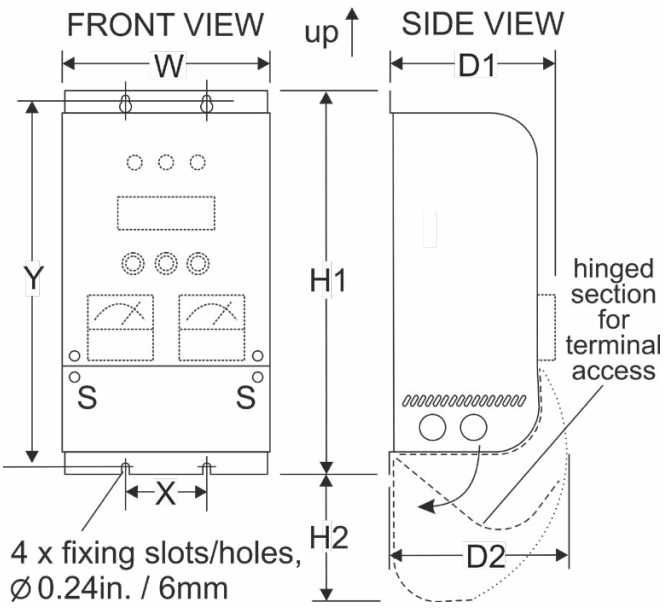
Open-frame SNTL300P



Optional clip for DIN rail mounting
(2 required for each charger)
part number 045-0001

Overall	
W	6.22 in. / 158 mm
H	8.19 in. / 208 mm
D	3.31 in. / 84 mm
Fixing holes	
X	5.91 in. / 150 mm
Y	5.91 in. / 150 mm
Weight	
	2.5 lb. / 1.1 kg

Enclosed ESNTL300P



Overall	
W	6.50 in. / 165mm
H1	11.81 in. / 300 mm
H2	3.15 in. / 80 mm
D1	4.92 in. / 125 mm
D2	5.12 in. / 130 mm
Fixing holes:	
X	2.50 in. / 63.5 mm
Y	11.25 in. / 285.5 mm
Weight:	
	4.4 – 4.6 lb. / 2.0 – 2.1 kg

Dimensions for reference only. Use actual product for mounting template. For safe heat dissipation, mount product in orientation shown, with minimum air gap clearance of 1.5 in. / 40 mm above/below and 1.0 in. / 25 mm at each side.

Part Number	Model and Description	Notes
42703851	SNTL300PFP: Open-frame (protective cover) Sentinel 300P-FP Input supply 110/120/220/240 VAC (50 Hz / 60 Hz) Output 10 A @ 12/24 V (fire pump applications)	 NFPA 110
42703853	SNTL300PCFP: As above, plus CAN/J1939 communication	FM specification tested for use on FM Approved controllers for Diesel Engine Driven Fire Pumps
42703880	ESNTL300PMFP: Enclosed Sentinel 300P-FP Input supply 110/120/220/240 VAC (50 Hz / 60 Hz) Output 10 A @ 12/24 V (fire pump applications) Analog ammeter and voltmeter	 NFPA 110
42703876	ESNTL300PCLMFP: As above, plus analog ammeter and voltmeter	 NFPA 110
42703619	42703619 SNTL-RTC: Remote temperature sensor with 9.8 feet / 3.0 meter lead assembly, for automatic charge output temperature compensation	
42703898	SNTL300P-PCSUITE: Windows®-based software suite for all (E)SNTL300P models. Request by email with company name, details and valid email address	
42703899	SNTL300P-PCCONN: PC connection suite for all (E)SNTL300P models. Includes SNTL-PCSUITE software on CD-ROM, charger RS485 lead (6.5 feet / 2 meter), RS485/USB converter and USB lead (3.2 feet / 1 meter)	

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PowerView® PV25
Engine and Diagnostic Display

The PowerView 25 is an engine and diagnostic display in an economical, compact package. This J1939-compliant device provides electronic engine parameter data, is simple to install, matches the PowerView line of rugged displays and can be powered by 12-volt or 24-volt systems.

The PV25 is equipped with two push buttons to quickly access a convenient menu. In addition, a back-lit graphic display and two LEDs indicate Active-fault Alarm or Shutdown status.

Active and Stored Fault messages display the SPN (Suspect Parameter Number), FMI (Failure Mode Indicator) and the OC (Occurrence Count) using the SAE J1939 protocol.

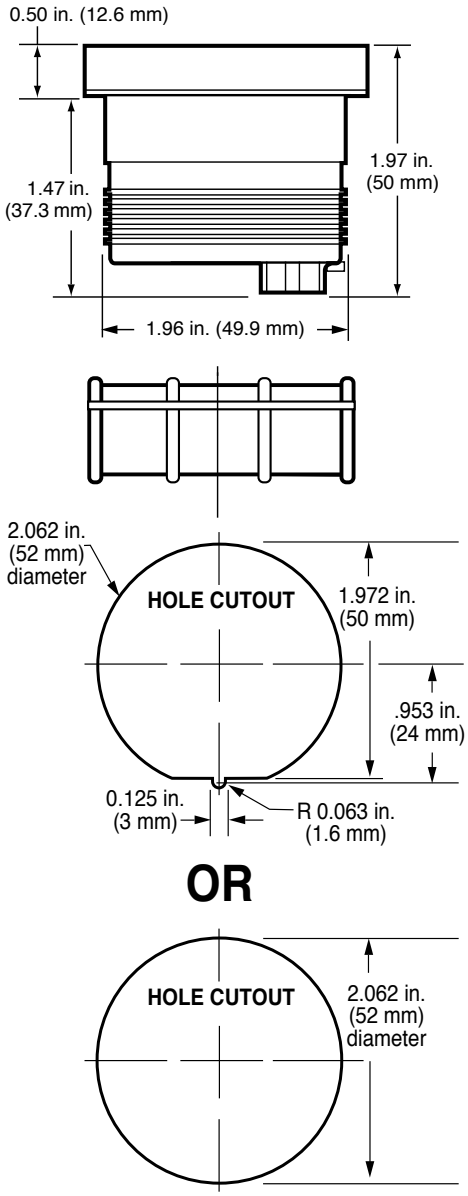
The PV25 displays up to 20 standard J1939 parameters in standard or metric units. The following are some of the engine parameters of the PV25 displays:

Engine RPM	Coolant Temperature
Engine Oil Pressure	ITA/Stage IIIB Parameters
Engine Hours	Active Service Codes
System Voltage	Stored Service Codes

Specifications

Tier 4 / Stage IIIB/IV Compliant Ready
Operating Voltage: 6 VDC minimum to 36 VDC maximum
Power Supply Operating Current:
460 mA max @ 12 VDC
810 mA max @ 24 VDC
Reversed Polarity: Withstands reversed battery terminal polarity
Environmental
Operating Temperature: -40° to 158° F (-40 to 70° C)
Storage Temperature: -67° to 185° F (-55 to 85° C)
Sealing: IP68
CAN Bus: SAE J1939 compliant
Connectors
4-pin AMP Mini-universal Mate-N-Lok Connector
AMP Plug: P/N 172338-1
AMP Socket: P/N 171639-1 (4 each, assumes 18 gage wire. See AMP Plug specification to match socket and wire size.)
Maximum Panel Thickness: 3/8 inch (9.6 mm)
Shipping Weight: (all models) 0.2 lb. (0.1 kg)
Shipping Dimensions: (all models)
3-7/8 x 2-3/4 x 2-3/4 in.
(98.4 x 69.85 x 69.85 mm)

Dimensions



Bezel Options

Two Bezel styles are available. One is low profile, and both are constructed of ABS.

PV25 Bezel Styles	
AB A-20 Style	BB Low Profile SAE Style
 †	 †

How to Order

Part Number	Description	Notes
78700541	PV25 Bezel type (flat lens) AB = A20 (Black)	Displays
78700571	PV25 Bezel type (flat lens) BB = Low Profile SAE (Black)	
78000613	PVW-PDA-12 PowerView Wiring Harness, CAN & Power, 12 in. / 305mm	Accessories
78000614	PA-30 PowerView Wiring Harness, loose wiring, 30 in. / 762mm	
78000480	Terminating Resistor, PVMJR	

PowerView® PV101

Engine and Diagnostic Display

The PowerView PV101 display is a multifunction tool that enables equipment operators to view standard engine and transmission parameters and active/stored trouble codes. The display can show a single or a four-parameter simultaneous display with text descriptions for most common fault conditions. The enhanced alarm indicators have ultra-bright alarm and shut-down LEDs.

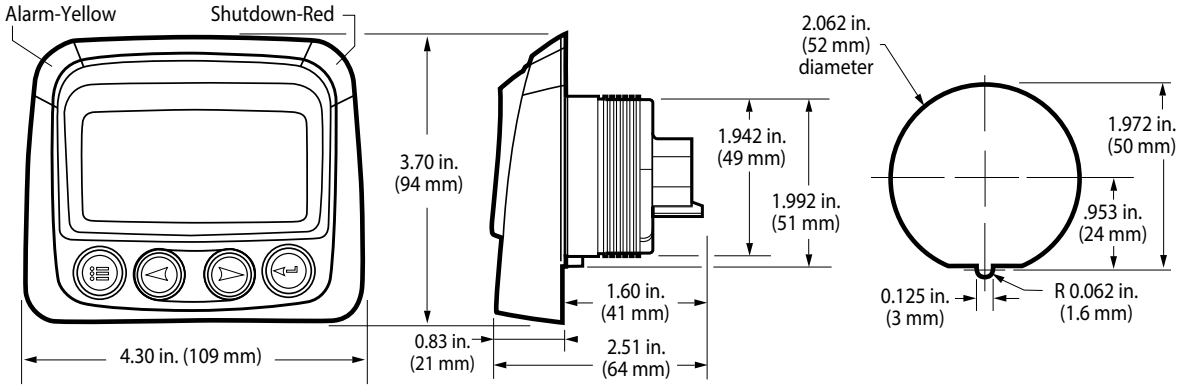
All models Tier 3/Euro Stage III and earlier (PV101-A) and Tier 4/Euro Stage IV (PV101-C-T4) share the following features:

- Multiple language options – English, Spanish, German, Italian, French, Brazilian Portuguese, Chinese, Japanese, Czech and Russian.
- Sender Input – Select between backlight dimmer function or fuel level. Can be calibrated to use non-Murphy fuel senders.
- Service Reminders – Five service reminders allow users to set hours for: Change Engine Oil, Air Filters, Hydraulic Oil, and Service Engine and Service Machine.
- Select Source Address – Select the exact address the PV101 will claim on the bus.
- The ability to select CAN bus Data Rate.
- Displays more than 50 standard SAE J1939 parameters.
- Shows helpful troubleshooting description of supported parameters.

Additional features for the Tier 4/Euro Stage IV (PV101-C-T4) models include:

- The menu offers Auto Regen, Request Regen and Inhibit Regen. Visible icons indicate:
  - Active Regeneration
  - Diesel Exhaust Fluid Level (DEF)
  - Diesel Particulate Filter (DPF) Restricted
  - Inhibit Regeneration or High Exhaust Temp
  - After Treatment Fault
- OEM Menu – A password protected menu offers access to MODBUS Setup, Engine Speed Control ON/OFF, DEF Regen Menu ON/OFF, SCR Enable Disable and other critical menu items that require restricted access.
- TSC1 (Torque Speed Control) – Allows users to set run speed via CAN if supported by engine manufacturer.
- Additional 4-Up Screen – Allows user to have two 4-Up screens to toggle between. Second user configurable screen is defaulted to show Tier 4 Parameters: DEF Level (Diesel Exhaust Fluid Level), DPF Active Regen Status, Exhaust Filter Outlet Temp and Exhaust Filter Inlet Temp.
- Shows SPN, FMI and OC for all faults.
- PV101-C Configuration Tool – PC tool allows users to create, view, edit and download configurations for the PV101-C.

Dimensions

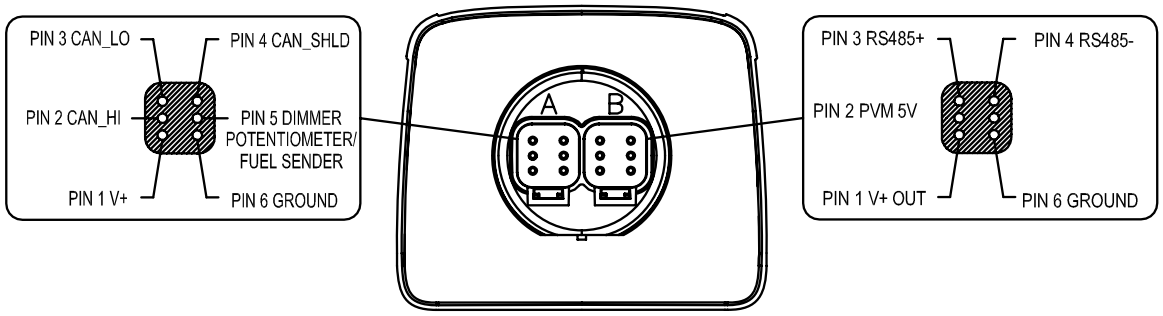


Specifications

Operating Voltage: 8 - 32 VDC
Reversed Polarity: Withstands reversed battery terminal polarity indefinitely within operating temperatures
Environmental
Operating Temperature: -40° to 185° F (-40° to 85° C)
Display Viewing Temperature: -20° to 185° F (-29° to 85° C)
Storage Temperature: -40° to 185° F (-40° to 85° C)
Environmental Sealing: IP68, ± 5 PSI (± 34 kPa)
Power Supply Operating Current
(@ 14 VDC) 52 mA min., 300 mA max
(@ 32 VDC) 1A max (with LCD heater)
CAN Bus: SAE J1939 compliant
Case: Polycarbonate/polyester
Maximum Panel Thickness: 3/8 inch (9.6 mm)
Auxiliary RS485 Communications Port:
User configurable as Modbus Master or Modbus RTU Slave
Master Active (default) drives optional PVA or PVM gages
Slave Active offers user adjustable communication parameters
Resistive Input: User selectable as one of the following
Backlighting Potentiometer: 1 K Ohm, 1/4 W
Murphy Fuel Sender: 33 Ohm full, 240 Ohm empty set standard from factory for use with Murphy fuel sender. Programmable for use with non-Murphy fuel senders.
Shipping Weight: 1 Lb. (450 g.)
Shipping Dimensions: 5 x 6 x 6 in. (127 x 152 x 152 mm)
Clamp: PBT
Connectors: 6-pin Deutsch DT Series

Pinout

DEUTSCH DT06-6 STYLE CONNECTIONS



How To Order

Part Number	Model	Description	Languages Available
78700615	PV101-C-MSTD-TIER4	Murphy STD	English, Spanish, French, Italian, German
78700610	PV101-C-M01-TIER4	Murphy STD Russian	English, Russian
78700611	PV101-C-M02-TIER4	Murphy STD Chinese	English, Chinese
78700612	PV101-C-M03-TIER4	Murphy STD Japanese	English, Japanese
78700613	PV101-C-M04-TIER4	Murphy STD Brazilian Portuguese	English, Brazilian Portuguese, French, German, Spanish
78700614	PV101-C-M05-TIER4	Murphy STD Czech	English, Czech, French, German, Spanish
78700439	PV101-C	Murphy STD	English, Spanish, French, Italian, German
78700497	PV101-C-M01	Murphy STD Russian	English, Russian
78700498	PV101-C-M02	Murphy STD Chinese	English, Chinese
78700499	PV101-C-M03	Murphy STD Japanese	English, Japanese
78700500	PV101-C-M04	Murphy STD Brazilian Portuguese	English, Brazilian Portuguese, French, German, Spanish
78700501	PV101-C-M05	Murphy STD Czech	English, Czech, French, German, Spanish
78700435	PV101-C Configuration Tool Kit	User Configuration Tool	
78700244	PV101-A	Murphy STD	English, Spanish, French, Italian, German
78700396	PV101-A-M01	Murphy STD Russian	English, Russian
78700409	PV101-A-M02	Murphy STD Chinese*	English, Chinese
78700411	PV101-A-M03	Murphy STD Japanese*	English, Japanese
*Added features not available in these language models.			

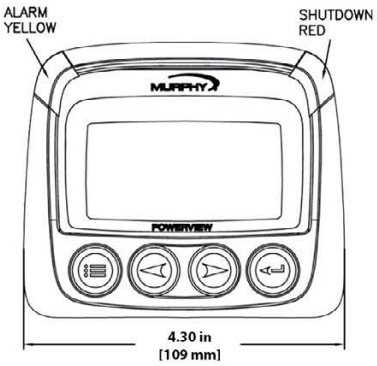
PowerView® PV101-A-HAZ & PV101-C-HAZ

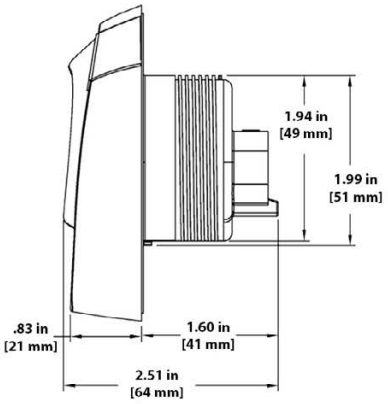
The PowerView PV101 display is a multifunction tool that enables equipment operators to view standard engine and transmission parameters as well as active and stored trouble codes. The device can show a single parameter or display four parameters simultaneously. Diagnostic capabilities include codes with text description for most common fault conditions. The enhanced alarm indicators have ultra-bright alarm and shut-down LEDs (amber and red). The HAZ models of the PV101-C and PV101-A have many features including:

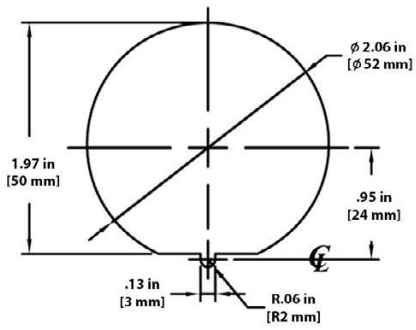
- ATEX Certified, Zone 2, Category 3G Ex II 3G IIC T3 Ta = -10°C to 70°C (14°F to 158°F)
- Tier 4 Emissions Implementation (PV101-C only) – Three icons indicating Active Regeneration, Inhibit Regeneration and Diesel Particulate Filter (DPF) Restricted. Menu offers Auto DPF Regen and Request DPF Regen.
- OEM Menu – A password protected menu offers access to MODBUS Setup, Engine Speed Control ON/OFF and other critical menu items that require restricted access.
- TSC1 (Torque Speed Control) (PV101-C only) – Allows user to set run speed via CAN if supported by engine manufacturer.
- Additional 4-Up Screen (PV101-C only) – Allows user to have two 4-Up screens to toggle between. Second user configurable screen is defaulted to show Tier 4 parameters: DEF Level (Diesel Exhaust Fluid Level), DPF Active Regen Status, Exhaust Filter Outlet Temp and Exhaust Filter Inlet Temp.
- Multiple language options – Russian, Czech, Brazilian Portuguese, Chinese and Japanese models have been added to the line of existing languages (English, Spanish, French, German and Italian).
- Sender Input – Select between backlight dimmer function or fuel level. Can be calibrated to use non-Murphy fuel senders.
- Service Reminders – Five service reminders allow users to set hours for: Change Engine Oil, Change Air Filters, Change Hydraulic Oil, Service Engine and Service Machine.
- Select Source Address – Select which address the PV101 will claim on the bus.
- Select CAN bus Data Rate – Allows user to select CAN bus data rate.
- PV101-C Configuration Tool (PV101-C only) – PC tool allows users to create, view, edit and download configurations for the PV101.
- The PV101-C Display Gauges – Compatible with PVA and PVM gauges, as well as additional J1939 I/O modules.

