CONTINENTAL CONTROLS CORPORATION

Installation and Operating Manual

Fuel Control Valve Model AGV10, AGV50 & AGV50 Pilot

II 2 G
Ex d IIA T4 Gb

0036, 0344

Class I, Div 1, 2, Group D: T4

ISO 9001:2015 CERTIFIED

Table of Contents

1 Introduction

1.1 General Description

This manual provides instruction and maintenance information for AGV10, AGV50 and AGV50 Pilot Fuel Control Valves, which herein may also be referred to as AGV Fuel Control Valves or AGV valves.

It is highly recommended that users read this manual in its entirety before commencing operations. It is the policy of the Continental Controls Corporation (CCC) that it is neither our intention, nor our obligation, to instruct others on how to design or implement engine control systems. Continental Controls Corporation will not assume responsibility for engine controls that are not designed or installed by our authorized representatives.

Do **NOT** attempt to operate, maintain, or repair an AGV fuel control valve until the contents of this document have been read and are thoroughly understood.

Every attempt has been made to provide sufficient information in this manual for the proper operation and maintenance of AGV Fuel Control Valves.

All information contained within shall be considered proprietary information and its release to unauthorized personnel is strictly prohibited.

This manual is intended to help the end user install and operate AGV Fuel Control Valves in the way they were intended, and in a way that minimizes risk of injury to personnel or damage to engine or equipment.

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1.2 Overview

This manual is designed to describe the installation and operation of the AGV10, AGV50 and AGV50 Pilot Fuel Control Valves on gas engines.

The combination of a sophisticated mechanical design with the advanced electronic design and on-board microprocessor along with the elegant software integration combines to provide the best available control technology for controlling gas engines.

2 Safety Warnings

2.1 General Description

The Continental Controls Fuel Control Valve (metering) is used with natural gas. Natural Gas and Air, when combined, the mixture becomes very combustible. When contained within an enclosure, such as a gas turbine engine or its exhaust system can explode in a violent manner when ignited. It is necessary to always use extreme caution when working with any fuel system.

Controls for gas engines should always be designed to provide redundant fuel shutdowns. Towards this goal, fuel control valves play an important part in the safety of the whole system. AGV10, AGV50 or AGV50 Pilot valves are **NOT** the primary control to shut down an engine.

AGV Fuel Control Valves are NOT shutoff valves. Shutoff valves should be **used in addition** to the fuel control valves. The fuel system should be designed in such a way that:

1. **No single failure of a component will cause the fuel system to admit fuel to the engine when the engine has been shut down.**
2. **No single failure can result in grossly over-fueling the engine when attempting to start.**

Failure to follow the above rules may lead to serious damage to equipment and/or injury to personnel!

A separate fuel shutoff valve, in a double block and bleed configuration, must be installed UPSTREAM of AGV Fuel Control Valves. Fuel shutoff valves should provide for the venting of pressure from the upstream side of AGV valves while the engine is stopped or before an engine start sequence is initiated. In a dual-fuel configuration, while running on liquid, the plumbing should be configured so that there is no pressure on the downstream side of the AGV valves. This pressure typically comes from the compressor discharge pressure of the engine. Therefore, an additional shutoff valve and vent must be installed downstream of AGV Fuel Control Valves.

It is the customer's responsibility to ensure that purge times are completed, and the igniter of the turbine is turned on before fuel pressure is allowed to reach AGV Fuel Control Valves.

Before installing an AGV Fuel Control Valve, check the configuration, as the valve may contain an embedded Acceleration Schedule. An AGV10 and an AGV50 with an "-A" extension indicates that the valve has an embedded acceleration schedule. This valve will only allow an appropriate level of gas to the turbine, based upon the compressor discharge pressure (PCD or CDP)—no external transmitters are required.

A non-acceleration schedule valve will allow fuel flow proportional to the max flow of the valve. 4mA is closed, or 0 SCFM, and 20mA is max flow command. Max flow is indicated on the cover of the valve in SCFM. The command is linear between the two points: zero (0) and max flow.

When the Acceleration Schedule is to be turned off, one of the following warning tags shall be affixed to the valve. The technician disabling the Acceleration Schedule will need to call Continental Controls Corp. using the number on the tag affixed to the valve in order to obtain the equation code for the valve before the schedule may be turned off.

Under no circumstances should a valve with an acceleration schedule be replaced with a valve without an acceleration schedule.

Failure to follow the above rules may lead to serious damage to equipment or injury to personnel!

WARNING: THIS VALVE DOES NOT INCLUDE AN ACCELERATION SCHEDULE

THIS VALVE HAS BEEN CONFIGURED FOR EXTERNAL PILOT! EXTERNAL PILOT MUST BE CONNECTED FOR VALVE TO WORK OR THE PG PLUG MUST BE

- When installing the AGV10, AGV50 and AGV50 Pilot Fuel Controls Valves in a class I division 1 group D or Ex d IIA T4 environment; heat resistant rating of 105°C min Cable, Cable Gland, Conduit Seal, and Conduit Wires must be used at the 3/4 NPT threaded opening. Installation of all electrical Equipment will be following the National Electric Code (NEC). Customer is responsible for termination of pigtail wires out of the ¾" NPT Union Harness Assembly on the AGV10, AGV50 and AGV50 Pilot.
- Use fasteners with yield stress greater than 3.45MPa. Contact the Original Equipment Manufacturer for information on dimensions of flameproof joints.
- The equipment may be used with flammable gases and vapors with apparatus groups IIA and with temperature class T4 in the ambient temperature range -40 and +85°C (-20 and +85°C for ATEX).
- The equipment is only certified for use in ambient temperatures in the range -40 and +85°C (-20 and +85°C for ATEX) and should not be used outside this range.
- Installation shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. EN 60079-14:2007.
- Inspection and maintenance of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. EN 60079-17:2007.
- Repairing this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. EN 60079-19:2011.
- Putting into service, use, assembling, and adjustment of the equipment if applicable shall be detailed. Drawings and/or diagrams must be included if they are necessary to complete these tasks.

- Components to be incorporated into or used as replacement parts of the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.

- The certification of this equipment relies upon the following materials used in its construction: 304 stainless steel, 440C, and anodized aluminum and Viton seals.

- If the equipment is likely to encounter aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

  Aggressive substances: e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.

  Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheets that it is resistant to specific chemicals.

- Sealing devices must be used and shall be fitted directly at the enclosure wall when using conduct.
- Cable glands shall be suitable for the environment and shall be certified as flameproof if used in Division 1 application to connect outside electric wire.
- NPT cable glands and conduit to be installed minimum 5 full.
- Select the appropriate cable glands for the number of 18AWG (minimum) conductors.
- When cable entries or conduit entries are not used, user or installer shall close by certified blanking
- Always ground the enclosure in accordance with local electric codes. The most effective enclosure grounding method is a direct connection to earth ground with minimal impedance.

  Methods for grounding the enclosure include:

  External ground connection: The ground bracket is located on the side of the body. (Min 18AWG wire required)

- Fire and gas detection monitoring system must be present on the turbine skid. It's the responsibility of the end user to have both the Fire and gas detection monitoring system per the turbine manufacturer.

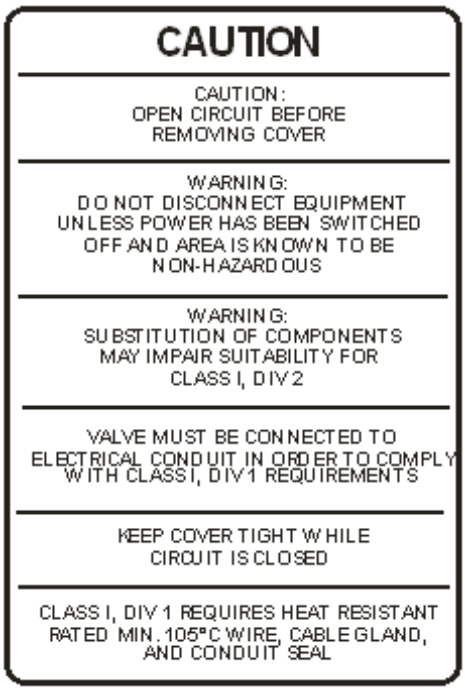
- Although the AGV is pressure tested for leaks at the factory, it's highly recommended after installation of the AGV, to leak the test the AGV on the engine skid at SAE Flange connections and external pilot connection any possible loose connection that might have occurred during the handling.

- All Vent lines must be vented to a well-known safe location.

- Assure that the actuator is isolated from the air supply or electrical ancillaries before attempting to perform any maintenance.
- Before disconnecting the Fuel Control Valve from the engine skid, always be sure the line has been depressurized and drained.
- The operator must follow and observe any national or local safety laws and regulations.
- Any product warranty will be invalidated in the case of improper operation resulting from misapplication or faulty maintenance.

Failure to follow the above rules may lead to possibly serious damage to equipment or injury to personnel!

Front Cover Caution and Warning Translations



1. **CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER**

   I: ATTENZIONE: APRE CIRCUITO PRIMA DI TOGLIERE COPERCHIO
   G: ACHTUNG: ÖFFNEN SIE DEN STROMKREIS, BEVOR SIE DIE ABDECKUNG ENTFERNEN
   S: PRECAUCIÓN: ABRA EL CIRCUITO ANTES DE QUITAR LA CUBIERTA

2. **WARNING: DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF AND AREA IS KNOWN TO BE NON-HAZARDOUS**

   I: ATTENZIONE: NON SCOLLEGARE L'APPARECCHIATURA A MENO CHE L'ALIMENTAZIONE NON-SIA STATA SPENTA E L'AREA NON-SIA NOTA PER ESSERE PERICOLOSA
   G: WARNUNG: TRENNEN SIE DAS GERÄT NUR, WENN DIE STROMVERSORGUNG AUSGESCHALTET WURDE UND DER BEREICH ALS UNGEFÄHRLICH BEKANNT IST
   S: ADVERTENCIA: NO DESCONECTE EL EQUIPO A MENOS QUE SE HAYA APAGADO LA ALIMENTACIÓN Y SE SEPA QUE EL ÁREA NO ES PELIGROSA

3. **VALVE MUST BE CONNECTED TO ELECTRICAL CONDUIT IN ORDER TO COMPLY WITH CLASS I, DIV. 1 REQUIREMENTS**

   I: LA VALVOLA DEVE ESSERE COLLEGATA A UNA CONDOTTO ELETTRICA PER ESSERE CONFORME ALLA CLASSE I, DIV. 1 REQUISITI
   G DAS VENTIL MÜSSEN MIT EINER ELEKTRISCHEN LEITUNG VERBUNDEN SEIN, UM DIE ANFORDERUNGEN ZU ERFÜLLEN VON CLASS I, DIV. 1 ANFORDERUNGEN
   S: LA VÁLVULA DEBE ESTAR CONECTADA AL CONDUCTO ELÉCTRICO PARA CUMPLIR CON LA CLASE I, DIV. 1 REQUISITOS

4. **KEEP COVER TIGHT WHILE CIRCUIT IS CLOSED**

   I: MANTENERE IL COPERCHIO BEN TESO MENTRE IL CIRCUITO È CHIUSO
   G: DECKEL DICHT HALTEN, SOLANGE DER KREISLAUF GESCHLOSSEN IST
   S: MANTENGA LA CUBIERTA APRETADA MIENTRAS EL CIRCUITO ESTÁ CERRADO

5. **CLASS I, DIV 1 REQUIRES HEAT RESISTANT RATED MIN. 220°C WIRE, CABLE GLAND, AND CONDUIT SEAL**

   I: CLASSE I, DIV 1 RICHIEDE UNA RESISTENZA AL CALORE NOMINALE MINIMA DI 105°C FILO, PRESSACAVO E GUARNIZIONE DEL CONDOTTO RESISTENTI AL CALORE
   G: KLASSE I, DIV 1 ERFORDERT EINE HITZEBESTÄNDIGE KABELVERSCHRAUBUNG VON MIN. 105°C DRAHT, KABELVERSCHRAUBUNG UND ROHRDICHTUNG
   S: LA CLASE I, DIV 1 REQUIERE UNA CLASIFICACIÓN DE RESISTENCIA AL CALOR MIN. ALAMBRE DE 220°C, GLÁNDULA DE CABLE Y SELLO DE CONDUCTO

3 Flow Control Valve AGV10 / AGV50 / AGV50 Pilot

3.1 General Description

The Continental Controls Fuel Control Valve (metering) is used with natural gas. Natural Gas and Air, when combined, the mixture becomes very combustible. The AGV is used to accurately meter Gaseous fuel to gas turbine engines based on the engine control system demand.

3.2 Application

The Fuel Control Valve AGV10, AGV50 and AGV50 Pilot are designed to provide extremely fast and accurate metering fuel flow to an industrial gas turbine engine. Gas flow is stopped when the flow demand is removed or at 4 mA or when pilot pressure is removed. It is suitable for operation with gas temperatures between -40 and +85°C (-20 and +85°C for ATEX).

This product is suitable for use on industrial turbines up to 5820 hp output (AGV10) and for 38,000 hp output (AGV50) range with single or multiple combustion fuel manifold systems.

3.3 Hardware

It is highly recommended that the user read this manual in its entirety before commencing operations. It is the policy of the Continental Controls Corporation that it is neither our intention nor our obligation to instruct others on how to design or implement engine control systems. Continental Controls Corporation will not assume responsibility for engine controls not designed or installed by our authorized representatives.

AGV10 Flow Control Valve

AGV10 is for gas turbines up to 5820 horsepower applications. The AGV10 Valve is 1-1/2” pipe fuel control valve with SAE 1-1/2” flange connections.

AGV50 Flow Control Valve

AGV50 is for gas turbines up to 38,000 horsepower applications. The AGV50 Valve is 2” pipe fuel control valve with SAE 2” flange connections.

AGV50 Pilot Valve

Dry Low Emission Fuel Control Valve for pilot application. The AGV50 Pilot Valve is 2” pipe fuel control valve with SAE 2” flange connections.

Fuel Control Valve External Pilot Stage Filter

The fuel train is equipped with 0.01-micron coalescing filter to provide clean gas pressure to the pilot stage of the AGV10 / AGV50. As preventative maintenance, the filter must be checked. After inspection replace the filter element if required. The filter element part number is 50109169.

3.4 AGV10 Specifications

Flow Capacity:	1100 SCFM (3081 lbs/hr)
Fuel:	Natural Gas, Gaseous Hydrocarbons (Wellhead & Biogas)
Applications:	Up to 5,820 horsepower
Maximum Operating Pressure:	500 PSIG
Filtration Requirement:	25–50 Micron Absolute
External Pilot Filtration Requirement:	0.01 Micron Absolute
Operating Temperature:	-40°C (-40°F) to +85°C (+185°F) -20°C (-4°F) to +85°C (+185°F) [ATEX]
Response Time:	90 ±10 milliseconds 10%–90% stroke
Flow Accuracy:	±3.0% of reading or 0.5% of full scale
Fuel Demand Signal [to Fuel Control Valve]:	4–20 mA (Standard); 0–50 mA (Optional) 0–200 mA (Optional)
Fuel Feedback Signal [from Fuel Control Valve]:	4–20 mA (Standard)
Power Input:	19–30 VDC (1.0 Amp Maximum)
Electrical Interface:	3/4" Ridged Conduit, 84" Pigtail Wires
Communication Interface:	RS485 Serial Port
Housing Materials:	6061-T6 Anodized Aluminum
Wetted Materials:	Stainless Steel, Carbon Steel, 6061-T6 Anodized Aluminum, Viton® Seals, Nitrile Seals
Flanges:	1-1/2" SAE Series 61, 4-Bolt Flange 2” SAE Series 61, 4-Bolt Flange
Dimensions:	13.9”L x 7.6”H x 5.8”W
Approximate Weight:	31.80 pounds
Certifications:	**Class I, Division 1, 2, Group D: T4** **II 2 G Ex d IIA T4 Gb** Pressure Equipment Directive (PED) CE 0344 CE 0036 UKCA 8505 UKCA 0168

3.5 AGV50 Specifications

Flow Capacity:	Up to 6880 SCFM (19,267 lbs/hr)
Fuel:	Natural Gas, Methane (Wellhead and Biogas)
Applications:	Up to 46,935 horsepower
Maximum Operating Pressure:	500 PSIG
Filtration Requirement:	25–50 Micron Absolute
External Pilot Filtration Requirement:	0.01 Micron Absolute
Operating Temperature:	-40°C (-40°F) to +85°C (+185°F) -20°C (-4°F) to +85°C (+185°F) [ATEX]
Response Time:	90 ±10 milliseconds 10%–90% Stroke
Flow Accuracy:	±3.0% of reading or 0.5% of full scale
Fuel Demand Signal [to Fuel Control Valve]:	4–20 mA (Standard); 0–50 mA (Optional) 0–200 mA (Optional)
Fuel Feedback Signal [from Fuel Control Valve]:	4–20 mA (Standard)
Power Input:	19–30 VDC (1.0 Amp Maximum)
Electrical Interface:	3/4" Ridged Conduit, 84" Pigtail Wires
Communication Interface:	RS485 Serial Port
Housing Materials:	6061-T6 Anodized Aluminum
Wetted Materials:	Stainless Steel, Carbon Steel, 6061-T6 Anodized Aluminum, Viton® Seals, Nitrile Seals
Flanges:	2" SAE Series 61, 4-Bolt Flange
Dimensions:	13.8”L x 8.7”H x 5.5”W
Approximate Weight:	44.2 pounds
Certifications:	**Class I, Division 1, 2, Group D: T4** **II 2 G Ex d IIA T4 Gb** Pressure Equipment Directive (PED) CE 0344 CE 0036 UKCA 8505 UKCA 0168

3.6 AGV50 Pilot Specifications

Flow Capacity:	Application Pilot Flow Depended
Fuel:	Natural Gas, Methane (Wellhead and Biogas)
Applications:	Up to 46,935 horsepower
Maximum Operating Pressure:	500 PSIG
Filtration Requirement:	25–50 Micron Absolute
External Pilot Filtration Requirement:	0.01 Micron Absolute
Operating Temperature:	-40°C (-40°F) to +85°C (+185°F) -20°C (-4°F) to +85°C (+185°F) [ATEX]
Response Time:	90 ±10 milliseconds 10%–90% Stroke
Flow Accuracy:	±3.0% of reading or 0.5 % of full scale
Fuel Demand Signal [to Fuel Control Valve]:	4–20 mA (Standard); 0–50 mA (Optional) 0–200 mA (Optional)
Fuel Feedback Signal [from Fuel Control Valve]:	4–20 mA (Standard)
Power Input:	19–30 VDC (1.0 Amp Maximum)
Electrical Interface:	3/4" Ridged Conduit, 84" Pigtail Wires
Communication Interface:	RS485 Serial Port
Housing Materials:	6061-T6 Anodized Aluminum
Wetted Materials:	Stainless Steel, Carbon Steel, 6061-T6 Anodized Aluminum, Viton® Seals, Nitrile Seals
Flanges:	2" SAE Series 61, 4-Bolt Flange
Dimensions:	15.8”L x 8.7”H x 5.8”W
Approximate Weight:	48.3 pounds
Certifications:	**Class I, Division 1, 2, Group D: T4** **II 2 G Ex d IIA T4 Gb** Pressure Equipment Directive (PED) 0344 0036 8505 0168

4 AGV Design and Controls

4.1 Theory of Operation – Fuel Control in Gas Turbine Engines

The fuel control system in a gas turbine engine plays a critical role in managing engine performance and ensuring safe operation, particularly during engine start-up. Proper fuel control begins with safely initiating the engine start sequence. During this phase, the gas producer (typically consisting of the compressor and associated rotating components) draws in ambient air, compresses it, and directs it into the combustor.

Within the combustor, fuel is introduced and mixed with the compressed air. The fuel control system must accurately meter the fuel to maintain an optimal air-to-fuel ratio. This ratio is crucial, as it directly affects the temperature of the combustion gases.

If the combustion temperature rises too high, it can create excessive backpressure. This condition may lead to engine stall or surges, both of which can compromise engine performance and integrity. Furthermore, prolonged exposure to excessively high temperatures can cause thermal damage to the turbine section, especially the exhaust components.

Therefore, the fuel control system must continuously and precisely adjust fuel flow to ensure efficient combustion, prevent overheating, and protect critical engine components.

