

# Flo-Tech™ ITB

## Integrated Throttle Body and Actuator

### Applications

The Flo-Tech™ ITB integrated throttle body and actuator is designed with flow shaping to assist in engine idle stability. The throttle body will provide equivalent maximum flow rates of standard butterfly throttle bodies of the same diameter. The system contains a return spring to fully comply with DOT 571.124 specifications.

Determination of the proper size requires a knowledge of the absolute pressure drops across the valve, the expected temperature of the gaseous media flowing, and the density of the gas. Cv (volume coefficients) are provided to determine the flow vs. angle. For initial testing a valve body diameter similar to the one typically used on the application can be used.

The Flo-Tech ITB is designed for direct replacement of manual throttle bodies. It requires no actuator or linkage.

### Description

The Flo-Tech family of electrically actuated throttles/valves controls flow. The flow is a function of throttle position and pressure drop. The throttle position is proportional to the position command signal.

The Flo-Tech ITB can be made with 33, 48, 60, 68, and 75 mm bore sizes for various applications. Command input options come in PWM, 0–5 Vdc, 4–20 mA, and 0–200 mA. Position feedback output signal will vary from  $0.5 \pm 0.1$  volts to  $4.5 \pm 0.1$  volts nominal at the min and max actuator position respectively. The PWM command input version will return to minimum actuator position with a command of greater than 95% duty cycle.

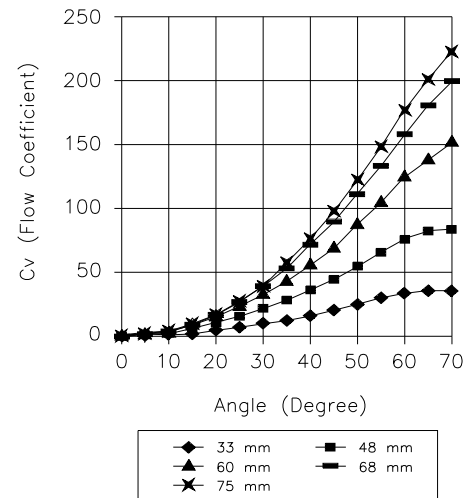
The Flo-Tech actuator requires a power supply of 9–32 Vdc. The supply must be capable of supplying a sustained 25 watts at steady-state and 50 watts for transient state conditions for at least 0.25 second.



- No linkage or couplings
- Cost-effective and highly efficient
- Extremely low maintenance product
- Small size for easy installation
- Conveniently integrated electronics
- Includes return spring to fully comply with DOT 571.124 specs
- Versatile 12 or 24 Vdc operation

## Installation

The Flo-Tech ITB integrated throttle body and actuator may be mounted in any position. Both mounting flanges on the throttle body have four 10 mm through-holes in a square, 74 mm pattern. The base of the unit has an optional bolt pattern that can be used for mounting support. It uses 4 – M8x0.125 bolts in an 88.9 mm square pattern. The connector to the Flo-Tech actuator is a Packard Electric male connector. The mating connector is a Packard female connector (Woodward p/n 8923-461) with seals and pins. Different connectors are available but not standard. Please contact the factory if you would like to use a different connector.

041-274  
98-10-26 skw

**Cv for Standard Flo-Tech Units**

## Determining Proper Valve Size

Proper valve size can be determined by using the following equation:

$$Cv = Q * .00978 * (G * T / ((P1-P2) * K)) ^{0.5}$$

Where:

Q = Flow (PPH)

G = Specific gravity of fluid (= 1.0 for air)

T = Absolute temperature (460 + °F)

P1 = Inlet pressure (psia)

P2 = Discharge pressure (psia)

K = P2 if P1-P2 is less than 10% of P1

= P1 if P1-P2 is 25% or more of P1

= (P1+P2)/2 if P1-P2 is in between 10 and 25%

P2 must be Greater than .53 \* P1 (or flow becomes choked)

Cv (flow coefficient) should be calculated for the minimum and maximum flows expected (at 50°) on the application.

Angle	Cv (Flow Coefficient)				
	33 mm	48 mm	60 mm	68 mm	75 mm
0	0.689	1.36	1.81	2.44	1.41
5	0.787	1.81	2.57	3.04	3.37
10	1.30	3.34	4.65	4.83	2.71
15	2.70	6.64	9.39	10.4	8.28
20	4.63	10.8	15.9	18.3	16.9
25	6.86	16.0	24.0	28.1	28.3
30	9.58	21.8	33.1	39.7	41.8
35	12.7	28.5	43.7	53.4	57.8
40	16.3	36.2	55.9	70.0	76.2
45	20.4	45.0	70.4	88.0	97.3
50	24.9	54.8	86.8	109	120
55	30.1	65.9	105	133	147
60	33.8	75.6	125	157	174
65	35.9	81.6	138	179	200
70	36.1	82.9	151	197	220

## Command vs. Position Feedback/Throttle Position

The actuator is designed to provide 0.5 volts output at zero position, and 4.5 volts at full position. Feedback signals of 0 or 5 Vdc indicate faults.