The MurphyLink® system includes the microprocessor-based PowerView Analog (PVA) Gages for displaying critical engine data broadcast by an electronic engine or transmission's Engine Control Unit (ECU). Other components include engine RPM, oil pressure, coolant temperature and system voltage. A combination audible alarm/relay unit offers warning and shut-down alerts. Up to 32 components may be linked to the PowerView using a simple daisy chain wire connection scheme using RS485. The PowerView and all connected components can be powered by either 12- or 24-volt systems.

Product Dimensions







MOUNTING HOLE

Specifications

Operating Voltage

12/24V (8-32 VDC minimum and maximum voltage)

Reversed Polarity

Withstands reversed battery terminal polarity indefinitely within operating temperatures.

Environmental

ATEX Operating Temperature: -10°C to 70°C (+14°F to 158°F)

Storage Temperature: -40°C to 85°C (-40°F to 185°F)

Environmental Sealing: IP68, ±5 PSI (±34.4 kPa)

Power Supply Operating Current

(@ 14VDC) 52 mA min: 300mA max

(@ 32VDC) 1A max (with LCD heater)

CAN bus: SAE J1939 compliant

Case: Polycarbonate / polyester

Maximum Panel Thickness: 3/8 inch (9.6mm)

Resistive Input: (user selectable as one of the following)

Backlighting Potentiometer: 1K Ohm, 1/4 W

Murphy Fuel Sender: 33 Ohn full, 240 Ohm empty set from the factory or programmable to work with non-Murphy fuel senders.

Fuel Sender Input: 33 Ohm full, 240 Ohm empty set standard from factory for use with Murphy Fuel Sender. Programmable for use with non-Murphy fuel senders.

Shipping Weights (all models): 1 lb. (450g)

Shipping Dimensions (all models):

5 x 6 x 6 in. (127 x 152 x 152 mm)

Clamp: PBT

Connectors: 6-pin Deutsch DT Series

How To Order

Part Number	Model and Description	Notes
78700248	PV101-A-HAZ: Murphy Standard, Hazardous Environment	English, Spanish, French, Italian German
78700581	PV101-C-HAZ: Murphy Standard, Hazardous Environment	English, Spanish, French, Italian German
78700428	PV101 Shield: Impact Shield Assembly	
78700430	HAZ Environment Kit: PV101-A-HAZ w/PV101 Shield	English, Spanish, French, Italian German

PowerView® PV350

Engine and Diagnostic Display

The PowerView 300 Series features robust, multifunctional displays for advanced monitoring of multiple electronic engines. The PV350 display in this series monitors multiple engine and machine parameters on an easy-to-read 3.8-inch (97 mm) QVGA monochrome LCD. Tahe display is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown.

The PV350 display is customizable using the PowerVision Configuration Studio® software, an intuitive tool designed to make customization simple. Utilizing the software tool, users can tailor basic graphics, designate screen layout and define custom parameters.

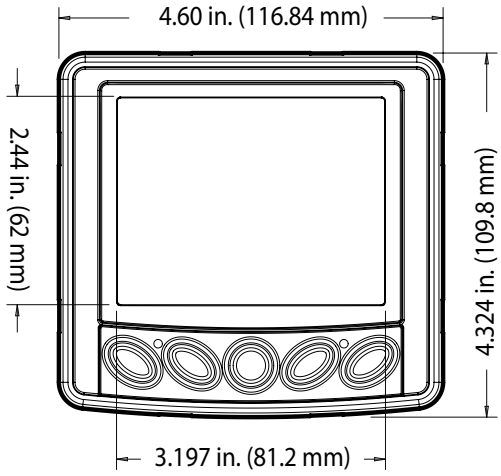
The PV350 is equipped with five tactile push buttons to quickly access a convenient menu. In addition, a backlit, heated graphic display and two LEDs indicate active-fault alarm or shut-down status.

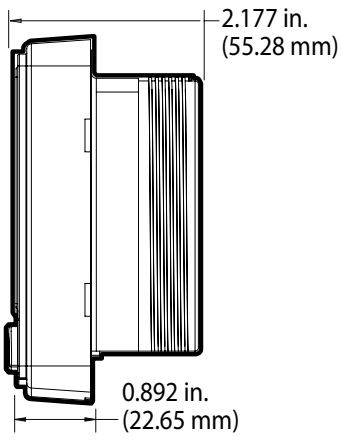
CE

Specifications

Operating voltage: 6-36 VDC
Vibration and shock: 7.86 random vibe (5-2000 Hz) and ±50 g shock in three axes
Reversed polarity: Withstand reversed battery terminal polarity
Operating temperature: -40° F to 185° F (-40° C to 85° C)
Storage temperature: -40° F to 185° F (-40° C to 85° C)
Communications: (2) CAN 2.0B; second CAN port is NMEA 2000 isolated; J1939 and NMEA 2000 protocol; proprietary messaging
EMC/EMI: 2004/108/EC and 2006/95/EC directives
EN61000-6-4:2001 (emission)
EN61000-6-2:2001 (immunity)
EN-50121-3-2 and EN 12895
Connectors: Deutsch DT series 6 pin; M12 for NMEA 2000 (micro-C)
Inputs: (1) resistive analog
Outputs: (1) 500 mA; switched low-side
SAE J1113/2, 4, 11, 12, 21, 24, 26 and 41 display
E-Mark: ECE-R10.05
Display: 3.8" (97 mm) QVGA (320 x 240 pixels); monochrome transflective LCD with white LED backlight and heater
Viewing angle: ±50° horizontally; +45°/-60° vertically
Keys: 5 tactile push buttons
Alarms: Red and amber warning LEDs; capable of set points-triggered output for external piezo buzzer or shutdown relay
Real-time clock: With Li-ion rechargeable battery backup

Dimensions





Pinout

How To Order

Part Number	Description	Notes
78700616	PV350-R2, Murphy Standard	Display
78090100	Programming Kit, PV380-350 with dongle	Accessories
78051077	Seal, PV380-350 gasket	Service
78000752	PowerVision Configuration Studio® CD and license	Software

PowerView® PV380

Engine & Diagnostic Display

The PowerView 300 Series features robust, multifunction displays for advanced monitoring of multiple electronic engines. The PV380 display in this series monitors multiple engine and machine parameters on an easy-to-read 3.8-inch (97 mm) QVGA monochrome LCD. The display is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown.

Customize the PV380 display utilizing the PowerVision Configuration Studio® software, an intuitive tool designed to make customization simple. Using the software tool, users can tailor basic graphics, designate screen layout and define custom parameters.

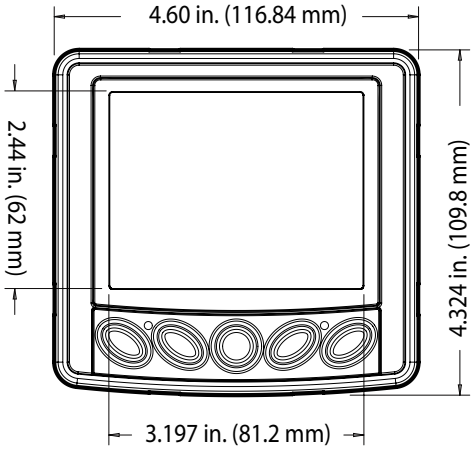
The PV380 is equipped with five tactile push buttons to quickly access a convenient menu. In addition, a backlit and heated graphic display with LEDs indicate alarm or shutdown status.

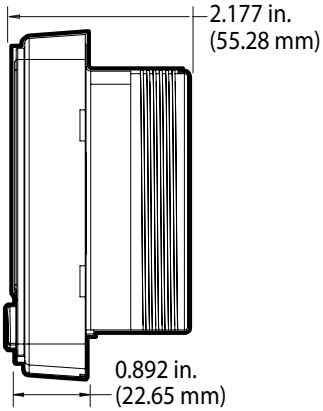
CE

Specifications

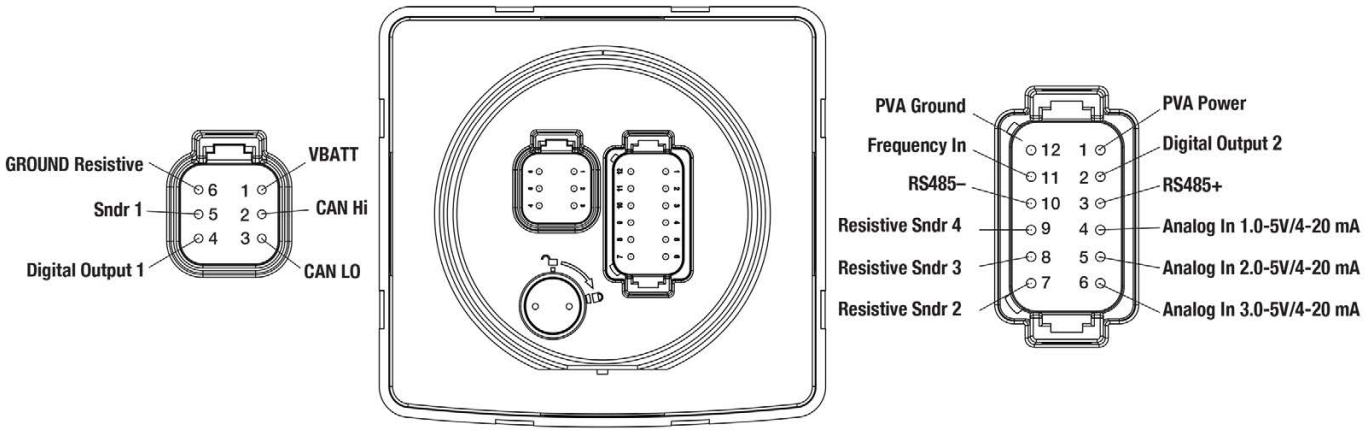
Operating Voltage: 6-36 VDC
Vibration and Shock: 7.86 random vibe (5-2000HZ) and ±50g shock in 3 axes
Reversed Polarity: Withstands reversed battery terminal polarity
Operating Temperature: -40° F to 185° F (-40° C to 85° C)
Storage Temperature: -40° F to 185° F (-40° C to 85° C)
Communications: (1) CAN 2.0B; J1939 Protocol; Proprietary Messaging; (1) RS-485 serial
EMC/EMI:
2004/108/EC and 2006/95/EC directives
EN61000-6-4:2001 (emission)
EN61000-6-2:2001 (immunity)
EN-50121-3-2 and EN 12895
Connectors: Deutsch DT Series 6 and 12 pin
Inputs: (4) resistive analog; (3) analog; 0-5 V analog or digital; (1) frequency 2-10000 Hz, 3.6-120 VAC
Outputs: (2) 500 mA; switched low-side
SAE J1113/2, 4, 11, 12, 21, 24, 26 and 41
Display: 3.8" (97 mm) QVGA (320 x 240 pixels); monochrome transflective LCD with white LED backlight and heater
Viewing Angle: ±50 horizontally; +45°/-60° vertically
Keys: 5 tactile push buttons
Alarms: Red and amber warning LEDs; capable of set point-triggered output for external piezo buzzer or shutdown relay
Real-time clock: With Li-ion rechargeable battery backup

Dimensions





Pinout



How To Order

Part Number	Description	Notes
78700609	PV380-R2, Murphy Standard	Display
78000752	PowerVision Configuration Studio® CD and license	Software
78051077	Seal, PV380-350 gasket	Service
78001104	Connector Kit, PV380, 12 and 6 position connector	Accessories
78001060	12 position, one foot whip harness	
78090100	Programming Kit, PV380-350 with dongle	

PowerView® PV450

Engine and Diagnostic Display

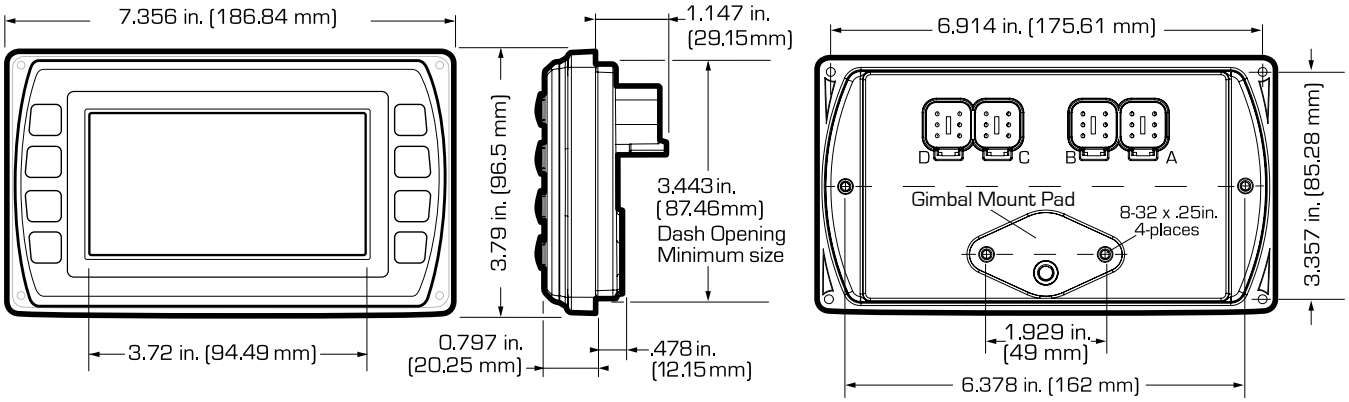
The PowerView 450 display features a freely configurable design allowing custom software to be quickly developed.

The display is compatible with PowerVision Configuration Studio® software to enable quick and easy changes to the programming.

The highly durable display features a full-color, robust 4.3-inch bonded LCD for best-in-class sunlight readability. The PV450's rugged design makes it a great solution for all types of environments and applications.

Graphic interface not included, custom configuration required

Dimensions



Specifications

Technical

Display: Bonded 4.3" color transmissive TFT LCD
Resolution: WQVGA, 480 x 272 pixels, 16-bit color
Aspect Ratio: 16:9
Orientation: Landscape or portrait
Backlighting: LED, 500-650 cd/m2 (30,000 hr lifetime)
Microprocessor: Freescale i.MX357 32bit, 532Mhz QNX Realtime Operating System
Flash Memory: 256 MB
RAM: 128 Mbytes DDR2 SDRAM
Operating Voltage: 6-32 VDC, protected against reverse polarity and load dump (CSA, 6-30 VDC)
Power Consumption: 10W max. (CSA, 163 mA max @ 30VDC)
CAN: (2) CAN 2.0B; optional NMEA 2000 isolation, isolation with HVS450
Protocols: J1939, NMEA 2000, CAN open
RS-485: (1) MODBUS Master/Slave
Video input (Optional): (2) NTSC/PAL input channels with one displayed at a time
Connection: (4) Deutsch DT 6-pin connectors
Keyboard: (8) tactile buttons with white LED backlight
USB: 2.0 host, full speed
Output: (1) Open-drain, capable of sinking 500 mA
Input: (1) Resistive, 0-5 V or 4-20 mA (software configurable) (10-bit resolution)
Clock: Real time clock with built-in rechargeable Li-ion battery backup (0.033 mWh)

Environmental

Operating Temperature: -40°C to +85°C (-40°F to +185°F)
Storage Temperature: -40°C to +85°C (-40°F to +185°F)
Protection: IP 66 and 67, front and back
Electromagnetic Compatibility:

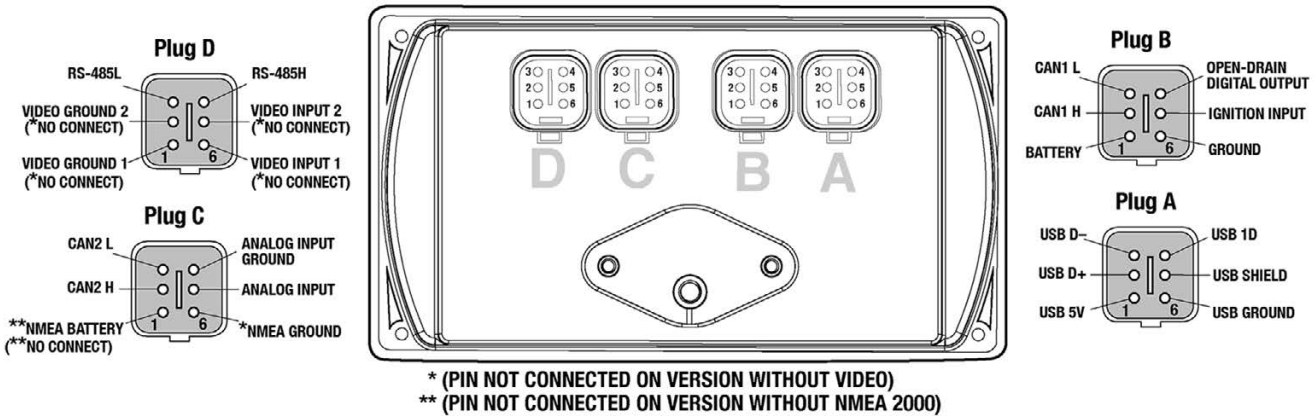
2004/108/EC	EN 60945:2002
EN 61000-6-4	EN 50121-3-2
EN 61000-6-2 (immunity)	EN 12895
J1113/2, 4, 11, 12, 21, 24, 26 and 41	

Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axes
Shock: ± 50G in 3 axes

Specifications applicable to CSA-certified PV450 only

CSA Certification: Class I Div 2 Groups B, C & D; T4; IP66
CAN: (2) CAN 2.0B (transmission rates up to 1Mbps)
Protocols: J1939 and CAN open
Environmental Protection: IP 66 and 67

Pinout



* (PIN NOT CONNECTED ON VERSION WITHOUT VIDEO)
** (PIN NOT CONNECTED ON VERSION WITHOUT NMEA 2000)

How To Order

Part Number	Model/Description	Notes
78700436	PV450	Display
78700538	PV450, J1939, NMEA, with Video	
78700515	PV450, with Video	
78700543	PV450-01-CSA, with Video (cCSAus)	
78700544	PV450NV-01-CSA, (cCSAus)	
78000831	PV450, Visor Kit	Accessories

PowerView® PV485

Engine and Diagnostic Display

The PowerView 485 is a customizable, all-in-one color display and controller designed to meet the needs of modern electronic engines and equipment applications. Its rugged design offers a wide array of configurable I/O and supports both mechanical and J1939 electronic engines.

