



Model **4000** Pressure Controllers



Figure 1 Model 4000 Pressure Controller
Patent Pending

The Dyna-Flo 4000 Series pneumatic pressure controllers are used in all kinds of demanding applications, including oil and gas production and chemical process industries.

Pressure controllers are the "brains" of a self contained, local pneumatic control loop.

The pressure controller (Figure 1) detects the process pressure using a Bourdon tube sensing element. The process pressure is then compared to an operator-adjusted set point, which in turn modulates the controller output. The controller's pneumatic output is connected to a final control device, typically a control valve, that changes the process pressure.

The Dyna-Flo 4000 Series pneumatic pressure controllers are manufactured to a high level of quality specifications to ensure superior performance and customer satisfaction.

Features

Multiple Configurations

The 4000 series pressure controller can be configured into either proportional only or proportional plus reset mode with a minimum of parts.

Rugged Design

Die cast aluminum case and cover can withstand impacts that would fracture plastic cases.

Corrosion Resistant Construction

The standard powder coated casting, stainless steel external fasteners, and standard stainless tubing ensure long and reliable operation.

Flexible Action

Control action is field reversible between direct acting and reverse acting without additional parts.

Instrument Gas Tight Case

A standard feature for controlled venting when using natural gas as power gas.

Wide Range of Pressure Elements

Bourdon tube ranges from a minimum of 30 psig (200 kpag) to a maximum 5000 psig (34,400 kpag). Contact factory for bellow ranges.

Bourdon Tube Materials

Bourdon tube materials are 316 SST for standard application and K-Monel for NACE process applications.

Sour Instrument Gas Capability

Stainless steel gauges, relay, tubing and bellows are available for applications using sour instrument gases.



Model 4000 Pressure Controllers

Specifications

Models

- Model 4000 - Proportional Only Controller
- Model 4010 - Proportional-Plus-Reset Controller
- Model 4020 - Bellows Sensing
- Model 4030 - Differential Gap Controller

Performance

- Repeatability: 0.5% of sensing element range
- Deadband: 0.1% of output span
- Differential Gap: 15-100% of sensing element range

Reset Adjustment

For Proportional-plus-reset controller:
Adjust from 0.01 to 74 minutes per repeat
(100 to 0.01 repeats per minute).

Approximate Weight

12 pounds (5.5 kg)

Ambient Operating Temperature Limits

-40° to 160° F (-40° to 71° C)

Input Signal

Limits: See Table 1

Output Signal Range

- 3-15 psig (20 to 100 kPag)
- 6-30 psig (40 to 200 kPag)

Pressure Connections

All pressure connections on 4000 Series controllers are 1/4-inch NPT female. Use 1/4-inch (6mm) or 3/8-inch (10mm) pipe or tubing for supply, and output. Vent lines should increase 1 pipe size every 10 feet, or, be kept as short as possible.

Steady-State Air Consumption

See Table 2

Supply Pressure Requirements

See Table 2

Controller Action

Control action is field reversible between direct acting (increasing sensed pressure produces increasing output signal), and reverse acting (increasing sensed pressure produces decreasing output signal) without additional parts.

Dimensions

See Figure 5

Mounting Information

Mounting Kits are available for actuator yoke, actuator casing, panel mount, wall mount and 2" pipe stand mounting. See Figure 5 and 6.

Table 1

	Pressure Ranges		Maximum Allowable Static Pressure Limit		Materials
	psig	kPag	psig	kPag	
Bourdon Tube Pressure and Materials	0 to 30	0 to 200	30	200	
	0 to 60	0 to 400	60	400	316 Stainless Steel
	0 to 100	0 to 700	100	700	
Bellow Sensing Contact Factory For Ranges	0 to 200	0 to 1400	200	1400	
	0 to 300	0 to 2000	300	2000	* Available in K-Monel
	0 to 600*	0 to 4000*	600	4000	(Other materials and
	0 to 1000*	0 to 7000*	1000	7000	Ranges - Special Order)
	0 to 1500*	0 to 10000*	1500	10000	
	0 to 3000	0 to 20000	3000	20000	
	0 to 5000	0 to 35000	5000	30000	



