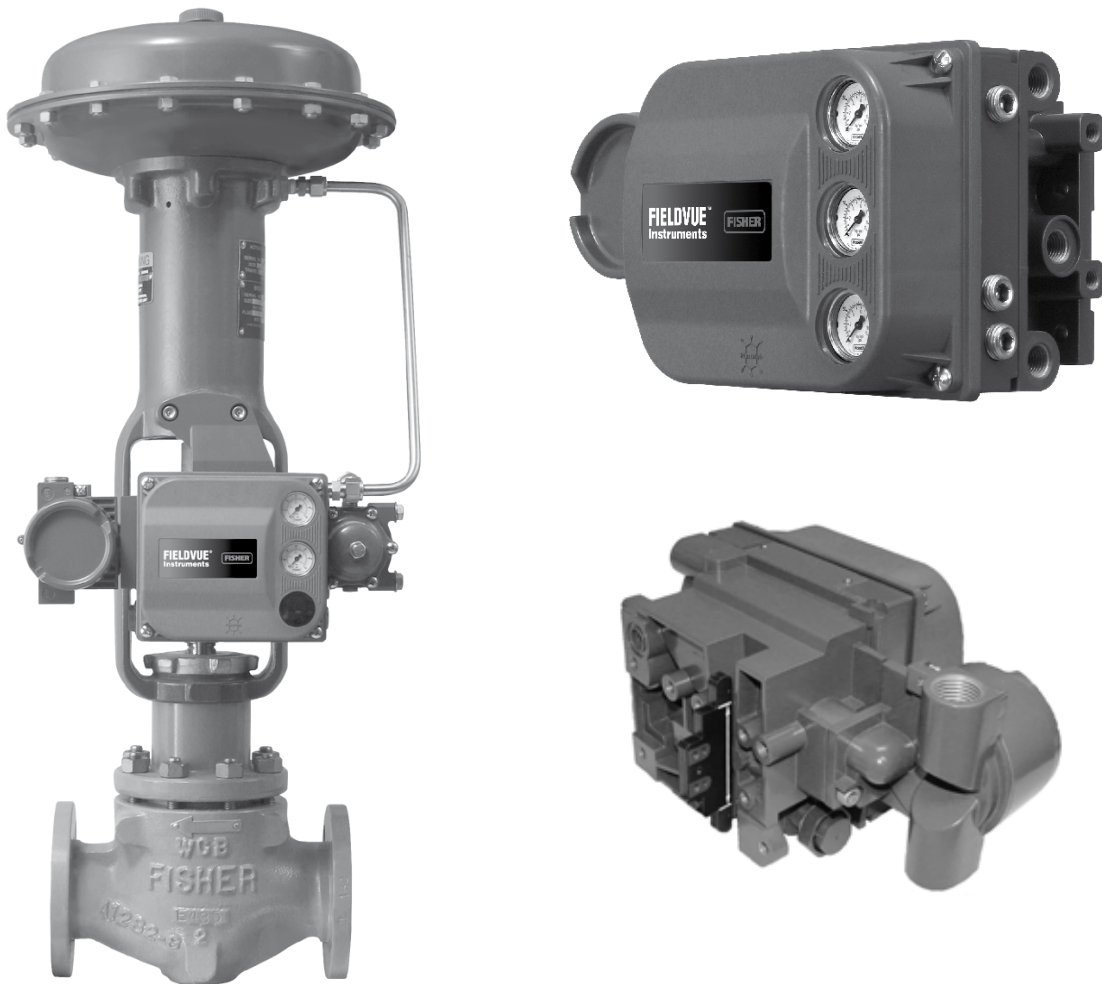


Fisher® FIELDVUE™ DVC6200 and DVC6200f Digital Valve Controller Management of Change Guide



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Background

The Fisher® FIELDVUE™ DVC6000 series of digital valve controllers have proven to be the most reliable digital valve controllers produced. Today, the introduction of the DVC6200 and DVC6200f marks a step change in the technology, which will further improve the reliability of these instruments in the harshest environments. This step change in technology was made possible by utilizing the proven modular technology of the one million and counting existing DVC6000 units in the field today.