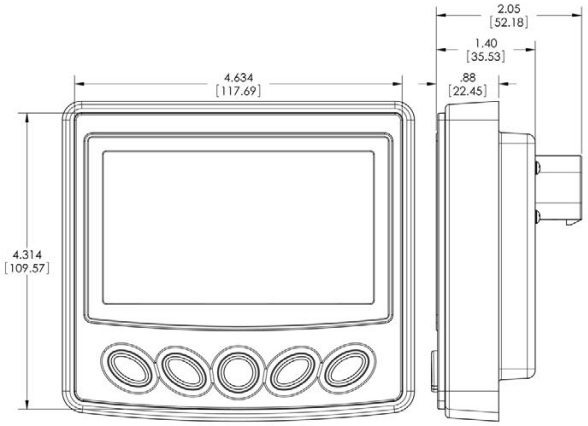
The PV485 also supports Tier 4 and stage IV engines, helping to make your transition to Tier 4 easier.

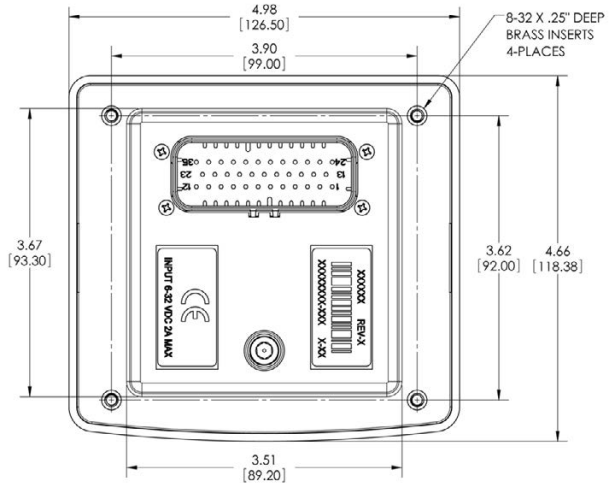
The PV485 controller is compatible with the PowerVision Configuration Studio® software, so custom configurations can be quickly developed. With the PowerVision Configuration Studio software, it is easy to define the user interface screens, as well as the functionality and sequence of events controlled by the PV485. You can configure equipment control such as: autostart, pressure control, data logging and alarms. You can even add custom graphics and company branding to the user interface.

Tier 4 Final ready Stage IV

Graphic interface not included, custom configuration required

Dimensions





Specifications

Technical

Display: Bonded 4.3"/109mm color transmissive TFT LCD
Resolution: WQVGA, 480 x 272 pixels, 16-bit color
Aspect Ratio: 16:9
Orientation: Landscape
Backlighting: LED, 900-1000 cd/m2 (30,000 hr lifetime)
Microprocessor: Freescale i.MX35 32bit, 532Mhz
Operating System: QNX Real-Time Operating System
Flash Memory: 256 MB
RAM: 128 Mbytes DDR2 SDRAM
Operating Voltage: 6-32 VDC, protected against reverse polarity and load dump
Power Consumption: 10W max.
CAN: (1) CAN 2.0B
Protocols: J1939, FreeForm CAN support
Connection: (1) 35-pin AMP seal connector (AMP 776231-4)
Keyboard: (5) tactile buttons
USB: (1) USB 2.0 host (full speed)
Digital Inputs: (3) Digital Inputs
Digital Outputs: (4) Low Side Open-drain, capable of sinking 500 mA
Analog Inputs: (6) total, (4) software configurable (0-5V, 4-20mA, Resistive) + Battery Voltage + 2nd Battery Voltage
Analog Outputs: (1) 0-5V
Frequency Inputs: (1) Alternator and Magnetic PIckup
Real-time clock: with battery backup

Communication:

(1) CAN 2.0B according to ISO-11898-2; J1939 and CANopen protocols; proprietary messaging

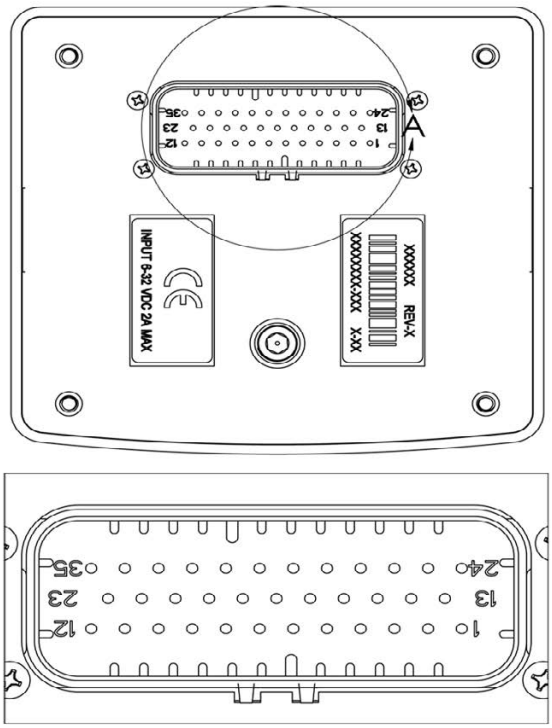
Environmental

Operating Temperature: -40°C to +85°C (-40°F to +185°F)
Storage Temperature: -40°C to +85°C (-40°F to +185°F)
Protection: IP 67, front and back
Emissions/Immunity: SAE J1113 or customer-specified; (CE) - EN61000-6-2, EN12895, ISO 13766
Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axes
Shock: ± 50G in 3 axes

Mechanical

Case Material: Polycarbonate/ABS

Wiring



DETAIL A
SCALE 2 : 1

Pin #	Pin Assignment	Pin Notes
1	USB D-	For reprogramming
2	USB ID	For reprogramming
3	Digital output 1 (low side, 500 mA)	For an alarm if needed
4	Digital output 3 (low side, 500 mA)	For an alarm if needed
5	Frequency input (alternator or mag)	Tach (for analog engines)
6	Digital input 1	May use for switch inputs
7	Digital input 3	May use for switch inputs
8	A/D input 2 (0-5V, 4-20 mA, resistive)	Fuel (for analog engines)
9	A/D input 4 (0-5V, 4-20 mA, resistive)	Trim (for analog engines)
10	Analog output (0-5V)	Do not use
11	N/C	Do not use
12	N/C	Do not use
13	USB shield	For reprogramming
14	CAN -	CAN low (for CAN engines)
15	Digital output 2 (low side, 500 mA)	For an alarm if needed
16	Digital output 4 (low side, 500 mA)	For an alarm if needed
17	Frequency input return	Tach ground
18	Digital input 2	May use for switch inputs
19	A/D input 1 (0-5V, 4-20 mA, resistive)	Analog input, open for now
20	A/D input 3 (0-5V, 4-20mA, resistive)	Honda trim
21	A/D ground	Ground for tach, trim, fuel
22	Analog output ground	Do not use
23	N/C	Do not use
24	USB D+	For reprogramming
25	USB Vbus	For reprogramming
26	CAN +	CAN high
27	Ignition	Ignition switched input
28	Batt +	Main power
29	Batt -	Ground
30	Batt 2+	Volts
31	N/C	Do not use
32	N/C	Do not use
33	N/C	Do not use
34	RS485-	For RS485 negative
35	RS485+	For RS485 positive

How To Order

Part Number	Model/Description	Notes
78700639	PV485	Display
78000815	Rear-Mount Bracket	Accessories
78000824	Wiring Harness, Loose Leads, 24 inches	
78090077	Programming Harness	
78700590	Programming Kit	

PowerView® PV780

Engine and Diagnostic Display

The PowerView 780 display is a full-featured, configurable display that shows integrated engine, transmission and diagnostic information in an easy-to-read operator interface. Equipment functionality can be further integrated through the available I/O and controlled via the CAN bus.

The PV780 features a full-color, 7-inch bonded LCD for brighter, smoother graphics and best-in-class sunlight readability. The rugged design makes this display a great solution for extreme environments.

The PV780 display is compatible with PowerVision Configuration Studio® software which allows users to edit
CAN parameters, add OEM branding and create custom equipment screens for a unique and sophisticated user interface.

Features include:

- CAN-based display with rich, full-color graphics
- Compatible with both mechanical and electronic engines
- Rugged design for extreme environments
- Multiple languages

Graphic interface not included, custom configuration required

Specifications

Tier 4 / Euro Stage IV Ready

Environmental

Operating Temperature: -40°F to +185°F (-40°C to +85°C)

Storage Temperature: -40°F to +185°F (-40°C to +85°C)

Protection: IP66 and 67, front and back.

EMC/EMI:

- 2004/108/EC and 2006/95/EC directives
- EN 61000-4-3 (radiated EMF immunity radiated)
- EN 61000-4-4 (EFT immunity power and I/O lines)
- EN 61000-4-5 (surges power lines)
- EN 61000-4-6 (RF immunity)
- EN 61000-4-8 (magnetic field immunity)
- EN 60945 (ESD)
- EN 60945 (conducted emissions)
- HYBRID EN 60945 CISPR 11 CLASS B (radiated emissions)

Electrical:

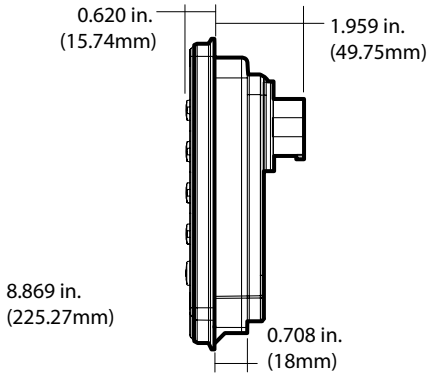
- J1113-2, -4, -11, -13, -21, -26 and -41

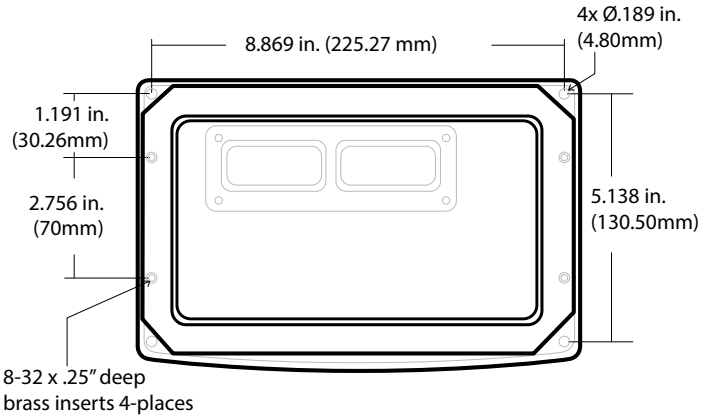
Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axes

Shock: ±50G in 3 axes

Specifications are continued on the next page.

Dimensions





Specifications - continued

Technical

Display: Bonded print/glare-free glass and 7" (178mm) color transmissive TFT LCD
Resolution: WVGA, 800 x 480 pixels, 16-bit color
Viewing Angle: ±65° horizontal, +55°/-65° vertical
Orientation: Landscape or portrait
Backlighting: LED, 1000 nit typical brightness 40,000 hr. minimum
Contrast Ratio: 400:1
Refresh Rate: 60 Hz
Microprocessor: Freescale™ i.MX357, 32 bit, 532 MHz, ARM11 core QNX® Realtime Operating System
Flash Memory: 2 GB total, 1 GB available for data logging
RAM: 128 Mbytes SRAM
Operating Voltage: 6-36 VDC, reverse polarity protected
Video Inputs: 3 NTSC/PAL (single channel viewable)
Connectors: 2 AMPSEAL 23 Pin (AMP 770680-1 and AMP 770680-4)
Keyboard: 10 tactile pushbuttons with white LED backlight
Touchscreen: (optional) projected capacitive
USB: (1) USB 2.0 host (full speed)
Real time clock: with Li-ion rechargeable battery backup

Communications:

- (2) CAN 2.0B according to ISO-11898-2; J1939 and CANopen protocols; proprietary messaging
- (1) RS-485 serial (MODBUS master/slave or PVA gage)
- (1) USB host

Outputs:

- (1) 500mA switched low-side
- (1) Frequency Out (2Hz - 3 kHz, Vbat rms square wave) for tach

Inputs:

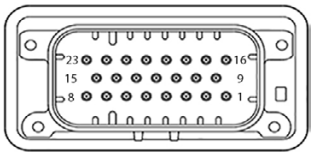
- (3) Analog 0-5VDC, 4-20 mA, or resistive, 10-bit resolution
- (5) Discrete Digital, Active High
- (1) Frequency In (2Hz - 10 kHz), 5Vpk-pk min, 120Vpk-pk max

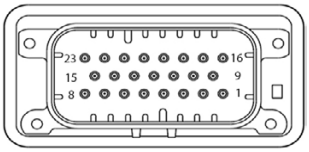
Mechanical

Dimensions: 8.37 x 6.0 in. (212.5 x 152.3 mm) landscape
Unit Depth: 3.57 in. (90.8 mm)
Case Material: PC/ABS, ISO 3795 (SAE J369, FMVSS 302) rated
Mounting Options: Front mount, back mount or RAM mount
Certifications:

- CE
- E-mark capable

Pinout





Connector 2 (Gray)			
Pin	Description	Pin	Description
1	Video Input 1	13	Frequency Input
2	Video Input 2	14	Frequency Return
3	Video Input 3	15	no connect
4	RS-485 High	16	USB D-
5	RS-485 Low	17	USB D+
6	no connect	18	USB 5V
7	no connect	19	USB GND
8	no connect	20	USB Shield
9	Video Input 1 GND	21	no connect
10	Video Input 2 GND	22	no connect
11	Video Input 3 GND	23	no connect
12	USB ID		

Connector 1 (Black)			
Pin	Description	Pin	Description
1	Digital Input 1	13	Digital Input 2
2	Analog Input 3	14	Frequency Output 1
3	Analog Input 2	15	Ignition In
4	Analog Input 1	16	no connect
5	CAN 1 L	17	no connect
6	CAN 1 H	18	CAN 2 L
7	Battery	19	CAN 2 H
8	Ground	20	Digital Input 4
9	Analog Input 3 GND	21	Digital Input 5
10	Analog Input 2 GND	22	Digital Output
11	Analog Input 1 GND	23	no connect
12	Digital Input 3		

How To Order

Part number	Description	Note
78700560	PV780 Display, Murphy Standard Configuration	Displays
78700564	PV780 Touch Display (no configuration; bootloader only)	
78090098	Programming Kit, PV780	Accessories
78051181	Cover, PV780	
78001053	Bracket Kit (screws included)	
78001055	Harness, Gray Connector, USB	
78001056	Harness, Gray Connector, Flying Leads	
78001057	Harness, Black Connector, Flying Leads	
78001017	Harness, Black Connector, Development	
78001018	Harness, Gray Connector, Development	
78090069	Harness, PV750 Conversion, Power/CAN	Service
78051180	Bezel, PV780	

HelmView® HV450

Commercial Marine Display

The HelmView 450 is a 4-inch display specifically designed to meet the engine monitoring needs of the commercial marine industry. Its durable design and easy-to-use interface offer a complete view of your vessel's engines. Monitor propulsion, auxiliary, transmission and genset engines all on one display. It is equipped with the ability to switch between day and night mode operations and even has a blackout option. There are multiple screens to choose from, and it features the ability to turn screens on/off to meet your specific marine application needs. The HV450 has the ability to be connected to a video camera for monitoring the engine room or other important areas of the vessel. It can utilize modern electronic engines and vessel monitoring using a SAE J1939 CAN network.

This multifunctional, bonded screen allows you to monitor multiple engines, transmissions, fuel usage and more using only one device, thus greatly reducing operating costs. It has eight tactile push buttons that can easily be pressed with or without gloves. The HV450's sunlight-viewable, full-color screen makes seeing lifelike gages, alarm warnings, service codes and video easy to view in virtually any condition. The HV450 is fully programmed to display Diagnostic Trouble Codes showing critical alarms and text explanations.

CE

Graphic interface not included, custom configuration required

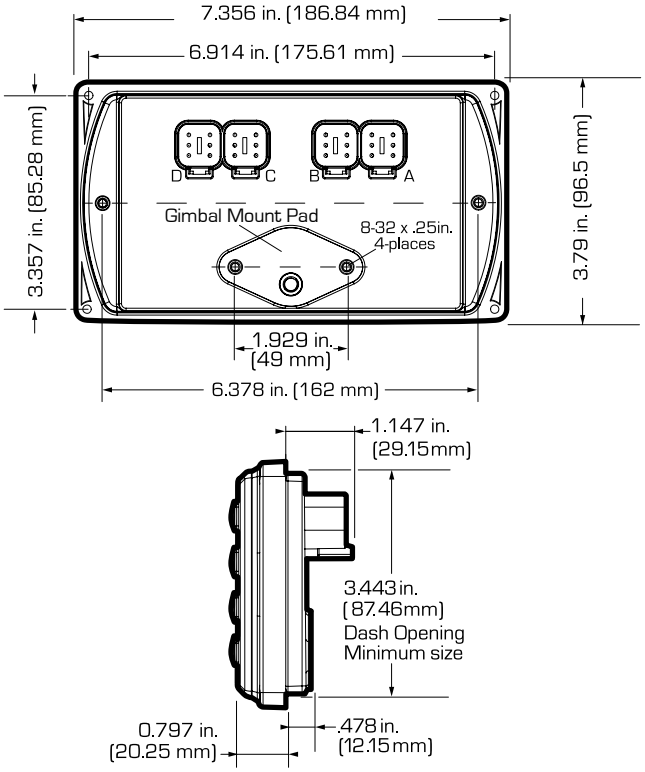
Display Parameters

The following are some of the parameters displayed by the HV450 in Imperial or Metric units (when applicable, consult engine or transmission manufacturer for SAE J1939 supported parameters).