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Table 2

Model 4000 Supply Pressure Requirements

Output Signal Range Throttling (On/Off) Applications	Normal Operating Supply Pressure (1)	Maximum Allowable Supply Pressure to Prevent Internal Part Damage	Steady-State Air Consumption		
			SCFH Minimum (2)	SCFH Maximum (3)	
psig	3-15 (0-20)	20	40	4.20	27
	6-30 (0-35)	35	40	7.00	42
kPag	20-100 (0-100)	140	280	0.11	0.72
	40-200 (0-200)	240	280	0.19	1.10

1. Control may be degraded if this pressure is exceeded.
2. Proportional band setting of 0 or 10.
3. Proportional band setting of 5.

Operating Principles

The Model 4000 Series pressure controller operation is based on the pressure-balanced relay with its bridged double diaphragm assembly. In the relay, the supply pressure bleeds through the fixed orifice before passing through the nozzle, to register on the large relay diaphragm, and controller output pressure on the small relay diaphragm.

With steady state process pressure, the Bourdon tube is held steady in relation to the nozzle, allowing pressure to be released between the nozzle and beam-flapper assembly at the same rate released through the fixed orifice.

A process pressure change either expands or contracts the arc of the Bourdon tube, thereby moving the beam-flapper assembly with respect to the nozzle.

An increasing process pressure with direct action produces a nozzle to flapper restriction that increases the pressure on the large relay diaphragm, causing the relay valve to close at the exhaust end and to open at the supply end. The additional supply pressure passes through the relay housing to increase the output signal (loading pressure to the final control device).

In the opposite case of a falling process pressure with direct action creates a larger nozzle flapper gap that releases pressure from the large relay diaphragm, causing the relay valve inlet to close, thereby opening the exhaust, and

reducing the output signal (loading pressure to the control device).

Proportional-Only Controllers - Model 4000

The controller output signal is fed back to the proportional bellows, off setting the in the nozzle pressure change and balancing the pressure differential across the relay diaphragm. The relay valve establishes the new output signal (loading pressure to the final control device) based on the change in the controller set pressure.

When the proportional valve is at the maximum dial setting (wide open), all the controller output pressure change is fed back to the proportional bellows, for a proportional band of 100%. As the proportional valve is closed, more controller output pressure change passes back through the proportional valve exhaust, reducing the feed back to the proportional valve exhaust, and thereby reducing the proportional band.

See Figure 3 for Proportional-only controller adjustment locations.

Proportional-Plus-Reset Controllers - Model 4010

The 4010 Series controllers have a two-way reset restriction valve that controls (delays) the speed of the proportional pressure flow into the reset bellows (which oppose the proportional bellows action). The reset valve can be adjusted to vary the delay (reset) time.

See Figure 4 for Proportional-plus-reset controller adjustment locations.



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Operating Principles

Differential-Gap Controller - Model 4030

On/off action is obtained by connecting the proportional bellows so that feedback pressure forces the beam and flapper in the same direction as caused by the sensed pressure.

A decreasing process pressure with direct action (reverse action - increasing pressure) produces a nozzle to flapper restriction that reduces pressure on the large relay diaphragm. The relay valve inlet will then close and the exhaust port will open, therefore removing the output signal from the final control device.

The summing of feedback bellows movement, and the beam-flapper assembly movement, drives the relay valve either to available supply pressure or to complete exhaust, with no throttling action.

Pressure Definitions

Deadband

The amount which the measured input can change without causing a change in output signal.