4.2 Overview – AGV Series Fuel Control Valves

The AGV series fuel control valves are engineered to manage natural gas flow for industrial gas turbines, providing reliable and precise fuel delivery across a wide range of power outputs.

- **AGV10 Valve**: Designed for gas turbines with output ratings between **500–6,000 horsepower** (373 kW to 4.47 MW).
- **AGV50 Valve**: Intended for larger gas turbines rated between **5,000–38,000 horsepower** (3.73 MW to 28.5 MW).

4.3 Operation and Control Mechanism

AGV valves utilize the fuel gas supply pressure (Pg) not only for combustion but also as "muscle pressure" to actuate the valve. This pressure must be at least 42 PSIG above the nozzle pressure to ensure proper function.

Key components and control flow:

- **Poppet Valve Assembly**: Actuated by Pg to regulate the main fuel flow.
- **Pilot Stage**: A small amount of fuel gas is diverted through a differential pressure regulator to the pilot stage, which interprets an electrical control signal from the internal computer and translates it into a proportional pressure output.
- **Center Section Piston**: This pressure output acts on a piston to open the valve.

- **Fail-Safe Spring Mechanism**: A large spring holds the valve closed in the absence of a control signal, ensuring fail-safe operation.

4.4 Closed-Loop PID Control

Each AGV valve includes an onboard PID (Proportional-Integral-Derivative) control loop. The fuel flow rate serves as the feedback signal, enabling continuous adjustment and fine-tuned control. The onboard computer manages the following:

- Monitors fuel demand
- Calculating real-time fuel flow
- Controls valve position to match demand precisely

Because the system uses fuel pressure as the actuator driving force, no external actuators, accessories, or plumbing are required, reducing system complexity and increasing reliability.

4.5 Control Interface and Integration

AGV valves are designed to interface with various turbine control systems:

- **PLC Integration**: Typically receive a **4–20 mA governor signal** from the user's **Programmable Logic Controller (PLC)**.
- **Mark II Control System (MFAC/Black Box)**:
  - Uses a 0–50 mA governor signal.
  - At engine start (speed below set point), signal is high (50 mA), commanding maximum fuel.
  - As the engine approaches the set point, the signal drops (typically to 25 mA), reducing fuel flow.
  - The governor logic resides in the MFAC or PLC, not in the AGV valve itself.

4.6 Optional Features

AGV valves can be equipped with an **embedded acceleration schedule,** enabling smoother turbine ramp-up control in coordinated startup sequences. The AGV Fuel Control Valves support customizable acceleration profiles to match specific engine characteristics and startup behavior. These parameters allow operators to fine-tune turbine startup performance, ensuring a balance between response time and mechanical or thermal stress mitigation.

4.7 Mechanical Valve Design – AGV Series Fuel Control Valves

AGV valves are purpose-built for industrial gas turbine engines operating on natural gas. Unlike valves adapted from other applications or modified from pressure regulators, AGV valves are

designed from the ground up by **Continental Controls Corporation** for gas turbine environments. This ensures optimal performance, durability, and control precision.

All components—including CNC-machined parts and electronics assemblies—are manufactured in-house at our facility in **San Diego, California**, guaranteeing consistent quality and design control.

Proper calibration ensures precise and reliable operation of AGV fuel control valves across various environmental and installation conditions. The following parameters are used to fine-tune flow measurement and maintain sensor integrity.

4.8 Key Mechanical Design Features

Full Fuel Authority

Each AGV valve features an embedded control computer that governs the entire range of fuel flow—from zero to full flow—entering the engine. This capability:

- Prevents control range limitations, even in demanding applications
- Enables rapid response to load transients
- Improves fuel control precision and system responsiveness

High-Speed Electromechanical Actuator

At the core of the AGV valve is a high-speed linear actuator driving the valve's poppet mechanism. This actuator incorporates:

- A rare-earth permanent magnet for strong and consistent magnetic flux
- A precision-wound electromagnetic coil attached to the metering spool (piston)
- Opposing magnetic forces (from the magnet and energized coil) that actuate the flapper in the open direction

This design yields exceptional responsiveness, enabling the valve to meet rapidly changing engine demands with speed and accuracy.

Integrated Pressure Sensors

To support flow control and diagnostics, the valve includes multiple pressure transducers that continuously monitor:

- **Gas Inlet Pressure (Pg)**
- **Orifice Inlet Pressure (Po)**
- **Control Pressure (Pc)**
- **Differential Pressure (Dp)** across the metering orifice

These signals feed into the internal computer, enabling real-time flow calculation and diagnostic monitoring.

Proportional Control Logic
The AGV valve utilizes dual closed-loop control architecture for superior accuracy and dynamic response:

1. **Inner Loop (Position Control Loop)**
    - A proportional control loop executed at 1 millisecond (1000 Hz)
    - Regulates valve position based on actuator force and control pressure (Pc)
    - Maintains stable valve position with fine-grained control
2. **Outer Loop (Flow Control Loop)**
    - A proportional-integral (PI) control loop executed at 10 milliseconds (100 Hz)
    - Uses measured fuel flow as feedback to control valve position
    - Sets the target for the Inner Loop, enabling fast, accurate response
    - Outperforms typical open-loop systems in both speed and accuracy

Actuator Offset
The Actuator Offset represents the minimum actuator current required to begin opening the valve:

- 0 current = valve closed
- Offset current = minimum current required for flow initiation
- Expressed in **counts** to the Digital-to-Analog Converter (DAC)

This fine control ensures precise valve actuation even at very low flow rates.

Flow Adjustment Offset
Flow Offset is a calibration parameter measured in standard cubic feet per minute (SCFM) and is applied directly to the measured fuel flow value to correct for systemic measurement errors.

- This offset compensates for consistent deviations across the entire operating range.
- Example: If the valve underreports flow by 10 SCFM, applying a Flow Offset of -10 SCFM will correct the measurement.

Flow Calculation Formula:
Corrected Fuel Flow = (ωf * Flow Gain / 100) + Flow Offset

Where:

- **ωf** is the raw flow value
- **Flow Gain** is a scaling factor (percentage)
- **Flow Offset** is the calibration constant (in SCFM)

Altitude Adjustment

Altitude Adjustment modifies the orifice inlet pressure (Po) reading from gauge pressure to absolute pressure by accounting for atmospheric pressure at the installation elevation.

- This adjustment improves flow measurement accuracy, particularly at high altitudes where atmospheric pressure is significantly lower than at sea level.
- Factory default = sea level
- Only flow measurements are affected; valve control and performance remain unaffected by this setting.

For best accuracy, set the Altitude Adjustment to match the site elevation of the gas turbine installation.

Transducer Offsets (Pg, Po, Pc, Dp)

Each AGV valve is shipped with calibrated pressure transducer offsets for:

- **Pg** – Gas Inlet Pressure
- **Po** – Orifice Inlet Pressure
- **Pc** – Control Pressure
- **Dp** – Differential Pressure across the orifice

These offsets are stored in the valve's onboard computer and used to:

- Track sensor drift over time
- Detect sensor faults

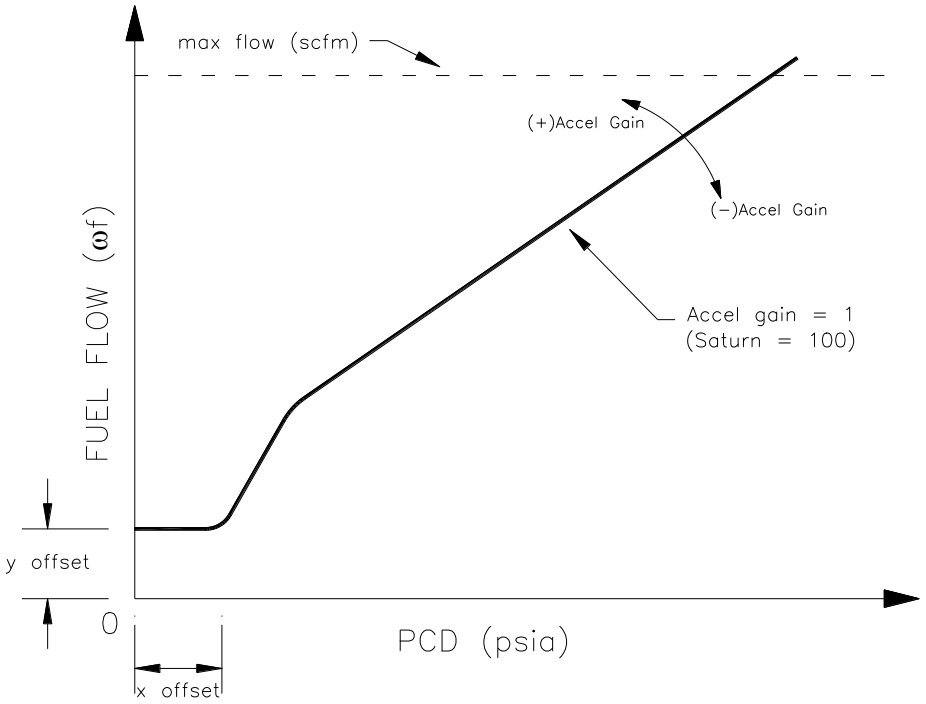
Fault Behavior:

- If a transducer drifts beyond a predefined limit (typically ±5% or ±200 DAC counts), the valve assumes a sensor failure.
- In such cases, the valve is disabled for safety.
- The output signal is forced to 3.2 mA, indicating a sensor fault condition to the external control system.

Acceleration Gain (ACCEL GAIN)

The Acceleration Gain parameter allows the user to control how aggressively the engine accelerates during startup. This gain is part of a pre-defined acceleration schedule, typically based on the specific turbine model provided by the manufacturer (e.g., Solar Saturn 20 vs. Solar Centaur 40).

- A higher ACCEL GAIN value results in faster acceleration, suitable for applications demanding rapid startup.
- A lower value results in slower, more conservative acceleration, which may extend engine life or reduce thermal stress.
- Adjustment should be made cautiously to ensure safe turbine operation and proper combustion stability during light-off.



Acceleration Y Offset (Fuel Flow to PCD Ratio Offset)

The Y Offset allows modification of the vertical position of the acceleration schedule curve, effectively shifting the initial fuel flow (ωf) to PCD (compressor discharge pressure) ratio at which acceleration begins.

- Purpose: To reduce phenomena such as initial flaring or "booming" during engine light-off.
- Positive Y Offset: Increases starting fuel flow, which may help with cold starts or poor light-off reliability.
- Negative Y Offset: Decreases starting fuel flow, which may help reduce combustor over-fueling and acoustic events.
- Caution: Excessive adjustment may prevent engine light-off altogether.

Acceleration X Offset (PCD Start Point Adjustment)

The X Offset adjusts the horizontal position of the acceleration schedule curve, shifting the PCD value at which the acceleration ramp begins.

- Positive X Offset: Delays the start of acceleration to a higher PCD value.
- Negative X Offset: Starts acceleration at a lower PCD, potentially initiating ramp-up earlier.

This setting is useful for optimizing the timing of acceleration relative to the compressor's development of sufficient pressure, enhancing startup reliability and minimizing stress on engine components.

Summary Table – Acceleration Scheduling Parameters

Parameter	Description	Effect on Engine Behavior
ACCEL GAIN	Controls rate of engine acceleration	Higher = faster ramp-up; lower = slower ramp-up
Y Offset	Adjusts starting fuel flow (ωf/PCD ratio)	Helps reduce flaring; too low may prevent start
X Offset	Adjusts PCD point where acceleration begins	Delays or advances schedule initiation

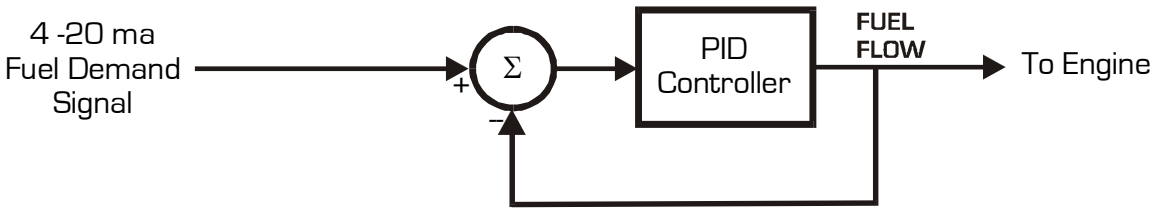
4.9 Typical Calibration Values

Below are typical calibration values. These values can vary from valve to valve. Do not change or adjust these numbers unless you are instructed to do so by CCC.

DESCRIPTION	TYPICAL	MINIMUM	MAXIMUM
Control Prop Gain	12	9	15
Control Intg. Gain	0	0	0
Control Intg is	OFF	Not Used	
Control Derv. Gain	0	0	0
Control Derv. is	OFF	Not Used	
Flow Prop Gain	17	10	40
Flow Intg. Gain	100	50	550
Flow Intg. is	ON	Not Used	
Flow Derv. Gain	0	0	0
Flow Derv. is	OFF	Not Used	
Control Demand Offset	1100	800	1600
Flow Adjust	71	0	100
Flow Offset	-20	-70	50
Altitude Adjustment	300	100	500
Demand Gain	980	200	1225
PG Offset	270	150	300
PO Offset	270	150	300
DP Offset	250	150	300
PC Offset	270	150	300
Gauge Range	200	150	260

4.10 AGV without Acceleration Schedule

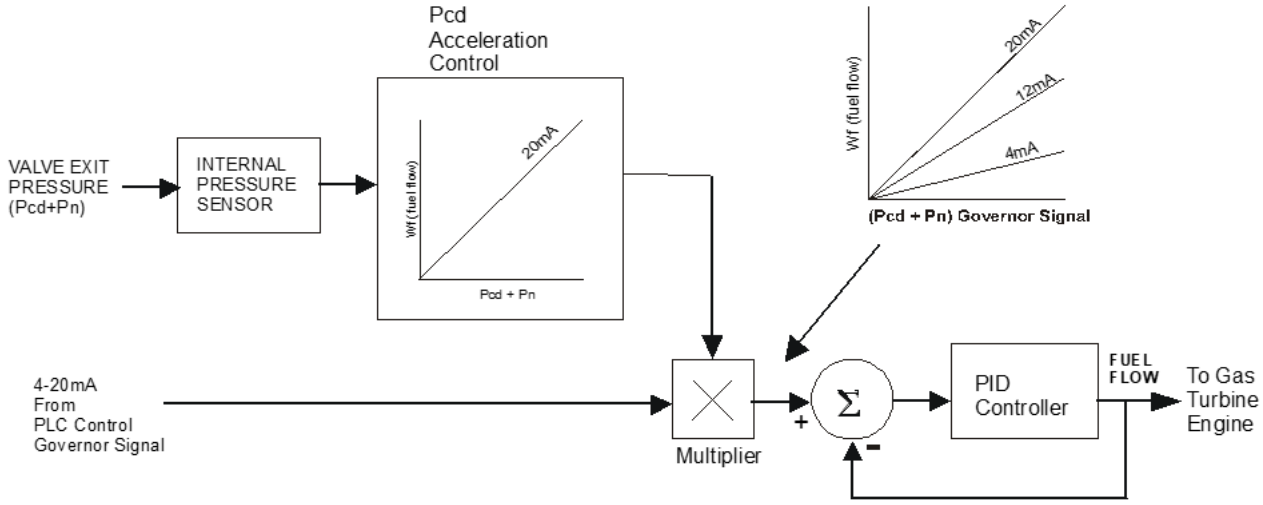
AGV Fuel Control Valves contain a computer that measures the analog input signals from the internal pressure sensors and the associated PLC. The function of the software configuration without the acceleration control is shown in the simplified diagram below.



The 4–20 mA signal from the PLC is a fuel demand signal. An AGV Fuel Control Valve's computer receives the gas temperature and pressure data from internal sensors and computes the fuel flow through the valve. The measured fuel flow is compared with the fuel demand signal. The PID controller adjusts the valve-throttling orifice to cause the fuel flow to match the fuel demand. The metered fuel is directly proportional to the fuel demand signal.

4.11 AGV with Acceleration Schedule

AGV10 and AGV50 valves contain a computer that measures the analog input signals from the internal pressure sensors and the associated PLC. The function of the software configuration with the acceleration control (schedule) is shown in the simplified diagram below.



The compressor discharge pressure (CDP or PCD) is a good measure of the air flow through the engine, providing that the effective area the orifice (or restriction) of the turbine section is constant, i.e. the engine does not have variable turbine nozzles or devices that change the effective area of the turbine section.

The manufacturer's acceleration fuel schedule is stored in the computer during calibration and is shown in the block diagram as "PCD Acceleration Schedule." When the governor signal is 20 mA, the valve limits the fuel flow to the value of the function. The Acceleration Schedule is the maximum fuel that the valve will meter for that PCD value with a 20-mA input (Governor signal) from the PLC.

The 4–20 mA signal from the PLC now functions as a governor signal. If the engine is under speed and not temperature limiting, it will be requesting more fuel and will be 20mA (max). The Acceleration Schedule will be controlling the amount of fuel metered to the engine. A 20mA signal corresponds to an input of 100%.

If the temperature limit is reached during acceleration, the 20mA signal will be cut back by the controls system. When the speed of the gas producer or the power turbine reaches the respective set point, the 20mA signal will decrease under the control of their PID loop to maintain the speed at the set point.

The fuel schedule with a 20–mA governor signal is the engine's Acceleration Schedule. As the governor signal decreases, the slope of the Acceleration Schedule also decreases in a

proportional manner. For example, a lower schedule is shown on the diagram for a 12–mA governor signal. The valve is calibrated so that a 4mA governor signal provides the Deceleration Schedule. The Deceleration Schedule is provided so that the combustion flame will not blow out when the governor cuts the fuel back all the way.

The advantages of having the Acceleration Schedule built into AGV10 and AGV50 valves software are:

- **Safety** – The control system cannot over-fuel the engine at any speed because the valve computer limits the fuel flow to the engine based upon its measured PCD.
- **Variable Gain** – The gain of the governor loop is proportional to PCD or airflow through the engine. The multiplier is in the governor loop and the fuel flow input to the multiplier varies with the PCD. The loop gain increases as the PCD increases. This enhances the stability of speed and temperature control loops.
- **Compressor Degradation Compensation** – As the compressor gets dirty or wears, airflow will decrease. With built in acceleration control, the maximum fuel also decreases so that the fuel to air ratio remains constant to maintain proper emissions.

4.12 What Makes AGV Fuel Control Valves Better?

Simplicity

Ease of use for the customer is a key goal of AGV Fuel Control Valves. We recognize that if a system is too difficult to set up, install or use, then all the features in the world won't help.

AGV valves are designed to be extremely easy to set up and use, requiring only a simple installation process and minimal configuration. Once installed, users can start and control their engines with ease, thanks to intuitive interfaces.

Range

If simplicity is the main feature of AGV Fuel Control Valves, a close second is operational range. Because AGV Fuel Control Valves are true full authority smart fuel valves, the flow range is much greater than with systems relying on a pressure regulator using a butterfly valve, or a restrictor stepper motor for fuel control.

Fully Automatic Control

AGV valves are fully automatic smart valves. This means that regardless of any operational changes made in the turbine engine, the valves will maintain accurate engine operation. There is no requirement to have an operator called out to reset the valve's controller, as this will be taken care of automatically.

Digital Communication

AGV valves are RS-485 Modbus compatible. Monitoring of sensors and fuel measurement is allowed from an external PLC control system via Modbus communications. Laptop communication is also available using our proprietary Valve Viewer software (also compatible with Solar's Valve Wizard software) for diagnostics and trouble shooting.

5 Installation

5.1 General Description

When installing AGV Fuel Control Valves, the possibility exists that welding slag, tubing cuttings or other debris may foul the poppet assembly if allowed to enter. If this occurs, the valve may not function properly due to the poppet assembly being improperly seated. To this effect, Continental Controls Corp. recommends that one (1) of two safety precautions be installed to monitor the amount of fuel present in the engine during light-off. The installation of these precautions provides redundant safety measures, ensuring there is no single point failure of the fuel system.

1. **Pressure Switch –** Some engines have a pressure switch on the fuel manifold to detect over-fueling during ignition. If the switch detects an unsafe condition, the fuel supply would be "cut-off" by the shut-off valves, ceasing operations of the AGV valve.