- Engine RPM
- Engine Hours
- System Voltage
- % Engine Load at the Current RPM
- Coolant Temperature
- Oil Pressure
- Transmission Oil Temperature
- Transmission Oil Level
- Tank Levels
- Course Over Ground*
- Speed Over Ground*
- Longitude and Latitude*
- Real-Time Display*
- Instantaneous Fuel Usage
- Trip Fuel
- Navigational Bearing
- Active Service Codes
- Stored Service Codes (when supported)
- Video

*NMEA GPS Antennae required

Dimensions

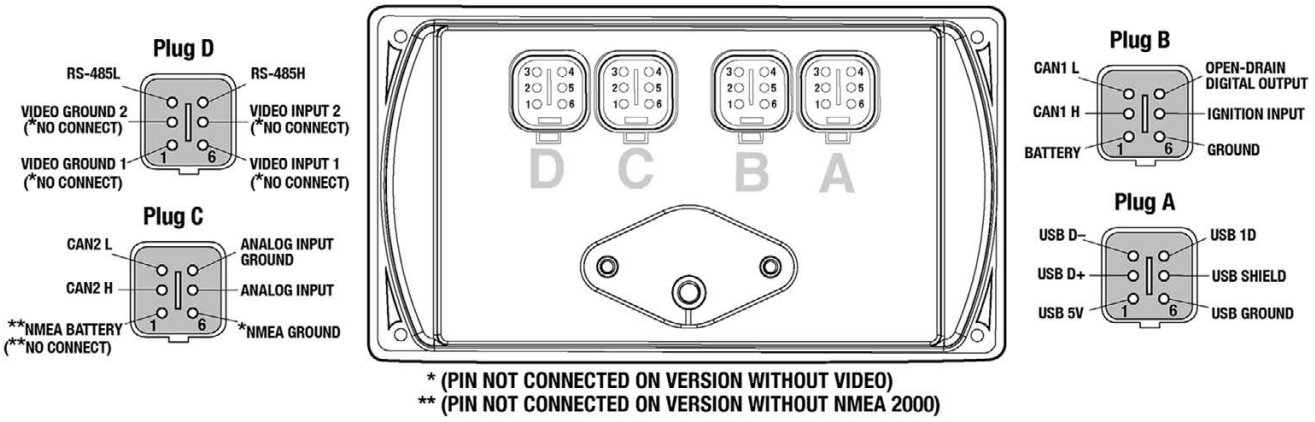


Specifications

Technical
Display: Bonded 4.3" color transmissive TFT LCD
Resolution: WQVGA, 480 x 272 pixels, 16-bit color
Aspect Ratio: 16:9
Orientation: Landscape
Backlighting: LED, 500-650 cd/m2 (30,000 hr lifetime)
Microprocessor: Freescale i.MX357 32bit, 532Mhz
QNX Realtime Operating System
Flash Memory: 256 MB
RAM: 128 Mbytes DDR2 SDRAM
Operating Voltage: 6-32 VDC, protected against reverse polarity and load dump
Power Consumption: 10W max.
CAN: (2) CAN 2.0B; optional NMEA 2000 isolation
Protocols: J1939, NMEA 2000
RS-485: (1) MODBUS Master/Slave
Video Input: (2) NTSC/PAL input channels - one displayed at a time
Connection: (4) Deutsch DT 6-pin connectors
Keyboard: (8) tactile buttons with white LED backlight
USB: 2.0 host, full speed
Output: (1) Open-drain, capable of sinking 500 mA
Input: (1) Resistive, 0-5 V, or 4-20 mA (software configurable) (10-bit resolution)
Clock: Real-time clock with built-in rechargeable Li-ion battery back-up (0.033 mWh)

Environmental
Operating Temperature: -40° to +185°F (-40° to +85°C)
Storage Temperature: -40° to +185°F (-40° to +85°C)
Protection: IP 66 and 67, front and back
Electromagnetic Compatibility:
2004/108/EC
EN 61000-6-4 EN 501121-3-2
EN 61000-6-2 (immunity) EN 12895
J1113/2, 4, 11, 12, 21, 24, 26 and 41
Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axes
Shock: ± 50G in 3 axes

Pinout



* (PIN NOT CONNECTED ON VERSION WITHOUT VIDEO)
** (PIN NOT CONNECTED ON VERSION WITHOUT NMEA 2000)

How To Order

Part Number	Description	Notes
78700563	HV450, J1939, with video	Commercial marine configuration and non-isolated CAN ports
78700538	HV450, J1939, NMEA, with video	Commercial marine configuration with one NMEA 2000 isolated CAN port

PowerView® CAN Gages

The PowerView CAN Gages (PVCAN) are a series of intelligent gages designed to display easy-to-read information broadcast over the SAE J1939 communications. These gages are designed to be wired directly to the J1939 CAN bus without the need of another device driving them.

The PVCAN gage includes features such as a smooth stepper motor operation for the 270-degree sweep pointer, an environmentally sealed case with two Deutsch DT style connectors molded into the case and green LED backlighting.

They are available for standard 2 1/16-inch (52 mm) and 3 3/8-inch (86 mm) diameter hole sizes. In addition, its polycarbonate/polyester alloy cases incorporate a D shape allowing panel cutouts that eliminate gage rotation during installation.

All PowerView gages can be powered by 12- or 24-VDC systems.

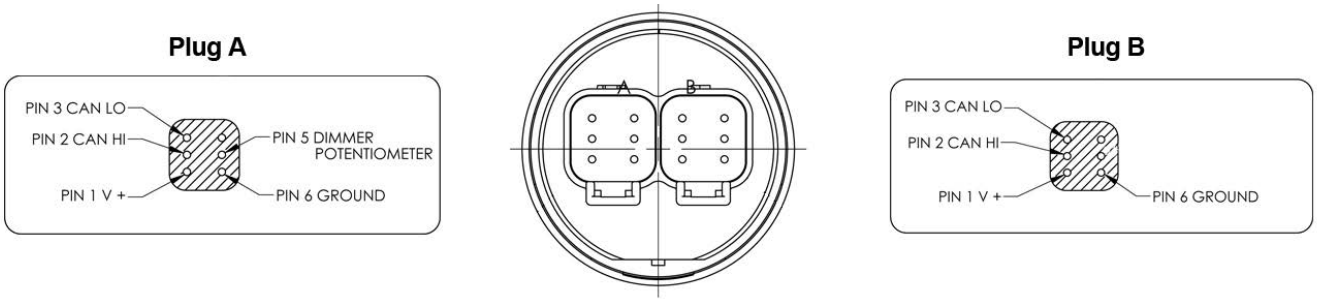
Styles

A-20 Style	Low Profile SAE Style	Contemporary Domed Bezel and Lens Style
Bezels available on the PVCAN20 and PVCAN35 Series		
AB Bezel Type	BB Bezel Type	EB Bezel Type
A Bezel Type	B Bezel Type	E Bezel Type

Specifications

Power Supply Input Voltage: 12/24 V (8-32 VDC Minimum and Maximum Voltage)
Power Supply Operating Current: Typically 70 mA
Backlight Maximum Current: 45 mA
Input: CAN (SAE J1939)
Operating Temperatures: -40° F to 185° F (-40° C to 85° C)
Storage Temperatures: -76° F to 185° F (-60° C to 85° C)
Dial: White numerals over black background
Gage Accuracy: Better than ±1% of full scale
Environmentally Sealed Enclosure: IP68: ±5PSI (±34.4kPa).
Case Material: Polycarbonate/Polyester (PC+PBT)
Clamp Material: Polyester (PBT)
Lens Material: Polycarbonate
Bezel Material: ABS
Maximum Panel Thickness: 3/8 in. (9.6 mm)
Connectors: 6-Pin Deutsch DT06 Series
Electromagnetic Compatibility:
Directive: **89/336/EEC**
Directive: **2004/108/EC**
European Harmonised standard:
EN 61000-6-3:2006
EN 61000-6-1:2005
Vibrations:
Random: 7.86 Grms (5-2,000 Hz), 3 axes
Shock: ±50 G, 3 axes

Pinout PVCAN 20 and PVCAN 30 Series



How To Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

PVCAN20 – A – 100 – A

Model	
PVCAN20	2” PowerView Gage
PVCAN35	3.5” PowerView Gage (Tachometer or Speedometer only)

Gage Functions	
A	Engine Oil Pressure
B	Engine Coolant Temperature
BA	% Diesel Exhaust Fluid (DEF) Level
C	Voltmeter
D	Percent Load at Current RPM
E	Transmission Oil Pressure
F	Transmission Oil Temperature
G	Engine Oil Temperature
H	Hydraulic Oil Temperature
J	Percent Fuel Level
K	Boost Pressure
L	Exhaust Gas Temperature
M	Intake Manifold Temperature
T	Tachometer
S	Speedometer
SS	Shaft Speed

Bezel Type	
Flat Lens	
A	A20 (Brushed Silver)
AB	A20 (Black)
B	Low Profile SAE (Brushed Silver)
BB	Low Profile SAE (Black)
Domed Lens	
E	Contemporary Domed (Brushed Silver)
EB	Contemporary Domed (Glossy Black)

Gage Ranges		Available for Gage Functions
100	100 psi/700 kPa	A, BA
150	150 psi/1000 kPa (PVCAN20-A only)	A
7B	7 Bar/100 psi	A
10B	10 Bar/150 psi	A
250	250° F/120° C	B, F, G, H, M
120C	120° C/250° F	B
12	12 VDC	C
12C	12 VDC Cummins (SPN 168)	C
24	24 VDC	C
24C	24 VDC Cummins (SPN 168)	C
100	100% Load@Current RPM	D, J, BA
400	400 psi/28 bar	E
28B	28 bar/400 psi	E
150C	150° C/300° F	F, G
40	40 psi/275 kPa	K
1600	1600° F/870° C	L
85	85 mph/130kmh	S (PVCAN35 model only)
130K	130 kmh/85 mph	S (PVCAN35 model only)
3000	3000 rpm	T, SS (PVCAN35 model only)
6000	6000 rpm	T (PVCAN35 model only)

Part Number	Description	Notes
78000761	CANJR, Terminating Resistor	Accessories
78000745	CANW-J-9, 9” Jumper Harness*	
78000746	CANW-J-12, 12” Jumper Harness*	
78000747	CAN-J-24, 24” Jumper Harness*	
78000748	CANW-J-36, 36” Jumper Harness*	
78000124	PVW-P-12, 12” Power/CAN Harness	

*According to recommended SAE J1939 wiring practices, any device on the CAN bus should be noded into the bus with a distance of no more than 1 meter.

PowerView® Analog Gages

PVA Series

The PowerView Analog Gages (PVA) are a series of intelligent gages designed to display easy-to-read information transmitted by the PowerView. The PVA gages communicate with the PowerView via a single RS485 twisted pair MODBUS RTU serial link. The gages can be daisy-chained using quick-connect harnesses with watertight connectors.

The major feature of the PVA gage is its balance between design and functionality. These modern gages offer a selection of lens and bezel styles and colors.

The PVA gages also include features such as a smooth stepper motor operation for the 270-degree sweep pointer, an environmentally sealed case with two Deutsch DT style connectors molded into the case and green LED backlighting.

They are available for standard 2-1/16-inch (52mm) and 3-3/8-inch (86mm) diameter mounting hole sizes. In addition, the polycarbonate/polyester alloy cases incorporate a D shape allowing panel cutouts that eliminate gage rotation during installation.

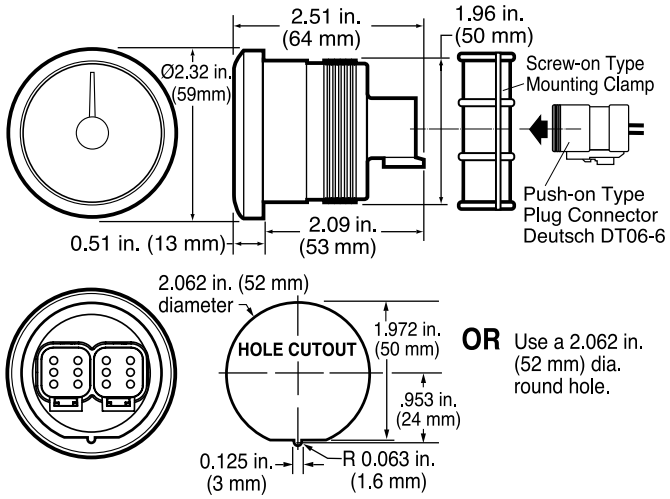
The PowerView Audible Alarm (PVAA) alerts operators to fault conditions via piezoelectric alarm and relay contacts. It also has a temporary silencer button that silences the audible tone for two minutes on warnings and 30 seconds on shutdown conditions. All PowerView gages can be powered by 12- or 24-VDC systems.

Specifications

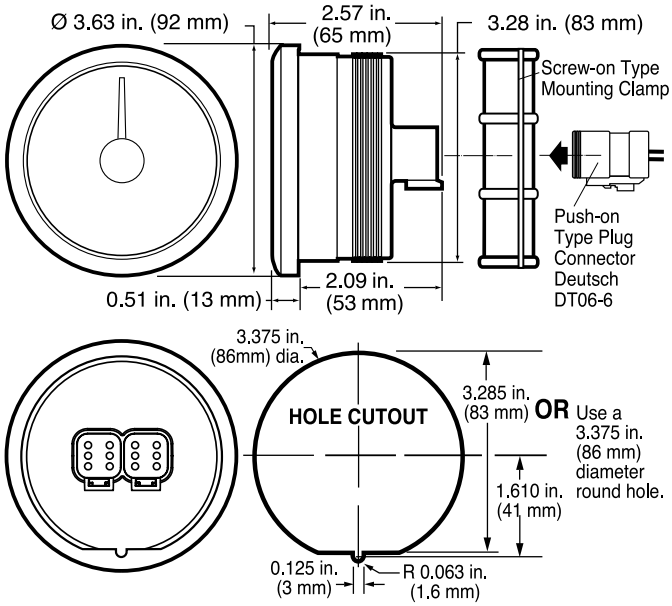
Power Supply Input: 12/24 V (8-32 VDC min/max voltage)
Power Supply Operating Current: (@ 14 VDC) =
PVA20, PVA35: 28 mA minimum: 52 mA maximum
PVAA20: 19 ma minimum; 46 mA maximum
Backlight Maximum Current: 24 mA (Not valid for PVAA20)
Input: RS485 MODBUS RTU Data
Output: Analog readout
Operating Temperature: -40° F to 185° F (-40° C to 85° C)
Storage Temperature: -76° F to 185° F (-60° C to 85° C)
Dial: White text over black background
Indicating Pointer: Stepper motor Operation with 270° sweep
Gage Accuracy: Better than ± 1% of full scale
Environmentally Sealed Enclosure:
Sealing: IP68, ±5 psi (±34.4 kPa)
Case Materials: Polycarbonate/Polyester (PC+PBT)
Clamp Materials: Polyester (PBT)
Lens Material: Polycarbonate
Bezel Material: ABS
Maximum Panel Thickness: 3/8 inch (9.6 mm)
Connectors: 6-pin Deutsch DT06 Series
The following items apply only to PVAA20
Sound Output Level: 90 dB @ 30cm
Relay Rated Load: 0.5 A, 125 VAC: 1 A, 24 VDC
Relay Maximum Switching Capacity: 62.5 VA, 30 W
External Audible Alarm Output: 28 VDC, 30 mA maximum current sink
Temporary Silence Button: Charge transfer technology
Vibrations: Random: 7.86 Grms (5-2,000 Hz), 3 axes
Shock: ± 50G, 3 axes
Electromagnetic Compatibility:
PVA: 2014/30/EU & 2014/35/EU
IEC 60945: 2002 (CISPR 16-1 & 16-2-1)
PVAA: 89 / 336 / EEC
EN 61000-6-4 : 2001
EN 61000 -6-1 : 2001

Dimensions

PVA20/PVAA20 Series - Typical Gage Dimensions



PVA35 Series - Typical Gage Dimensions



Available Bezels

A-20 Style **Low Profile SAE Style** **Contemporary Style**

Gauges available in the PVA20, PVA35 and PVAA20 Models

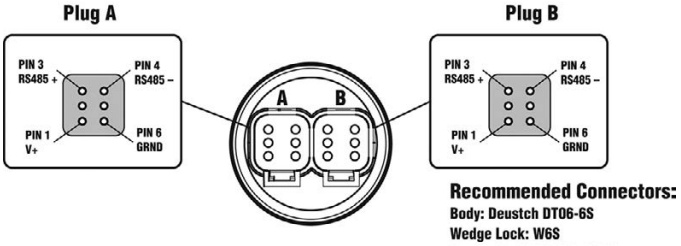
AB Bezel Type

BB Bezel Type

EB Bezel Type

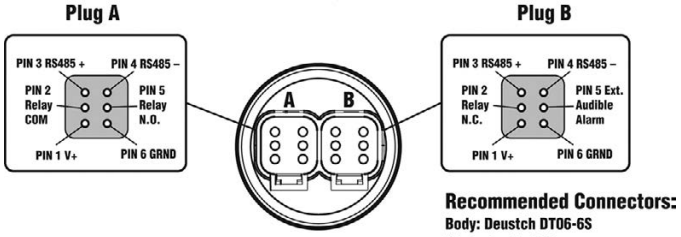
Pinout

PowerView Gages Back View
Deutsch DT06-6S Style Connections



Recommended Connectors:
Body: Deustch DT06-6S
Wedge Lock: W6S
Terminals: 0462-201-16141
Sealing Plug: 114017

PowerView Audible Alarm Back View
Deutsch DT06-6S Style Connections



Recommended Connectors:
Body: Deustch DT06-6S
Wedge Lock: W6S
Terminals: 0462-201-16141
Sealing Plug: 114017

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

PVA20 – A – 100 – A R1

Model	
PVA20	= 2” PowerView Gage
PVA35	= 3.5” PowerView Gage (Tachometer or Speedometer only)
PVAA20	= 2” PowerView Audible Alarm

Gage Functions (excludes PVAA20)	
A	= Engine Oil Pressure
B	= Engine Coolant Temperature
C	= Voltmeter
D	= Percent Load at Current RPM
E	= Transmission Oil Pressure
F	= Transmission Oil Temperature
G	= Engine Oil Temperature
H	= Hydraulic Oil Temperature
J	= Percent Fuel Level
K	= Boost Pressure
L	= Exhaust Gas Temperature
M	= Intake Manifold Temperature
N	= Auxiliary Temperature
P	= Auxiliary Pressure
T	= Tachometer
S	= Speedometer

Bezel Type	
Flat Lens	
A	= A20 (Brushed Silver)
AB	= A20 (Black)
B	= Low Profile SAE (Brushed Silver)
BB	= Low Profile SAE (Black)
Domed Lens	
E	= Contemporary Domed (Brushed Silver)
EB	= Contemporary Domed (Glossy Black)

Remote Gage	
R1	= Option for a second gage of identical type on gage network.