The design philosophy of the DVC6200 and DVC6200f allows the user the flexibility to transition from legacy FIELDVUE products to the current DVC6200, avoiding lengthy management of change approval documents. This document will highlight the design of the DVC6200 and DVC6200f, which incorporates linkage-less, non-contact feedback technology into an intrinsically safe and explosion-proof package. This feedback technology has been field-proven in the DVC2000 since 2004 in high vibration and corrosive environments. Over 73,000 FIELDVUE DVC2000 instruments have been installed with no failures of this feedback technology.

Management of Change

Management of change (MOC) is a procedure used to proactively manage changes that have the potential to result in safety or process impacts. Evaluating new techniques for improving MOC approval procedures can have an impact on plant efficiency. Historically, upgrading obsolete products or replacing existing process control equipment has been delayed or abandoned due to the extensive paper work involved in completing a complex MOC approval sheet.

Displayed in the following sections are design comparisons between the current DVC6200 and legacy DVC6000 products. These comparisons demonstrate how the design of Fisher technologies allows users to efficiently transition to new, more reliable FIELDVUE products.

Common Management of Change Checklist Question and Answer

Q1. Does the proposed modification cause any changes to P&ID's?

A1. Only the instrument name changes from DVC6000 to DVC6200.

Q2. Does the proposed modification change process chemistry, technology or operating and control philosophies?

A2. No.

Q3. Have the operating and design limits of the proposed modification changed?

A3. No.

Q4. Have the codes and standards to which the new equipment has been designed changed?

A4. No.

Q5. Does the proposed modification change the Hazardous Electrical Area classification?

A5. No.

Q6. Does the proposed modification change existing or create new demands for battery back-up or other power supply redundancy or reliability?

A6. No.

Q7. Does the proposed modification introduce new equipment that needs to be operated and, has a new operations list been stated?

A7. Yes. The DVC6200 and DVC6200f are operated the same as the DVC6000 and DVC600f.

Q8. Does the proposed modification introduce new equipment items that require spare parts, training manuals, maintenance procedures or training to teach the maintenance department how to maintain them?

A8. Yes. The standard components that maintenance may be required on are the same between the old and new equipment, except for the differing feedback technology. The mounting methodology also varies between the old and new technology.

Q9. Does the proposed modification change the spares for existing pieces of equipment?

A9. No.

Q10. Does the proposed modification introduce new equipment items that require periodic predictive maintenance?

A10. No. The new equipment items that may require periodic maintenance are the same as the old equipment items, except for the position feedback element. The new position feedback element (magnet / hall effect sensor) requires no maintenance where the old feedback element was a potentiometer that required periodic evaluation to confirm no mechanical issues were present.

FIELDVUE DVC6000 and DVC6200 Instrument Comparison

The DV6200 with HART® communication uses the same internal components, electronics and covers as the DVC6000. This is detailed below in Table 1. The DVC6000 uses a potentiometer to obtain position feedback, whereas the DVC6200 position feedback utilizes a Hall effect sensor and magnetic array. This is the same technology as used in the DVC2000. The DVC2000 was the first Fisher product released by Emerson that used a Hall effect sensor and a magnet array to measure valve travel. The Hall effect sensor is located in the DVC6200 housing between two “pole pieces” that are used to sense the magnet flux field of a magnetic array. The magnet array is mounted to the valve stem. As the valve stem moves, the magnet array also moves (relative to the sensor). The magnet array is composed of a series of magnets of different strengths, so the sensor can measure the changing magnetic field. Since there are no touching parts, this feedback is completely non-contact and does not rely on linkages.

Table 1: FIELDVUE DVC6000 and DVC6200 Instrument Component Comparison

DVC6000 or DVC6000f Component	DVC6200 and DVC6000	DVC6200f and DVC6000f
I/P	No change	No change
Relay	No change	No change
Printed Wiring Board	No change	New
Term Box	No change	No change
Cover	No change	No change
Mod Base	No change	No change
Back Housing	New	New
Mounting	New	New
Position Feedback	DVC2000 Technology	DVC2000 Technology
Firmware	No change	New

Table 2: FIELDVUE DVC6000 Remote Mount and DVC6200 Remote Mount Component Comparison

Description	DVC6200 vs. DVC6000 Remote Mount HART	DVC6200f vs. DVC6000f Remote Mount
<i>Base Unit</i>	<i>DVC6205 vs. DVC6005</i>	<i>DVC6205f vs. DVC6005f</i>
I/P	No Change	No Change
Relay	No Change	No Change
Printed Wiring Board	No Change	New
Loop Term Box	No Change	No Change
Field Termination Term Box	New	New
Cover	No Change	No Change
Module Base	No Change	No Change
Back Housing	No Change	No Change
Firmware	No Change	New
<i>Remote Travel Feedback Unit</i>	New	New
<i>Position Feedback</i>	DVC2000 Technology	DVC2000 Technology
Wiring between the remote and base unit	Needs to be housed in flexible or rigid metal conduit.	

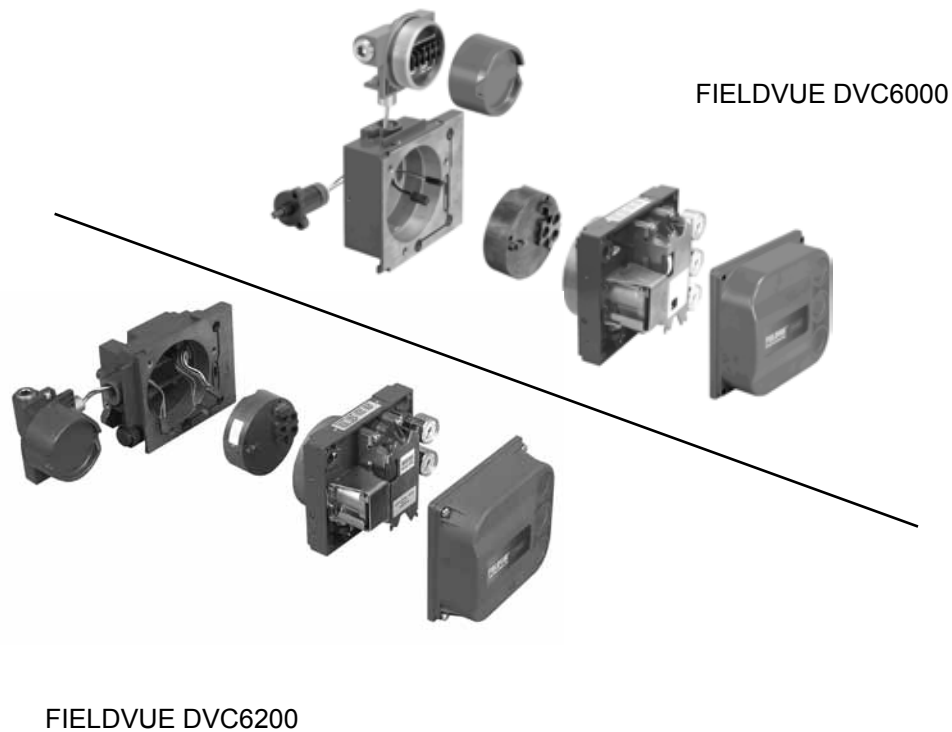
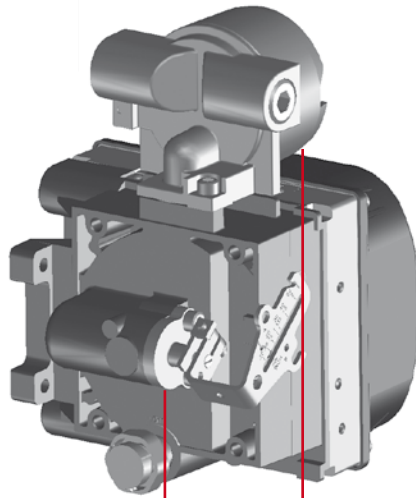


