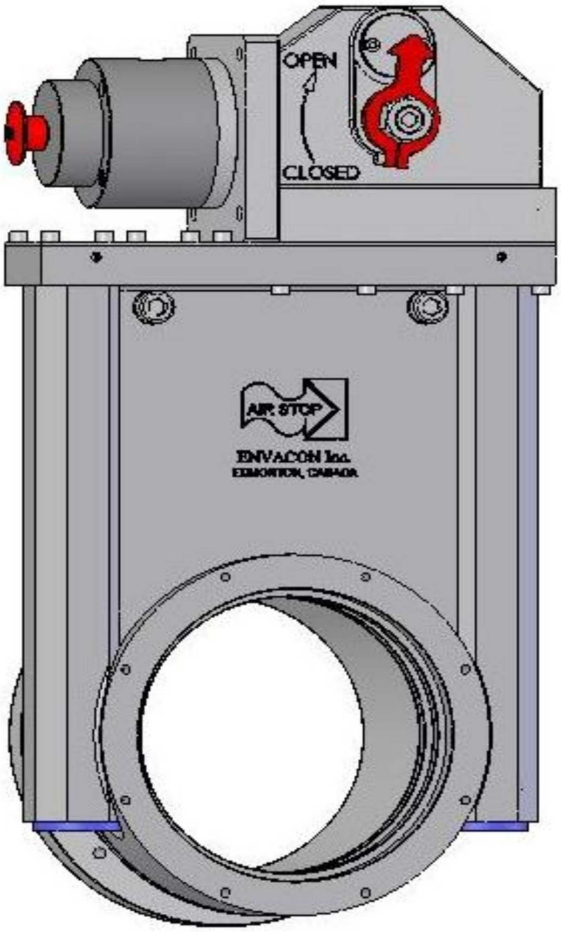
ENVACON Inc.

Engine Valve and Control Technologies

POSITIVE ENGINE AIR-INTAKE SHUT-OFF VALVES



End User, Engine Packagers and OEM Applications

AIR STOP engine air intake shut-off valves enable control over the operation of internal combustion engines. Installed in the air inlet line, they are used as basic mechanical engine shut downs, or as a safety device for protection against catastrophic diesel engine over-speed resulting from an inhaled hydrocarbon gas (gas leak) from the surrounding atmosphere.

ISO 9001:2000

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Application

Why are engine shut-off (shut-down) valves used?

The main reason for installing an engine shut-off valve is to ensure that there is a means of stopping the engine in the event of an over-speed due to an inhaled combustible gas or fumes from the surrounding atmosphere (examples: natural gas or propane leak, fumes venting from a tank that has or had hydrocarbons in it, or fumes from spill on the ground etc). In the event of such an over-speed, shutting off the engine electronics and / or the ignition system will not stop the engine because it can continue to run, and over-speed, due to compression ignition of the combustible gas in the engine cylinders. Without an engine shut-off, an uncontrolled engine can result in a catastrophic failure and / or the ignition of the surrounding combustible gas or fumes. Eliminating the engine air supply and / or the combustible gas supply are the most practical means of stopping such an over-speeding engine, and an installed air intake shut-off valve is the fastest and most cost effective device for doing so.

Where is the best location to mount the shut-off valve on the engine?

In a general sense, the best place to install a shut-off valve is as close to the air intake manifold (as close to the engine cylinders) as possible. This minimizes the chance of air leaks, or alternate air entry routes into the airline between the valve and the cylinders. However, the actual shut-off installation location is typically dependant on the physical space available in the air line and on engine accessories mounted nearby. In such a case the the shut-off valve may have to be mounted further upstream in the engine air-line, however except for customer specified installations, the install location is usually defined by ENVACON when a specific installation kit is designed.

Do not hesitate to contact ENVACON to discuss the valve installation location for a specific engine application.

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What type of valve is used?

The ENVACON AIR STOP valve was specifically designed for engine air intake shut-off applications. The guillotine design of the AIR STOP valve offers an unrestricted through bore and the gate and its seals are out of the air flow and protected when the valve is open. There is no reduction in engine air line efficiency, air flow turbulence is avoided, and the narrow in-line profile of the valve enables maximum adaptability to the engine piping. Once closed, the gate can not be re-opened by engine backfire and any reverse flow would be blocked by the momentary reseat of the gate to the upstream seal.