For Example: If you are already using one PVA20-A-100-A, a second oil pressure is needed, order a PVA20-A-100-A-R1.

Gage Ranges (Excludes PVAA20)			Available for Gage Functions
100	=	100 psi/700 kPa	A
150	=	150 psi/1000 kPa (PVA20-A only)	A
7B	=	7 bar/100 psi	A
10B	=	10 bar/150 psi	A
250	=	250° F/120° C	B, F, G, H, M
120C	=	120° C/250° F	B
12	=	12 VDC	C
24	=	24 VDC	C
100	=	100% Load@Current RPM	D, J
400	=	400 psi/28 bar	E, P
28B	=	28 bar/400 psi	E, P
150C	=	150° C/300° F	F, G, N
40	=	40 psi/275 kPa	K
1600	=	1600° F/870° C	L
280	=	280° F/138° C	N
85	=	85 MPH/130kmh	S
130K	=	130 kmh/85 MPH	S
3000	=	3000 RPM	T
6000	=	6000 RPM	T (PVA35 model only)

Shipping Weight: 1 lb. (450 g) All models
Shipping Dimensions: 6 x 6 x 6 in. (153 x 153 x 153 mm) All models

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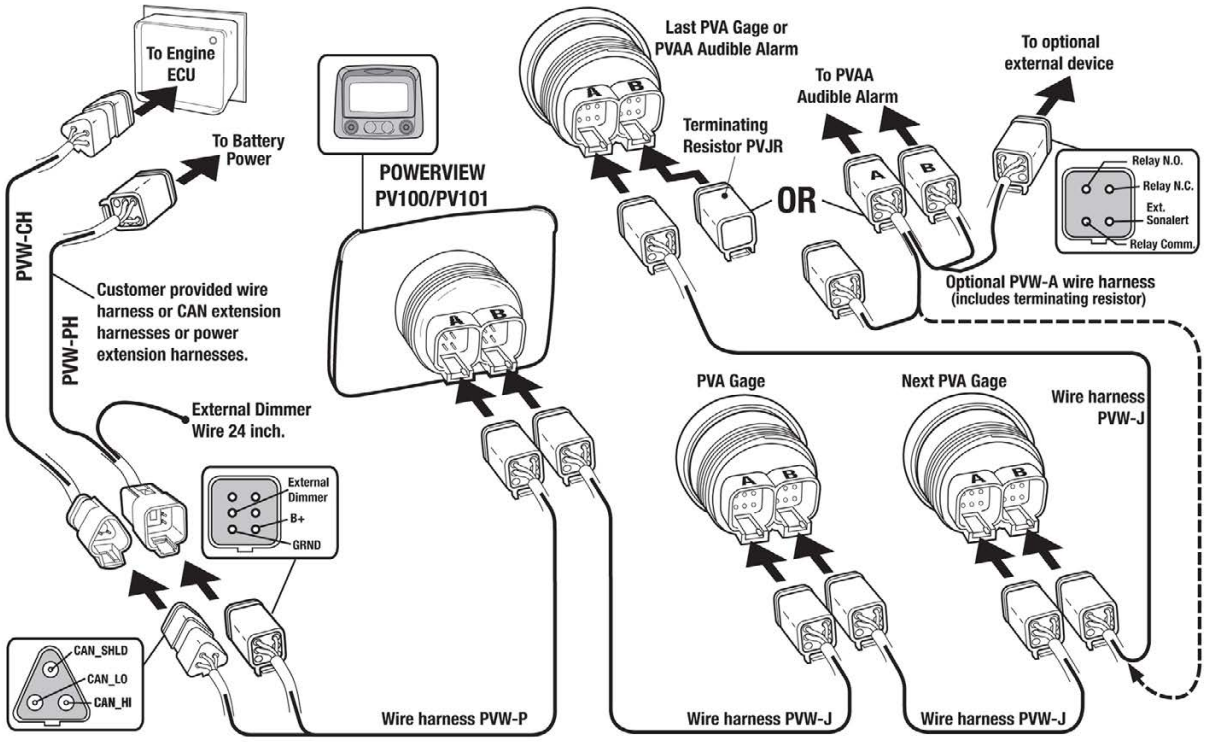
Wiring Harness Accessories

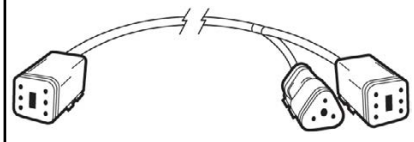
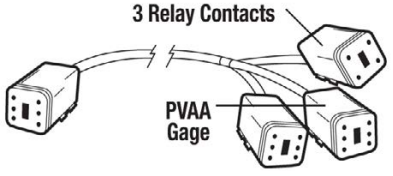
PowerView™ PV101 Module and PVA Analog Gages

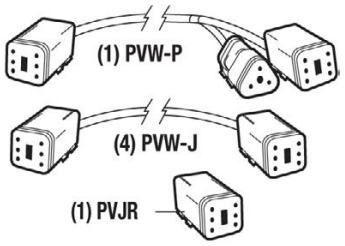
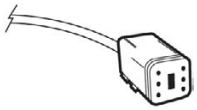
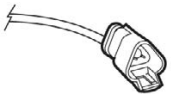
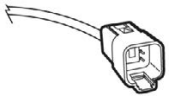
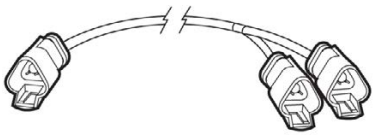
Diagram

Use this easy-connect diagram to help you locate the wiring harness you need.



How To Order

Part Number	Length	Model: Description	Diagram
78000124	12 in. (305 mm)	PVW-P-length: CAN and power harness for PowerView module (includes 120Ω CAN resistor)	
78000121	9 in. (229 mm)	PVW-J-length: PowerView jumper harness	
78000122	12 in. (305mm)		
78000123	24 in. (607 mm)		
78000153	9 in. (229 mm)	PVW-A-length: PowerView audible alarm jumper harness (provides alarm ready contacts for external devices)	
78000154	12 in. (305mm)		
78000155	24 in. (607 mm)		

Part Number	Length	Description	Diagram
78000128	–	PVJR: Terminating resister (use on last PVA gage in a series - not needed for PV100)	
78000157	72 in. (1.82 m)	PVW-CH-length: PowerView CAN extension harness	
78000158	144 in. (3.65 m)		
78000159	240 in. (6.10 m)		
78000160	360 in. (9.10 m)		
78000149	72 in. (1.82 m)	PVW-PH-length: PowerView battery Power extension harness	
78000150	144 in. (3.65 m)		
78000151	240 in. (6.10 m)		
78000152	360 in. (9.10 m)		
78000188	12 in. (305 mm)	PVW-K: PowerView wiring kit includes: one PVW-P, four PVW-J, one PVJR	
78000189	24 in. (607 mm)		
78000125	30 in. (762 mm)	PVW-PW-length: PowerView CAN and power loose wiring (includes 120Ω CAN resistor)	
78000127	24 in. (607 mm)	PVW-CC-length: PowerView CAN loose wiring	
78000126	24 in. (607 mm)	PVW-PC-length: PowerView power loose wiring	
00009510	–	PVW-CT: CAN BUS tee wiring harness	

PowerView® Gages
PVM Series

The PowerView PVM Series Gages are intelligent gages designed to display easy-to-read information transmitted by PowerView. The PVM gages communicate with PowerView via a single RS485 twisted pair MODBUS RTU serial link. The gages can be daisy-chained using quick-connect harnesses.

The major feature of the PVM gage is its balance between design and functionality. These modern gages offer a selection of lens and bezel styles and colors.

The PVM gages also include features such as a smooth stepper motor operation for the 270° sweep pointer, an environmentally sealed case with two Amp Mini Universal Mate-N-Lok connectors molded into the casing, and green LED backlighting. They are available for standard 2-1/16" (52mm) and 3-3/8" (86mm) diameter hole sizes. Their plastic cases incorporate a D shape allowing panel cutouts that eliminate gage rotation during installation.

Features

- For modern electronic engines and equipment using SAE J1939 Controller Area Network
- Display SAE J1939 parameters broadcast by the PowerView system
- Cutting-edge, stepper motor technology and robust functionality combined
- Microprocessor-driven for high accuracy
- Simple installation and wiring design

PVM20 Series

PVM20-A - Engine Oil Pressure
PVM20-B - Coolant Temperature
PVM20-C - Voltmeter
PVM20-D - Percent Load at current RPM
PVM20-E - Transmission Oil Pressure
PVM20-F - Transmission Oil Temperature
PVM20-G - Engine Oil Temperature
PVM20-H - Hydraulic Oil Temperature
PVM20-J - Percent Fuel Level
PVM20-K - Boost Pressure
PVM20-L - Exhaust Gas Temperature
PVM20-M - Intake Manifold Temperature
PVM20-N - Auxiliary Temperature
PVM20-P - Auxiliary Pressure
PVM20-T - Tachometer

PVM35 Series

PVM35-T - Tachometer
PVM35-S - Speedometer

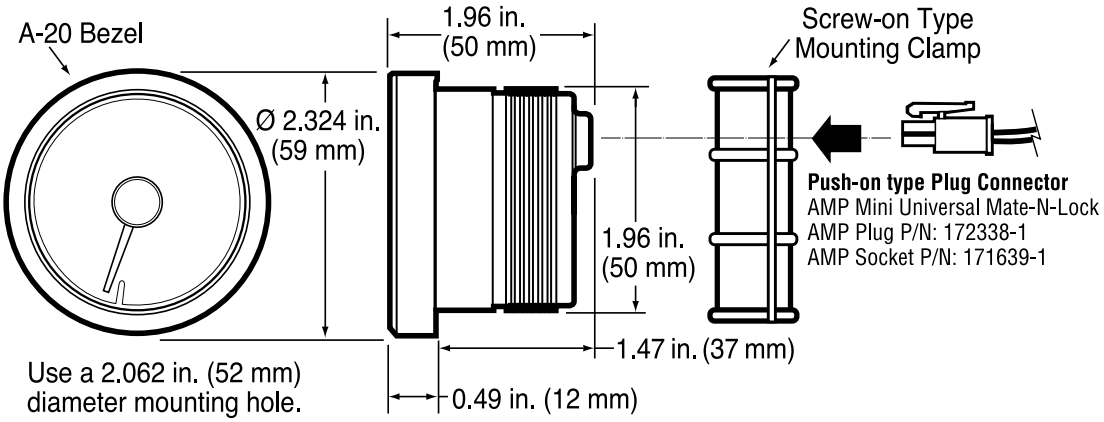
Specifications

PV101 Compatibility
Maximum supported: 5 PVM gages
Maximum distance to last gage: 8.5 meters
Power Supply Input Voltage: 5V (4.5-5, 5.5 VDC minimum & maximum voltage)
Power Supply Operating Current (@ 5 VDC): PVM20, PVM35: 18 mA minimum; 80 mA maximum
Backlight Maximum Current: 60 mA
Input: RS485 MODBUS RTU data
Output: Analog readout
Environmental
Operating Temperature: -40° to 185° F (-40° to 85° C)
Storage Temperature: -67° to 185° F (-55° to 85° C)
Environmental Sealed Enclosure:
Sealing: IP68, ±5PSI (±34.4 kPa)
Case and Clamp Material: Polyester (PBT)
Lens Material: Polycarbonate
Bezel Material: Polyester (PBT)

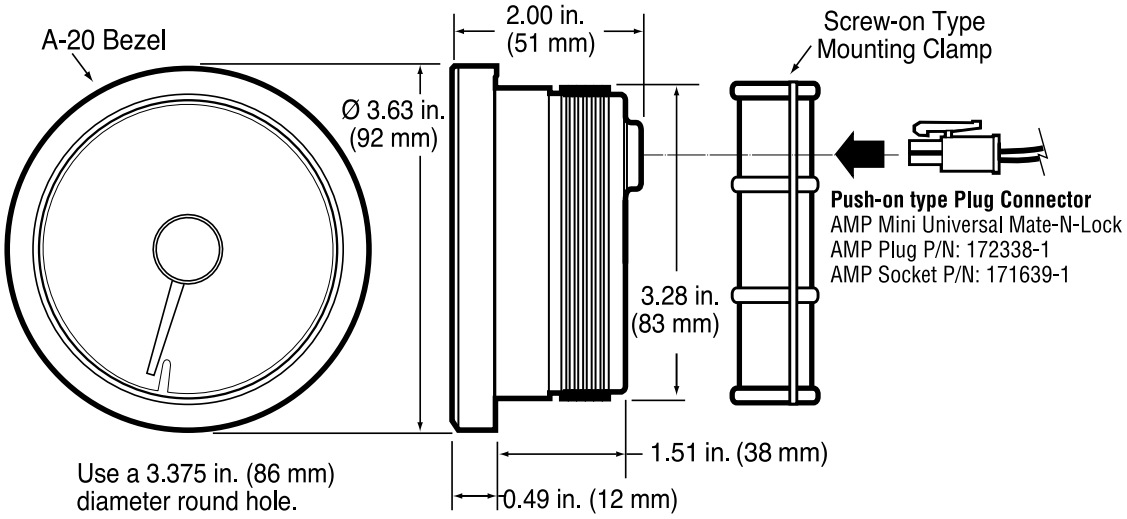
Dial: White numerals over black background
Return-to-Zero Needle Movement: Not available for PVM20 models
Indicating Pointer: Stepper motor operation with 270° sweep
Gage Accuracy: Better than ±1.0% of scale
Maximum Panel Thickness: 3/8 in. (9.6 mm)
Connectors:
Amp Mini Universal Mate-N-Lok
Amp Plug P/N: 172338-1
Amp Socket P/N: 171639-1
Shipping Weight: 1 lb. (450 g)
Shipping Dimensions: 6 x 6 x 6 in. (153 x 153 x 153 mm)

Typical Gage Dimensions

PVM20 Series



PVM35 Series



Bezel Styles

PVM20 Series and PVM35 Series

AB A-20 Style	A A-20 Style	BB Low Profile SAE Style	DB Low Curved Style
			

How to Order

Options listed below. All configurations may not be available. Call your sales representative or Enovation Controls for more information.

PVM20 – A – 100 – A

Model	
PVM20	= 2” PowerView Gage
PVM35	= 3.5” PowerView Gage (Tachometer or Speedometer only)

Gage Functions	
A	= Engine Oil Pressure
B	= Engine Coolant Temperature
C	= Voltmeter
D	= Percent Load at Current RPM
E	= Transmission Oil Pressure
F	= Transmission Oil Temperature
G	= Engine Oil Temperature
H	= Hydraulic Oil Temperature
J	= Percent Fuel Level
K	= Boost Pressure
L	= Exhaust Gas Temperature
M	= Intake Manifold Temperature
N	= Auxiliary Temperature
P	= Auxiliary Pressure
T	= Tachometer
S	= Speedometer

Bezel Type (flat Lens)	
A	= A20 (Brushed Silver)
AB	= A20 (Black)
BB	= Low Profile SAE (Black)
DB	= Low Curved (Black)

28-Gage Ranges			Available for Gage Functions
100	=	100 psi/700 kPa	A
150	=	150 psi/1000 kPa	A
7B	=	7 bar/100 psi	A
10B	=	10 bar/150 psi	A
250	=	250° F/120° C	B, F, G, H, M
120C	=	120° C/250° F	B
12	=	12 VDC	C
24	=	24 VDC	C
100	=	100% Load@Current RPM	D, J
400	=	400 psi/28 bar	E, P
28B	=	28 bar/400 psi	E, P
150C	=	150° C/300° F	F, G, N
40	=	40 psi/275 kPa	K
1600	=	1600° F/870° C	L
280	=	280° F/138° C	N
85	=	85 MPH/130kmh	S
130K	=	130 kmh/85 MPH	S
3000	=	3000 RPM	T
6000	=	6000 RPM	T

Wiring Harnesses and Accessories
For details see bulletin 0710179 - Wiring Harness Accessories for PVM Gages