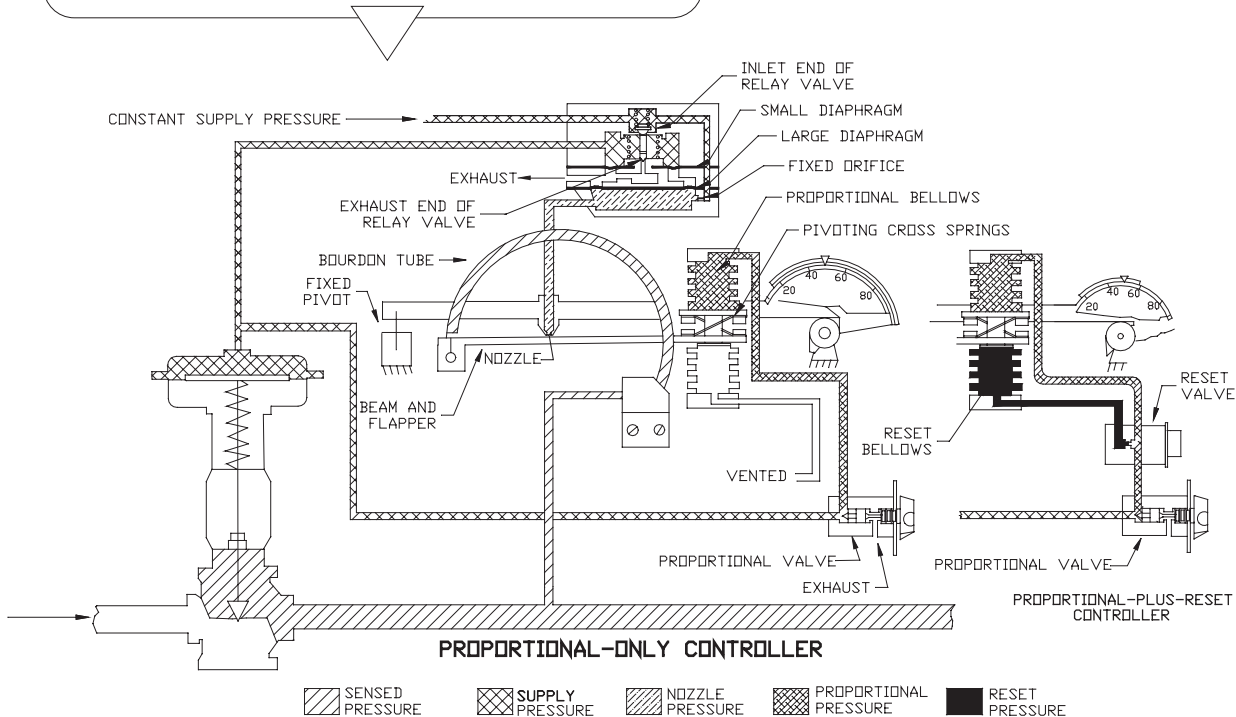
Repeatability

The ability of an instrument to reproduce an output signal when a set input signal is applied repeatedly.

Differential Gap

A form of on/off control where the difference between the switch points is adjustable.

Figure 2 Operational Schematic for Pressure Control Application



Direct-Acting Proportional-Only & Proportional-Plus-Reset Controllers



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Figure 3 Proportional Only Controller

Figure 4 Proportional With Reset Controller

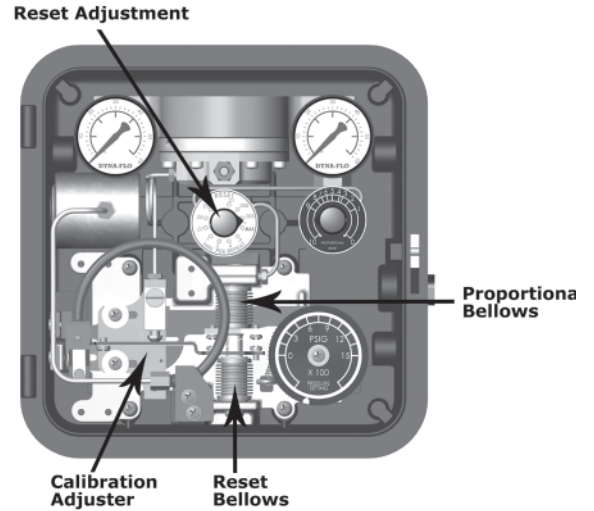
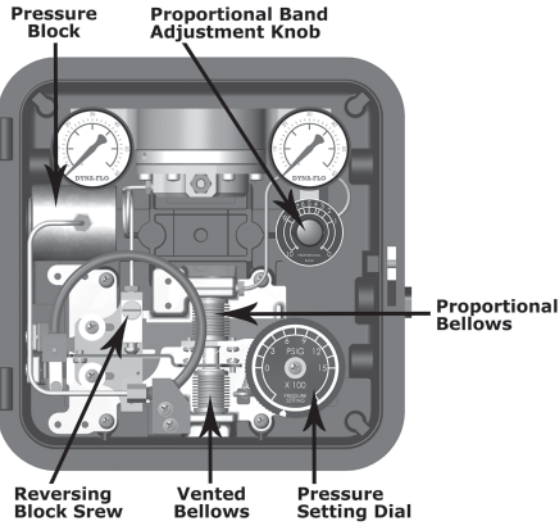