How are shut-off valves mounted into the engine air intake line?

The ENVACON AIR STOP shut-off valve can be supplied with a wide range of outlet connection types that accommodate most, if not all engine requirements. These include but are not limited too; hose mount, flanged, O-ring, and V-band (see examples). In addition, combinations of these connection types or miss matched sizes can also be accommodated, and ENVACON has a broad range of pre-designed installation kits to suit many common engine makes and models.

How is the shut-off valve actuated?

ENVACON AIR STOP shut-off valves can accommodate a range of actuation methods including; manual via ‘throttle type’ pull cable, manual electric, manual pneumatic, manual electric over pneumatic, automatic electric, automatic pneumatic, and automatic electric over pneumatic. In addition, application and / or customer specific manual or automatic hydraulic, loss of pressure to trip, and low-pressure actuation systems have been supplied. It should be noted that any manual actuated system requires that the engine operator(s) be in close proximity to the manual control at all times, and that they must recognize an over-speed situation and react to it immediately by actuating the manual control. For the highest level of safety, ENVACON recommends a fully automatic system be used.

Do not hesitate to contact ENVACON to discuss the actuation requirements or preferences for a specific engine application.

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Actuation Options

Shut-off (or shutdown) valve actuation systems range from manual activated to fully automatic RPM sensed methods.

Envacon standard options include:

- Manual via a "throttle type" pull cable: Operator must realize the over-speed and manually pull the 'T' handle of the cable assembly to actuate the AIR STOP valve.
- Manual pneumatic: Operator must realize the over-speed and manually actuate a 3-way valve to actuate the AIR STOP valve.
- Manual electric: Operator must realize the over-speed and manually actuate a switch to energize the solenoid actuator on the AIR STOP valve.
- Manual electric over pneumatic: Operator must realize the over-speed and manually actuate a switch to energize the solenoid valve, which in turn allows pneumatic pressure to actuate the AIR STOP valve.
- Automatic electric over pneumatic system: Similar to the manual electric over pneumatic above, the system also includes an over-speed module in parallel to the manual circuit. The module reads an electronic signal that is related to engine RPM (a magnetic pick-up is commonly used to read the passing flywheel teeth), and if a preset maximum RPM is exceeded, the system/module will automatically actuate the shut-off to shutdown the engine.
- Automatic electronic electric system: Similar to the manual electric above, the system also includes an over-speed module in parallel to the manual circuit. The module reads an electronic signal that is related to engine RPM (a magnetic pick-up is commonly used to read the passing flywheel teeth), and if a preset maximum RPM is exceeded, the system/module will automatically actuate the shut-off to shutdown the engine.
- ENVACON customer specific systems. ENVACON can design customer specific actuation systems. In addition to the above systems, ENVACON has also supplied hydraulic actuated, loss of pressure to close, and low pressure actuation systems.
- For the highest level of safety, ENVACON recommends a fully automatic system be used

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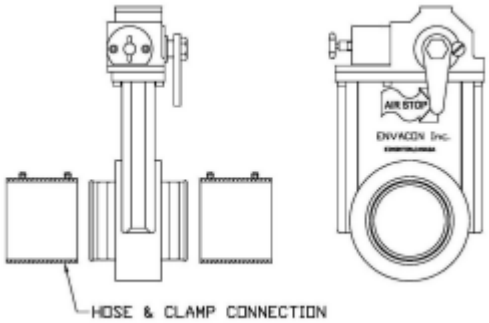
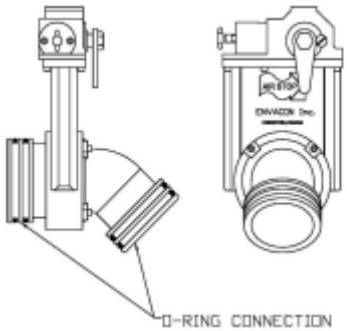
Installation Examples

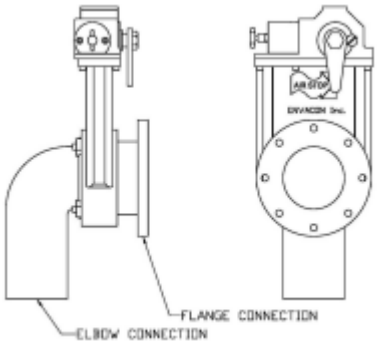
Below are some examples of the installation kits provided by ENVACON.