2. **Monitoring Device –** Monitors the flow feedback signal (4–20mA) from the control valve to the control system. In this scenario the control system detects when an unsafe condition during ignition exists. In which case, the monitoring device (i.e. PLC) would abort the start in progress, close the fuel shut-off solenoids and disable the igniter.

5.2 Initial Inspection

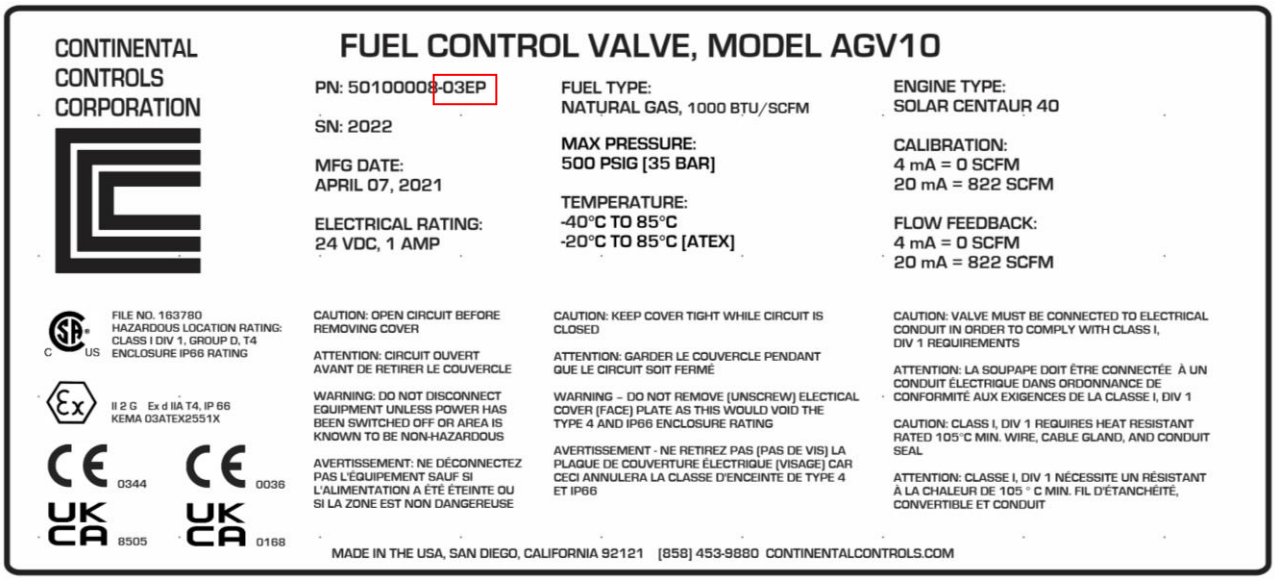
The AGV should be inspected immediately after unpacking. Check for any damage that may have occurred during shipping. If there are any questions regarding the physical integrity of the valve and which requires repairs and services, call Continental Controls immediately.

NOTE: If possible, keep the original shipping container. If future transportation or storage of the Fuel Train is necessary, this container will provide optimum protection.

Ensure each AGV received matches the model number and configuration to the pack slip, and if possible, to the purchase order. The top plate on each valve contains information (i.e. embedded acceleration schedule) pertinent to that valve.

AGV Fuel Control Valves' part numbers correspond with the applications they're configured and calibrated for.

The generic part number for the AGV10 is 50100008-X. The generic part number for the AGV50 & AGV50 Pilot is 50200008-X. "X" serves as a place holder for various applications and configurations of each AGV10, AGV50 and AGV Pilot model.



Different configurations for the valve are available for other engine types manufactured by most other engine manufacturers.

Optional features included in the valve are denoted by a single letter designation. A list of optional features is shown below:

A Embedded Acceleration Schedule

C Control signal is 0–50 mA (control input is 4–20 mA unless denoted otherwise)

D Control signal is 0–200 mA

E The valves' electrical connections are by conduit entry (with seal) and therefore the valves are explosion-proof and approved for use within Class I, Div I hazardous areas as defined by the appropriate electrical code.

F 2" ANSI 300lbs, 8-bolt flange

M RS-485 serial communications

N The valve is NACE compliant for use in sour gas services

P The valve is configured for use with an external filter on the pilot gas inlet

S 2" SAE 4-bolt (series 61) flange

5.3 General Considerations

When considering where to place the AGVit is recommended that several issues be kept in mind.

- The Fuel Train should be located away from any extreme sources of heat. Operating ambient temperature is –40°C to +85°C [–20°C to +85°C for ATEX]. Temperatures higher than this will

require special precautions from the manufacturer. However, if the temperature of the fuel gas is < 85°C, this will act as a heat sink and the valve may then be mounted in extreme temperature environments.

- Supply gas temperature will not influence the flow of fuel through the acceptable operating temperature range of the valve (see above). If the fuel gas temperature is anticipated to exceed 85°C, the fuel valve will need to be modified by the manufacturer.
- Pressure variation in the fuel supply does not affect the gas flow through the valve, providing that the pressure does not drop below the minimum required for that fuel flow.
- Always provide an adequate supply pressure for the application.
- Always provide good filtration to the Fuel Train. Dirty fuel would cause the valve not to work properly and could damage the internal components.
- Supply the valve with 24Vdc with 1 amp. Using small gauge wire may cause a large voltage drop resulting in inadequate power at the valve. Local NEC guidelines must be followed for any wiring connections
- Do not install the valve in such a manner where condensate may build up inside the isolation solenoid valve electronics housing.

5.4 Hazardous Area Requirements

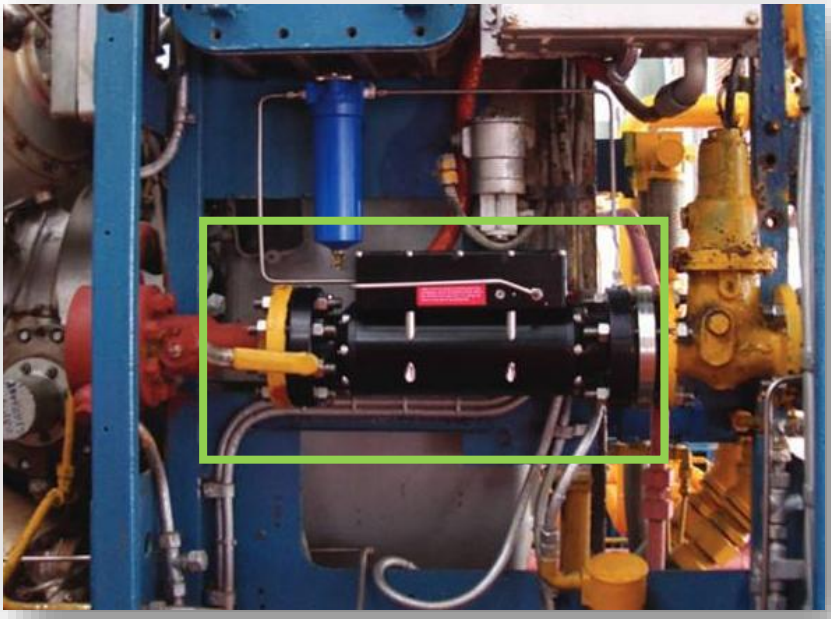
Hazardous locations are those areas where a potential for explosion and fire exist because of flammable gases, vapors or finely pulverized dusts in the atmosphere, or because of the presence of easily ignitable fibers or flying (NEC; articles 500 – 517, CEC; section 18).

Because of the necessary requirements, the wiring methods to be used are through threaded, ridged metal conduit with termination fittings approved for the location. The entire assembly is to be explosion-proof and where necessary, to employ flexible connections approved for Class I Division 1.

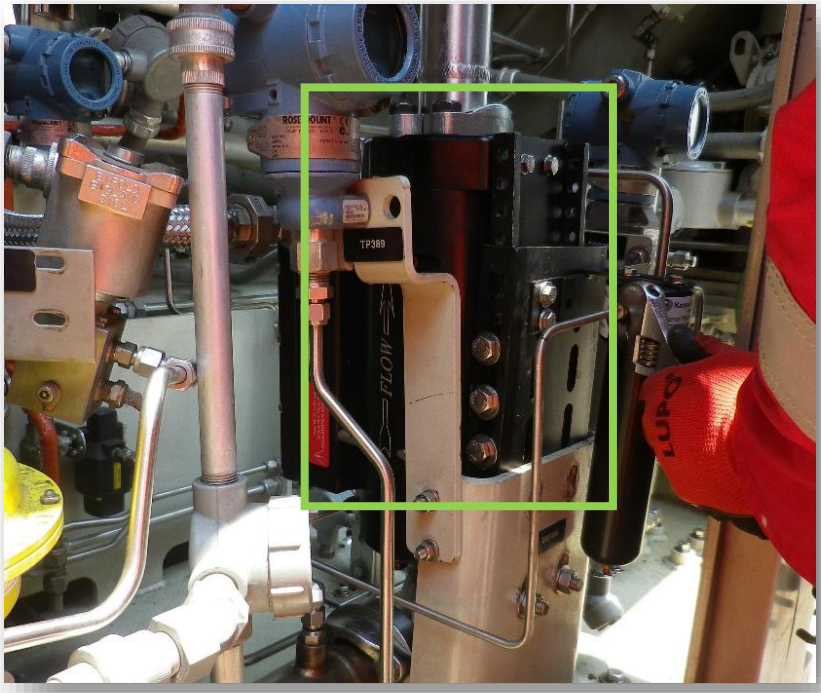
5.5 Installation Locations

Typically, AGV valves are mounted in a horizontal position below the turbine engine, however, they can also be mounted vertically, with no loss of performance. Ideally, the installation will allow for at least 10 pipe diameters of straight pipe (15” for 1.5” piping) on the downstream side of the valve. This helps to ensure consistent and smooth airflow through the metering orifice, providing a more accurate fuel flow measurement. Straight runs of piping to and from the valve are not necessary, though some performance degradation in flow meter accuracy will result if unable to accommodate this.

Mounting AGV Fuel Control Valves



Horizontal



Vertical Mount

AGV Fuel Control Valves may also be mounted in a vertical position with no loss of performance.

The valve is normally mounted and supported via 4 or 8 bolt flanges, or via an optional mounting plate. Threaded holes (5/16”-18) that can be used for securing the unit to a flat surface are provided on the bottom of the valve.

5.6 Mechanical Connections

The AGV10 is normally supplied with SAE 61 Series 4-bolt flanges for 1 1/2” piping. The AGV50 and AGV50 Pilot are supplied with SAE 61 Series 4-bolt flanges for 2” piping. As an option, ANSI 8-bolt, Class 600 flanges for 2” pipe (Option -F) is available for the AGV10. Before installing gas lines to an AGV valve, ensure that all electrical components are OFF and that the main fuel line is “shut in” and blocked.

5.7 Electrical Connections

The following section applies to the electrical requirements of the installation of the Fuel Train. All efforts should be made to conform to the applicable electrical code concerning hazardous environmental installations.

When installing the Fuel Train in a Class I Division 1 Group D or Ex d IIA T4 environment; heat resistant rating of 105°C min Cable, Cable Gland, Conduit Seal, and Conduit Wires must be used at the ¾ NPT threaded opening. Installation of all electrical Equipment will be in compliance with the National Electric Code (NEC).

Mechanical Limit Switch (2 SPDT)

APL limit switch box enclosure features pre-wired switches. All user connections are made at a numbered terminal strip. A wiring diagram, located inside the cover, indicates which terminal numbers correspond to switch contacts, such as normally open (NO), normally closed (NC), etc. Follow the wiring diagram and electrical code to connect the switches to your system.

Conduit Connections

AGV Fuel Control Valves are supplied with a ¾” conduit seal at the entrance of the valve housing.

CAUTION: The system power should be OFF before any of the valve wiring is connected or disconnected. Failure to do so may result in damage to your turbine system and/or AGV Fuel Control Valves.

Power Supply

To power AGV Fuel Control Valves, +19–32VDC is required from the station instrumentation power (+24VDC is typical). AGV valve electronics are electrically isolated.

The power wires from the AGV valves are:

- White: +24VDC
- Grey: 24VDC common

THESE WIRES ARE THE ONLY CONNECTIONS TO ANY VOLTAGE SOURCE. Keep in mind, AGV electronics are internally isolated from the supply voltage.

Connecting the Control Signal to / From AGV Valves

AGV valves may be ordered with any of several fuel demand input signals (4–20mA and 0–50mA are the most common). Keep in mind, current to an AGV valve's Demand Input must never exceed the maximum of the calibrated range.

The analog ground on the Demand Signal is internally connected within the valve to the analog ground on the Flow Feedback signal.

However, if any other devices are connected in the demand or feedback circuits, or if demand and feedback are connected to different devices, care must be exercised not to create potential ground loops. An example of one such installation that is common is using an external electronic governor on generator sets. Even if the external devices are powered from the same source, the internal circuitry of the external devices may cause a ground potential difference. Different ground voltage potentials in the demand or feedback circuits will cause ground loops to the AGV valves. Ground loops will "zero shift" the AGV valve's electrical components, and may cause the valve to start erratic behavior, and possibly damage the valve circuitry.

To avoid ground loops when the demand and feedback signals are wired to different devices, or when external devices are to be added to either circuit, it is recommended that signal isolators be installed in the feedback wiring.

Most, if not all, signal isolators have significant time delays between their input and output. These delays can cause problems if the isolators are wired into the fuel demand signal. Please contact Continental Controls Corp. before installing any device that may add signal delays in the fuel demand signal.

Connecting to the AGV Analog Input (Flow Demand Signal)

This is the blue wire on the wiring harness. The valve can be configured for:

- 4–20mA input (typically from a PLC)
- 0–50mA input from a Black Box or MFAC
- 0–200 mA from a Woodward 2301

The return for this mA signal is the white/blue wire within the wire harness.

Connecting to the AGV 4-20 mA Analog Output (Flow Feedback)

This is the yellow wire on the wiring harness, and its output is self-powered. Do not apply 24 volts to the analog output circuit. 4mA indicates the valve is closed and not flowing. 20mA indicates maximum flow for the valve calibration. The signal is linear between the two (4–20mA) points. The analog return, or analog ground, is the white/yellow wire.

For valves **without** an Acceleration Schedule, the feedback will follow the Valve Demand unless there is inadequate supply pressure or plugged filters.

For valves **with** an Acceleration Schedule, the two signals (Demand and Feedback) will not match.

Installation with Black Boxed (Solar Mark II Control System)

This option pertains to Solar Turbine customers with Saturn and Centaur engine installations dating pre-1985 only.

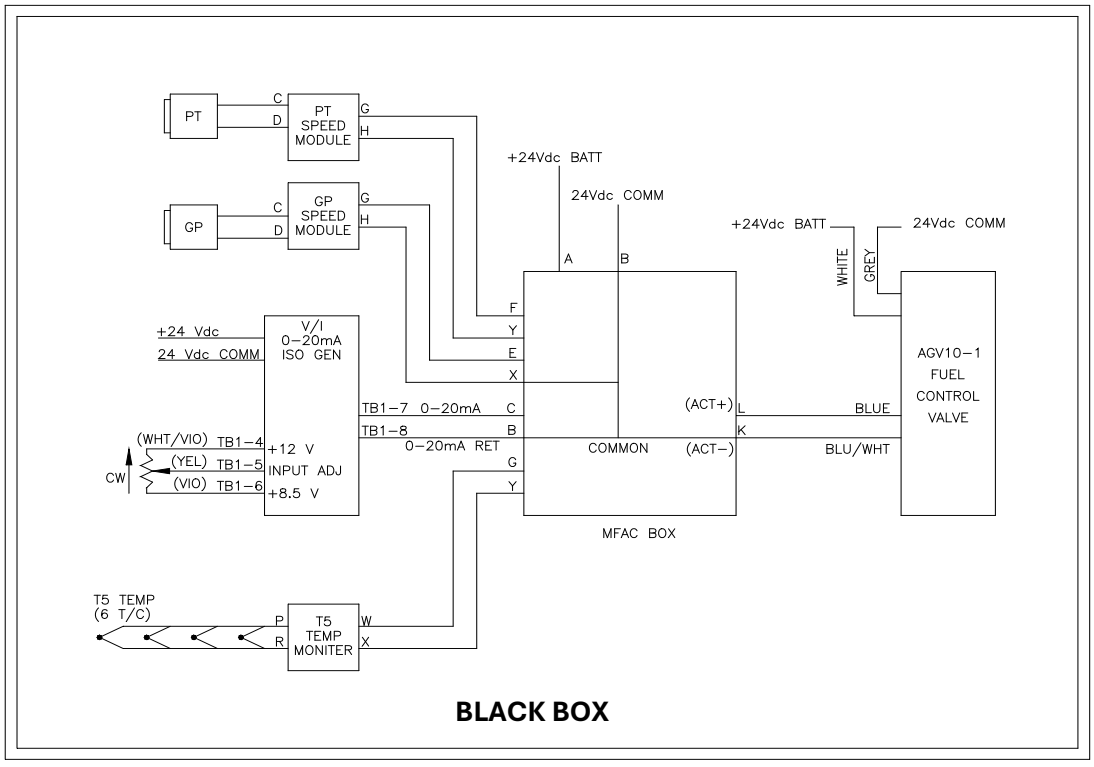
A schematic showing the wiring connection between Black Boxes and AGV Fuel Control Valves is shown below.

The only wiring changes that are necessary are: The two (2) wires that connected to the HR Textron (LEDEEN) actuator would be removed and connected to the AGV valve. The battery +24VDC and its return wire (24VDC common) would be connected to the AGV valve.

- **Speed Monitors** - Analog output signals from the GP and the PT Speed Monitors should be 4.167VDC when the input frequency from the magnetic pickup is correct for 100% speed. These signals connect to the MFAC box as shown below.

- **Temperature Monitors** - Temperature Monitor input is from the T5 or T7 thermocouple harness. The analog signal output from the Temperature Monitor is set for 0–5.0VDC and is adjustable based upon Solar specifications of individual engine types. The Temperature Monitor is based upon a 300° per volt output and will not require adjustment.

- **Main Fuel Actuator (MFAC) Control** – The MFAC Box may require adjustment. It should be calibrated in accordance with the Solar Service P/N108649-__ for that specific engine type/application.

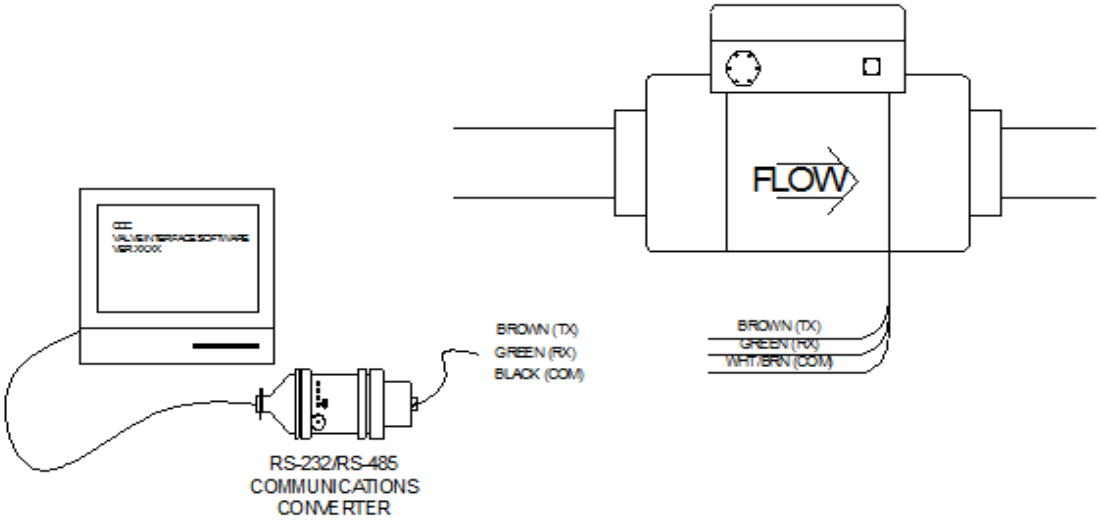


CAUTION: There are several models of Solar turbines with different T5 and T7 operating temperature ranges. It is the user's responsibility to ensure the MFAC is adjusted to properly limit the temperature to a safe value for that respective engine.

6 Communication Setup Instructions

6.1 General Description

The following instruction is for assistance in setting up the communication link between customer's PC/laptop and the AGV. AGV valves use RS-485 communications protocol. Most laptop computers use a USB port for communications. A USB/RS-485 protocol converter must be used to communicate with AGV valves. A converter and cable are available from Continental Controls Corporation (part no. 50109059).



6.2 Valve Viewer - Valve Interface Software

The AGV Valve Viewer is a Windows based application and is used to interface with AGV Fuel Control Valves.

The Valve Viewer application provides real-time monitoring of control functions in AGV valves. It gives the user overall control over the AGV valve's functionality and serves as a diagnostic tool in helping to detect and evaluate problems related to fuel control on gas turbines.

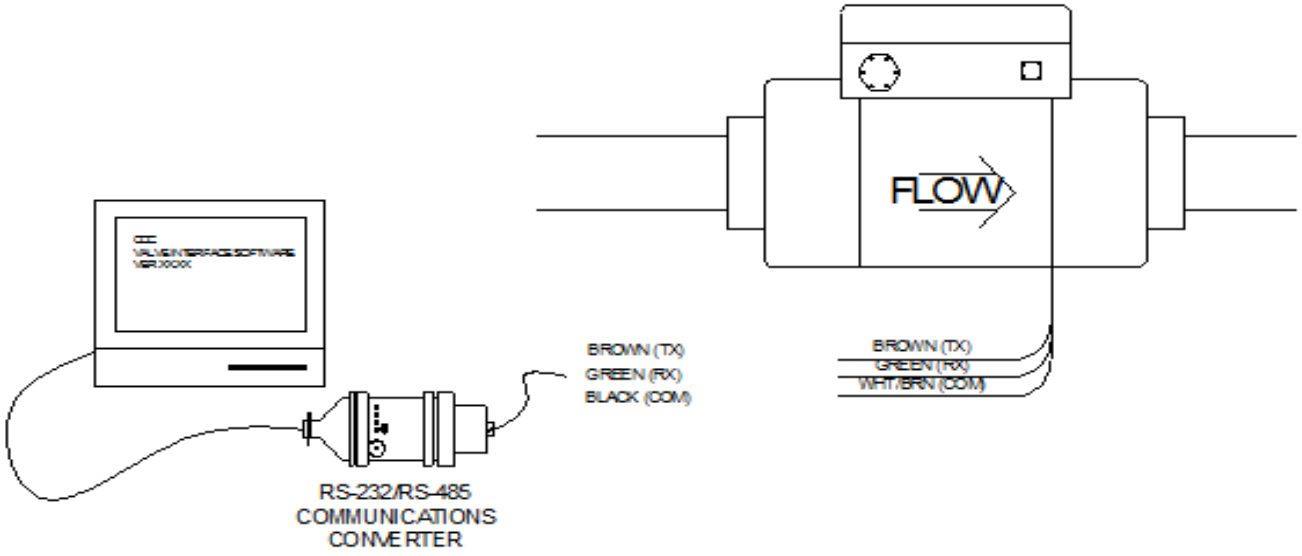
The AGV Valve Viewer is an intuitive software tool which offers an array of features such as the setup of all user-definable set-points in the AGV, monitoring of key data points, optional data logging, playback of history files, and exporting data to Excel. A similar program offered by Solar Turbines is Valve Wizard. This recorded data are known as log files that are saved in PC / laptop "My Document" under "CCCLog" by valve serial number, followed by the date of operation.

Further, AGV Valve Viewer can be used to view AGV calibration settings and possible changes can be made with Continental Controls Engineering team approval.

Warning!!! Do not attempt to change any settings without Continental Controls Corporation engineering approval or you have been trained through Continental Controls Corporation technical training class on AGV10, AGV50 and AGV50 fuel control valve.

6.3 AGV Establishing Communication with Computer

The following instruction is for assistance in setting up the communication link between customer's PC/laptop and the AGV10. The AGV10, AGV50 and AGV50 Pilot Fuel Control Valve uses RS-485 communications protocol. Most laptop computers use an RS-232 serial protocol from their respective communications ports. An RS-232/RS-485 protocol converter must be used to communicate with the AGV10, AGV50 and AGV50 Pilot. A converter and cable is available from Continental Controls (part no. 50109059).



Ensure the AGV power is enable prior to opening the AGV Valve Viewer program. +24 VDC power is connected to White wire of the AGV and 24 VDC Return / Common are connected to the Grey wire of the AGV.

Comm Port Settings

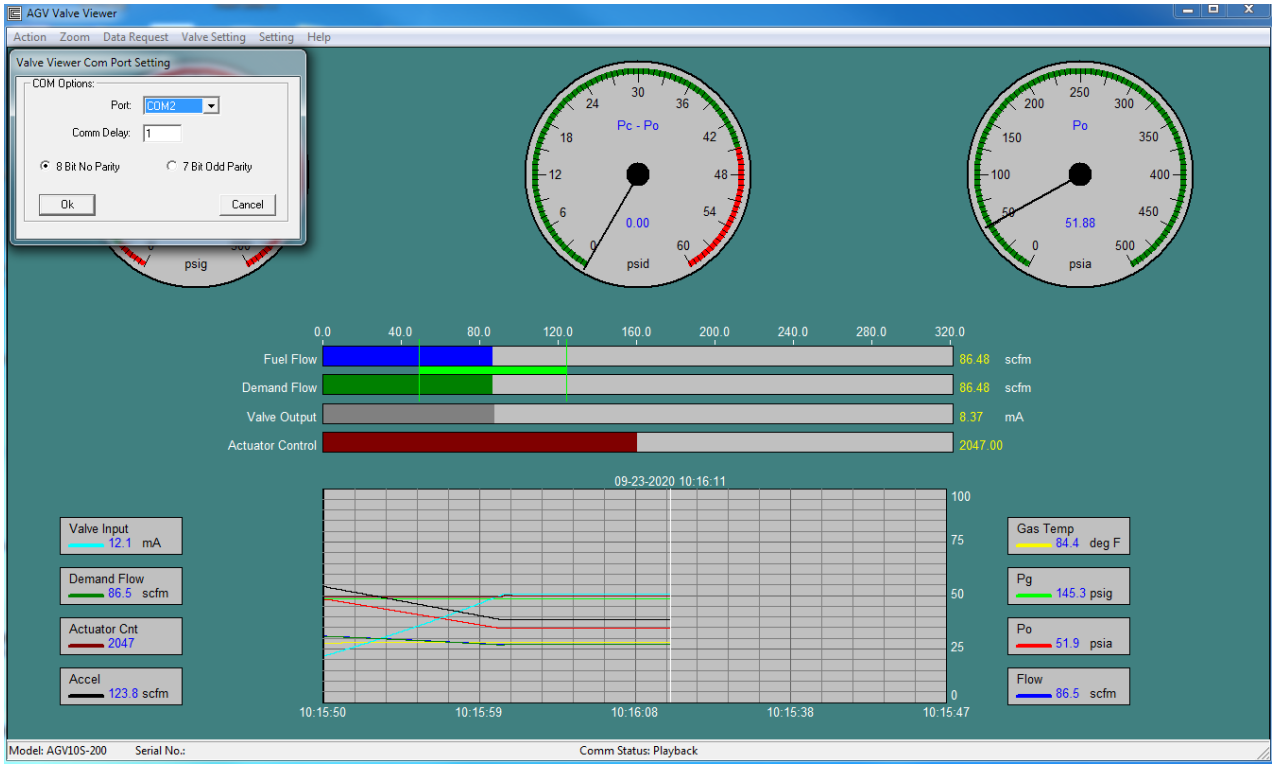
After 24 VDC power is turned on to AGV, double click on the AGV Valve Viewer on your computer to open.

AGV Valve Viewer automatically establishes communications with AGV fuel control valve using default communication port **COM 1**. If needed, a different communication port could be specified.

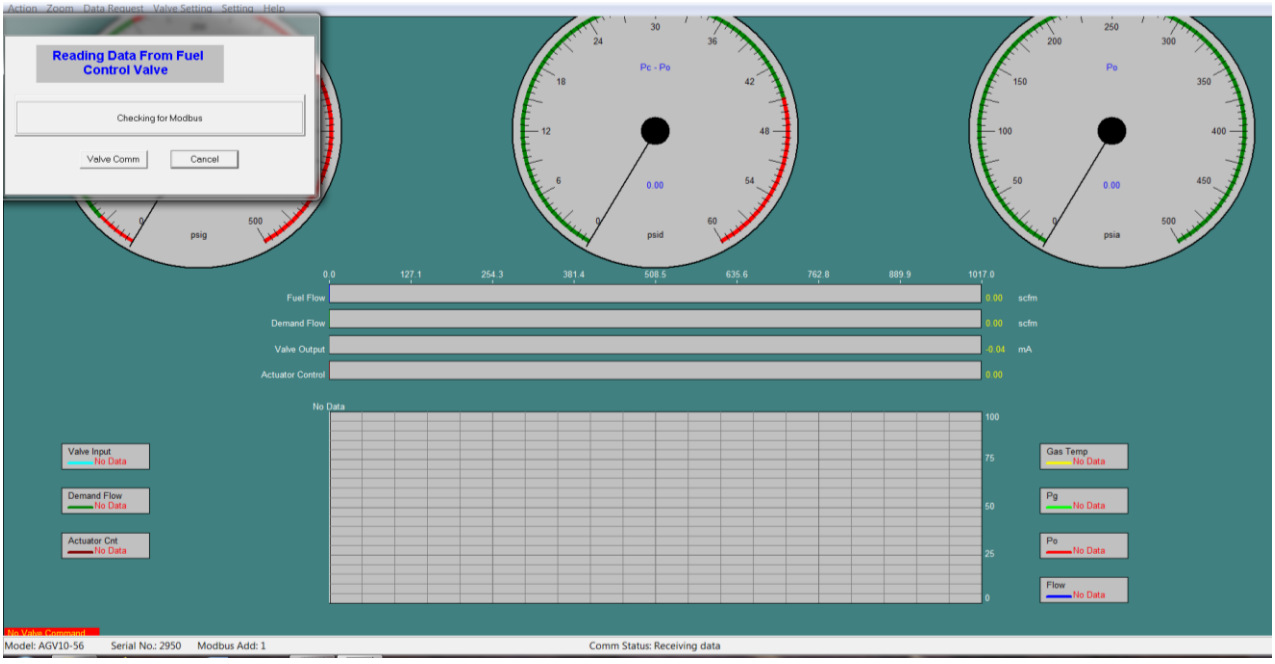
Communication setup guide:

1. Go to Setting -> Comm Port Setting.
2. Communication Port dialog box should open up.
3. Enter communication port. ***Note:*** *Ports COM1 through COM4 are supported.*
4. Press OK to apply changes and close dialog box.

AGV Valve Viewer will apply new settings to establish communications with AGV valve.



Note:
If valve communication does not immediately start, power to the valve may have to be cycled (on/off). Before doing this, start the AGV Valve Viewer program and have the appropriate connections made.



6.4 AGV Available Commands & Their Functions

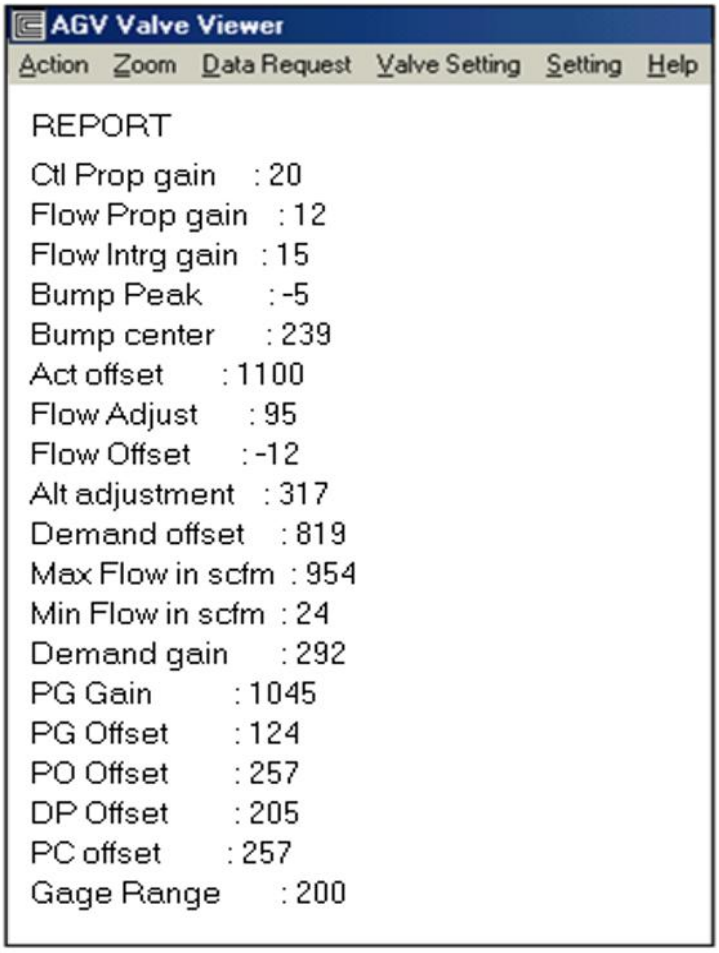
Warning!!! Do not attempt to change any settings without Continental Controls Corporation engineering approval or you have been trained through Continental Controls Corporation technical training class on AGV10, AGV50 and AGV50 fuel control valve.

When changing a setting, you will see the original factory setting. Type the desired or instructed setting valve, then press the "enter" key on your keyboard. Pause for 1 second, then continue through the remaining settings. But when approaching the next setting in the order of the display, you MUST pause for 1 second prior to pressing the "Enter" key on your computer keyboard. If you proceed with pressing the "Enter" key to quickly, you will accidentally set the settings to zero.

REPORT Command

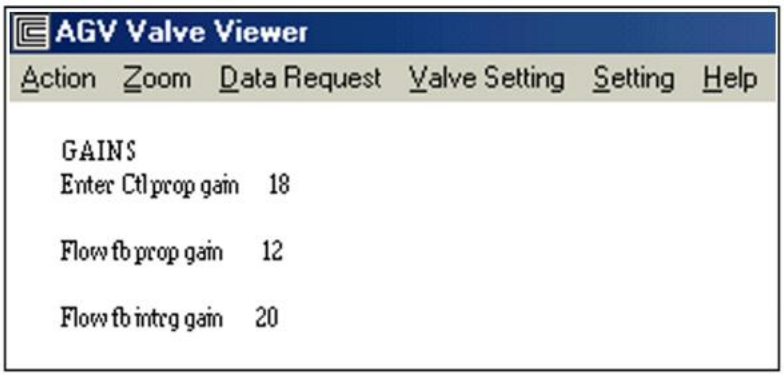
Provides a REPORT of gains, offsets and adjustments accessible for calibration of the valve. This information can be printed out directly from the screen by pressing the "Print Screen" button on your computer keyboard. ***This should be done first before valve operation or engine tuning***.

Valve settings are NOT interchangeable. Do not enter values from another valve's calibration unless instructed to do so by Continental Controls Corp.



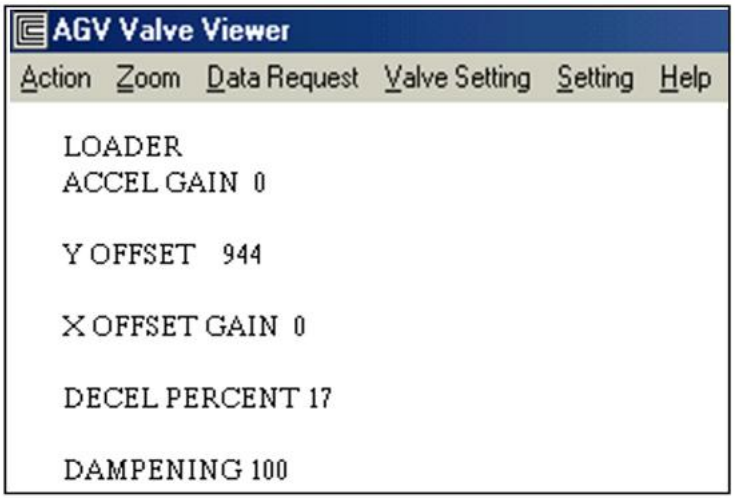
GAINS Command

This menu is used for setting GAINS during the valve calibration process and is available for fine-tuning of the valve to match the installation.



LOADER Command

The LOADER command works as the ACCEL command with the exception that it affects the embedded Acceleration Schedule, which varies between engine types.



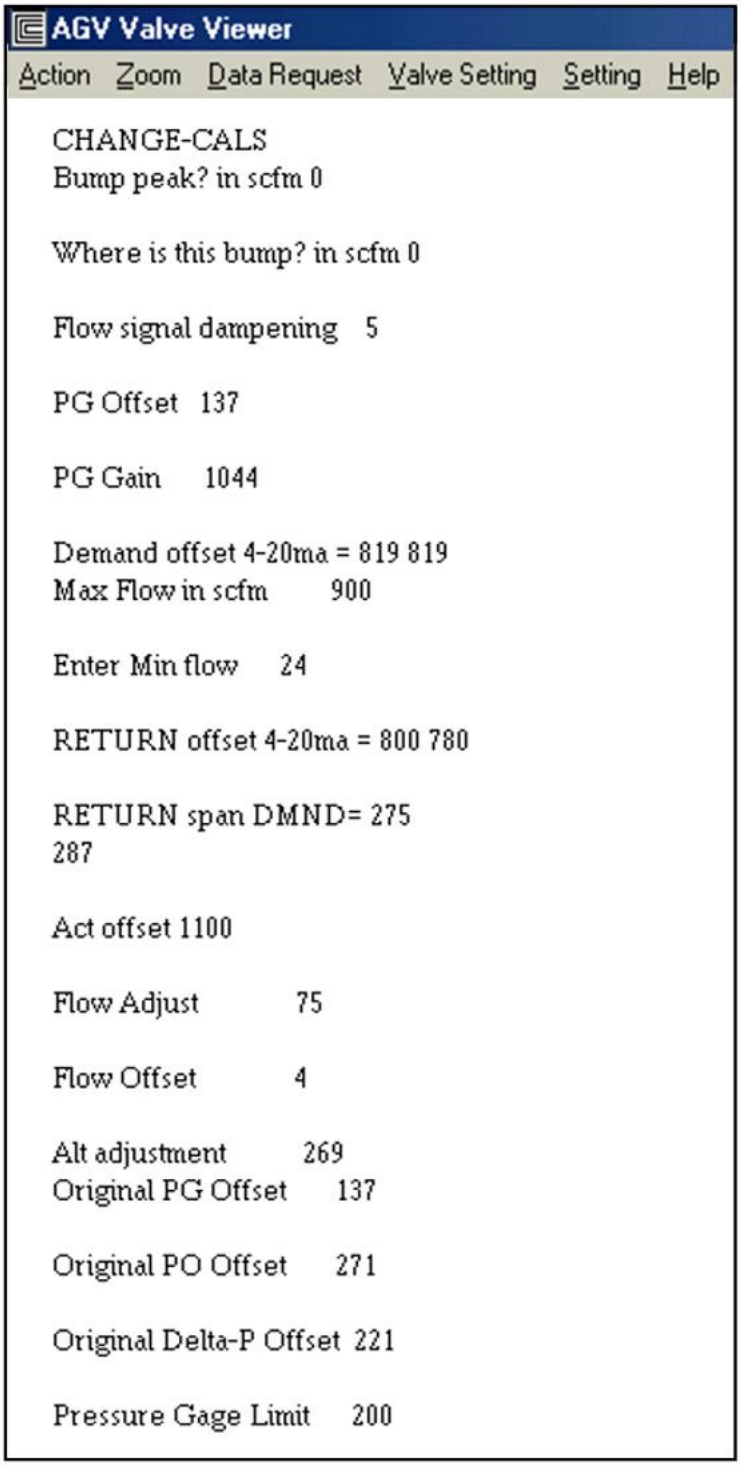
SET-ORG Command

This command sets the original transducer counts as the “zero” point after calibration and is used as the reference point for the program and to identify that the transducers are operating within tolerance. Tolerance being +/-200 computer counts from the “original” set point. Performing a SET-ORG function after a transducer malfunction will change the accuracy of the flow calibration across the entire range of the valve.

This should not be performed in the field unless the transducer counts are first verified to be approximately the same as the original counts through the READINGS command, or when instructed to do so by Continental Controls Corp. Additionally, the AGV must be removed from the engine skid with no supply pressure or trapped pressure downstream.

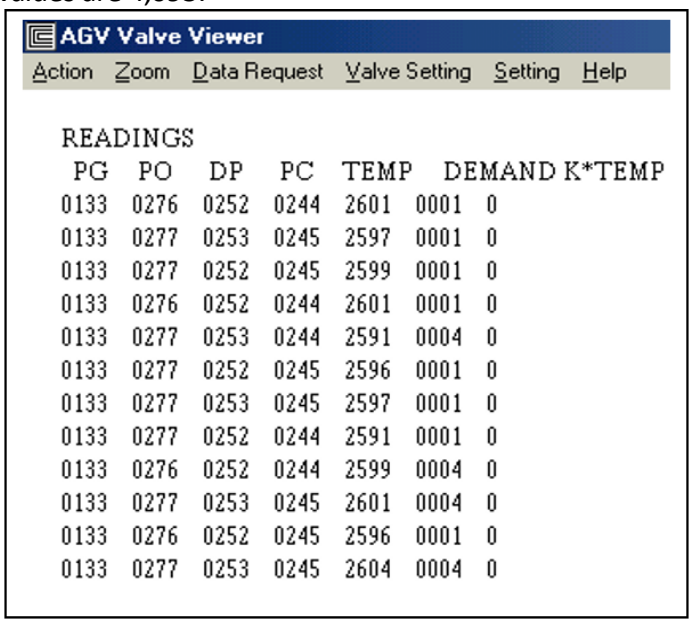
CHANGE-CALS Command

Normally used during the calibration process, this menu allows for setting the acceleration parameters for the engine flow calculation adjustments, altitude and original transducer settings.



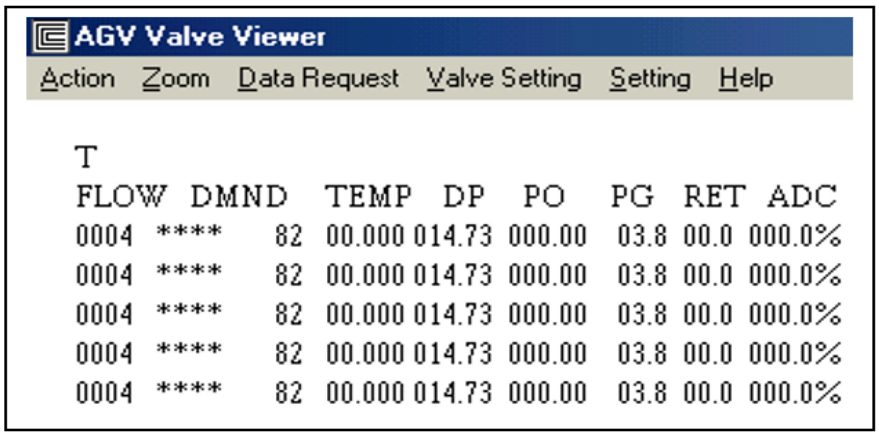
READINGS Command

The READINGS command shows transducer computer counts in real time and can be done during valve operation to determine if transducers are reporting within allowable ranges. Maximum count values are 4,095.



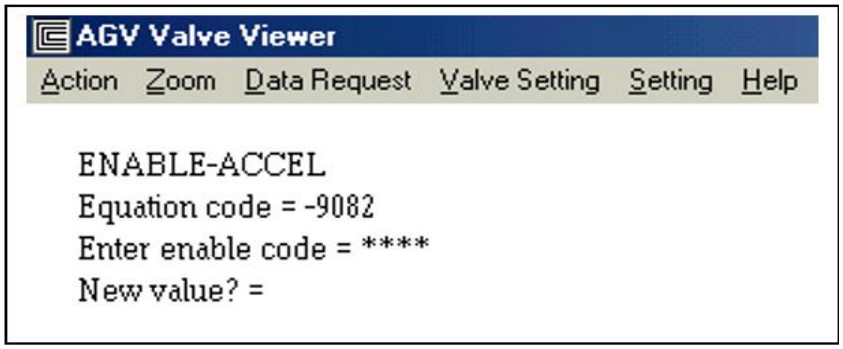
T Command

T command provides operational data—actual flow, demand from the control system, gas temperature, Dp across the orifice, discharge pressure, supply pressure and feedback in mA.



ENABLE-ACCEL Command

ENABLE-ACCEL command allows the operator to enable the embedded acceleration control, but only with the proper equation code (obtainable only from Continental Controls Corp.).

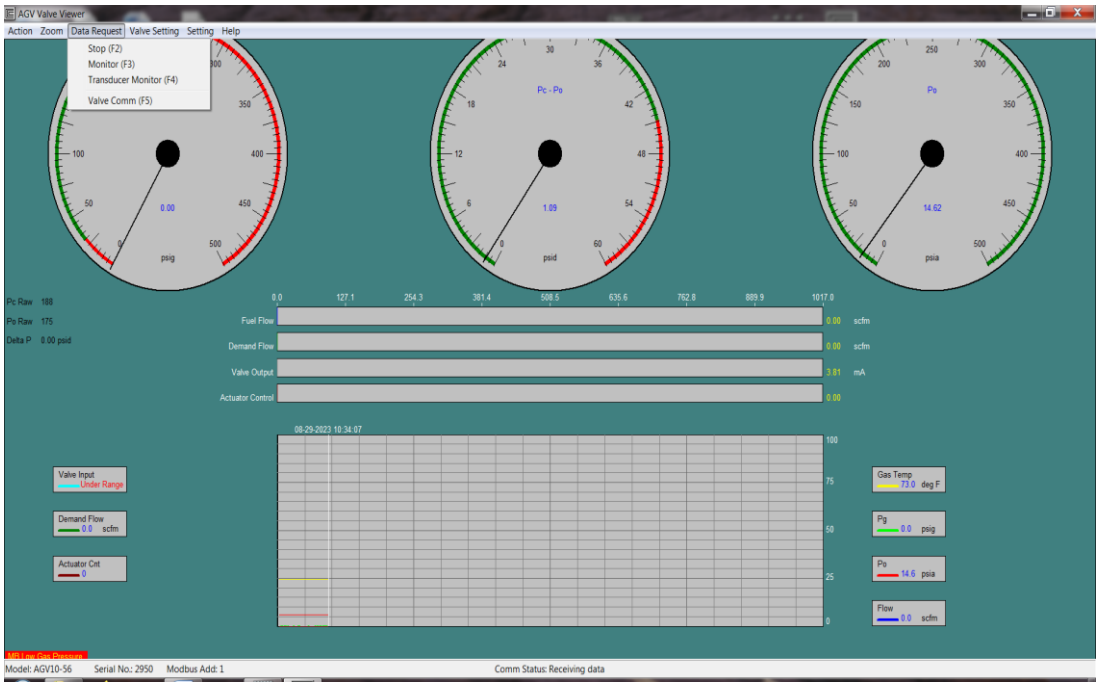


DISABLE-ACCEL Command

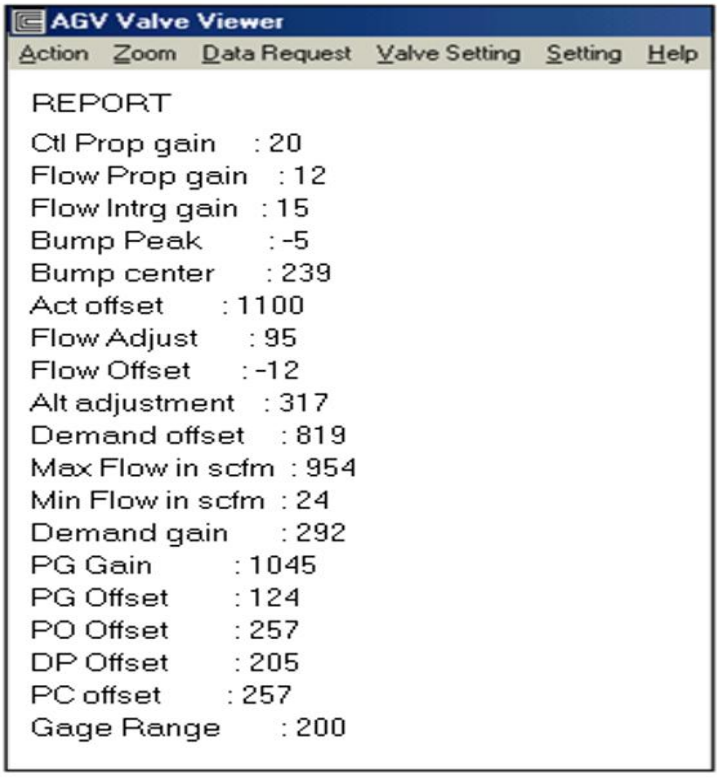
The DISABLE-ACCEL command allows the operator to disable the embedded Acceleration Schedule, but only with the proper equation code (obtainable only from Continental Controls Corp.).

6.5 Factory Calibration Settings Report

The following instruction To take Print Screen shot of the settings, in the AGV Valve Viewer click on “Data Request” on top left corner of the screen. Scroll down to “**Valve Comm (F5)**”. See figure below.

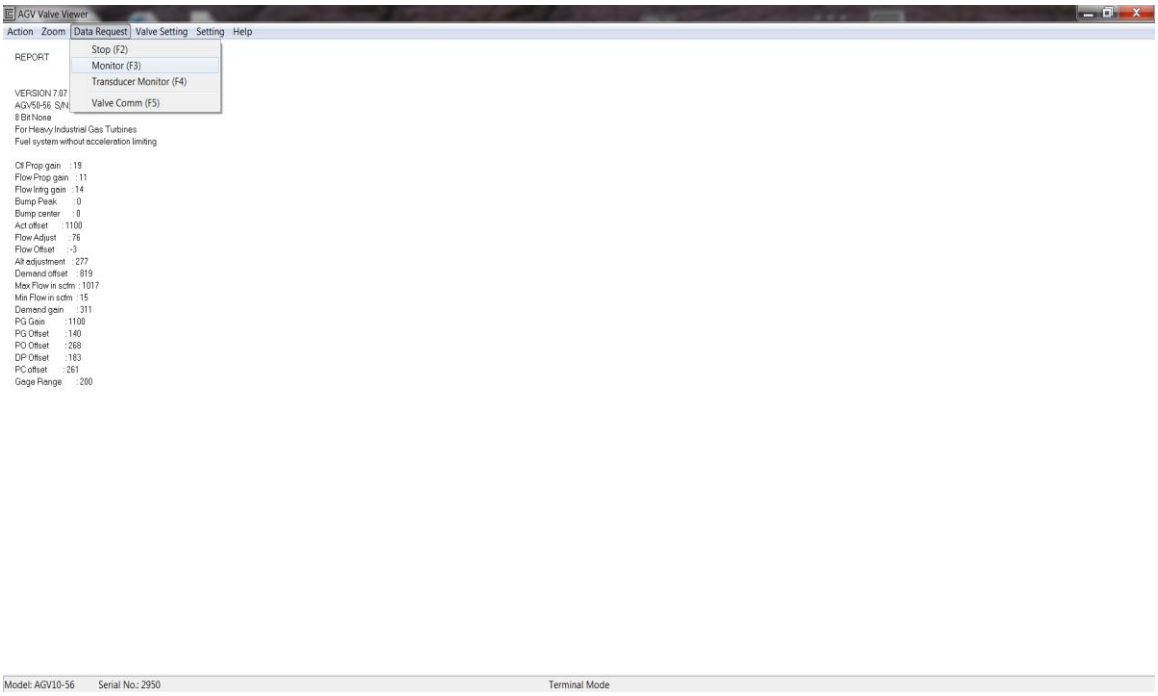


After selecting “**Valve Comm (F5)**”, prompt for password will popup. Type 1133 for the password and hit “ok” on the screen. Then another screen will popup and hit “Ok” again.



In the white screen (above figure) that is known as "**Valve 50**", type **REPORT**. The valve calibration settings will be displayed. You can view the settings and if requested to share the settings, hold "**CTRL + Prtscn**" on your keyboard to share the settings with the requested individual.

To go back to the graphical screen, click on "**Data Request**" on top left corner of the screen. Scroll down to "**Monitor (F3)**".



7 Preventative Maintenance

7.1 General Description

The AGV has been designed to operate reliably with a minimum amount of maintenance. To ensure optimum performance, periodic inspection and cleaning is necessary.

Preventative maintenance issues can be integrated into the current maintenance schedule of the turbine engine. Most maintenance requires little effort and no downtime of the Fuel Train.

Corrective maintenance is to be done when AGV Fuel Control Valves begin to behave erratically. Procedures have been generated to troubleshoot and repair most minor issues. It is recommended that Continental Controls Corp. be informed whenever corrective maintenance is to be performed on AGV valves.

7.2 External Visual Inspection

Inspect the exterior of the valve for loose connections, frayed wires or major structural damage.

7.3 Cleaning

Exterior cleaning will aid in the visual inspection of the external casing and ensure good connections. Ethyl alcohol or mild soapy water can be used as cleaning agents. It is recommended that the valve be cleaned every 60 days. If environmental conditions are extremely dirty, more frequent cleaning will be necessary.

7.4 External Pilot Gas Filter

The pilot gas filter, if installed, should be changed every six (6) months or more frequently if operations if necessary. A replacement filter (part no. 50109169) may be ordered from Continental Controls. The filter is a coalescing .01 micron filter with a <3 psi drop at 15 scfm.

7.5 Maintenance Log

To facilitate troubleshooting and to establish service schedules, a maintenance log should be kept on AGV valves.

7.6 Calibration

Flow calibration of AGV valves is performed prior to shipment. Since calibration of the valve requires equipment not normally available in the field, it is recommended that the valve be returned to Continental Controls Corp. if adjustments are necessary.

8 Corrective Maintenance

8.1 General Description

The only corrective maintenance procedures that field personnel may be able to perform on AGV Fuel Control Valves are that of regulator and pilot filter cleaning/replacing, and poppet valve assembly removal. Any other actions taken on AGV valves may cause physical damage or loss of calibration and would require that the valve be returned to Continental Controls Corp. for refitting or re-calibration.

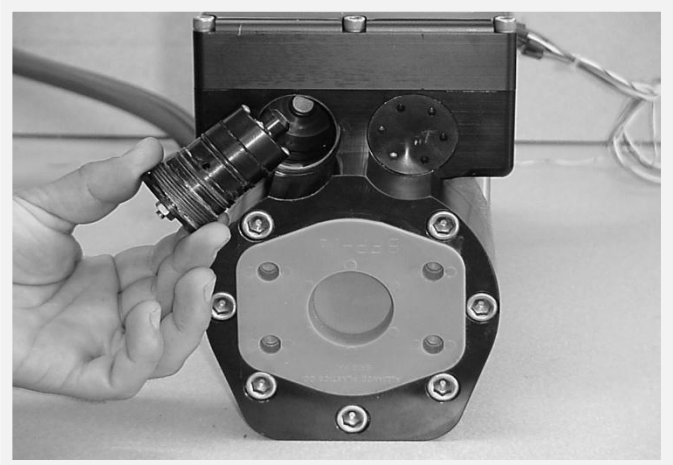
8.2 Regulator & Internal Filter Cleaning or Replacement

The following section will cover the replacement or cleaning of the Regulator Assembly (part no. 50105008). Before starting, it is recommended that a clean flat work surface be prepared and the proper tools available. It is also recommended that Valve Repair Kit (part no. 50109129) be purchased from Continental Controls Corp. The kit contains items such as a spanner wrench, replacement O-rings, replacement filter and O-ring lube.

Valve Repair Kit, PN: 50109129

Procedure for Cleaning/Replacing Pilot Filter

1. Using the spanner wrench, apply pressure in a counter-clockwise motion and remove the regulator assembly.



2. **DO NOT** remove the regulator adjustment screw and nut. If these are removed, the correct regulator settings (42 psid) cannot be reset without returning the valve to Continental Controls Corp. for re-calibration.

3. Check to see that the regulator does not interfere with the end flanges. If there is no interference, continue to step 5. If there is interference, the inlet flanges need to be removed (step 4).

4. Remove the seven cap screws holding the inlet flange on, using a 5/16" Allen wrench. Remove the flange.

5. The filter O-ring (size 4470-200-012) and filter should now be visible.

6. Carefully remove the O-ring for later use. Inspect the O-ring for cuts and abrasions before reusing. If there is any physical damage to the O-ring, it is to be replaced.

7. If you have a replacement filter and DO NOT want to reuse the current filter, puncture the filter with a sharp object and remove it. Continue to step 11.

8. If the filter is to be reused (not recommended), use a dental pick to carefully ease the filter out by its edges.

9. Back flush the filter with Stoddard solvent or other cleaner.

10. Place the new or cleaned filter into the housing filter cavity, coarse side down.

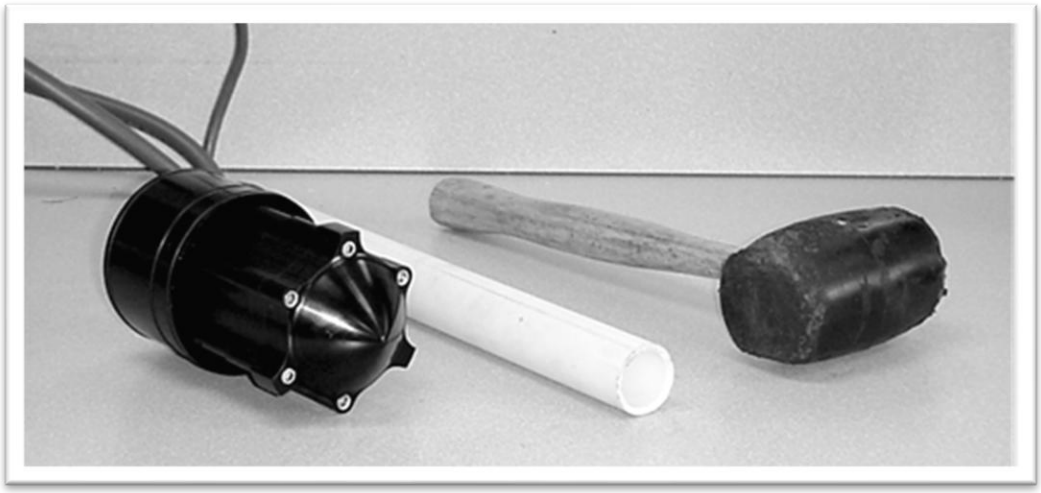
11. Place the O-ring in front of the filter to fasten it. **When replacing or reusing an O-ring, the proper lubricant should be used at all times** (i.e. Dow Corning lubricant #55).

12. Tighten the regulator assembly using the spanner wrench in conjunction with a torque wrench (30 lb-ft of torque).

13. If the end flange had to be removed, place a small amount of O-ring grease on the flange O-ring and re-install.

8.3 AGV10 Poppet Valve Assembly Replacement

Since the center section (Poppet Valve Assembly) is not serviceable in the field, a replacement must be installed if on-site repairs are desired. These parts are included in the Valve Repair Kit (part no. 50109129) available from Continental Controls Corp. In addition, replacement poppet valve assemblies are sold separately.



1. Remove the AGV10 valve from the fuel line.

2. Remove the downstream flange (indicated by ridges) while being careful not to cut the O-ring. If needed, tap the flange upward with a rubber mallet to ease removal.

3. Using a pair of snap ring pliers, remove the steel snap ring. Use eye protection, as the snap ring can release out of the assembly unexpectedly.

4. Using the soft, rubber coated side of the snap ring pliers; pry out the orifice metering plate (DO NOT DAMAGE THE INNER EDGE IN ANY WAY).

5. Remove the upstream flange, being careful not to cut the O-ring. Again, tap the flange with a rubber hammer to ease removal.

6. Put a 2” diameter PVC pipe over the downstream portion of the center section. Using a rubber mallet, tap the PVC pipe until the center section is removed from the housing. Do not press or turn the poppet itself.

7. Coat the three O-rings of the new center section with O-ring lubricant.

8. Insert the poppet assembly into the valve body with the cone facing in the upstream direction.

9. Align the control pressure inlet of the poppet assembly with the dowel insert of the control pressure transducer. NOTE: The cone of the assembly, which does not have a cap screw, is in line with the control pressure inlet of the assembly.

10. Click the center section in place by providing sufficient downward force on the center section cone. In the field, this can be done by CAREFULLY standing on the cone portion of the center section when it is oriented vertically.

11. Replace the upstream flange (it has two ridges). Tighten down the seven cap screws (6 lb-ft torque each).

12. Apply O-ring lubricant to the O-ring orifice. Firmly press the orifice into the valve body at the downstream end. Ensure that the taper faces the downstream side of the valve.

13. Replace the snap ring.

14. Replace the downstream flange. Tighten down the seven cap screws (6 lb-ft torque each).

15. Send the malfunctioning center section to Continental Controls Corp. for refitting.

8.4 AGV10 Poppet Valve Assembly Cleaning

Occasionally, foreign debris may make its way into the metering housing and become lodged inside. This will cause an AGV valve to fail to close. A control system will abort a start caused by command and feedback mismatch. This debris may be removed by using instrument air.

CAUTION: Due to the strong nature of the shutoff spring within the center section, DO NOT place your fingers near the poppet valve if it is in an open position.

1. Upon the removal of the poppet assembly from the metering housing of the AGV10, inspect the housing for any internal damage that may have occurred.

2. Shop air can be used to blow away and clean any loose particles that may have accumulated. DO NOT use any hard-edged instrument to clean the valve housing.

3. Holding the center section in hand, apply instrument air to the poppet assembly through the control pressure port (Pc).

4. The poppet valve will open with 30–70 psi air applied. Do not exceed this range.

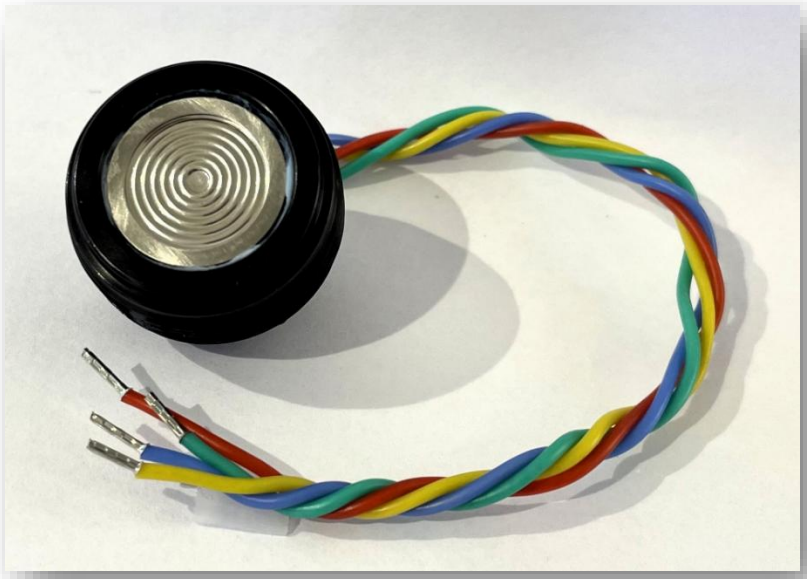
5. Using a soft edged device (i.e. Popsicle stick, Q-Tip, etc.) hold open the poppet valve. **Do NOT use any hard-edged instruments (i.e. screwdrivers) as this will damage the assembly** and concurrently require repairs made by Continental Controls.

6. Ensuring that the poppet assembly is clear of debris, release the poppet valve.

7. Re-lubricate the O-ring seals of the poppet assembly and reinstall as instructed.

8.5 Replacing Pressure Transducer Assembly

It's very important to write down the transducer assembly wiring location on paper or take a picture of the transducer connection in the electronic assembly.



Replacement of AGV valve transducers can be done in the field under the direction of Continental Controls Corporation. The transducers that may be replaced are:

- PC (Control) transducer
- PO (Outlet) transducer
- PG (Supply) transducer

NOTE: By replacing a transducer in the field, the accuracy of the AGV valves may be slightly affected due to the small variances in transducer parts.

1. Remove the electronics housing cover.

2. Examine, make notes and take photos of the AGV valve's electronic board assembly (i.e. wire placement and orientations).

3. Unclip the affected transducer from the electronics board and unscrew the board from the circuitry housing. **Do not remove more wires than necessary.**

4. Using snap ring pliers, remove the snap ring of the affected transducer.

5. With a small pry tool, remove the transducer from its housing.

6. **NOTE: There is an O-ring placed on the underside of the transducer. If this O-ring is damaged, it must be replaced properly.**

7. Insert the new transducer into the appropriate position, taking care to have the O-ring in place (within the cavity).

8. Re-insert the snap ring to hold the transducer in place.

9. Attach the wiring to the electronics board in the proper orientation.

   NOTE: The red wire of the harness is on the downstream side of the valve.

10. Reassemble the electronics board to the electronics housing.

11. Install the electronics cover to the AGV valve. Do NOT allow any wires to become pinched when placing the cover on. Re-tighten the cap screws to 40 in-lb torque. Max clearance between the cover and the housing is 0.0015”.

9 Warranty

9.1 Warranty

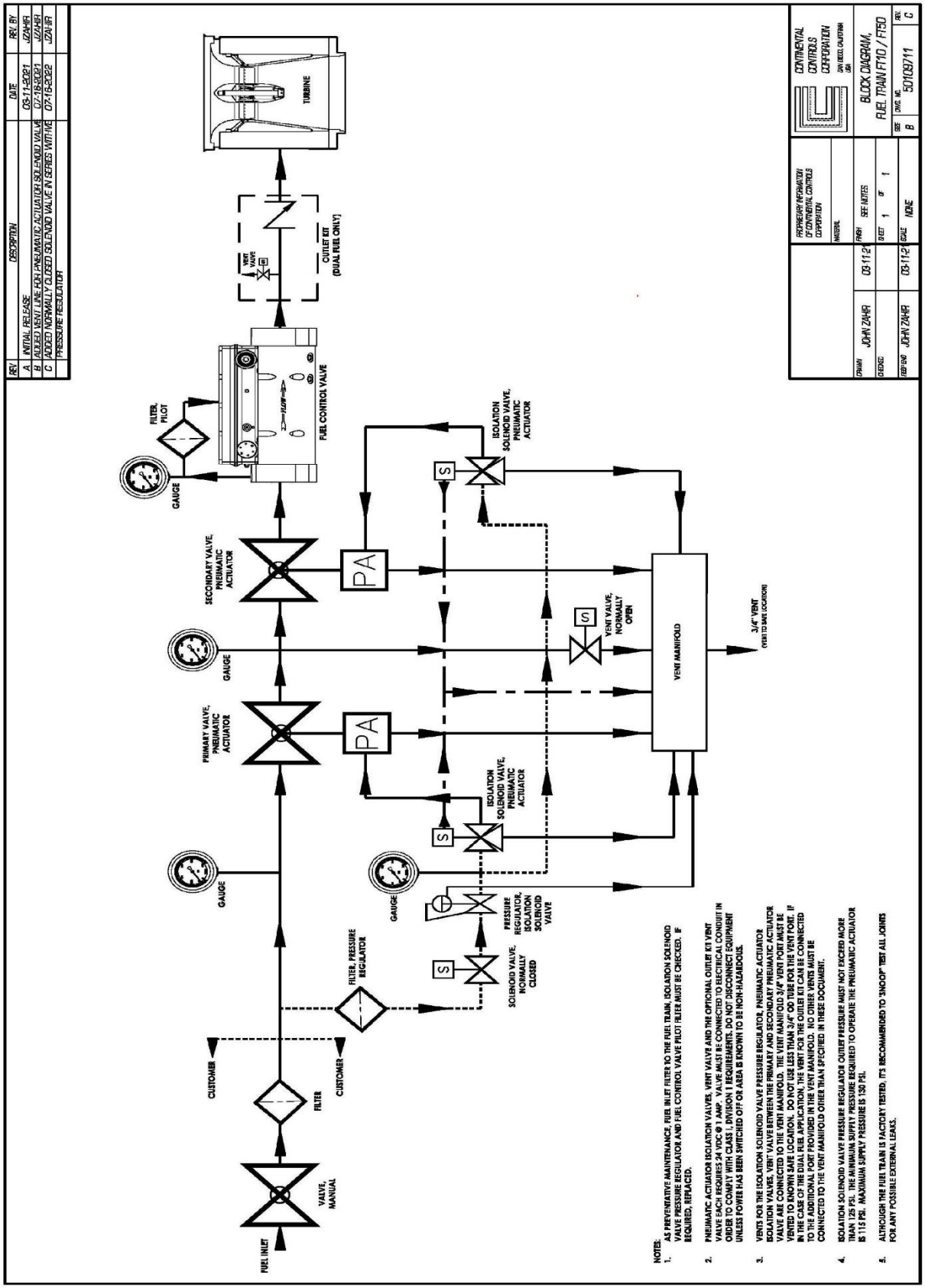
Continental Controls Corporation warrants that all goods furnished by CCC are free from defects in workmanship and material as of the time and place of delivery.

As a matter of general warranty policy, CCC honors an original buyer's warranty claim in the event of failure within 12 months of shipment to the end-user, when the equipment has been installed and operated under normal conditions and in accordance with installation instructions contained in the operating manual and generally accepted operating practices.

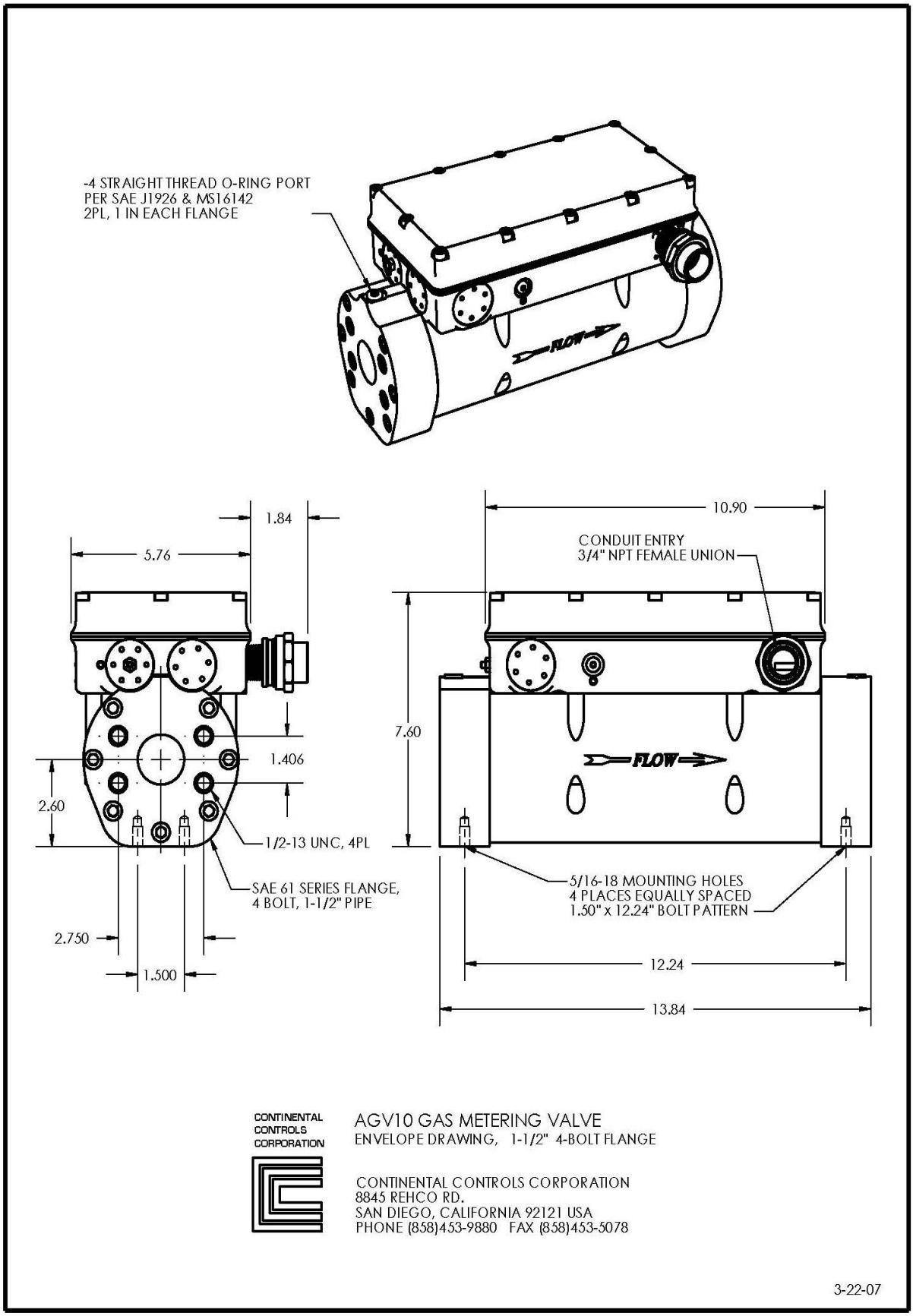
All warranty work must be performed and CCC’s manufacturing facility in San Diego. The customer is responsible for shipment or delivery of the product to the CCC facility. CCC will pay return ground freight. The customer will pay any expedited freight fees.

10 Block Diagram & Envelope Drawings

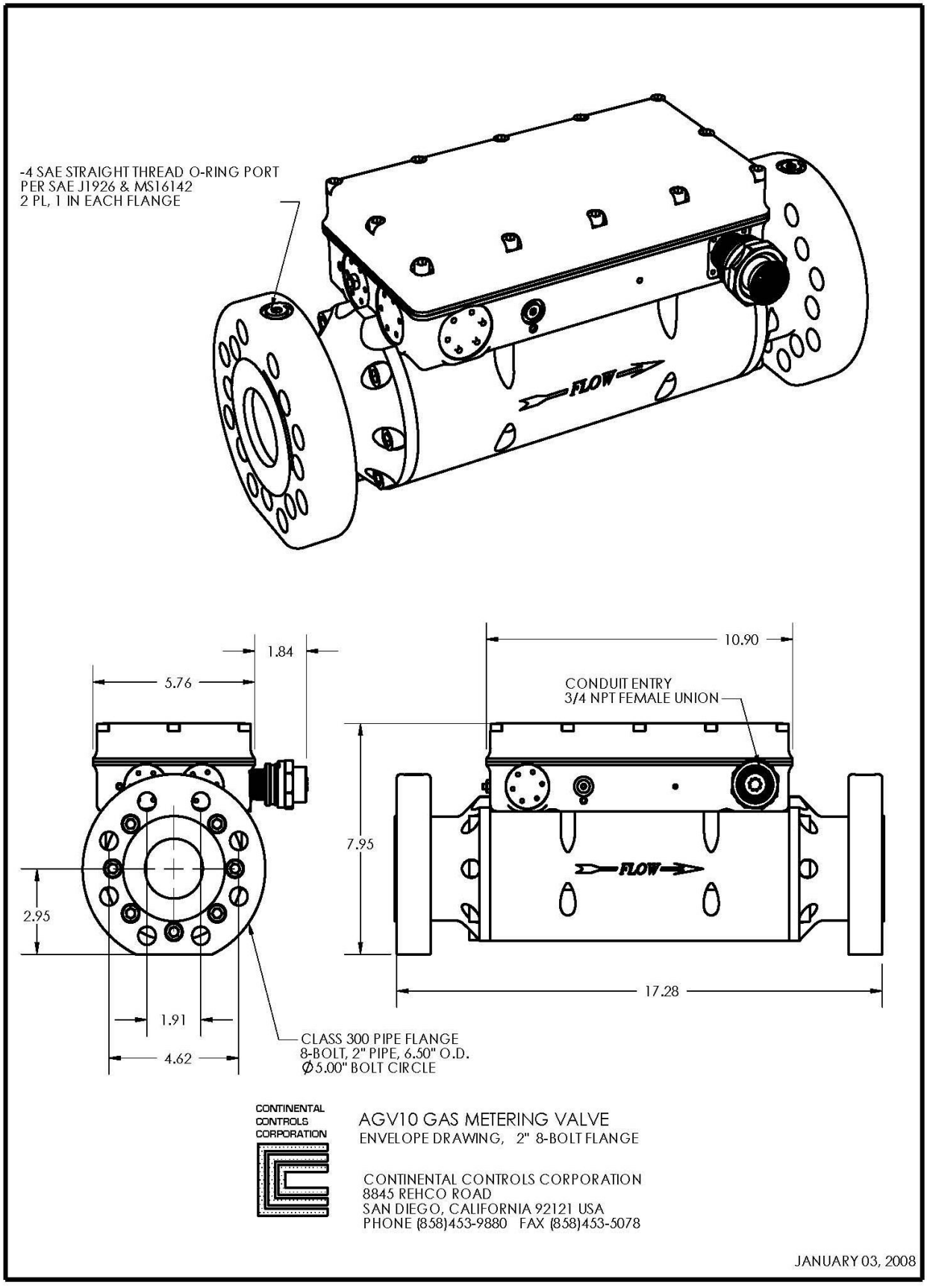
10.1 Block Diagram



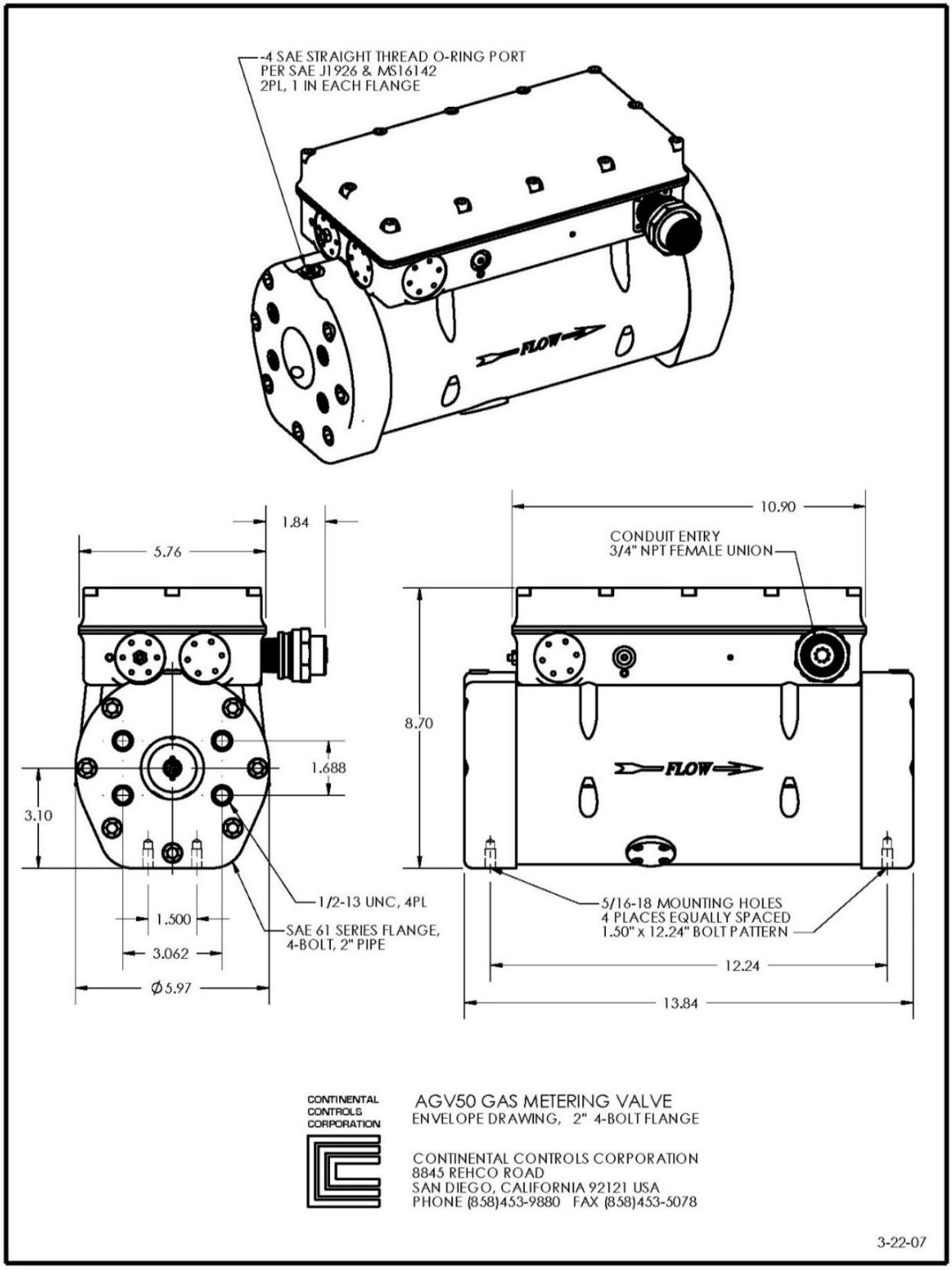
10.2 AGV10, 1-1/2" Pipe 4-Bolt SAE 61 Series