Table 3

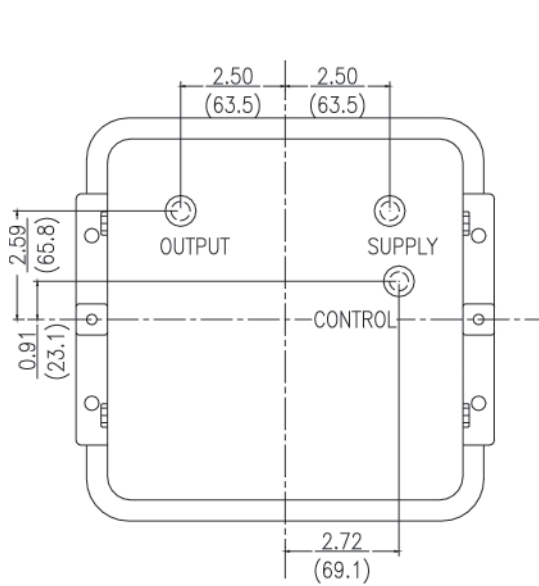
Model 4000 Construction Materials

Contact	Part	Standard Material	Optional Material
With Process	Bourdon tube	Stainless steel	K-Monel
	Pressure block	Forged steel	Stainless Steel
	Control tubing	Stainless steel	-
With Operating Medium (at pressure)	All other interior tubing	Stainless steel	-
	Nozzle and reversing block	Stainless steel/Aluminum	Stainless steel/Aluminum
	Relay springs and spring plate	Steel	Steel
	Relay diaphragms	Neoprene/Nylon	Neoprene/Nylon
	Other metal relay parts	Zinc/Aluminum/Stainless steel	Zinc/Aluminum/Stainless steel
	Proportional, reset bellows	Brass	Stainless steel
	Proportional valve assembly	Aluminum/Stainless steel	Aluminum/Stainless steel
	O-rings	Nitrile	Nitrile
	Gaskets	Neoprene	Neoprene
	Reset valve assembly	Aluminum/Stainless steel	Aluminum/Stainless steel
With Operating Medium (at atmospheric pressure)	Case and adjustment dial	Powder Coated Aluminum	Powder Coated Aluminum
	Cover	Powder Coated	Powder Coated
	Flapper	Stainless steel	Stainless steel
	Control link	Stainless steel	Stainless steel
	Flexure and pressure setting adjustment assemblies	Aluminum/Steel/Stainless steel/Plastic	Aluminum/Steel/Stainless steel/Plastic
	O-rings	Nitrile	Nitrile
	Calibration adjuster and proportional adjustment assembly	Aluminum	Aluminum

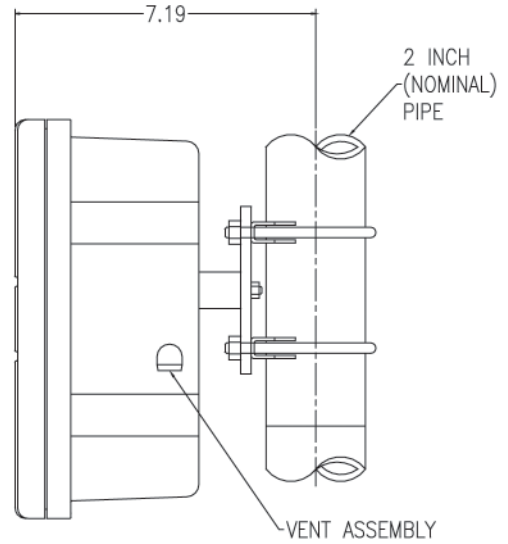


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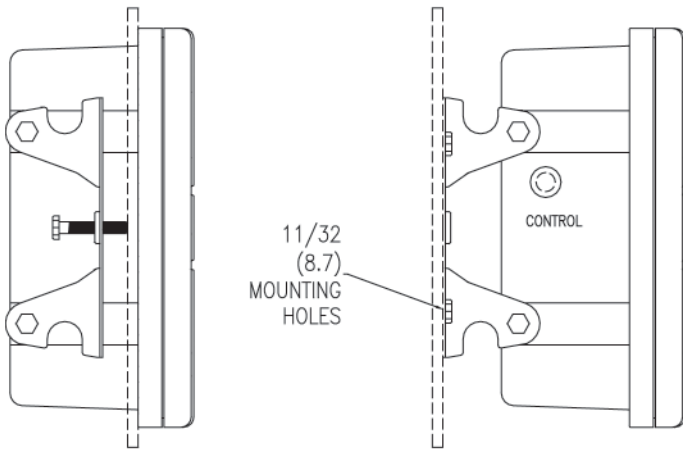
Figure 5 Dimensions, and Panel, Wall, and Pipestand Mounting



Pipestand Mounting

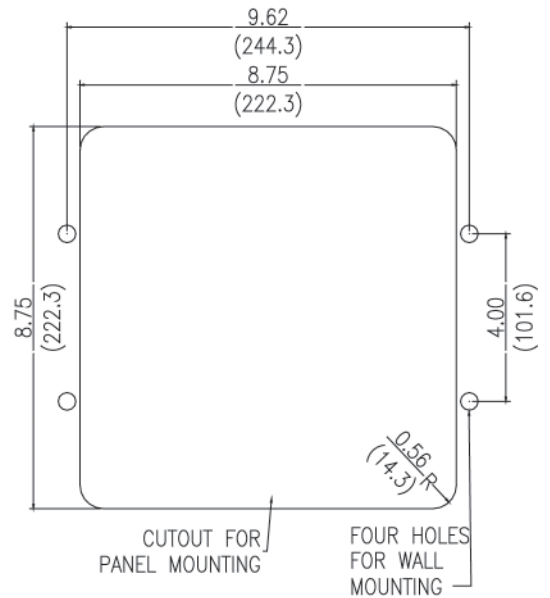


Back View



Panel Mounting

Wall Mounting



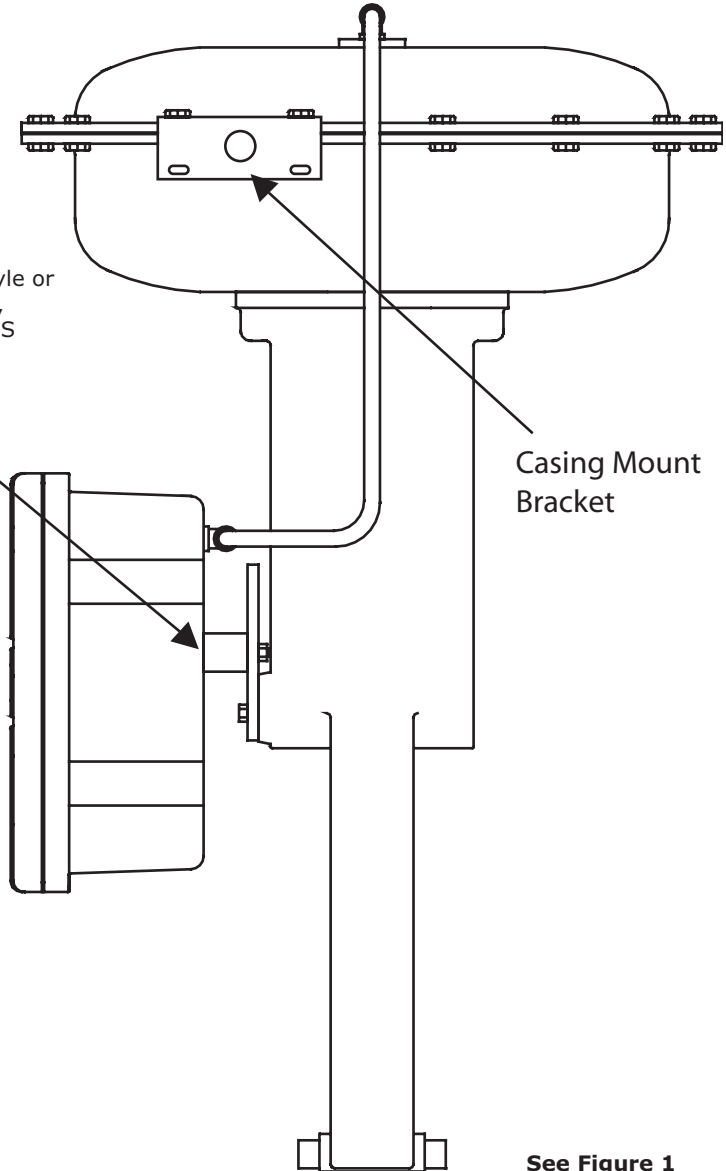
INCH
(mm)