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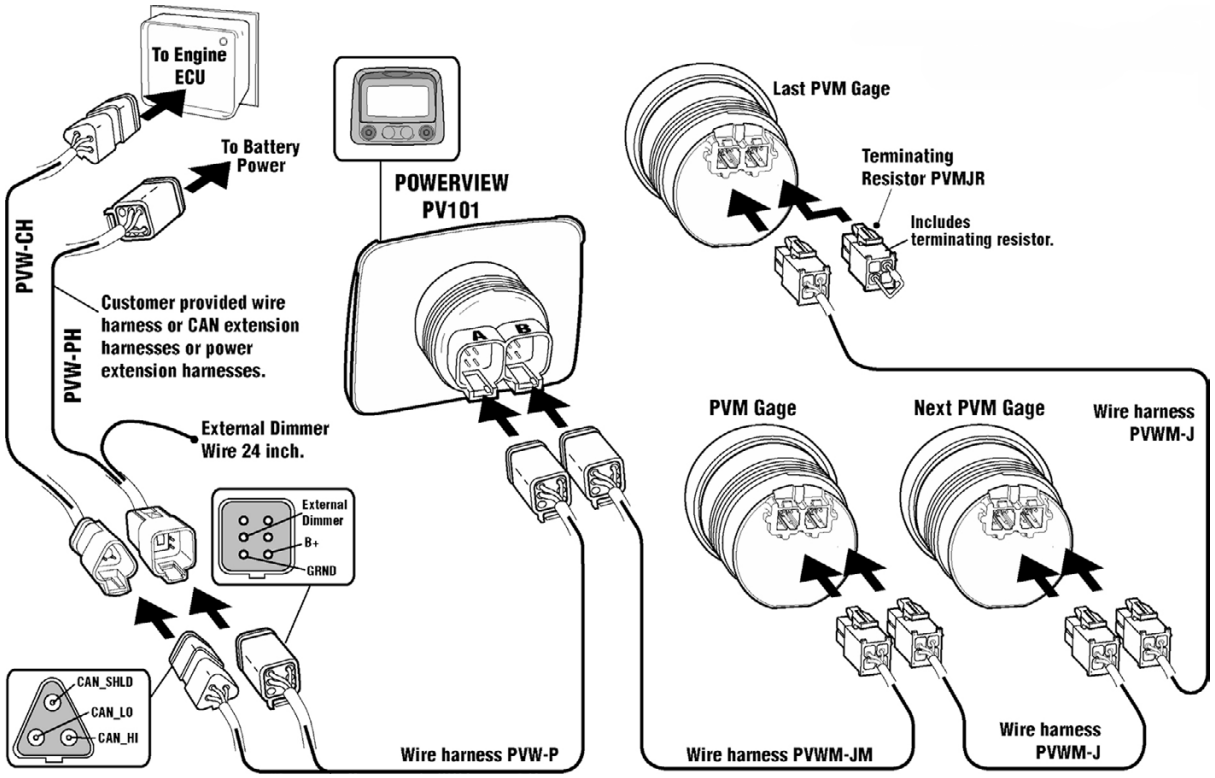
Wiring Harness Accessories

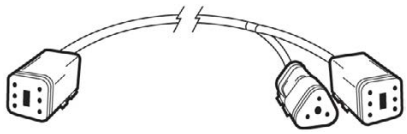
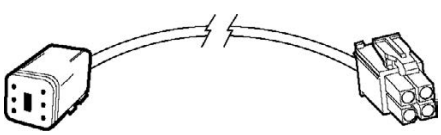
PowerView® PV101 and PVM Gages

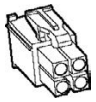
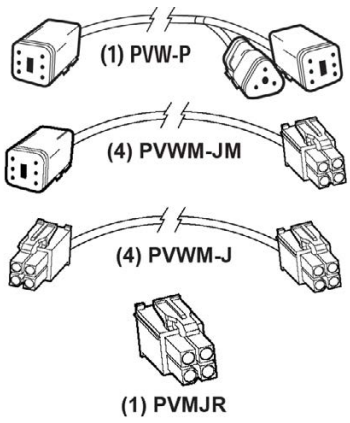
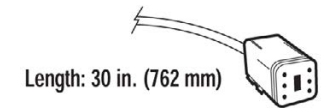
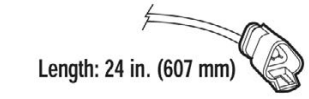
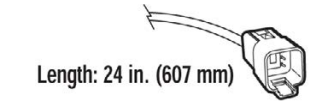
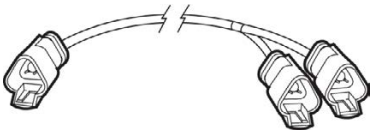
Diagram

Use this easy-connect diagram to help you locate the wiring harness you need.
NOTE: The PV101 can support up yo five PVM gages in a distance less than 8.5 meters.



How to Order

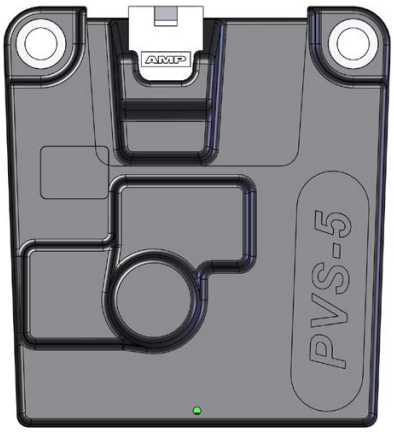
Part Number	Length	Model: Description	Diagram
78000124	12 in. (305 mm)	PVW-P-length: CAN and power harness for PowerView module (includes 120Ω CAN resistor)	
78000479	9 in. (229 mm)	PVWM-J-length: Gage harness	
78000490	12 in. (305mm)		
78000503	24 in. (607 mm)		
78000481	9 in. (229 mm)	PVWM-JM-length: PowerView jumper harness	
78000504	12 in. (305mm)		
78000505	24 in. (607 mm)		

Part Number	Length	Model: Description	Diagram
78000157	72 in. (1.82 m)	PVW-CH-length: PowerView CAN extension harness	
78000158	144 in. (3.65 m)		
78000159	240 in. (6.10 m)		
78000160	360 in. (9.10 m)		
78000149	72 in. (1.82 m)	PVW-PH-length: PowerView battery power extension harness	
78000150	144 in. (3.65 m)		
78000151	240 in. (6.10 m)		
78000152	360 in. (9.10 m)		
78000480	–	PVMJR: Terminating Resistor (use on last PVM gage in a series - not needed for PV101)	
78000511	12 in. (305 mm)	PVWM-K-length: PV101 - PVM Wiring Kit includes: one PVW-P, four PVWN-J, one PVWM-JM, one PVMJR	
78000512	24 in. (607 mm)		
78000125	30 in. (762 mm)	PVW-PW-length: PowerView CAN & Power Loose Wiring (includes 120Ω CAN resistor)	
78000127	24 in. (607 mm)	PVW-CC-length: PowerView CAN Loose Wiring	
78000126	24 in. (607 mm)	PVW-PC-length: PowerView Power Loose Wiring	
00009510	–	PVW-CT: CAN bus tee Wiring Harness	

PVS-5 Power Supply

External power is required to make the PVM gage line compatible with existing MurphyLink® products, such as PV1000, Cascade, iGuard and eGuard. The PVS-5 power supply device supplies 5 volts of external power and load dump protection for up to 6 PVM gages. The maximum length of the power and data connection between gages is 0.5 meters (8.5 meters total).

The unit may be installed inside a panel or behind a dash.

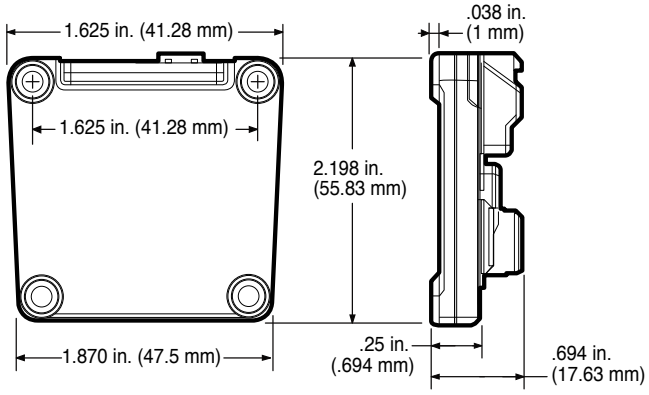


CE

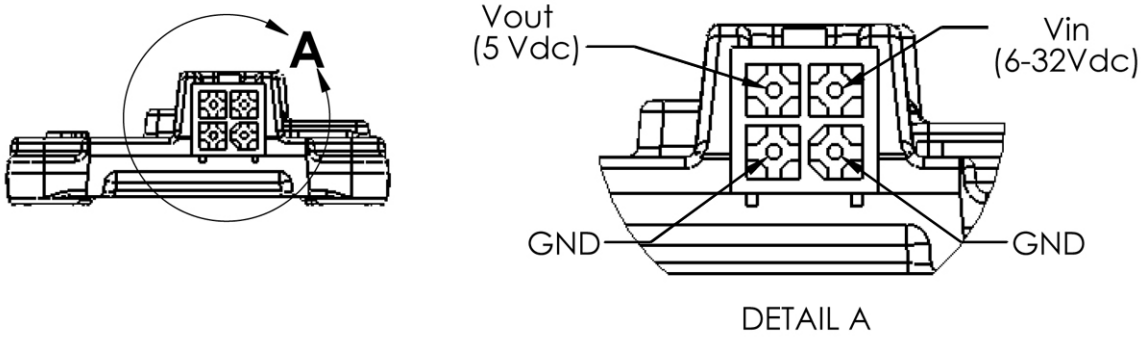
Specifications

Input Voltage:
6 VDC minimum to 32 VDC maximum
12/24 VDC nominal
Output Voltage: 5 VDC @ 450 mA maximum
Reverse Polarity Protection: -36 VDC and above
Overcurrent Protection: 600 mA @ 36 VDA maximum
Connector: AMP 1-770968-1
Operating Temperature: -40° to 185° F (-40° to 85° C)
Storage Temperature: -40° to 221° F (-40° to 105° C)
Random Vibration: 5-2000 Hz
Operating Shock: 50G
Certification: CE
Case Material: Polyamide
Dimensions: 2 x 2 x .75"
Mounting Hole Dimensions: Two #8 screws, 1.625" offset

Dimensions



Wiring Diagram



Mating Connector - Tyco Electronics AMP Mini Universal Mate-N-Lok Plug Housing 4 Position,
AMP P/N 172338-1
Murphy P/N 00006935

Part Number	Description	Notes
78700383	PVS-5 Power Supply	
00006935	Murphy Mating Connector	Accessory
78000479	9-inch Harness	PVM Gage Harnesses 
78000490	12-inch Harness	
78000503	24-inch Harness	

CAN/IO Modules

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SenderCAN®

SAE J1939 Input and Output Module

The SenderCAN is a compact, encapsulated input and output module for J1939 CAN bus systems. SenderCAN allows the integration of analog and digital measurement, control and indicating devices into modern CAN and ECU-based engines and systems.

SenderCAN has up to four inputs and two outputs, each of which is factory configured to OEM requirements. Inputs can be set for use with resistive sender or switch signals, which are translated into J1939 CAN bus messages with appropriate PGN address, data scaling and transmission rate. Outputs can be configured to drive gages, lamps, relays or other control devices based on received J1939 data.

Standard versions are available for use with common senders (for example, the FuelCAN™ and MeCAN™), but SenderCAN is primarily intended for OEM-specified input, output and CAN bus requirements. Please note that minimum order quantities or charges apply for custom solutions.

SenderCAN is compact and light enough for inclusion in most wiring harnesses but can also be surface mounted. The case is fully sealed in epoxy resin for high impact and environmental resistance.

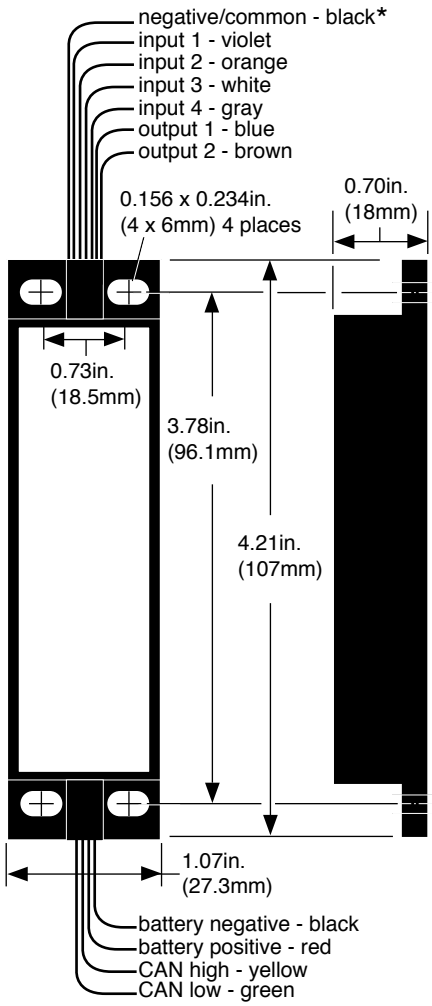
Specifications

Power supply
Operating voltage: 7 to 35 VDC
Current consumption: 25mA (typ.)
Input/Output
Input range: OEM/application specific, -2 to +35 VDC max
Output: OEM/application specific, 250mA max.
CANbus: SAE J1939 protocol, optional 120 Ohm terminating resistor
Physical
Case material: High impact ABS, epoxy filled
Weight: Approx 60 g / 0.13 lb
Operating temperature: -40°F to +185°F / (-40° C to +85° C)
Environmental Sealing: IP65 case, exposed lead ends
Electromagnetic compatibility: 2004/108/EC
Electrical:
J1113-11 pulses 1c, 2a, 3a/b and 5a
EN 61000-4-2 ESD
EN 61000-4-3 Radiated disturbance
EN 61000-4-4 Fast transients
EN 61000-4-5 High Energy transients
EN 61000-4-6 Conducted RF disturbance
CISPR 16-1-2, 4.3 Conducted emissions
CISPR 16-2-3 Radiated emissions

How To Order

Please contact your Murphy representative to discuss requirements. Also see FuelCAN and MeCAN variants literature.

Dimensions* and Connections



* Wire lead not available for all configurations. Standard lead length 4in. (100mm) approx.

*Dimensions to be used for reference only. Use actual product for template.

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MeCAN™

Mechanical Engine to J1939 CAN Interface

The MeCAN™ is a compact, encapsulated interface module that translates resistive sender, fault switch and speed signals into SAE J1939 CAN bus data. MeCAN allows quick and simple integration of mechanical engines into modern CAN bus systems. Applications include the retrofit of older engine fleets with modern digital instruments, controls and telemetry, engine hour tracking and the development of standard control panels for mechanical engines.

MeCAN has three sensor inputs and one output. Two inputs are for oil pressure and coolant temperature sensing, either by fault switches or resistive senders. The third input measures engine speed using a magnetic pickup or charge alternator signal.
Input signals are translated into SAE J1939 CAN bus messages with assigned PGN address, data scaling and transmission rate. The output can drive an alarm lamp or buzzer or actuate a shut-down relay if the pressure, temperature or speed inputs deviate outside preset fault limits.

A fourth input is connected to a speed calibration potentiometer during set-up mode only. DIP switches allow selection of normal/set up mode and two speed input ranges. An LED gives indication of operating mode and CAN bus activity.

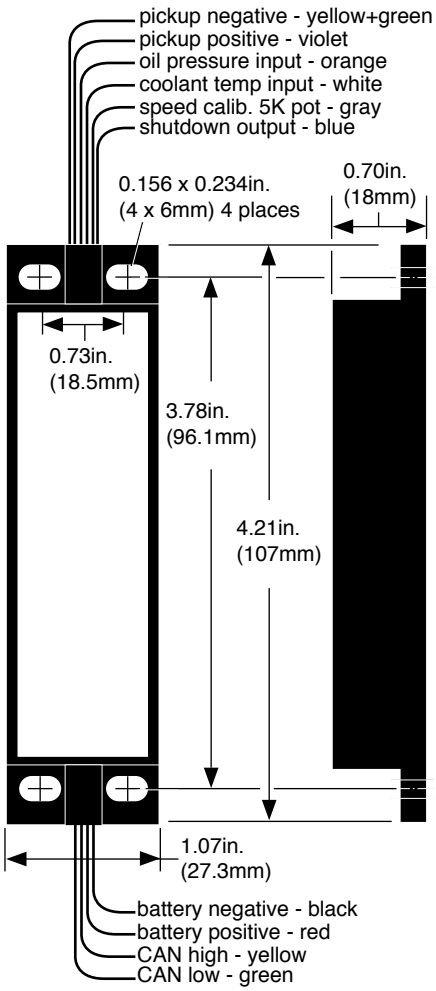
MeCAN is compact and light enough for inclusion in engine wiring harnesses but can also be surface mounted. The case is fully sealed in epoxy resin for high impact and environmental resistance. Two standard versions allow use with either fault switches or Murphy ES series resistive senders. Custom solutions are also available for non-standard, volume OEM requirements.

Messages Broadcast

PGN	Description
61444	Engine RPM
65263	Oil Pressure
65262	Coolant Temperature
65271	Battery Voltage
65253	Engine Hours

CE

Dimensions* and Connections



Standard lead length 4in. (100mm) approx.

*Dimensions are to be used only for reference purposes. Use actual product for template.

Specifications

Power supply
Operating voltage: 7 to 35 VDC
Current consumption: 25 mA (typ.)
Inputs
Maximum operating range: -2 to +35 VDC max.
Oil pressure, coolant temperature (model MEC301-1):
for Murphy ES(2)P and ES(2)T series resistive senders
Oil pressure, coolant temperature (model MEC301-2):
for fault switch, closing to negative DC on fault
Speed (magnetic pickup): Opto-isolated, 3 – 30 Vrms,
adjustable 10 – 180 pulses per rev
Speed calibration: 0 – 5 kOhm potentiometer (setup only)
Outputs (all ratings non-reactive)
Shutdown: Negative low-side or ground switch, 250 mA max.
CAN bus: SAE J1939 protocol with120 Ohm terminating resistor

Physical
Case material: High impact ABS, epoxy filled
Weight: Approx 60 g / 0.13 lb
Operating temperature: -40° F to 185° F (-40° C to 85° C)
Environmental sealing: IP65 case (with DIP switch protective film intact), exposed lead ends
Electromagnetic compatibility: 2004/108/EC
Electrical:
-J1113-11 pulses 1c, 2a, 3a/b and 5a
-EN 61000-4-2 ESD
-EN 61000-4-3 Radiated disturbance
-EN 61000-4-4 Fast transients
-EN 61000-4-5 High energy transients
-EN 61000-4-6 Conducted RF disturbance
-CISPR 16-1-2, 4.3 conducted emissions
-CISPR 16-2-3 Radiated emissions

How To Order

Part Number	Description	Notes
E2501200B	MEC301-2-TR, MeCAN, with terminating resistor	Use with pressure and temperature switches (output closes to ground on fault)
E2501300B	MEC301-1-TR, MeCAN, with terminating resistor	Use with ES(2)P pressure and ES(2)T temperature senders

FuelCAN™

Fuel Level Sender to J1939 Transmitter

The FuelCAN is a compact interface that translates fuel level sender signals into SAE J1939 CAN bus messages. The device allows integration of standard senders into modern J1939/CAN bus engine instrument and control systems.

FuelCAN modules have three inputs (only one of which is connected at any one time): input 1 is configured for use with Murphy ES series resistive fuel level senders; inputs 2 and 3 can be used with fuel level senders having compatible resistance ranges as shown below.