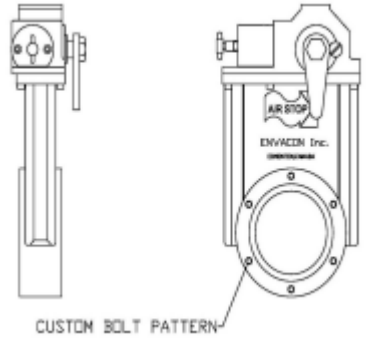
HOSE & CLAMP CONNECTION



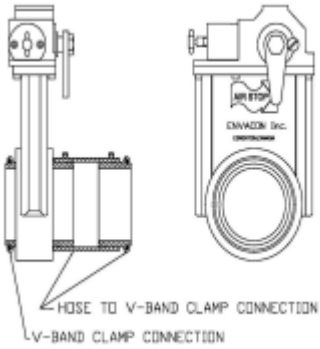
O-RING CONNECTION



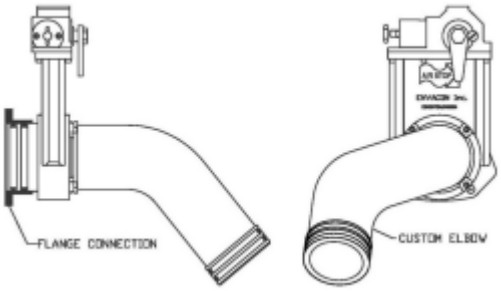
FLANGE & ELBOW CONNECTION



CUSTOM BOLT PATTERN



V-BAND CONNECTION



FLANGE & CUSTOM ELBOW CONNECTION

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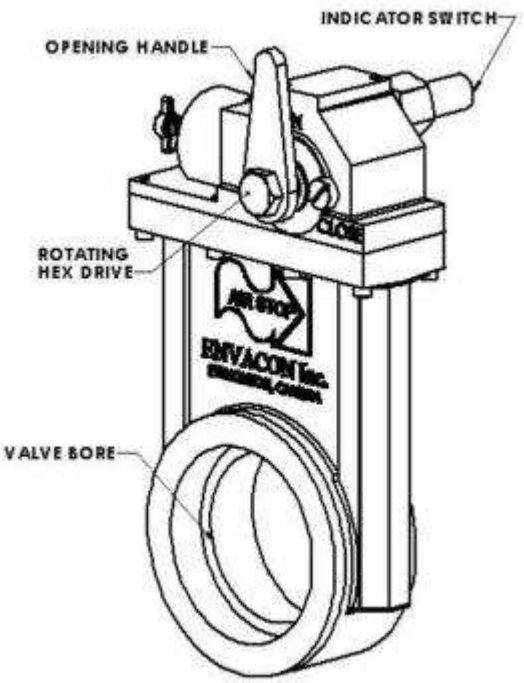
How It Works

The valve is opened by rotating the hex drive (or supplied handle) approximately 180 degrees clockwise. When sufficiently rotated, the valve will automatically latch and stay open. Sending the appropriate actuation signal (see actuation options) will pull the latching spindle and allow rapid gate closure by internal spring force. The valves are designed to operate in any orientation , however a downward shutting gate orientation is preferable.



In the smaller valves, all of the seals including the gate seals are fluorocarbon. In the larger valves, the gate seals are PTFE while all other seals are fluorocarbon. All valve materials are corrosion resistant including aluminum, stainless steel, brass and bronze.

The **AIR STOP** valve must be in the open position to start the engine on which it is installed. If the engine has multiple air intake lines, with multiple **AIR STOP** valves installed, all of the valves must be open prior to starting or operating the engine. If multiple valves are installed on one engine, ENVACON recommends the use of gate position indictor switches to ensure all valves are either open or closed in unison.

AIR STOP valve gate position indicator options:

All shut-off valves have either an indictor pin or opening handle attached to the hex drive. When the indictor pin or opening handle points toward the valve bore the valve is in the Closed position. When the indictor pin or opening handle points toward the top of the valve (opposite the bore) the valve is in the Open position.

For applications that require more than one shut-off valve per engine, ENVACON recommends the use of gate position indicator switches. Tied into the engine start and/or control system, the switches are used to ensure all of the valves are open before starting, and all valves are open during engine operation.