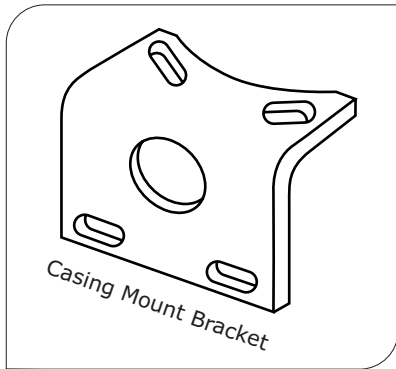
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Figure 6
Actuator Mounting

NOTE
When using yoke style or
pipestand mounting,
DON'T PUNCH HOLES
in back of case.
Use drill (5/16 bit).



Casing Mount
Bracket



Casing Mount Bracket

See Figure 1
for a front view

Our Commitment of Quality

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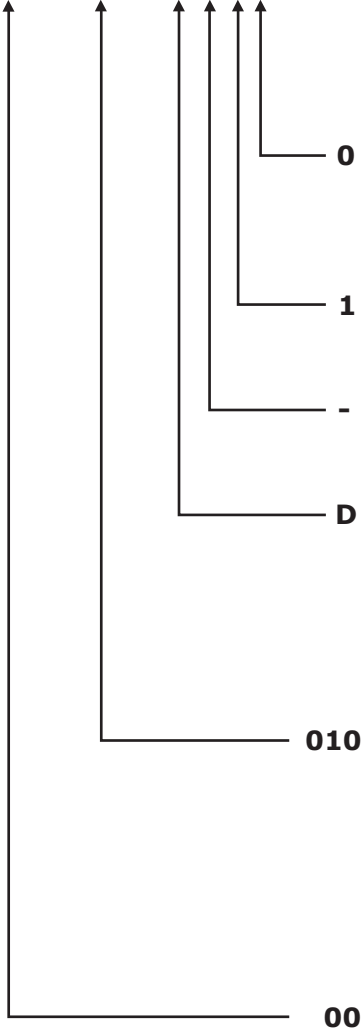
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Ordering Guide

Dyna-Flo 4000 Pressure Controller | Model Numbering System

Sample Part Number

4000-010-D-10



Code	Description
Options	
0	None
1	NACE Process Only
2	Sour Instrument Only
3	NACE Process and Sour Instrument
X	Special
Controller Output	
1	3 to 15 psig (20 to 100 kPag) / 0 to 20 psig (0 to 100 kPag)
2	6 to 30 psig (40 to 200 kPag) / 0 to 30 psig (0 to 200 kPag)
Options	
-	None (standard)
S	Bourdon Tube Stop
Controller Action	
D	Direct
R	Reverse
Input Signal Range	
003	0 to 30 Psig (200 kPag)
006	0 to 60 Psig (400 kPag)
010	0 to 100 Psig (700 kPag)
020	0 to 200 Psig (1400 kPag)
030	0 to 300 Psig (2000 kPag)
060	0 to 600 Psig (4100 kPag)
100	0 to 1000 Psig (6900 kPag)
150	0 to 1500 Psig (10500 kPag)
300	0 to 3000 Psig (20600 kPag)
500	0 to 5000 Psig (34400 kPag)
Note: consult factory for higher input signal ranges	
Controller Mode	
00	Proportional
10	Proportional + Reset
20	Bellows Sensing
30	Differential Gap

NOTE: order mounting kits separately