FuelCAN inputs can also be factory configured for use with other types of fuel level or resistive senders. FuelCAN is compact and light enough to be incorporated into most wiring harnesses but can also be surface mounted. The polycarbonate case is fully sealed in epoxy resin for high impact and environmental resistance. A rear facing LED indicates input/CAN bus status.

	Fuel Level / Approx. Resistance, Ohms				
	Empty	1/4	1/2	3/4	Full
Input 1 (Murphy)	240	147	96	60	33.5
Input 2	240	158	100	58	30
Input 3	10	56	95	138	180

Specifications

Power supply

Operating voltage: 7 to 35 VDC

Current consumption: 25 mA (typ.)

Inputs

Maximum operating range: -2 to +35 VDC

Input 1 sender range, Ohms: 240 (empty) to 33.5 (full)

Input 2 sender range, Ohms: 240 (empty) to 30 (full)

Input 3 sender range, Ohms: 10 (empty) to 180 (full)

Outputs

CAN bus: SAE J1939 protocol, PGN 65276 (00FEFC[16])

-2 sec update rate

-120 Ohm terminating resistor optionally fitted

Source Address: 160 (0 x A0)

Physical

Case material: High impact ABS, epoxy filled

Weight: Approx 60 g / 0.13 lb

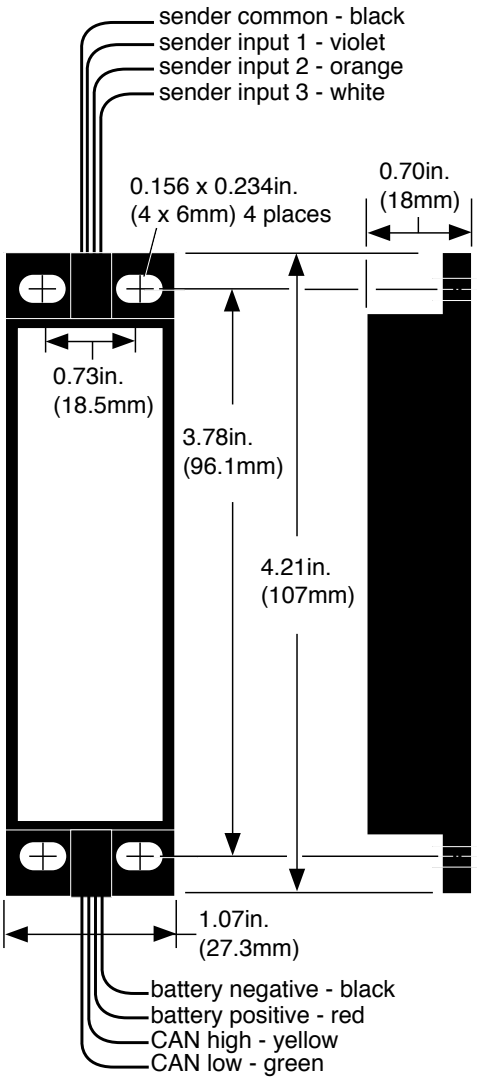
Operating temperature: -40° F to 185° F (-40° C to 85° C)

Environmental sealing: IP65 case, exposed lead ends

Electromagnetic compatibility: 2004/108/EC

CE

Dimensions* and Connections



Standard lead length 4in. (100mm) approx.

*Dimensions to be used only for reference. Use actual product for template.

Specifications - continued

Electrical:

-J1113-11 pulses 1c, 2a, 3a/b and 5a
-EN 61000-4-2 ESD
-EN 61000-4-3 Radiated disturbance
-EN 61000-4-4 Fast transients
-EN 61000-4-5 High energy transients
-EN 61000-4-6 Conducted RF disturbance
-CISPR 16-1-2, 4.3 Conducted Emissions
-CISPR 16-2-3 Radiated Emissions

How To Order

Part Number	Description	Notes
E2502000A	FuelCAN, FLC300 with no terminating resistor	
E2502100A	FuelCAN, FLC300-TR with terminating resistor	

Please contact your Murphy representative to discuss requirements. Also see SenderCAN® and MeCAN™ variants literature.

NOTE: Minimum order quantities apply for custom solutions.

PowerCore® Intelligent Xpansion™

IX3212 – Power Distribution Module (PDM)

The Murphy PowerCore® Intelligent Xpansion™ Power Distribution Module (PDM) expands CAN bus control networks by replacing existing relay and fuse boxes with more reliable solid-state switches that can directly drive work lights, wiper motors, cooling fans, directional DC motors and other high current loads.

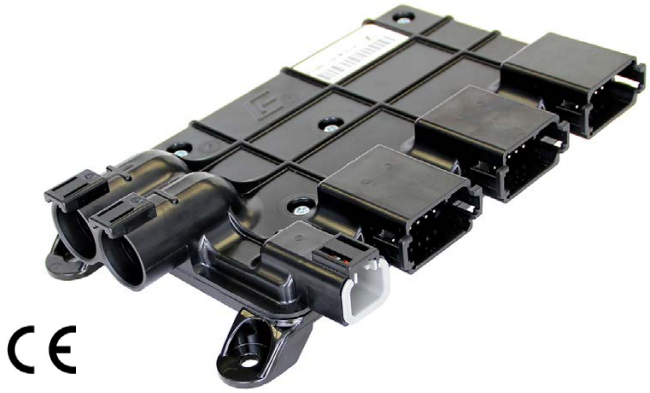
Each of the 12 IX3212 outputs can switch or proportionally control up to 15 A loads in 2.5 A increments and feature built-in over-current detection and shut-down capability. Outputs are paired to run up to six electric motors with H-bridge direction control. Twelve digital inputs monitor switched battery, ground and floating inputs. Additionally, eight analog inputs are available with a 5V sensor supply.

Wiring length is reduced and costs are cut by remotely locating the IX module near loads and signals. The I/O is multiplexed using a CAN bus network which allows engineers to greatly simplify harness design for ease of installation and improved reliability.

For applications not requiring a CAN bus controller, the inputs can directly trigger the outputs so there is no need for a separate controller.

The enclosure is fully sealed and potted to withstand wash down and protect from dust.

Model	IX3212-12	
Inputs	Analog	8
	Digital	12
Outputs	Digital	12
	PWM	12
	H-Bridge	6



Specifications

Operating Voltage: 8-32V (IX3212-24) for 12V and 24V systems
Total Current: 70 A maximum continuous
Dimensions: 245 mm (L) x 140 mm (W) x 50 mm (H)
Mass: 0.9 kg (2.0 lb)
Operating Temperature: -40° F to 185° F (-40° C to 85° C)
Storage Temperature: -40° F to 275° F (-40° C to 135° C)
Electrical and EMI/EMC:
2004/108/EC and 2006/95/EC directives
IEC 61000-4-3, -4-6 and -4-8
EN 60945 / CISPR 11
EN 61326-1
Shock: 30 G, 3 cycles
Vibration: 5-25 g, 50-2,000 Hz, 72 hrs per axis
Sealing: IP66 and 67, SAE J1455 4.5.3 (10,300 kPa @ 50° C and 100 mm away for 15 min)

Features

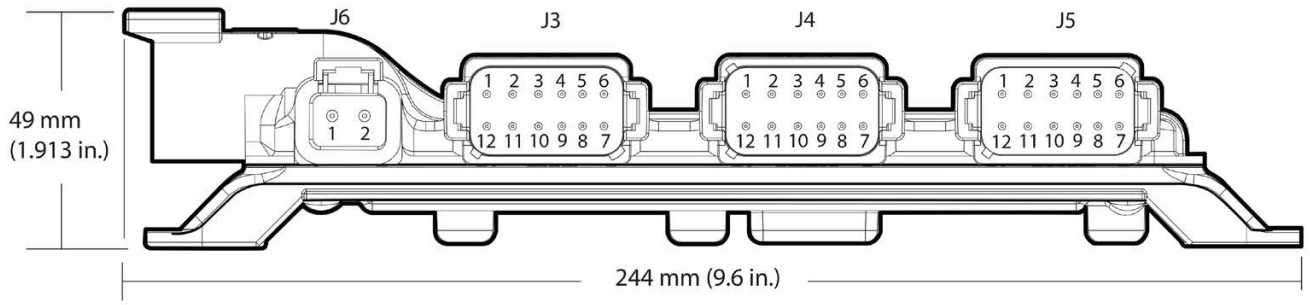
12 Outputs	• (6) 15 A max per channel, 500 Hz • (6) 15 A max, 100 Hz • Channel overload set in 2.5 A increments • High-side, open-loop PWM and directional DC motor control (H-bridge) modes • Off-state leakage current <0.1 mA
20 Inputs	• 12 digital, tri-state, input impedance 7.7 kΩ • 6 analog, 0-5 V, input impedance 100 kΩ pull-down • 2 analog, resistive, input impedance 2.2 kΩ pull-up • 10 bit resolution on all analog inputs
Sensor Supply	5V @ 70 mA
Communications	1 CAN 2.0B, 250 kbps, J1939 proprietary messaging
Mating Connectors	Deutsch DTHD, DT and DTP Series • J1, J2 – DTHD06-1-4S • J3 – DT06-12SA (Gray) • J4 – DT06-12SB (Black) • J5 – DT06-12SC (Green) • J6 – DTP06-2S
Certifications	CE mark

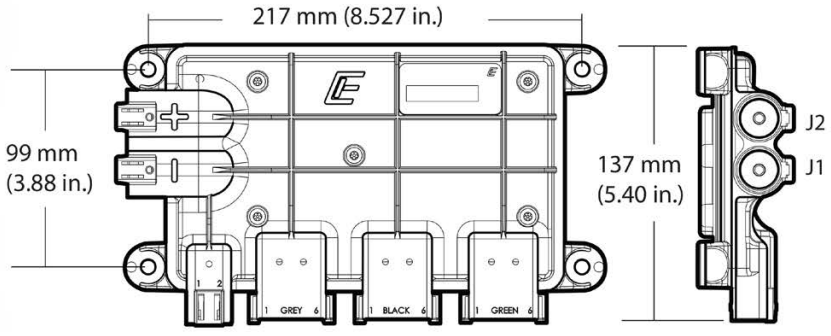
Connectors

Connector J1		
Pin	**Name**	**Function**
1	GND	Ground (-)
Connector J2		
Pin	Name	Function
1	PWR	Power (+)
Connector J3		
Pin	**Name**	**Function**
1	5V_GND	5V Sensor Ground (-)
2	DI12	Digital Input 12
3	DO7/PWM7	Digital Output 7 / PWM 7 (15 A, 100 Hz)
4	DO8/PWM8	Digital Output 8 / PWM 8 (15 A, 100 Hz)
5	DO9/PWM9	Digital Output 9 / PWM 9 (15 A, 100 Hz)
6	DO10/PWM10	Digital Output 10 / PWM 10 (15 A, 100 Hz)
7	AI8	Analog Input 8 (0-5V)
8	AI7	Analog Input 7 (0-5)
9	AI6	Analog Input 6 (0-5V)
10	AI5	Analog Input 5 (0-5)
11	AI4	Analog Input 4 (0-5V)
12	5V_PWR	5V Sensor Power (+)
Connector J6		
Pin	**Name**	**Function**
1	DO12/PWM12	Digital Output 12 / PWM 12 (15 A, 100 Hz)
2	DO11/PWM11	Digital Output 11 / PWM 11 (15 A, 100 Hz)

Connector J4		
Pin	**Name**	**Function**
1	DO1/PWM1	Digital Output 1 / PWM 1 (15A, 500 Hz)
2	DO2/PWM2	Digital Output 2 / PWM 2 (15A, 500 Hz)
3	DO3/PWM3	Digital Output 3 / PWM 3 (15A, 500 Hz)
4	DO4/PWM4	Digital Output 4 / PWM 4 (15A, 500 Hz)
5	DO5/PWM5	Digital Output 5 / PWM 5 (15A, 500 Hz)
6	DO6/PWM6	Digital Output 6 / PWM 6 (15A, 500 Hz)
7	AI3	Analog Input 3 (0-5V)
8	AI2	Analog Input 2 (Resistive)
9	AI1	Analog Input 1 (Resistive)
10	DI11	Digital Input 11
11	DI2	Digital Input 2 (Source Address 1)
12	DI1	Digital Input 1 (Source Address 0)
Connector J5		
Pin	**Name**	**Function**
1	CANLO	CAN – (Green)
2	DI3	Digital Input 3
3	DI4	Digital Input 4
4	DI5	Digital Input 5
5	DI6	Digital Input 6
6	5V_GND	5V Sensor Power (-)
7	5V_PWR	5V Sensor Power (+)
8	DI7	Digital Input 7
9	DI8	Digital Input 8
10	DI9	Digital Input 9
11	DI10	Digital Input 10
12	CANHI	CAN + (Yellow)

Dimensions





How To Order

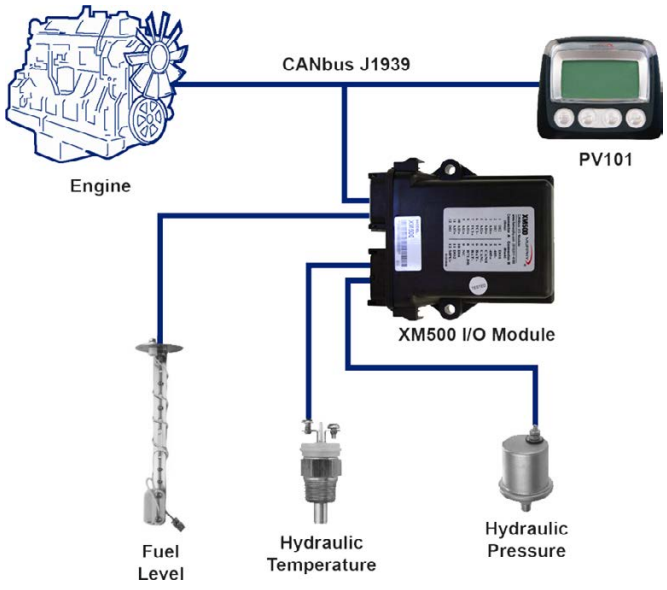
Part Number	Description	Notes
E2443053	IX3212-24, Power Distribution Module	12V or 24V Systems
78001026	Deutsch DTHD, DTP and DT Connector Kit	Plugs, Sockets and Keys

XM500
I/O Module

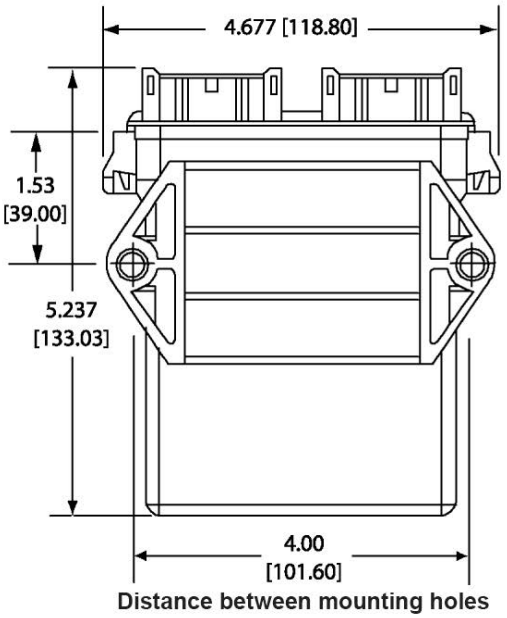
The XM500 Module is a configurable Input/Output (I/O) module designed to bring analog and digital inputs and output onto the SAE J1939 CAN. The XM500 configuration tool provides a user-friendly interface allowing the user to create or change the configuration used on the XM500 module.

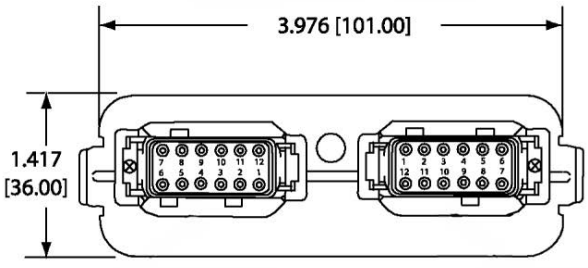
Your application may require monitoring of other information which may not be provided by the OEM engine or transmission electronic control unit (ECU), such as fuel level, hydraulic oil pressure or a low engine coolant level switch. The XM500 is ideally suited to bring the additional information you need onto the J1939 CAN bus and can be configured to broadcast fault codes and activate digital outputs per input condition such as fuel level low, hydraulic oil temperature high, etc. Because the XM500 broadcasts information using the J1939 standard protocol, the information can be displayed using standard J1939 display modules, such as the PowerView® 101.

Diagram



Dimensions and Connections





Specifications

Electrical

Power Input: 8 to 28VDC

Communication Ports: CAN J1939

Operating Temperature: -40° F to 185° F (-40° C to 85° C)

Digital Inputs: 4 - Ground or battery positive activation

Digital Outputs*: 2 Sinking (500 mA)

Product Weight: 10 ounces

Shipping Weight: 12 ounces

Shipping Dimensions: 4" x 6" x 2"

***(Outputs are NOT reverse polarity protected. Damage will occur if B+ is connected to the outputs. Damage incurred from improper installation is not covered under the Murphy limited warranty policy.)

Thermocouple Input[1]: Type K and Type J

Analog Inputs[2]:

1 - Battery Supply Voltage (dedicated)

7 - Configurable as 0-5 VDC, 4-20 mA, resistive senders[3] or used as an additional digital input

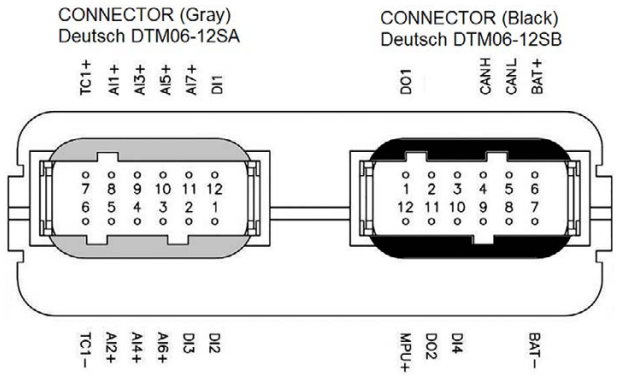
Speed Sensing Input: Magnetic pickup (2 to 120 VAC RMS from 30 to 10,000 Hz)

[1]When the thermocouple input is used, only 5 resistive, 4-20 mA, or 0-5 VDC can be used instead of 7.

[2]Analog inputs can be exchanged for digital inputs (battery ground activation only) for a total of 11 digital inputs.

[3]Other resistive senders can be supported. Contact Murphy's Industrial Panel Division for programming charges.

Connector Pins



Connector A (gray)	
Pin	Description
1	Digital IN 2
2	Digital IN 3
3	Analog 6
4	Analog 4
5	Analog 2
6	J & K Type -
7	J & K Type +
8	Analog 1
9	Analog 3
10	Analog 5
11	Analog 7
12	Digital IN 1

Connector B (black)	
Pin	Description
1	Digital OUT 1
2	
3	
4	CAN high
5	CAN low
6	Battery +
7	Battery -
8	
9	
10	Digital IN 4
11	Digital OUT 2
12	MAG pickup

How To Order

Part Number	Description	Notes
78700420	XM500 Murphy Standard*	Module
78700534	XM500 Configuration Tool	Tool
30000669	6' harness with terminating resistor	Wire Harness
30000685	6' harness without terminating resistor	
30000670	12' harness with terminating resistor	
30000686	12' harness without terminating resistor	

* To determine other configurations, review XM500 Config & Wiring documents.
Refer to www.enovationcontrols.com

CANdrive™

CAN bus J1939 to Electric Gage Interface

As part of the MurphyLink® family, CANdrive offers a cost-effective instrument solution for modern electronic engines. CANdrive modules read engine ECU CAN bus/ J1939 data, drive standard electric panel gages and provide LED indication of status and faults.

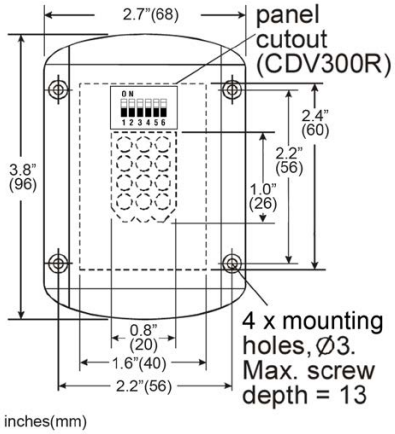
CANdrive has three dedicated outputs for tachometer, oil pressure and coolant temperature gages, with DIP switch selectable compatibility for Murphy, VDO or Datcon gages. For volume orders, the outputs can be custom configured for other gage types, lamps, relays or remote signaling.

CANdrive advantages include:

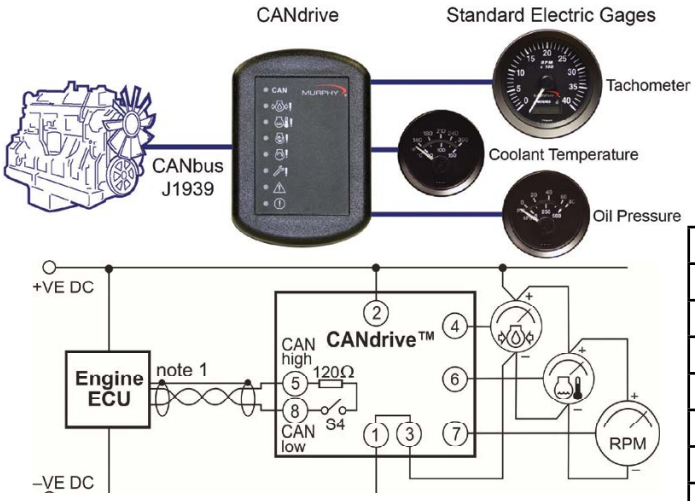
- the retrofitting of existing electric gage panels to new J1939 compatible engines
- the use of standard, economical electric gages with new J1939 engines
- no need for installation of additional gage senders, tachometer magnetic pickups and wiring.

CANdrive is packaged in a compact, surface-mounted case with epoxy encapsulation for maximum durability and environmental sealing. Electrical connection is via a 12-way automotive type connector. Model CDV100F has a forward facing connector and one power/ CAN status LED. Model CDV300R has eight LEDs for indication of J1939-transmitted engine faults and status. All models include a six-way DIP switch for flexible configuration.

Dimensions



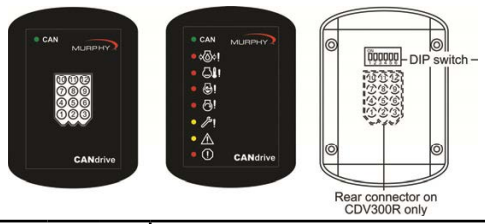
Diagram



NOTE: CAN bus J1939 networks typically have two 120 Ohm terminating resistors (one at each end) with a shield/screen connected to ground/earth at one end only. Check engine and ECU documentation for details.

Models and Configuration

CDV100 Front CDV300 Front



Switch Position					Options
S1	S2	S3	S4	S5	
on	on	on			Murphy EG(S) temp. & pressure gages
off	on	on			Datcon temp. & 0 – 7 bar pressure gages
off	on	off			Datcon temp. & 0 – 10 bar pressure gages
on	off	on			VDO temp. & 0 – 5 bar pressure gages
on	off	off			VDO temp. & 0 – 10 bar pressure gages
			on		CAN 120 Ohm terminating resistor in circuit
			off		CAN 120 Ohm terminating resistor removed
				on	12V DC power supply
				off	24V DC power supply

Specifications

Power Supply
Operating voltage:
12V range (switch S5 on/up): 7 to 16 VDC
24V range (switch S5 off/down): 19 to 30 VDC
Current consumption:
CDV100: 25 mA typ.
CDV300: 50 mA typ. (2 LEDs lit)
Inputs
CAN bus: SAE J1939 protocol. Input has a 120 Ohm terminating resistor, removable by switch S4.
Outputs (all ratings non-reactive)
Oil pressure gage, engine temperature gage:
switch selectable for Murphy, VDO or Datcon gages:
see Gage Compatibility section for pressure/temperature verses equivalent sender resistance tables
Tachometer: pulsed DC, 119 Hz ±1% @ 1500 RPM

Physical
Electromagnetic compatibility: 2004/108/EC
Case material: polycarbonate / polyester / epoxy encapsulation
Overall dimensions (w x h x d):
68 x 92 x 22mm / 2.7 x 3.8 x 0.9 in.
(allow 50mm / 2.0 in. depth with connector)
Weight: approx 80g / 0.2 lb
Temperature:
Operation: –40 to +85°C / –40 to +185°F, 70% RH
Storage: –55 to +105°C / –67 to +221°F
Environmental sealing: IP60
(CDV300R: IP65 from front with optional CDVG gasket)
Vibration: 15g, 10 to 2000 Hz, 3 axes
Shock: 50g, 11 mS, 3 axes

Gage Compatibility

Pressure Gage Compatibility Table: pressure versus approximate equivalent sender resistance (Ohms)																
Pressure	**psi**	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
	bar	0	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7
Murphy ES series		240	205	171	143	123	103	88	74	60	47	33				
Datcon 0 – 7 bar		240	195	160	140	115	100	82	68	55	43	35				
Datcon 0 – 10 bar		240	215	190	168	150	135	118	107	97	87	77	67	58	50	42
VDO 0 – 5 bar		10	38	61	85	110	130	155	180							
VDO 0 –10 bar		15	30	45	60	70	81	92	103	114	125	136	148	160	170	182

Temperature Gage Compatibility Table: temperature versus approximate equivalent sender resistance (Ohms)												
Temperature	**°C**	40	50	60	70	80	90	100	110	120	130	140
	°F	104	122	140	158	176	194	212	230	248	266	284
Murphy ES series		1029	680	460	321	227	164	120	89	74	52	40
Datcon		360		160		80		50		38		
VDO		282.4	190.0	134.0	95.2	69.1	51.2	38.5	29.4	22.7	18.0	14.5

How To Order

Part Number	Description	Notes
79700104	CDV100F, CANdrive™ J1939 to gage interface, 1 x CAN status LED, connector forward	CANdrive
79700105	CDV300R, CANdrive™ J1939 to gage interface, 8 x status/fault LEDs, connector rearward	CANdrive
78000437	CDV-PW-30, 8 way wiring harness, length 30 in./760mm	Accessories
79701003	CDVG, optional sealing gasket for CDV300R	
78700363	CDV100F plus CDV-PW-30 harness	
78700364	CDV300R, CDV-PW-30 and CDVG gasket	
79701001	CANdrive connector plug shell	
79701002	Connector pins for above (pack of 50)	
00020618	CANdrive installation and operation	Documentation
00020251	EG(S)21 series electric gage installation	
00020258	AT series tachometer installation	

ENOVATION CONTROLS

rev. 2018/03/20

Terms and Conditions of Sale

Prices
Prices are stated in U.S. Dollars at User Net (List Price) less applicable discount, or Net if so stated. Verbal quotes are subject to confirmation by a written quotation from authorized personnel of Enovation Controls. Verbal quotations expire. unless an order is accepted the same day they are made. Written quotations automatically expire in 30 days unless otherwise stated in writing. They can be terminated by written notice within that period. Price changes apply to all orders received after the effective date and will be billed at the latest price. Blanket orders with scheduled releases will be billed at the new price on the effective date.

Taxes
All prices, published or quoted do not include applicable local, state or federal taxes. Applicable taxes must be paid by the Purchaser.

Minimum Billing
All orders are subject to a net minimum billing.

Orders
All orders must be bona fide commitments showing stipulated quantities, complete item descriptions and required dates if applicable. We reserve the right to make design changes or improvements without notice.

Penalties and Delays
No penalty clause of any kind will be effective unless approved in writing by an authorized officer of Enovation Controls. The company will not be liable for any delay or damage caused by circumstances beyond Enovation Controls reasonable control, including fire, strike, acts of the Purchaser, insurrection, acts of God, transportation failures, or inability to obtain labor, materials or manufacturing facilities.

Acceptance
No order is binding upon the company until accepted by an authorized official of Enovation Controls.

Cancellation and Alterations
Any order or contract may be canceled or altered by the Purchaser only upon payment of reasonable charges based upon expenses already incurred and commitments made by Enovation Controls for the benefit of the Purchaser.

Damage and Loss
Murphy products are packed in specially designed cartons to protect them from shipping damage. Responsibility for delivery lies in the carrier upon our delivery to him and upon his acceptance of the merchandise. All shipments should be inspected upon receipt at destination for damage, either visible or concealed. Claims for loss or damage should be filed with the carrier immediately. Enovation Controls will assist in so far as is practical in securing satisfactory adjustment of claims. However, all claims for loss and damage must be made by the Purchaser to the carrier.

Shortages
Shortages in shipment must be reported within 15 days of material receipt or of invoice date and must be accompanied by the packing list. We reserve the right to back order any item unless you request that shipment be made in full, in which case we will schedule the complete shipment at the earliest date possible.

Terms of Payment and Reservation of Title
Terms are **NET 30 days** from date of invoice with approved credit. Enovation Controls reserves the right to require full or partial payment in advance of shipment where the financial condition of the Purchaser does not justify continuance of production or shipment on the terms of payment specified. Orders from Purchasers with unapproved credit ratings may be shipped C.O.D. with reservation of title in Enovation Controls until purchase price shall be paid in full. Export terms will be quoted. All prices are F.O.B. our plant, Tulsa, Oklahoma.

Return of Equipment
Material may be returned for credit only upon prior approval of authorized Enovation Controls representative. Accepted items require a Return Authorization Number, must be returned all charges paid and be sufficiently packed to prevent damage during shipment. Items must be new and unused and must have been purchased in the past six months. You must cite your purchase order number and our invoice or order number. Items must be returned through the same channels as purchased. A 15 percent minimum re-stocking charge will be made against all returns of Standard (Make-to-Stock) items. A higher re-stocking charge will apply to all Non-Standard (Assemble-to-Order) items. Custom (Make-to-Order) or special purchase items are not returnable. Credit will apply to future purchases and is not refundable.

Repairs
Repair services are available for selected products. Customers will be advised of applicable evaluation fees and estimated repair charges prior to the return. Items returned for repair require a Return Authorization Number and must be returned all charges paid.

Warranty
All Enovation Controls manufactured products are warranted against defects in materials and workmanship. The Warranty statement is available upon request or is available on our website at www.enovationcontrols.com/warranty. Repairs beyond the new product warranty carry a 90-day repair warranty.

Possession of a Murphy catalog and/or price list does not imply the right to purchase as an authorized Murphy dealer.

Enovation Controls Limited Warranty

Enovation Controls supplied products are warranted to be of good quality materials and workmanship. As with any monitoring or control system, the purchase, installation and use of Murphy control instruments and other Murphy systems is NOT AN INSURANCE POLICY. You have purchased dependable instrumentation and with normal care, it will provide long and faithful service and enhance the preventive maintenance program on your valuable equipment.

Limited Warranty

Enovation Controls Manufactured Products.
Enovation Controls warrants all Enovation Controls products that it determines to be defective in materials and/or workmanship, under normal use, for a period of **TWO** years from date of manufacture unless otherwise stated.

During the warranty period, at its sole option, Enovation Controls will use reasonable efforts to repair or replace any defective product; provided, however, that the customer has returned the defective product to Enovation Controls, shipping costs prepaid. Any repair or replacement, at Enovation Controls' option, shall be the customer's sole and exclusive remedy. We are not responsible for damage caused by improper installation, neglect or abuse and are limited under warranty to repairing or replacing the item only. We are not liable for equipment on which this product is installed.

Warranty Disclaimer

ENOVATION CONTROLS SHALL HAVE NO LIABILITY FOR, AND EXPRESSLY DISCLAIMS ANY WARRANTY OR AFFIRMATION OF FACT, EXPRESS OR IMPLIED, OTHER THAN AS SET FORTH IN THIS WARRANTY STATEMENT, INCLUDING, WITHOUT LIMITATION (1) THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE; (2) ANY WARRANTY OR AFFIRMATION OF FACT RELATED TO MISUSE, IMPROPER SELECTION, RECOMMENDATION, OR MISAPPLICATION OF ANY PRODUCT; AND (3) ANY WARRANTY OR AFFIRMATION OF FACT THAT THE CATALOGS, LITERATURE AND WEBSITES IT PROVIDES ACCURATELY ILLUSTRATE AND DESCRIBE PRODUCTS.

Product Return

Before returning any product customer believes is defective, customer must provide to Enovation Controls details of the warranty claim situation, a complete description of the product, details from the Model Number label attached to each product, including Model Number, part number and date code and obtain from Enovation Controls a Warranty/Return Authorization Number (RMA Number).

Any claim for shortage or damage to shipment must be accompanied by the packing slip within 15 days of receipt or invoice date, whichever is later. Damages in shipment are the responsibility of the carrier, and customer must make claim directly with the carrier.

Limitation of Liability

ANY LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL EXEMPLARY OR PUNITIVE DAMAGES IS EXPRESSLY DISCLAIMED. ENOVATION CONTROLS' LIABILITY IN ALL EVENTS SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCT THAT GIVES RISE TO ANY LIABILITY. ENOVATION CONTROLS' REPAIR, REPLACEMENT OR PAYMENT OF SUCH AMOUNT SHALL BE THE FINAL AND EXCLUSIVE REMEDY IN THE EXHAUSTION OR UNAVAILABILITY OF ANY OTHER REMEDY SPECIFIED HEREIN AND SHALL NOT BE CONSTRUED OR ALLEGED BY CUSTOMER TO HAVE FAILED OF ITS ESSENTIAL PURPOSE. THE LIABILITY OF THE COMPANY SHALL CEASE WITH THE EXPIRATION OF THE WARRANTY PERIOD MENTIONED ABOVE.

Warranty

Important Notice Regarding Product Repairs and Warranty Claims

In order to provide you with the best service possible and to expedite all product repairs and warranty claims, we are changing the processes required to complete the repair or warranty claim. This will require certain actions and information on your part. Partial details follow. For complete details please contact your product Inside Sales Representative.

RMA Number
A Warranty/Repair Return Authorization Number (RMA#) will be required prior to all product returns. This number will allow both of us to track the product and to expedite processing of your request. Simply contact our Inside Sales team to request this number. They will ask certain questions that will identify your exact request so that we can fully comply. They will also advise you of certain procedural changes or conditions that may apply to your request, as outlined below.

Complaint/Request Details
Warranty claims require a detailed explanation of the problem or complaint so that we can directly address your concerns. A large percentage of times we are unable to find a problem with the product because we don't know the details of your complaint, and we thus don't know what to look for. We evaluate the product against our specifications, but that may not address your complaint. This explanation will be required for Warranty requests in order to receive the return authorization (RMA#). This explanation is also recommended for repairs but is not required. See below for Repairs.

Evaluation Fee
The Evaluation Fee to cover certain costs associated with diagnosing product problems (or suspected problems). When you request the RMA#, your product Sales Representative will advise you of this charge and when it applies. For example, if our evaluation does not support a Warranty Claim, the customer will be asked to pay the fee. However, the fee can be applied to the cost of repair or against the purchase of a new unit. Likewise, the fee can be applied to the cost associated with a nonwarranty repair. If our evaluation supports the Warranty Claim, the fee will be waived. Also see Repairs below.

Warranty Claim
- Contact Enovation Controls to receive RMA#
- Provide detailed explanation of the problem and why warranty is claimed. Immediate replacement prior to our evaluation will require that the customer purchase a new unit. If the warranty claim is validated, a credit will be issued against the new unit purchased. A customer purchase order is required prior to replacement.
- Evaluation fee may apply. If applicable, the fee may be applied to repairing the unit or to the purchase of a new unit.

Repairs (Non-Warranty)
- Contact Enovation Controls to receive RMA#
- Some products may no longer be accepted for repair or because of its design cannot be repaired. Others are uneconomical to repair. In some cases, repair parts are available for the customer to make the repair. Your product Sales Representative will advise details when the RMA# is requested.
- Provide detailed explanation of the problem.
- An estimated repair charge is available for those products that can be repaired. When an exact cost is required prior to the actual repair, an evaluation fee will apply. The fee may be applied toward the final repair cost. A purchase order is required for either the estimated repair charge or the evaluation fee.
- If the actual cost to repair is greater than 65 percent of the customer's cost to purchase a new product, we will advise. The customer may then proceed with the repair, purchase a new product, scrap the unit or have it returned as is (at customer's expense). If the unit is scrapped or returned, an evaluation fee will apply.

NOTE: The evaluation fee is $45 net (no discount).

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