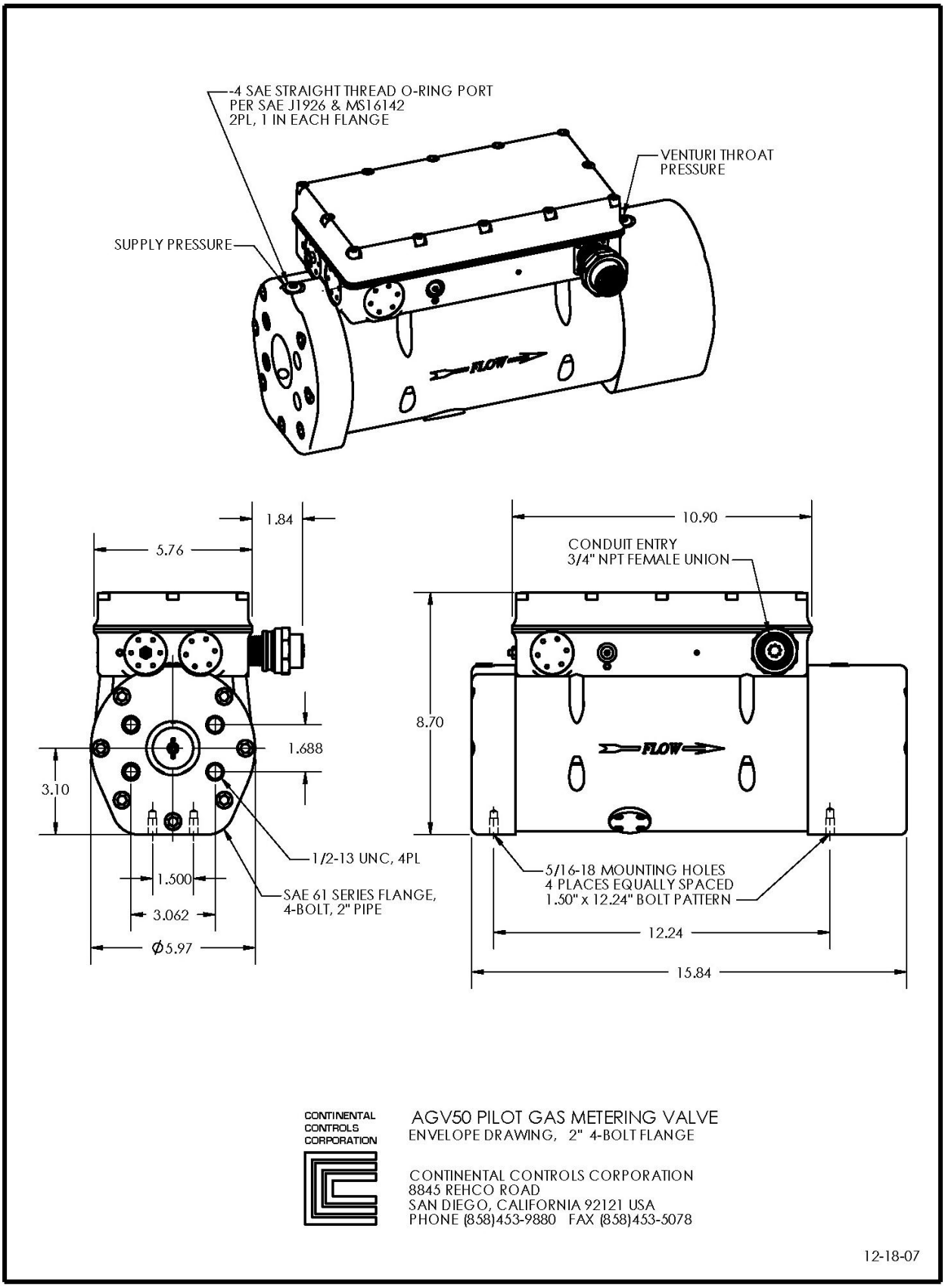
10.3 AGV10, 2" Pipe ANSI Class 300 Flange



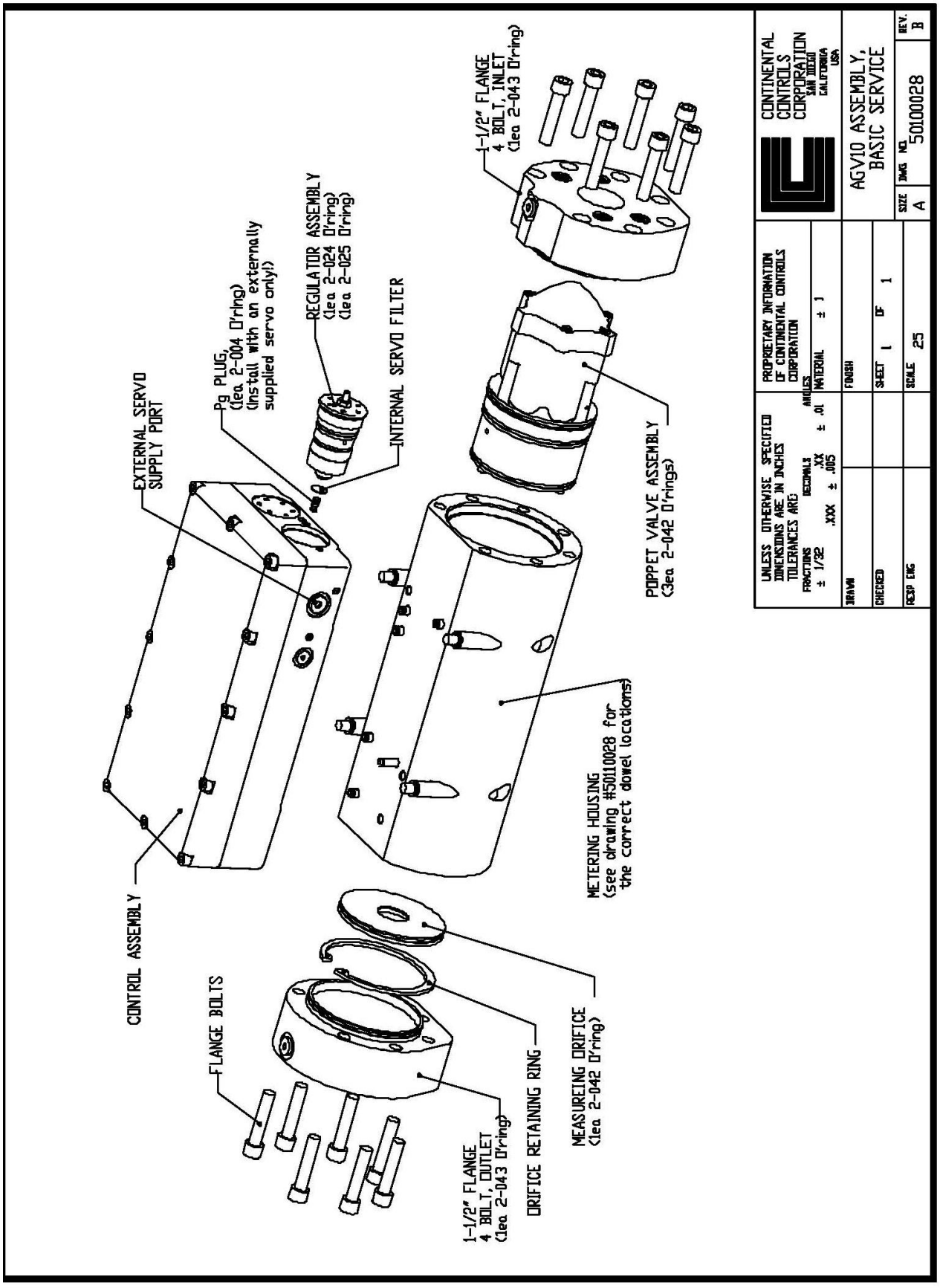
10.4 AGV50, 2” Pipe 4-Bolt SAE 61 Series



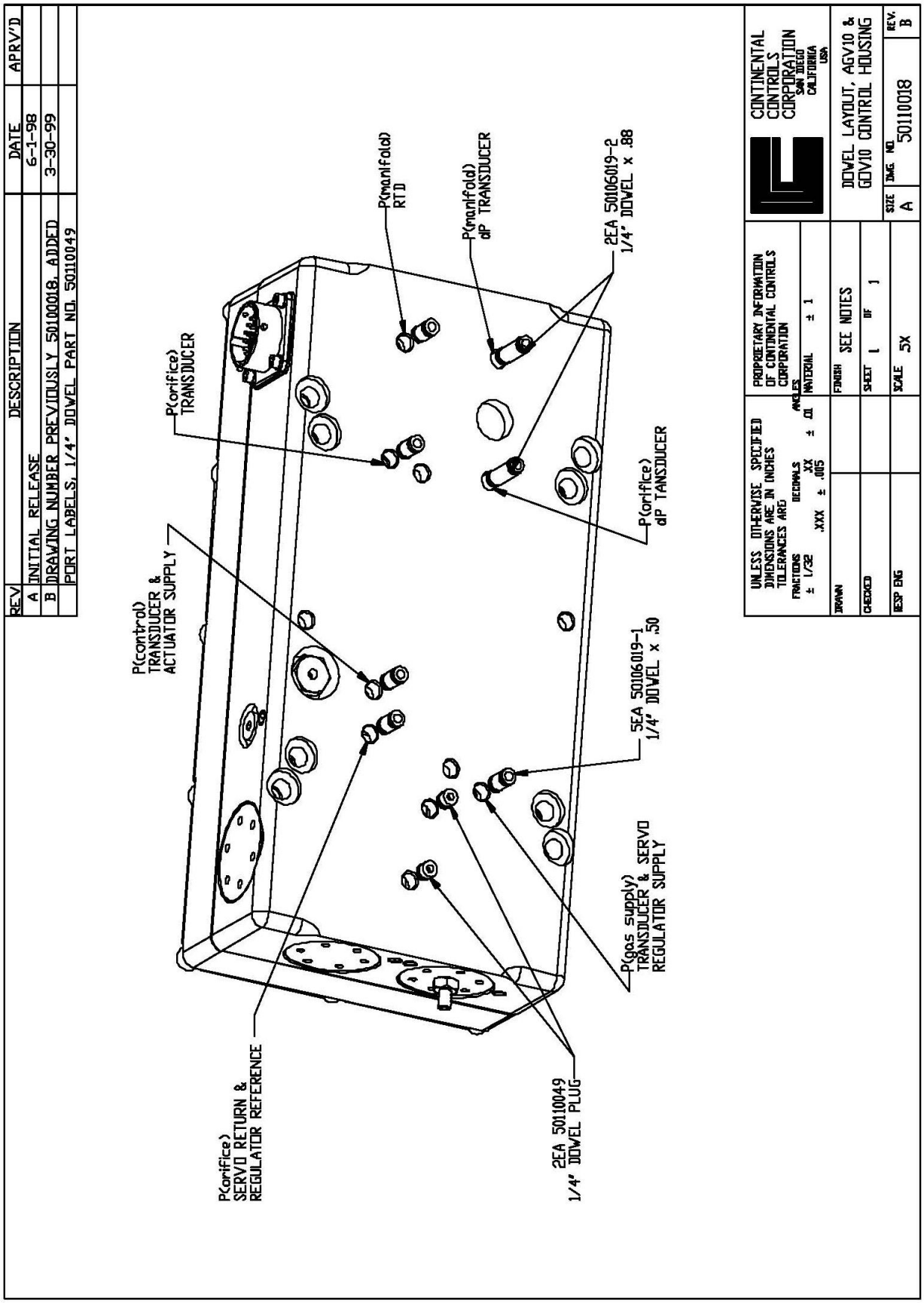
10.5 AGV50 Pilot (Solonox), 2" Pipe 4-Bolt SAE 61 Series



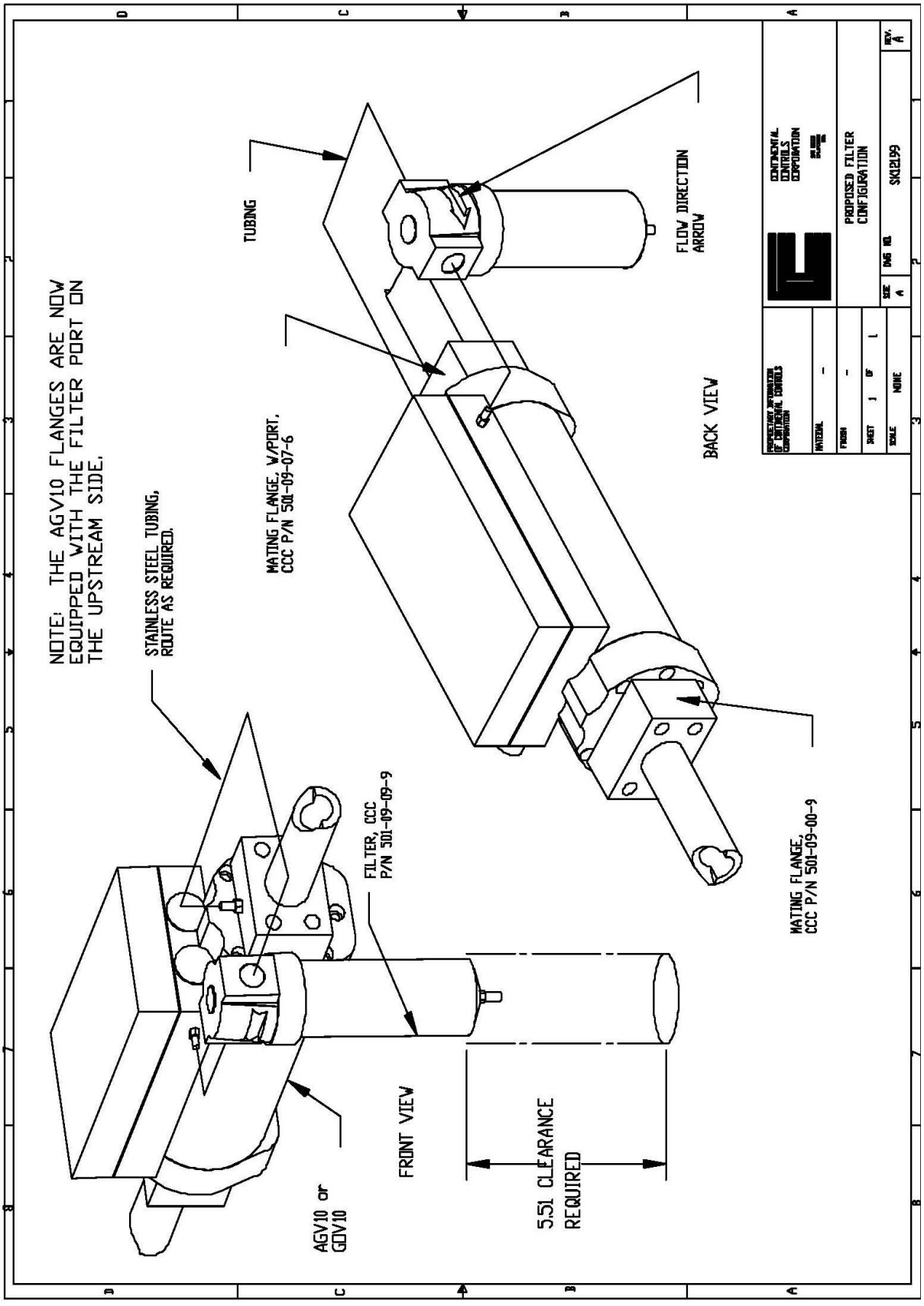
10.6 AGV10 Basic Service Drawing



10.7 AGV Control Housing Dowels Layout



10.8 AGV External Filter Installation Diagram



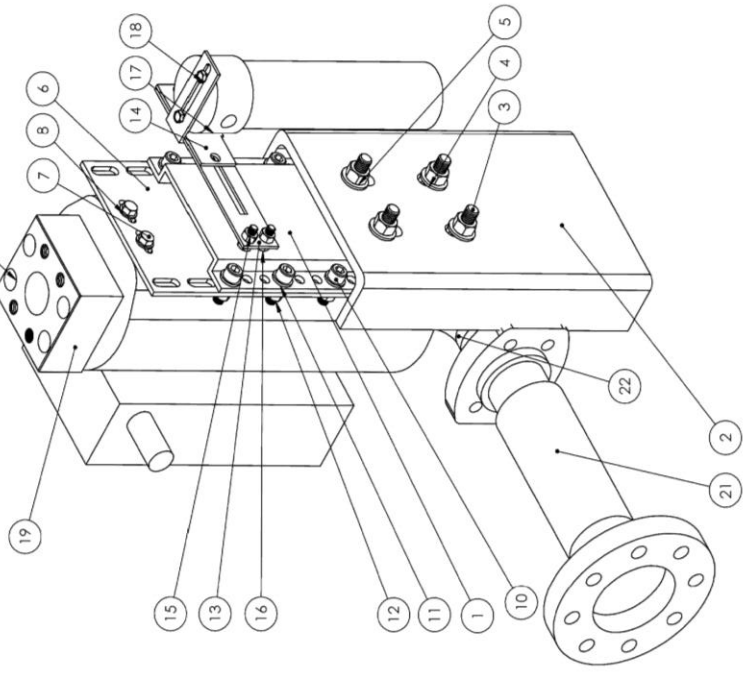
11 AGV50 Installation Kit Part Numbers

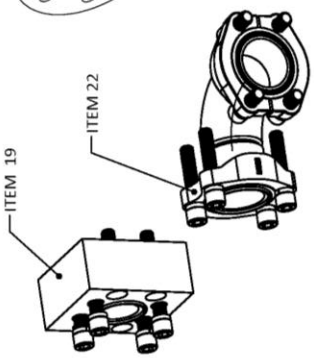
The following AGV50 installation kits are designed to replace the Meggitt High Force Valve in both standard combustion and Dry Low Emissions (DLE/Solonox) applications. These kits may also be suitable for other applications.

If you require components not listed below, please contact Continental Controls Corporation for further assistance.

11.1 Standard Combustion Installation Kit, P/N: 50219908-S

KIT P/N: 50219908-S ARE FOR STANDARD COMBUSTION USING 1 AGV50.