Figure 1: DVC6000 and DVC6200 Instrument Assembly Comparison

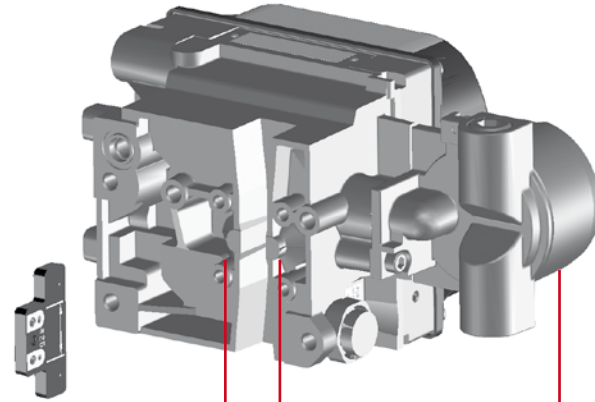
The DVC6200 and DVC6200f will utilize a new back housing and mounting as is illustrated in Figures 2 and 3 shown on the subsequent pages. The potentiometer of the DVC6000 is removed from the back plane and replaced with a Hall effect sensor that is potted into the new DVC6200 housing design. The terminal box moves to the left of the instrument in the DVC6200 (when viewed from front); this allows for a tighter fit with small actuators and integral mount actuators like the Fisher GX actuator.

The fieldbus version of the new 6200f features a new printed wiring board and firmware required to transition to a universal Emerson microprocessor platform. This microprocessor is designed by Emerson and is manufactured exclusively for the various Emerson divisions. All Emerson divisions having fieldbus devices use this processor; this provides consistent behavior and functionality among all Emerson divisions. This product change will include the following improvements to the DVC6200f instrument:

- Back-up LAS - Every fieldbus segment has a link active scheduler (LAS). There is also a designated device that will act as the backup LAS if the primary LAS were to become unavailable. The DVC6200f has the ability to act as the back-up LAS.
- Faster block execution - Faster block execution allows the user to schedule a faster macro cycle (better control) and an increased number of loops per segment (reduced wiring).



Potentiometer Terminal box



Feedback array Hall effect sensor Terminal box

Figure 2: DVC6000 Instrument Housing Detail

Figure 3: DVC6200 Instrument Housing Detail



DVC6005 Base Unit

DVC6015 or 25 or 35 (Dependent on Actuator Style) Remote Travel Feedback Unit

Figure 4: DVC6000 Remote Mount



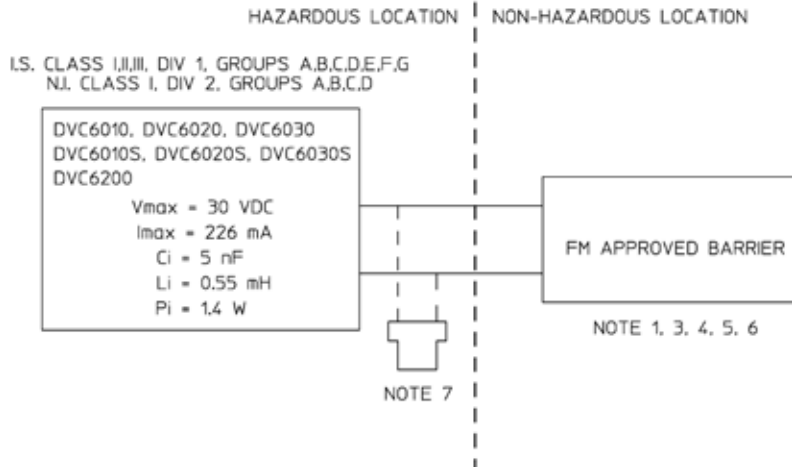
DVC6205 Base Unit

DVC6215 Remote Travel Feedback Unit

Figure 5: DVC6200 Remote Mount

DVC6000 to DVC6200 Instrument Transition Design Comparison

1. Electrical - No change to IS entity parameters (Figures 6–9).



1 THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (V_{max} or U_i), THE CURRENT (I_{max} or I_i), AND THE POWER (P_{max} or P_i) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (V_{oc} or U_o), AND THE CURRENT (I_{sc} or I_o), AND THE POWER (P_o) DEFINED BY THE ASSOCIATED APPARATUS. IN ADDITION, THE SUM OF THE MAX UNPROTECTED CAPACITANCE (C_i) AND MAX UNPROTECTED INDUCTANCE (L_i), INCLUDING THE INTERCONNECTING CABLING CAPACITANCE (C_{cable}) AND CABLING INDUCTANCE (L_{cable}), MUST BE LESS THAN THE ALLOWABLE CAPACITANCE (C_o) AND INDUCTANCE (L_o) DEFINED BY THE ASSOCIATED APPARATUS. IF THE ABOVE CRITERIA IS MET, THEN THE COMBINATION MAY BE CONNECTED.

$$V_{max} \text{ or } U_i \geq V_{oc} \text{ or } U_o \quad I_{max} \text{ or } I_i \geq I_{sc} \text{ or } I_o \quad P_{max} \text{ or } P_i \geq P_o \quad C_i + C_{cable} \leq C_o \quad L_i + L_{cable} \leq L_o$$

2 INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) NFPA70 AND ANSI/ISA RP12.06.01

3 MAXIMUM SAFE AREA VOLTAGE SHOULD NOT EXCEED 250 Vrms

4 RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN ONE OHM

5 LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS

6 IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED IT MUST BE FM APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING

Figure 6: DVC6200 Instrument FM Schematic

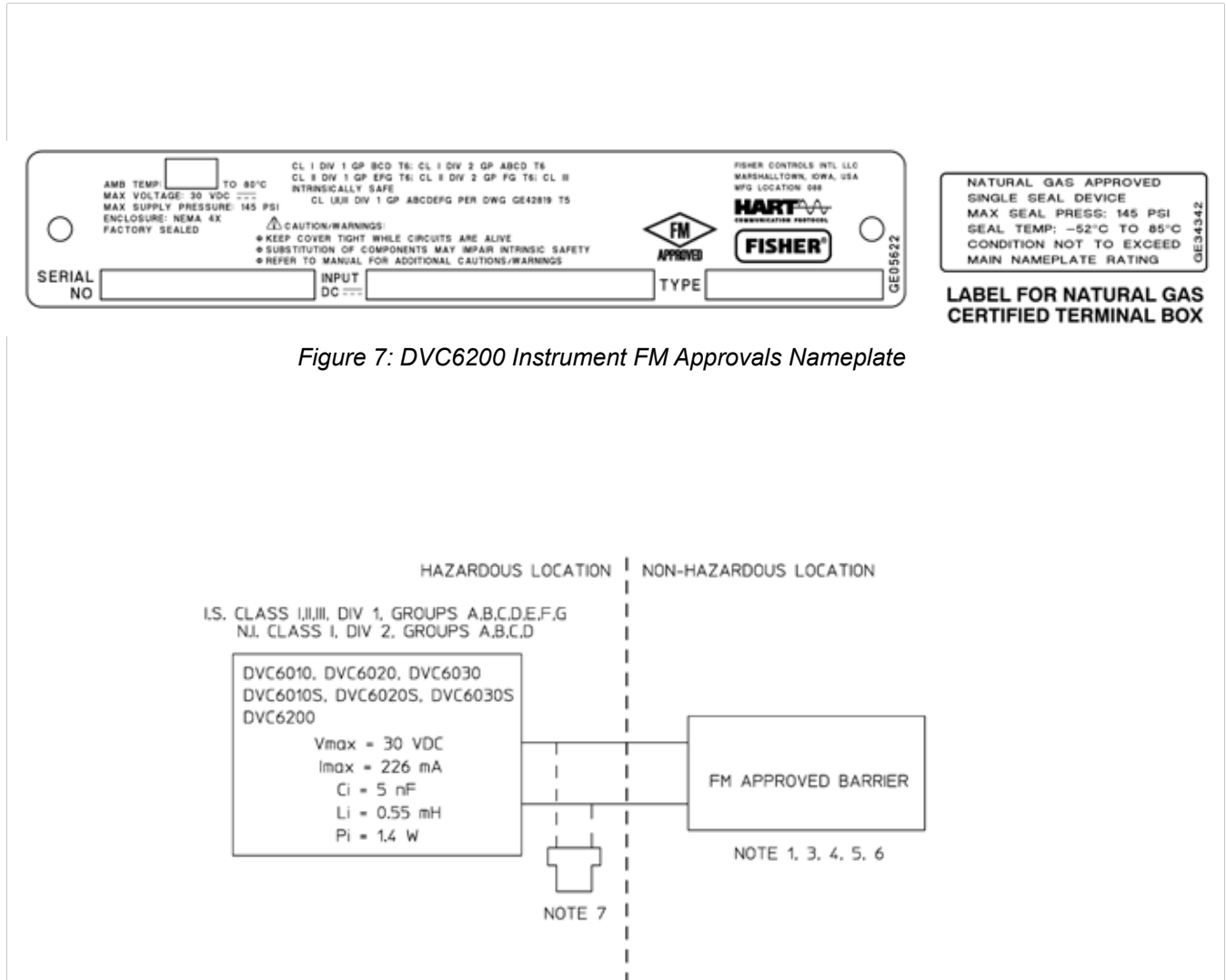


Figure 7: DVC6200 Instrument FM Approvals Nameplate

1 THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (V_{max} or U_i), THE CURRENT (I_{max} or I_i), AND THE POWER (P_{max} or P_i) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (V_{oc} or U_o) AND THE CURRENT (I_{sc} or I_o) AND THE POWER (P_o) DEFINED BY THE ASSOCIATED APPARATUS. IN ADDITION, THE SUM OF THE MAX UNPROTECTED CAPACITANCE (C_i) AND MAX UNPROTECTED INDUCTANCE (L_i), INCLUDING THE INTERCONNECTING CABLING CAPACITANCE (C_{cable}) AND CABLING INDUCTANCE (L_{cable}), MUST BE LESS THAN THE ALLOWABLE CAPACITANCE (C_o) AND INDUCTANCE (L_o) DEFINED BY THE ASSOCIATED APPARATUS. IF THE ABOVE CRITERIA IS MET, THEN THE COMBINATION MAY BE CONNECTED.

$$V_{max} \text{ or } U_i \geq V_{oc} \text{ or } U_o \quad I_{max} \text{ or } I_i \geq I_{sc} \text{ or } I_o \quad P_{max} \text{ or } P_i \geq P_o \quad C_i + C_{cable} \leq C_o \quad L_i + L_{cable} \leq L_o$$

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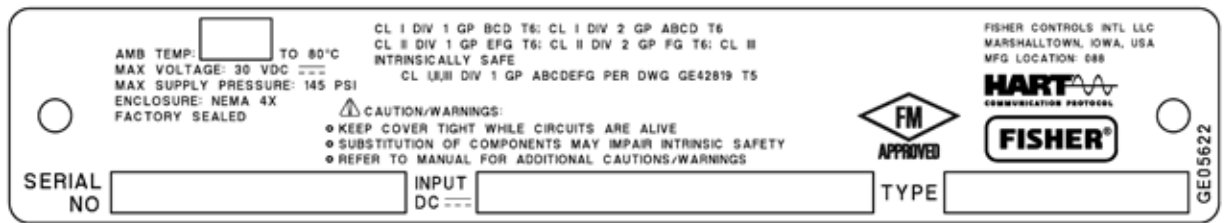
6 IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED IT MUST BE FM APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING

Figure 8: FM Schematic for DVC6010, DVC6020, and DVC6030 Instruments

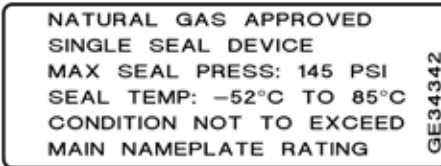
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December 2011



DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S



LABEL FOR NATURAL GAS CERTIFIED TERMINAL BOX

Figure 9: FM Nameplates for DVC6010, DVC6020, and DVC6030 Instruments

The DVC6200 Remote Mount does not have any third party hazardous area approvals yet.

2. Position control capability
 - a. Accuracy = ± 0.55% of output span
 - b. Hysteresis = ± 0.325% of output span
 - c. Deadband = < 0.125% of output span
3. Diagnostic capabilities - No change (Table 3)

Table 3: FIELDVUE DVC6200 and DVC6200f Instrument Diagnostic Level Capabilities

Capability	Diagnostic Level			
	AC	HC or FD	AD	PD
Auto Calibration	X	X	X	X
Custom Characterization	X	X	X	X
Burst Communication		X	X	X
Alerts		X	X	X
Step Response, Drive Signal Test and Dynamic Error Band, Valve Signature			X	X
Performance Tuner			X	X
Travel Control - Pressure Fallback			X	X
Performance Diagnostics				X

Note: AC = Auto calibration (HART instruments only)
 HC = HART communications (HART instruments only)
 FD = Fieldbus diagnostics (fieldbus instruments only)
 AD = Advanced diagnostics (HART and fieldbus instruments)
 PD = Performance diagnostics (HART and fieldbus instruments)

4. Operating ambient temperature limits - No change
 - a. -40° to 85°C (-40° to 185°F)
 - b. -52° to 85°C (-62° to 185°F) for instruments utilizing the extreme temperature option (fluorosilicone elastomers)
 - c. -52 to 125°C (-62 to 257F) for remote mount feedback unit
5. Steady-state air consumption - No change
 - a. At 1.4 bar (20 psig) supply pressure: less than 0.38 normal m3/hr (14 scfh)
 - b. At 5.5 bar (80 psig) supply pressure: less than 1.3 normal m3/hr (49 scfh)
6. Maximum output capacity - No change
 - a. At 1.4 bar (20 psig) supply pressure: 10.0 normal m3/hr (375 scfh)
 - b. At 5.5 bar (80 psig) supply pressure: 29.5 normal m3/hr (1100 scfh)
7. Connections - No change
 - a. Supply pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
 - b. Output pressure: 1/4 NPT internal
 - c. Tubing: 3/8-inch recommended
 - d. Vent (pipe-away): 3/8 NPT internal
 - e. Electrical: 1/2 NPT internal conduit connection
8. Available configurations
 - a. Available configurations change from (three configurations) DVC6000 instrument to (one configuration) DVC6200 instrument, reducing user inventory
 - i. DVC6000 valve-mounted instrument:
 1. DVC6010 instrument: Sliding stem applications
 2. DVC6020 instrument: Rotary applications and long stroke sliding stem applications.
 3. DVC6030 instrument: Quarter-turn rotary applications
 - ii. DVC6200 valve-mounted instrument:
 1. DVC6200: Sliding stem, rotary, quarter-turn rotary applications
 - b. Available configurations change from (three configurations) DVC6000 remote mount instrument to (one configuration) DVC6200 remote mount instrument, reducing user inventory
 - i. DVC6000 remote travel feedback sensor:
 1. DVC6015 instrument: Sliding stem applications
 2. DVC6025 instrument: Rotary applications and long stroke sliding stem applications.
 3. DVC6035 instrument: Quarter-turn rotary applications
 - ii. DVC6200 remote travel feedback sensor:
 1. DVC6215: Sliding stem, rotary, quarter-turn rotary applications

Conclusion

The FIELDVUE DVC6000 series of digital valve controllers have proven to be the most reliable digital valve controllers ever produced. The design philosophy of the DVC6200 and DVC6200f instruments allows the user the flexibility to transition from legacy FIELDVUE products to the current DVC6200 instrument, avoiding lengthy MOC approval documents.

Please refer to the Fisher FIELDVUE DVC6200 Digital Valve Controller Product Bulletin and Instruction Manual for complete features.