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SAFETY RECOMMENDATIONS:

As a safety device, the **AIR STOP** valve must be maintained in good working condition at all times. Weekly testing of the valve and actuation system is recommended, as is confirmation of functionality prior to entering a potentially hazardous work site. It is recommended that the test be performed with the engine running at idle, so as to confirm complete engine shutdown after the valve(s) is/are actuated. If the engine has multiple shut-off valves with gate position indicator switches; with the engine stopped, each valve should be closed while the other(s) is/are left open to confirm individual functionality of the gate position indicator system. In addition, all personnel working within the vicinity of the engine must be familiar with the operation of the **AIR STOP** valve actuation system, and with the potential 'inhaled combustible gas' engine over-speed scenarios that require its use.

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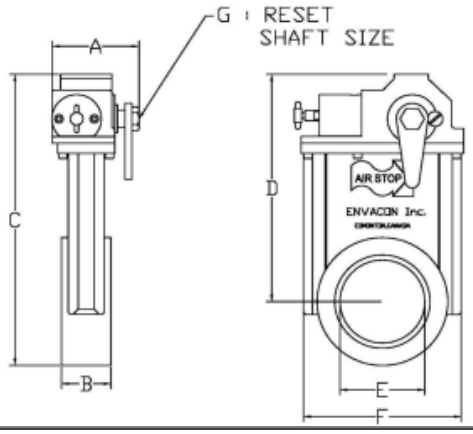
Dimensional Table



NOTE:
OUTLETS ARE NOT SHOWN IN SCHEMATICS

IMPERIAL

MODEL	A	B	C	D	E	F	G	WEIGHT
2G	3.00	1.25	7.75	6.09	2.00	3.96	0.75	5.80
3G	3.00	1.75	10.57	8.25	3.00	5.64	0.75	7.50
4G	3.00	1.75	13.21	10.22	4.00	6.77	0.75	10.50
5G	3.00	1.75	15.68	12.34	6.00	7.69	0.75	12.00
6.5G	4.85	2.50	21.38	17.13	6.50	11.00	1.00	30.00
8G	4.85	2.50	25.00	19.88	8.00	12.50	1.00	35.00
11G	3.80	2.81	32.03	25.25	11.00	15.91	1.00	55.00
12G	6.00	4.50	37.80	29.20	12.00	19.40	1.13	118.00
13G	6.00	5.00	39.90	29.62	13.00	20.40	1.13	130.00

DIMENSIONS : INCHES — WEIGHT : POUNDS

METRIC

MODEL	A	B	C	D	E	F	G	WEIGHT
2G	76	32	196	155	51	101	19	2.64
3G	76	44	268	210	76	143	19	3.41
4G	76	44	336	259	102	172	19	4.77
5G	76	44	398	313	127	195	19	5.45
6.5G	123	64	543	435	165	279	25	13.64
8G	123	64	635	505	203	318	25	15.91
11G	97	71	814	641	279	404	25	25.00
12G	152	114	960	742	305	493	29	53.64
13G	152	127	1013	752	330	518	29	59.09

DIMENSIONS : MILLIMETERS — WEIGHT : KILOGRAMS

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AIR STOP

About Us

Incorporated in 1999 and with a specific focus on engine air intake shut-off valves, ENVACON was started by a Shareholder group that included two existing corporations and two principles with over 40 years of previous experience in the design, manufacture, and marketing of shut-off valves. This experience was combined with the assistance of a government research organization and Tyler Research Corp. to develop and test the now patented AIR STOP shut-off valve design.

Production and marketing of the AIR STOP engine shut-off valve began in late 2000. Direct marketing combined with Agents in the United States, Europe, and Asia helped to gain wide ranging acceptance and the design is now known for its functionality and durability. Customers include individual engine operators through to fleet operators, engine dealerships, engine packagers, and original engine manufacturers (OEM's), and our design capabilities now range from the development of one-off installation kits for specific engines through to design, development, and testing programs for OEM and Naval applications.

Our manufacturing capabilities and procedures reflect our customers varying needs while maintaining the consistent quality required for a safety device. One-off requirements and production runs can be accommodated, including automotive industry risk management and quality control verification procedures.

Customer service, our employees and Agents, and our high quality design and manufacturing capabilities are the cornerstones of our company's success. We look forward to the opportunity to demonstrate them all while servicing your engine shut-off valve requirements.

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