FOR ITEM #19, SEE ASSEMBLY DRAWING P/N 50219918-S FOR BOM
FOR ITEM #22 SEE ASSEMBLY DRAWING P/N 50219958 FOR BOM

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	50219976	HAT CHANNEL, MEGGIT HIGH FORCE REPLACEMENT BRACKET	1
2	N/A	EXISTING BRACKET	1
3	HB-1213X134-SS	BOLT, HEX, 1/2-13 x 1.75", 316 SS	4
4	WF-12-SS	WASHER, FLAT, 1/2", 316 SS	8
5	NH-1213-SS	NUT, HEX, 1/2-13, 316 SS	4
6	50219966	BASE PLATE, HAT CHANNEL, MEGGIT HIGH FORCE REPLACEMENT BRACKET	1
7	HB-51618X34-SS	BOLT, HEX, 5/16-18 x 3/4", 316 SS	4
8	WF-516-SS	WASHER, FLAT, 5/16', 316 SS	4
9	50200008-X	FLOW CONTROL VALVE, MODEL AGV50	1
10	SC-M10-1.5X30MM-SS	SCREW, SOCKET CAP, M10-1.5 x 30mm, 316 SS	6
11	WF-10MM-SS	WASHER, FLAT, 10MM SOCKET CAP BOLT	6
12	NFH-10MM-SS	NUT, HEX, FLANGE, M10-1.5, 316 SS	6
13	50219999-1	FLAT BRACKET, EXTERNAL PILOT FILTER	1
14	50219999-2	L-BRACKET, EXTERNAL PILOT FILTER	1
15	HB-51618X118-SS	BOLT, HEX, 5/16-18 x 1.125", 316 SS	2
16	NH-51618-SS	NUT, HEX, 5/16-18, 316 SS	4
17	50109099-SAE	FILTER, COALESCING W/BUILT-IN PREFILTER, 0.01 MICRON, GRADE 4 (99.99999% EFFICIENCY), #4 SAE PORT, EXTERNAL PILOT	1
18	HB-M6-1.0X12MM-SS	BOLT, HEX,M6-1.0 x 12mm, 316 SS	2
19	50219958	OUTLET FLANGE ADAPTER, SAE 61 SERIES, 2" O-RING FACE TO 1 1/2" FLAT FACE	1
20	SC-1213X2-SS	SCREW, SOCKET CAP, 1/2-13 x 2.0", 316 SS	4
21	N/A	EXISTING SPOOL	1
22	50219918	INLET ADAPTER, MEGGIT HIGH FORCE VALVE REPLACEMENT, SAE SERIES 61 TO SAE SERIES 61 FLANGE ELBOW, 2" PIPE	1

NOTES:

1. AFTER WEDLING, PER ASME section 9 B31.1 RADIOGRAPHIC TESTING (X-RAY + HYDROSTATIC) MUST BE PERFORMED.
2. DESIGN PRESSURE IS 500 PSIG. HYDROSTATIC PRESSURE 1.5 TIMES DESIGN PRESSURE.
3. THIS ASSEMBLY IS USED IN HYDROCARBONS (NATURAL GAS, PROPANE). IT'S IMPORTANT WELDING, TESTING OF RADIOGRAPHIC AND HYDROSTATIC ARE ADHERE TO THE ASME B31 AND API 1104 REQUIREMENTS.

REV	DESCRIPTION OF CHANGES	DATE	REV BY
A	INITIAL PRODUCTION	03-07-25	JZAHIR
B	ADDED INSTALLATION BRACKET ASSEMBLY + BOM	05-28-25	JZAHIR

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/32
ANGULAR: MACH ±1 BEND ±1
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±.005

MATERIAL N/A

FINISH SEE NOTES

	NAME	DATE
DRAWN	JOHN ZAHIR	03-07-2025
CHECKED	JOHN ZAHIR	03-07-2025
ENG APPR.	JOHN ZAHIR	03-07-2025

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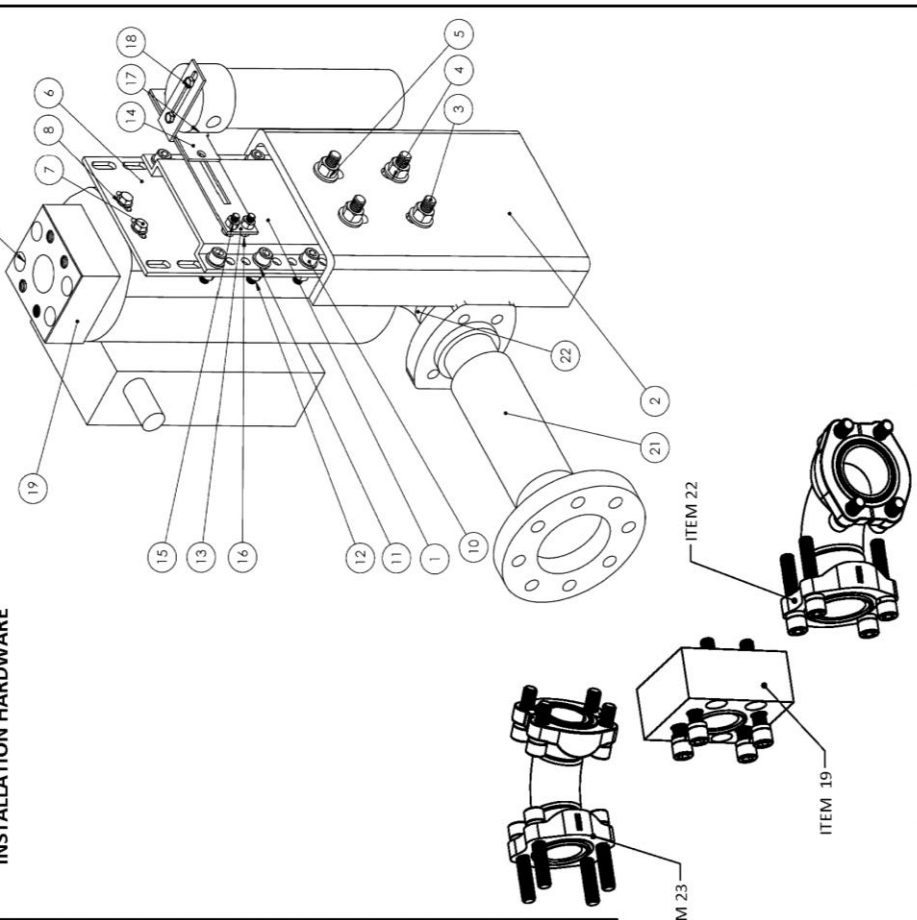
CONTINENTAL CONTROLS CORPORATION
SAN DIEGO, CALIFORNIA, USA

INSTALLATION KIT, STANDARD COMBUSTION, MEGGIT HIGH FORCE VALVE REPLACEMENT

SIZE A | DWG. NO. 50219908-S | REV. B
SCALE: 1:1 | WEIGHT: | SHEET 1 OF 1

11.2 DLE / SoloNox Combustion Installation Kit, P/N: 50219908-S-DLE

KIT P/N: 50219908-S-DLE INCLUDE PILOT AND MAIN VALVE
INSTALLATION HARDWARE



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	50219976	HAT CHANNEL, MEGGIT HIGH FORCE REPLACEMENT BRACKET	2
2	N/A	EXISTING BRACKET	2
3	HB-1213X134-SS	BOLT, HEX, 1/2-13 x 1.75", 316 SS	8
4	WF-12-SS	WASHER, FLAT, 1/2", 316 SS	16
5	NH-1213-SS	NUT, HEX, 1/2-13, 316 SS	8
6	50219966	BASE PLATE, HAT CHANNEL, MEGGIT HIGH FORCE REPLACEMENT BRACKET	2
7	HB-51618X34-SS	BOLT, HEX, 5/16-18 x 3/4", 316 SS	8
8	WF-516-SS	WASHER, FLAT, 5/16', 316 SS	8
9	50200008-X	FLOW CONTROL VALVE, MODEL AGV50	2
10	SC-M10-1.5X30MM-SS	SCREW, SOCKET CAP, M10-1.5 x 30mm, 316 SS	12
11	WF-10MM-SS	WASHER, FLAT, 10MM SOCKET CAP BOLT	12
12	NFH-10MM-SS	NUT, HEX, FLANGE, M10-1.5, 316 SS	12
13	50219999-1	FLAT BRACKET, EXTERNAL PILOT FILTER	2
14	50219999-2	L-BRACKET, EXTERNAL PILOT FILTER	2
15	HB-51618X118-SS	BOLT, HEX, 5/16-18 x 1.125", 316 SS	4
16	NH-51618-SS	NUT, HEX, 5/16-18, 316 SS	8
17	50109099-SAE	FILTER, COALESCING W/BUILT-IN PREFILTER, 0.01 MICRON, GRADE 4 (99.9999% EFFICIENCY), #4 SAE PORT, EXTERNAL PILOT	2
18	HB-M6-1.0X12MM-SS	BOLT, HEX,M6-1.0 x 12mm, 316 SS	4
19	50219958	OUTLET FLANGE ADAPTER, SAE 61 SERIES, 2" O-RING FACE TO 1 1/2" FLAT FACE	2
20	SC-1213X2-SS	SCREW, SOCKET CAP, 1/2-13 x 2.0", 316 SS	8
21	N/A	EXISTING SPOOL	2
22	50219918	INLET ADAPTER, MEGGIT HIGH FORCE VALVE REPLACEMENT, SAE SERIES 61 TO SAE SERIES 61 FLANGE ELBOW, 2" PIPE	2
23	50219928-DLE	OUTLET ADAPTER, MEGGITT HIGH FORCE SOLONOX VALVE REPLACEMENT, 1-1/2" O-RNG FACE TO 1-1/2" FLAT FACE FLANGE, 45 DEG. ELBOW	1

FOR ITEM #19, SEE ASSEMBLY DRAWING P/N 50219918-S FOR BOM
FOR ITEM #22 SEE ASSEMBLY DRAWING P/N 50219958 FOR BOM
FOR ITEM #23 SEE ASSEMBLY DRAWING P/N 50219928-DLE FOR BOM

REV	DESCRIPTION OF CHANGES	DATE	REV BY
A	INITIAL PRODUCTION	03-07-25	JZAHIR
B	ADDED INSTALLATION BRACKET ASSEMBLY + BOM	05-28-25	JZAHIR

NOTES:

1. AFTER WEDLING, PER ASME section 9 B31.1 RADIOGRAPHIC TESTING (X-RAY + HYDROSTATIC) MUST BE PERFORMED.
2. DESIGN PRESSURE IS 500 PSIG. HYDROSTATIC PRESSURE 1.5 TIMES DESIGN PRESSURE.
3. THIS ASSEMBLY IS USED IN HYDROCARBONS (NATURAL GAS, PROPANE). IT'S IMPORTANT WELDING, TESTING OF RADIOGRAPHIC AND HYDROSTATIC ARE ADHERE TO THE ASME B31 AND API 1104 REQUIREMENTS.

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±1/32
ANGULAR: MACH ±1 BEND ±1
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±.005

MATERIAL
N/A

FINISH
SEE NOTES

	NAME	DATE
DRAWN	JOHN ZAHIR	03-07-2025
CHECKED	JOHN ZAHIR	03-07-2025
ENG APPR.	JOHN ZAHIR	03-07-2025

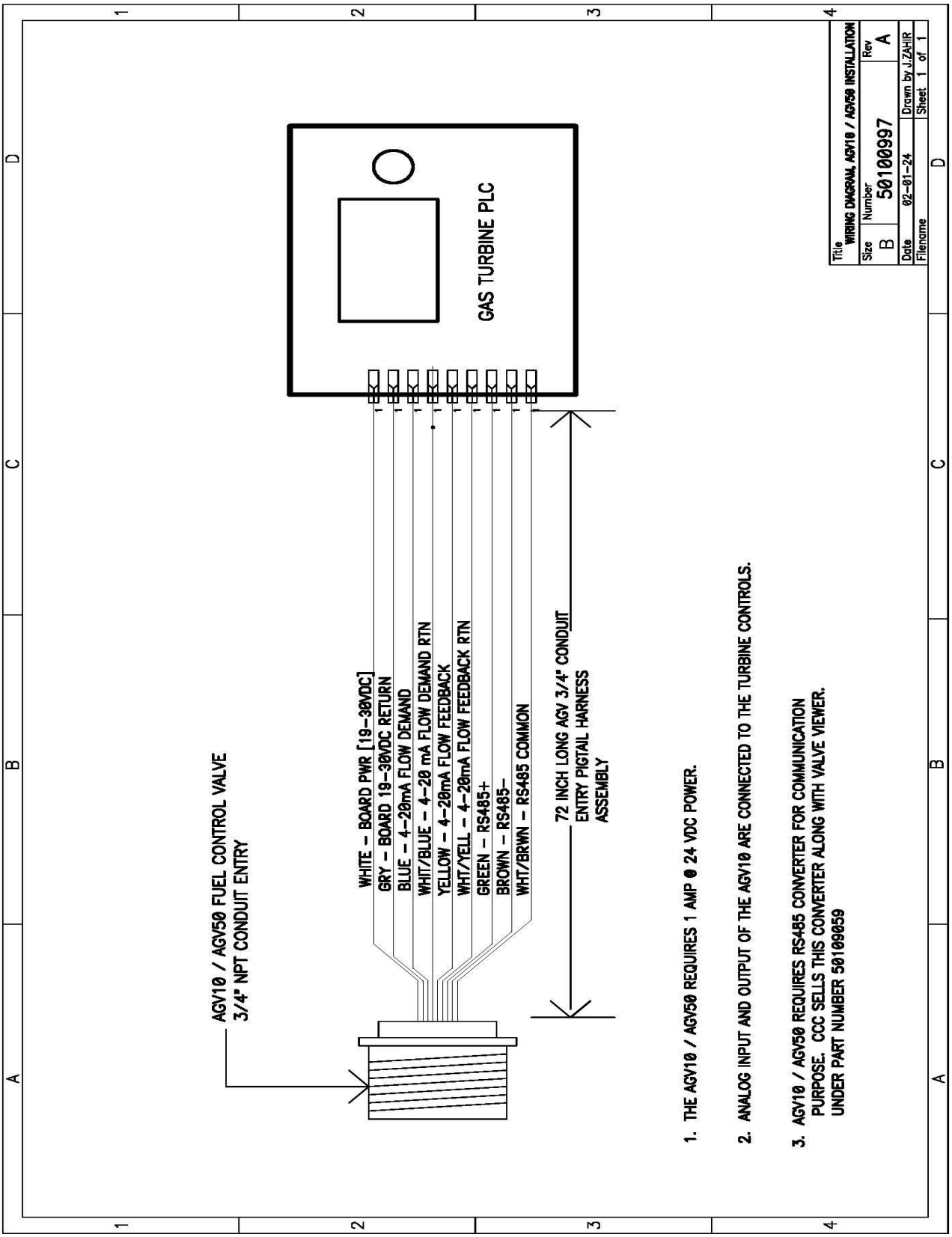
CONTINENTAL CONTROLS CORPORATION
SAN DIEGO, CALIFORNIA, USA

INSTALLATION KIT, DLE / SOLONOX, MEGGIT HIGH FORCE VALVE REPLACEMENT

SIZE A | DWG. NO. 50219908-S-DLE | REV. B
SCALE: 1:1 | WEIGHT: | SHEET 1 OF 1

12 Wiring Drawings

12.1 Wiring Diagram



Valve Board Description

TEST POINT	DESCRIPTION	VALUE/RANGE
TP01	Upstream Orifice Pressure	0 to –5 VDC
TP02	Differential Pressure	0 to –5 VDC
TP03	Control Pressure	0 to –5 VDC
TP04	Supply Pressure	0 to –5 VDC
TP05	Not Present/Not Used	
TP06	Gas Temperature	0 to –5 VDC
TP07	Board Voltage Common	Reference
TP08	Fuel Demand Signal	1–5 VDC
TP09	Board Amplifier Negative Power	-11 VDC +/-3%
TP10	Strain Gauge Power	7.0 VDC +/-0.5%
TP11	Actuator DAC Voltage	0–10 VDC
TP12	Strain Gauge Power	7.0 VDC +/-0.5%
TP13	Not Present/Not Used	
TP14	Flow Feedback	1–5 VDC
TP15	Board Amplifier Positive Power	11 VDC +/-3%
TP16	Digital Power Supply	5 VDC +/-2%
TP17	Board Voltage Common	Reference

Internal Board Wiring

DESCRIPTION	BD PIN No.	WIRE COLOR	CONNECTOR PIN	SIGNAL TYPE
+24VDC (Nominal) 24VDC Common	N/A N/A	WHITE GREY	A B	Supply Power Supply Return
Flow Demand Flow Return	11 10	BLUE WHITE/BLUE	C D	Non-Isolated 4–20 mA Input
Flow Feedback Flow FB Return	7 8	YELLOW YELLOW/WHITE	E F	Non-Isolated 4–20 mA Output
RS-485 (A) (B) GND	1 2 12	GREEN BROWN WHITE/BROWN	Y Z A	Non-Isolated RS485 Communication

13 Modbus Registers Map

Type	Register	Description	Scaling Factor	Units
Input Register	40001	Flow	0.1	SCFM
Input Register	40002	Demand	0.1	SCFM
Input Register	40003	Gas Temp	1	K
Input Register	40004	DP	0.01	PSID
Input Register	40005	PO	0.01	PSI
Input Register	40006	PG	0.01	PSI
Input Register	40007	DAC-Flow out	1	ADC
Input Register	40008	Flow - Demand In	1	ADC
Input Register	40009	Actuator Output	1	ADC
Input Register	40010	Status	1	ADC
Input Register	40011	Accel	0.1	%
Input Register	40012	Decel	0.1	%
Input Register	40013	Not Used	Ignore	Ignore
Input Register	40014	Not Used	Ignore	Ignore
Input Register	40015	PG raw	1	ADC
Input Register	40016	PO raw	1	ADC
Input Register	40017	DP raw	1	ADC
Input Register	40018	PC raw	1	ADC
Input Register	40019	Not Used	1	ADC
Holding Register	40020	PG (original setting)	1	ADC
Holding Register	40021	PO (original setting)	1	ADC
Holding Register	40022	DP (original setting)	1	ADC
Holding Register	40023	Not Used	1	Ignore
Holding Register	40024	CONTROL PROP	1	Control
Holding Register	40025	FLOW PROP	1	Control
Holding Register	40026	FLOW INTRG	1	Control
Holding Register	40027	PG OFFSET	1	Convert
Holding Register	40028	PG GAIN	1	Convert
Holding Register	40029	ACT OFFSET	1	Counts
Holding Register	40030	FLOW ADJUST	1	Convert
Holding Register	40031	FLOW OFFSET	1	Convert
Holding Register	40032	DEMAND GAIN	1	Convert
Holding Register	40033	DEMAND OFFSET	1	Convert
Holding Register	40034	GAUGE LIMIT	1	Convert
Holding Register	40035	BUMP CORRECTION	1	Convert
Holding Register	40036	BUMP LOCATION	1	Convert
Holding Register	40037	ACCELERATION GAIN	1	Control

Type	Register	Description	Scaling Factor	Units
Holding Register	40038	Y OFFSET	1	Convert
Holding Register	40039	X OFFSET	1	Convert
Holding Register	40040	DECELERATION %	1	Control
Holding Register	40041	DAMPENING	1	Control
Holding Register	40042	Not Used	1	Ignore
Holding Register	40043	FLOW DAMPENING	1	Control
Holding Register	40044	Not Used	Ignore	Ignore
Holding Register	40045	Not Used	Ignore	Ignore
Holding Register	40046	Not Used	Ignore	Ignore
Holding Register	40047	Not Used	Ignore	Ignore
Holding Register	40048	Not Used	Ignore	Ignore
Holding Register	40049	Not Used	Ignore	Ignore
Holding Register	40050	Not Used	Ignore	Ignore
Holding Register	40051	Not Used	Ignore	Ignore
Holding Register	40052	Slope 1	1	Control
Holding Register	40053	Offset 1	1	Control
Holding Register	40054	Slope 2	1	Control
Holding Register	40055	Offset 2	1	Control
Holding Register	40056	Slope 3	1	Control
Holding Register	40057	Offset 3	1	Control
Holding Register	40058	MIN FLOW	0.1	SCFM
Holding Register	40059	MAX FLOW SCFM	0.1	SCFM
Holding Register	40060	VERSION	0.01	Ignore
Holding Register	40061	TYPE	1	Ignore
Holding Register	40062	MFG DATE	1	Ignore
Holding Register	40063	SERVICE DATE	1	Ignore
Holding Register	40064	MAX PO	1	PSI

Note:

Convert - Conversion counts
Control - Control counts
ADC- Analog to digital convert counts
DAC- Digital to analog convert counts

14 AGV Fuel Valve Application Questionnaire

The following questions help us to ensure proper configuration of the AGV for your application. Please answer as completely as possible and add comments as necessary:

1. Engine manufacturer and model
   _____
2. Application (generator or mechanical drive)
   _____
3. Rated horsepower or KW of the engine
   _____
4. What is your existing fuel control valve?
   _____
5. Do you do your own acceleration schedule in the PLC?
   _____
6. Do you want 4–20 mA or 0–50 mA configuration valve? _____
7. Will the engine burn standard natural gas? (If not, what fuel?)
   _____
8. Will this be used in an area classified as Hazardous? Which classification?
   _____
9. What is the maximum compressor discharge pressure (CDP / PcD)?_____
10. Is there anything special or problematic about this application?
    _____

Additional notes to Continental Controls Corp.:

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