The PWM input signal greater than 95% causes the output to go to zero position. Thus, if the PWM fails to 5 Vdc, the unit fails in a safe direction.

Temperature drift from 25 °C to 105 °C or from 25 °C to -40 °C causes the internal sensor to shift calibration. The effect of this is that the output position does not start to move until 0.8 Vdc and gets to the full position at 4.2 Vdc at -40 and 105 °C. The output position signal will still track the command signal. This means that although the OEM cannot use this signal for true position, the OEM can still use this signal to verify that the Flo-Tech unit is responding to the command signal.

## Specifications

<b>Weight</b>	6 kg (13.2 lb)
<b>Operating Temperature</b>	-40 to +105 °C (-40 to +221 °F) Housing Temperature
<b>Storage Temperature</b>	-55 to +105 °C (-67 to +221 °F)

### VIBRATION

<b>Sine Sweep</b>	MS 810C, M514.2 Curve J (Mod)
<b>Random</b>	MS 202F, Method 214A, Cond. G
<b>Temperature and Humidity</b>	SAE J1455

### INPUTS

<b>Power Supply</b>	9 to 32 Vdc (12/24 Vdc nominal) 10 A fuse in series with the input power Must be able to supply 50 W for 0.25 second in transient conditions and 25 W continuous for steady state conditions.
<b>Position Command</b>	Using the max Cv number, and the chart below, select the Flo-Tech unit which most closely matches at 50° angle. Verify that the minimum required Cv is above the Flo-Tech unit's Cv ensuring the engine will reach idle when the Flo-Tech unit closes.
<b>Technical Manual</b>	04141

Input Command	Input Range	Input Impedance	Other Comments
<b>PWM</b>	10–90%	117.4 kΩ	PWM Frequency 500–2000 Hz Amplitude 4–32 Vdc 10 bit resolution
<b>0–5 Vdc</b>	0.5–4.5 Vdc	152.7 kΩ	
<b>4–20 mA</b>	5–19 mA	249 Ω	
<b>0–200 mA</b>	20–180 mA	35.7 Ω	

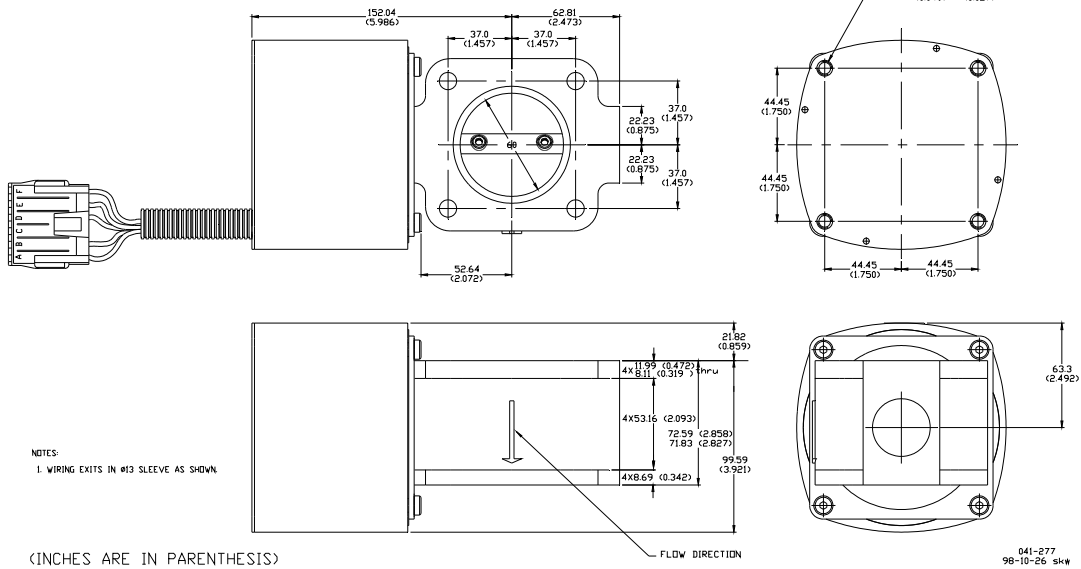
### OUTPUTS

Input Command	Input Range	Position Feedback Output 23 °C	Position Feedback Output -40 & 105 °C	Nominal Actuator Range
<b>PWM</b>	10–90%	0.5–4.5 ± 0.1 Vdc	0.8–4.2 ± 0.2 Vdc	0–70°
<b>0–5 Vdc</b>	0.5–4.5 Vdc	0.5–4.5 ± 0.1 Vdc	0.8–4.2 ± 0.2 Vdc	0–70°
<b>4–20 mA</b>	5–19 mA	0.5–4.5 ± 0.1 Vdc	0.8–4.2 ± 0.2 Vdc	0–70°
<b>0–200 mA</b>	20–180 mA	0.5–4.5 ± 0.1 Vdc	0.8–4.2 ± 0.2 Vdc	0–70°

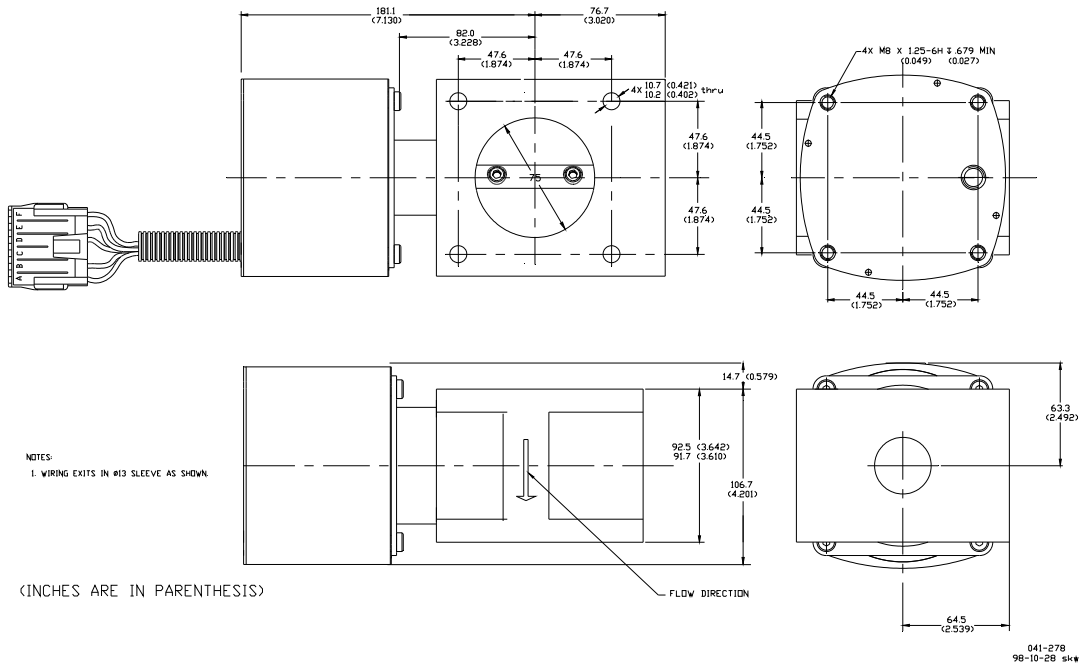
### PART NUMBERS

Valve Size (mm)	Input	Part Number
33	PWM	8235-132
33	4-20 mA	8235-163
48	PWM	8235-142
48	4-20 mA	8235-158
48	0-200 mA	8235-167
60	PWM	8235-160
60	0-5 Vdc	8235-157
60	4-20 mA	8235-143

Valve Size (mm)	Input	Part Number
68	PWM	8235-154
68	0-5 Vdc	8235-151
68	4-20 mA	8235-259
68	0-200 mA	8235-152
75	PWM	8235-140



**Outline for Flo-Tech 33, 48, 60, and 68 mm Bores**  
(Do not use for construction)



**Outline for Flo-Tech 75 mm Bore**  
(Do not use for construction)



**CAUTION**—Flo-Tech throttle body does not completely shut off. A separate shutdown is required.



PO Box 1519, Fort Collins CO, USA 80522-1519  
1000 East Drake Road, Fort Collins CO 80525  
Tel.: +1 (970) 482-5811 ♦ Fax: +1 (970) 498-3058  
[www.woodward.com](http://www.woodward.com)

**Distributors & Service**

Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

This document is distributed for informational purposes only. It is not to be construed as creating or becoming part of any Woodward contractual or warranty obligation unless expressly stated in a written sales contract.

Copyright © Woodward 1998–2001, All Rights Reserved

For more information contact:

