



THE UNITED KINGDOM VEHICLE APPROVAL AUTHORITY

COMMUNICATION CONCERNING THE APPROVAL EXTENDED OF A TYPE OF CNG  
COMPONENT, PURSUANT TO REGULATION NO 110



Approval No: 110R-000004

Extension No: 04

1. CNG component considered: Pressure regulator(s)
2. Trade name or mark: ITT Conoflow
3. Manufacturer's name and address:  
ITT Enidine  
105 Commerce Way  
Westminster, SC 29693  
USA
4. If applicable, name and address of manufacturer's representative: Not applicable
5. Submitted for approval on: As before and 12 February 2013
6. Technical service responsible for conducting approval tests: TUV Rheinland Group
7. Date of report issued by that service: As before and 18 April 2013
8. Number of report issued by that service: As before and 2172-601112
9. Approval EXTENDED

USP274538

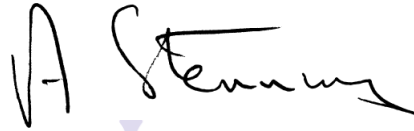


10. Reason(s) of extension (if applicable): To cover:

- 1) Alternative manufacturer's name and address
- 2) Addition of configuration with new integrated solenoid valve

11. Place: BRISTOL

12. Date:



18 APRIL 2013

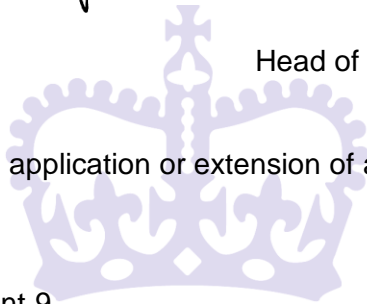
13. Signature:

A W STENNING  
Head of Technical and Quality Support Group

14. The documents filed with the application or extension of approval can be obtained upon request.

Any remarks: Approval to Supplement 9

(1) Delete where inapplicable



## ANNEX 2B – ADDENDUM

1. Additional information concerning the type approval of a type of CNG components pursuant to

Regulation No: 110:

1.1. Container(s) or cylinder(s)

1.1.1. Dimensions: Not applicable

1.1.2. Material: Not applicable

1.2. Pressure indicator

1.2.1 Working pressure(s): Not applicable

1.2.2. Material: Not applicable

1.3. Pressure relief valve (discharge valve)

1.3.1 Working pressure(s): Not applicable

1.3.2. Material: Not applicable

1.4. Automatic valve(s)

1.4.1 Working pressure(s): Not applicable

1.4.2. Material: Not applicable

1.5. Excess flow valve

1.5.1. Working pressure(s): Not applicable

1.5.2. Material:

1.6. Gas-tight housing

1.6.1. Working pressure(s): Not applicable

1.6.2. Material: Not applicable

1.7. Pressure regulator(s)

1.7.1. Working pressure(s): 26 MPa / 225 kPa (low) to 1050 kPa (high) <sup>(2)</sup>

1.7.2. Material: 6061 T6 Aluminum or anodized die cast 380 alloy aluminum

1.8. Check valve(s) or non-return valve(s)

1.8.1. Working pressure(s): Not applicable

1.8.2. Material: Not applicable

1.9. Pressure relief device (temperature triggered)

1.9.1. Working pressure(s): Not applicable

1.9.2. Material: Not applicable

1.10. Manual valve

1.10.1. Working pressure(s): Not applicable

1.10.2. Material: Not applicable

1.11. Flexible fuel lines

1.11.1. Working pressure(s): Not applicable

1.11.2. Material: Not applicable

1.12. Filling unit or receptacle

1.12.1. Working pressure(s): Not applicable

1.12.2. Material: Not applicable

1.13. Gas/air mixer (injector(s) )

1.13.1. Working pressure(s): Not applicable

1.13.2. Material: Not applicable

1.14. Gas flow adjuster

1.14.1. Working pressure(s): Not applicable

1.14.2. Material: Not applicable

1.15. Gas/air mixer (carburettor)

1.15.1. Working pressure(s): Not applicable

1.15.2. Material: Not applicable

1.16. Electronic control unit (CNG-fuelling)

1.16.1. Basic software principles: Not applicable

1.17. Pressure and temperature sensor(s)

1.17.1. Working pressure(s): Not applicable

1.17.2. Material: Not applicable

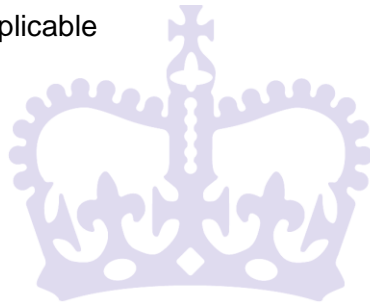
1.18. CNG filter(s)

1.18.1. Working pressure(s): Not applicable

1.18.2. Material: Not applicable

(1) Delete where inapplicable

(2) Specify the tolerance.



Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine

## TEST REPORT

about the test  
according to ECE-Regulation about

### Specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system

#### ECE-R 110

including all amendments until

#### supplement 9

Previously granted
ECE - certificate : E11 110R-00 0004 Ext. 3

Structure of report

1. Test object(s) and general test information
2. Test minutes
3. Remarks concerning test object(s)
4. Enclosures
5. Statement of conformity

Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine

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## 1. Test object(s) and general test information

- 1.1. Test object(s)
  - classification : Class 0
  - operating pressure : 26 Mpa / 225 kPa (Low) to 1050 kPa (High)
  - operating temperature range : - 40°C to 120°C
  - specific component : pressure regulator
  - material : 6061 T6 Aluminum or anodized die cast 380 alloy aluminum
  - type : HPNGV series pressure regulator
- 1.1.1. Identification number : Serial numbers: HPNGV4CX4HBP150  
13018-01 through 13018-06
- 1.2. General test information
  - 1.2.1. Order issued by : ITT Enidine
  - 1.2.2. Test object / test vehicle received on : not applicable
  - 1.2.3. Test date : February 12-14, 2013
  - 1.2.4. Test site : ITT Enidine, 105 Commerce Way, Westminster, SC 29693, USA
  - 1.2.5. Remark : The test results refer exclusively to the object(s) mentioned in item 1.1 of this report.

Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine

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## 2. Test minutes

- 2.1. Test facilities:  
The test facilities are in compliance with the requirements of the standard.
- 2.2. Test results :  
The new style of the regulator (our HPNGV4 series) differs from the currently approved product in the design and construction of the integral solenoid valve so a new test was performed.

### DESCRIPTION OF TEST UNIT

The HPNGV series pressure regulator is an engine coolant heated, single stage, pressure reducing gas fuel regulator. This pressure regulator contains an anodized aluminum regulator body, with various connection configurations. The various configurations of the regulator body are all made from a common part, which contains common valve components, diaphragm and seals.

A coolant bowl, which is available in different configurations to aid in connection to the engine coolant system, is fitted to the exterior of the pressure regulator to provide engine heat in operation. This heat is necessary to prevent ice or hydrate formation, as the compressed gas cools considerably as the pressure drops through this fuel pressure regulator.

The regulator is equipped with an outlet (low pressure) pressure relief device (PRD). This standard relief valve discharges to atmosphere, however optional capture pipes are available to permit the vehicle designer to pipe any discharged gas away from the regulator.

Optional high pressure solenoid valves (normally closed) and pressure sensors are offered and available in the HPNGV3 and HPNGV4 part number series.

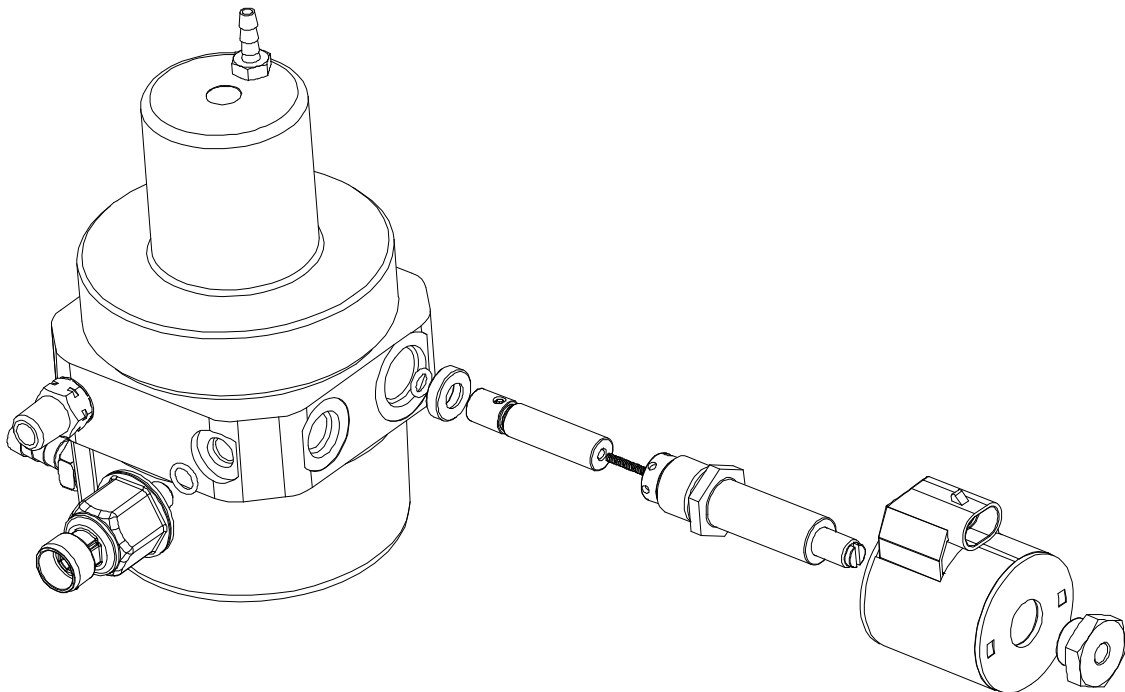
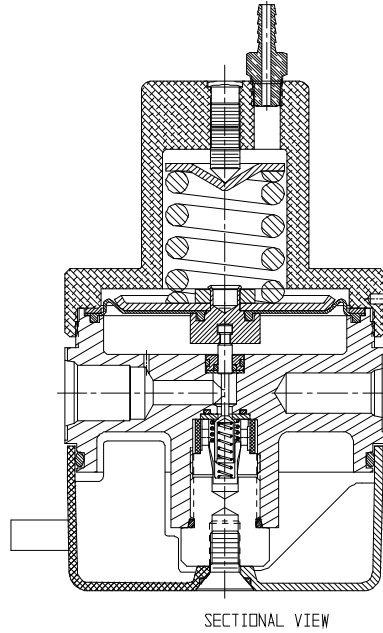
The output pressure of the regulator is factory calibrated from 240 kPa to 1034 kPa, depending on the customer requirements, and the adjustment sealed. Standard pressure settings reference atmospheric pressure, however an optional bonnet is offered which permits engine manifold vacuum as the reference pressure.

Gas connections for high pressure (Class 0) and low pressure are SAE J1926 O-ring boss female ports. Engine coolant connections include 3/8 inch hose barbs (SAE J962), or NPT female ports on optional coolant bowls. Optional gas connections for the PRD capture pipe include NPT male, SAE J1926 female, or tube stubs for industry standard compression fittings. (Drawings see Annex A)

Samples were built at the maximum output pressure calibration available, and tested with the optional solenoid valve and sensor.



Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine



EXAMPLE ONLY

Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

Description	Parameters
Operating Pressure	24.8 MPa (high pressure side)
Test Pressure high pressure side	38 MPa
Test Pressure low pressure side	1560 kPa
Operating Temperatures	- 40°C to 120°C (RATED)
Output Pressure	1035 kPa maximum factory setting
Internal Leakage	Zero at Operating Temperatures
External Leakage	Zero
Pressure Relief Device	200 psig, 270 psig, 350 psig
Fluid Compatibility	Natural Gas, Engine Coolant

2.2.1. General requirements :

SEQUENCE OF TESTING

Para. No.	Test	Test procedures	Data Sheet Page(s)	Test Unit SN#
2.3	Durability Test	Annex 5L		13018-01 to 13018-06
2.4	Overpressure (Strength) Test	Annex 5A	B-2, B-5	13018-01 to 13018-06
2.5	CNG Compatibility Test	Annex 5D	B-2, B-5	O-rings And Diaphragm
2.6	Corrosion Resistance Test	Annex 5E	B-2	13018-01 to 13018-06
2.7	Vibration Resistance Test	Annex 5N	B-2	13018-01 to 13018-06
2.8	External Leakage Test	Annex 5B	B-1, B-4	13018-01 to 13018-06

Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

2.2.2. TEST CONDITIONS

2.2.2.1 Test Media, Condition & Tolerance

Unless otherwise specified, the following test and laboratory conditions applied to all tests.

DESCRIPTION	CONDITION	TOLERANCES
Test Media	Nitrogen, Air, N-Pentane	-
Operating Pressure Range	0 to 390 bar	-0 bar, +3.5 bar
Temperature	-40°C to +120°C	-0 °C, +3 °C

2.2.2.2 Accuracy of Test Apparatus

All measurements were made with instruments of laboratory precision type whose accuracy had been certified in accordance with MIL-STD-45662.

2.3 Durability Test (continued operation)

Durability testing has been performed at three temperature levels:

- (i) Room temperature (18 °C )
- (ii) The maximum operating temperature (+120 °C)
- (iii) The minimum operating temperature (-40 °C)

During the test the equipment was connected to a compressed air source and a series of external solenoid valves. A pressure gauge was installed between an automatic valve and the sample under test pressure. A power supply and the automatic valves were powered by a computer controlled timer mechanism to cycle pressure and power as follows:

- Air inlet pressure to the sample under test (2 seconds)
- Energize normally closed solenoid in unit under test (3 seconds)
- Close air inlet solenoid valve and open air outlet solenoid valve to depressurize sample (3 seconds)
- Remove power from solenoid in unit under test (1 second)

This test protocol would cycle both the solenoid and the regulator under test, in accordance with Annex 5L.

Upon completion of all test cycles, the samples were evaluated for leakage.

Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

2.3.i	Durability Test (room temp)	The test samples were pressurized to 38 MPa at the inlet and 1560 kPa at the outlet	19200 pressure cycles. No Leakage.
2.3.ii	Durability Test (max. temp.)	Test samples were in a 120 °C environment. The test samples were pressurized to 38 MPa at the inlet and 1560 kPa at the outlet	400 pressure cycles at high temperature. No Leakage
2.3.iii	Durability Test (min. temp.)	Test samples were in a -40° C environment. The test samples were pressurized to 38 MPa at the inlet and 1560 kPa at the outlet.	400 pressure cycles at low temperature. No Leakage

**2.4 Overpressure (strength) Test**

The samples were connected to a source of nitrogen pressure. (required pressure at least 1.5 x 248 = 372 bar)

Over Pressure Test	Apply hydrostatic fluid to the pressure regulator inlet at 38 MPa and hold for min. one (1) minute.	No rupture or Distortion
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After the overpressure test the samples did not show permanent deformation, leakage or any other visible damage.

**2.5 CNG Compatibility Test**

The O-rings and the Diaphragm in contact with CNG was subjected to the CNG compatibility test according to Annex 5D of ECE R 110.

2.51	CNG Compatibility Test (n-pentane)	Subject the synthetic o-ring materials to an atmosphere of n-pentane at 23°C for a period of 72 hours.	Volume changed by less than 20%.
2.5.2	CNG Compatibility Test (air)	Subject the synthetic o-ring materials to an atmosphere of air at 40°C for a period of 48 hours.	Mass changed by less than 5%

Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

**2.6 Corrosion Resistance Test**

The 6061 T6 aluminum pressure regulators have been subjected to the corrosion resistance test according to Annex 5E of ECE R110. The test components have been cleaned and then subject to the salt spray test sequences. After completing the salt spray sequences the test units have been conditioned and subsequently subjected to external leakage testing.

Corrosion Test	The salt spray test per ISO CD 15500-2, shall be performed for a period of 144 hours with all connections closed. Upon completion of the Corrosion Test, conduct the External Leakage Test of paragraph 2.3 and Internal Leakage Test of paragraph 2.4.	No Internal or External Leakage.	B-2
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The test units did not exhibit visible corrosion attack and did not show external or internal leakage after completion of the corrosion tests.

**2.7 Vibration Resistance Test**

The test units were vibrated for 2 hours at 17 Hz with an amplitude of 1.5 mm in each of the orientation axes. After completion of in all 6 hours vibration testing the test units were subject to an internal and external leakage test.

No visible damage and no external leakage were detectable after completion of the test.

Vibration Test	Expose the test unit to a vibration of 17 Hz with an amplitude of 1.5 mm for 2 hours in each of the three perpendicular axes. Upon completion of the Vibration Test, conduct the Internal and External Leakage Test	No visible damage or Leakage.
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**2.8 External Leakage Test**

External leakage testing has been performed at three temperature levels:

- (i) Room temperature (18 °C)
- (ii) The maximum operating temperature (+120 °C)
- (iii) The minimum operating temperature (-40 °C)



Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

During the test the equipment was connected to a compressed nitrogen source. The pressure gauge was installed between an automatic valve and the sample under test pressure. To detect a leakage at room temperature and at -40 °C the samples were submerged into engine coolant. At +120 °C the samples were submerged into peanut oil.

2.8.i	External Leakage Test (room temp)	The test samples were pressurized to 38 MPa at the inlet and 1560 kPa at the outlet	No Leakage
2.8.ii	External Leakage Test (max. temp.)	Stabilize the test unit at 120°C for 8 hours. The test samples were pressurized to 38 MPa at the inlet and 1560 kPa at the outlet	No Leakage
2.8.iii	External Leakage Test (min. temp.)	Stabilize the test unit at -40° C for 8 hours. The test samples were pressurized to 38 MPa at the inlet and 1560 kPa at the outlet.	No Leakage



Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine

**3. Remark concerning test object(s)** : All versions of the type as stated in the information document are covered with the test samples.

**4. Enclosures**

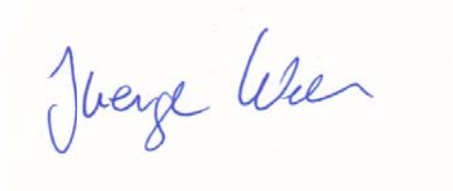
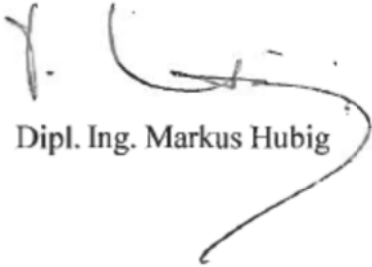
- 0 List of modifications
  - L Technical information about a CNG component pursuant to Regulation No. 110
- Information folder no. : HPNGV-4

**5. Statement of conformity**

The information folder and type referred to comply with the requirements mentioned on page 1.

The technical report comprises pages 1 to 14 - including enclosures L and 0 - and shall not be reproduced except in full without the written approval of the testing laboratory.

JW/MH  
April 18, 2013

 <p>Dipl. Ing. Juergen Walther</p>	 <p>Dipl. Ing. Markus Hubig</p>
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Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine

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List of modifications

Appendix 0

Correction of : ---

Modification of : supplement level (now 9)  
company name and address

Addition of : additional configuration with new integrated solenoid valve

Deletion of : - - -





Type : HPNGV series pressure regulator  
Manufacturer : ITT Enidine

Enclosure L

Technical information about a CNG component pursuant to Regulation No. 110

1. CNG component considered : ~~Container(s) or cylinder(s)~~  
~~Pressure indicator~~  
~~Pressure relief valve~~  
~~Automatic valve(s)~~  
~~Excess flow valve~~  
~~Gas tight housing~~  
**Pressure regulator**  
~~Check valve(s)~~  
~~Pressure relief device~~  
~~Manual valve~~  
~~Flexible fuel lines~~  
~~Filling unit or receptacle~~  
~~Gas/air mixer (injector(s))~~  
~~Gas flow adjuster~~  
~~Gas/air mixer (carburetor)~~  
~~Electronic control unit~~  
~~Pressure and temperature sensor(s)~~  
~~CNG filter(s)~~
  
2. Trade name or mark : ITT Conoflow
  
3. Manufacturer's name and address : ITT Enidine  
105 Commerce Way, Westminster, SC 29693, USA
  
4. If applicable, name and address of the manufacturer's representative : not applicable
  
5. Submitted for approval on : February 12-14, 2013
  
6. Technical service responsible for conducting the tests : TUV Rheinland Group

Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

Enclosure L

- 7. Date of report issued by that service : April 18, 2013
- 9. Number of report issued by that service : 2172-601112
- 12. Remarks : not applicable

Addendum

- 1. Additional information concerning the type approval of a type of CNG components pursuant to Regulation No. 110
  - 1.1. Container(s) or cylinder(s)
    - 1.1.1. Dimensions : ---
    - 1.1.2. Material : ---
  - 1.2. Pressure indicator
    - 1.2.1. Working pressure(s) : ---
    - 1.2.2. Material : ---
  - 1.3. Pressure relief valve (discharge valve)
    - 1.3.1. Working pressure(s) : ---
    - 1.3.2. Material : ---
  - 1.4. Automatic valve(s)
    - 1.4.1. Working pressure(s) : ---
    - 1.4.2. Material : ---
  - 1.5. Excess flow valve
    - 1.5.1. Working pressure(s) : ---
    - 1.5.2. Material : ---
  - 1.6. Gas-tight housing
    - 1.6.1. Working pressure(s) : ---
    - 1.6.2. Material : ---
  - 1.7. Pressure regulator(s)
    - 1.7.1. Working pressure(s) : 26 Mpa / 225 kPa (Low) to 1050 kPa (High)
    - 1.7.2. Material : 6061 T6 Aluminum or anodized die cast 380 alloy aluminum
  - 1.8. Check valve(s) or non-return valve(s)
    - 1.8.2. Working pressure(s) : ---
    - 1.8.2. Material : ---

Type : HPNGV series pressure regulator  
 Manufacturer : ITT Enidine

Enclosure L

- 1.9. Pressure relief device
  - 1.9.1. Working pressure(s) : ---
  - 1.9.2. Material : ---
- 1.10. Manual valve
  - 1.10.1. Working pressure(s) : ---
  - 1.10.2. Material : ---
- 1.11. Flexible fuel lines
  - 1.11.1. Working pressure(s) : ---
  - 1.11.2. Material : ---
- 1.12. Filling unit or receptacle
  - 1.12.1. Working pressure(s) : ---
  - 1.12.2. Material : ---
- 1.13. Gas/air mixer (injector(s))
  - 1.13.1. Working pressure(s) : ---
  - 1.13.2. Material : ---
- 1.14. Gas flow adjuster
  - 1.14.1. Working pressure(s) : ---
  - 1.14.2. Material : ---
- 1.15. Gas / air mixer (carburetor)
  - 1.15.1. Working pressure(s) : ---
  - 1.15.2. Material : ---
- 1.16. Electronic control unit
  - 1.16.1. Basic software principles : ---
- 1.17. Pressure and temperature sensor(s)
  - 1.17.1. Working pressure(s) : ---
  - 1.17.2. Material : ---
- 1.18. CNG filter(s)
  - 1.18.1. Working pressure(s) : ---
  - 1.18.2. Material : ---

ITT Enidine 105 Commerce Way Westminster, SC USA 29693	Information document  no. <b>HPNGV-4</b>  Type: <b>HPNGV series pressure regulator</b>	Page: 1  issue: <b>14-Feb-2013</b>
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**“ESSENTIAL CHARACTERISTICS OF THE CNG COMPONENT”**

1. (Not allocated)

1. 2. 4. 5. 1.	System description	: ---
1. 2. 4. 5. 2.	Pressure regulator( s)	: yes
1. 2. 4. 5. 2. 1.	Make (s)	: ITT Conoflow
1. 2. 4. 5. 2. 2.	Type (s):	: HPNGV series pressure regulator
1. 2. 4. 5. 2. 5.	Drawings	: HPNGV-1, -2, -3, -4
1. 2. 4. 5. 2. 6.	Number of main adjustment points	: 1
1. 2. 4. 5. 2. 7.	Description of principle of adjustment through main adjustment points	: Pressure Adjustment (factory sealed)
1. 2. 4. 5. 2. 8.	Number of idle adjustment points	: 0
1. 2. 4. 5. 2. 9.	Description of principles of adjustment through idle adjustment points	: n.a.
1. 2. 4. 5. 2. 10.	Other adjustment possibilities if so and which (description and drawings)	: n.a.
1. 2. 4. 5. 2. 11.	Working pressure( s)	: 26 MPa / 1035 kPa
1. 2. 4. 5. 2. 12.	Material	: 6061 T6 Aluminum or anodized die cast 380 alloy aluminum
<del>1. 2. 4. 5. 3.</del>	<del>Gas/ air mixer (carburettor)</del>	<del>: yes/ no 1/-</del>
<del>1. 2. 4. 5. 3. 1.</del>	<del>Number</del>	<del>:</del>
<del>1. 2. 4. 5. 3. 2.</del>	<del>Make( s)</del>	<del>:</del>
<del>1. 2. 4. 5. 3. 3.</del>	<del>Type( s)</del>	<del>:</del>
<del>1. 2. 4. 5. 3. 4.</del>	<del>Drawings</del>	<del>:</del>
<del>1. 2. 4. 5. 3. 5.</del>	<del>Adjustment possibilities</del>	<del>:</del>
<del>1. 2. 4. 5. 3. 6.</del>	<del>Working pressure( s)</del>	<del>: 2/ kPa</del>
<del>1. 2. 4. 5. 3. 7.</del>	<del>Material</del>	<del>:</del>



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1. 2. 4. 5. 4. Gas flow adjuster : yes/ no 1/  
1. 2. 4. 5. 4. 1. Number :  
1. 2. 4. 5. 4. 2. Make( s) :  
1. 2. 4. 5. 4. 3. Type( s) :  
1. 2. 4. 5. 4. 4. Drawings :  
1. 2. 4. 5. 4. 5. Adjustment possibilities :  
(description)-  
1. 2. 4. 5. 4. 6. Working pressure( s) : 2/ kPa  
1. 2. 4. 5. 4. 7. Material :  
  
1. 2. 4. 5. 5. Gas/ air mixer (injector)( s) : yes/ no 1/  
1. 2. 4. 5. 5. 1. Make( s) :  
1. 2. 4. 5. 5. 2. Type( s) :  
1. 2. 4. 5. 5. 3. Identification :  
1. 2. 4. 5. 5. 4. Working pressure( s) : 2/ kPa  
1. 2. 4. 5. 5. 5. Drawings of installation :  
1. 2. 4. 5. 5. 6. Material :  
  
1. 2. 4. 5. 6. Electronic Control Unit : yes/ no 1/  
(CNG fuelling)-  
1. 2. 4. 5. 6. 1. Make( s) :  
1. 2. 4. 5. 6. 2. Type( s) :  
1. 2. 4. 5. 6. 3. Adjustment possibilities :  
1. 2. 4. 5. 6. 4. Basic software principles :  
  
1. 2. 4. 5. 7. CNG container( s) or : yes/ no 1/  
cylinder( s)  
1. 2. 4. 5. 7. 1. Make( s) :  
1. 2. 4. 5. 7. 2. Type( s) (include drawings) :  
1. 2. 4. 5. 7. 3. Capacity : litres  
1. 2. 4. 5. 7. 4. Drawings of the installation :  
of the container :  
1. 2. 4. 5. 7. 5. Dimensions :  
1. 2. 4. 5. 7. 6. Material :  
  
1. 2. 4. 5. 8. CNG container accessories  
1. 2. 4. 5. 8. 1. Pressure indicator : yes/ no 1/  
1. 2. 4. 5. 8. 1. 1. Make( s) :  
1. 2. 4. 5. 8. 1. 2. Type( s) :  
1. 2. 4. 5. 8. 1. 3. Operating principle : float/ other 1/ (include description or drawings)  
1. 2. 4. 5. 8. 1. 4. Working pressure( s) : 2/ MPa  
1. 2. 4. 5. 8. 1. 5. Material :  
1. 2. 4. 5. 8. 2. Pressure relief valve : yes/ no 1/  
(discharge valve)-  
1. 2. 4. 5. 8. 2. 1. Make( s) :  
1. 2. 4. 5. 8. 2. 2. Type( s) :  
1. 2. 4. 5. 8. 2. 3. Working pressure( s) 2/ : MPa  
1. 2. 8. 5. 8. 2. 4. Material :  
  
1. 2. 8. 5. 8. 2. 4. Material :



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- ~~1.2.4.5.8.3. Automatic cylinder valve : yes/ no 1/~~  
~~1.2.4.5.8.3.1. Make( s) :~~  
~~1.2.4.5.8.3.2. Type( s) :~~  
~~1.2.4.5.8.3.3. Working pressure( s) 2/ : MPa 1-~~  
~~1.2.4.5.8.3.4. Material :~~
- ~~1.2.4.5.8.4. Excess flow valve : yes/ no 1/~~  
~~1.2.4.5.8.4.1 Make( s) :~~  
~~1.2.4.5.8.4.2 Type( s) :~~  
~~1.2.4.5.8.4.3 Working pressure( s) 2/ : MPa-~~  
~~1.2.4.5.8.4.4. Material :~~
- ~~1.2.4.5.8.5. Gas tight housing : yes/ no 1/~~  
~~1.2.4.5.8.5.1 Make( s) :~~  
~~1.2.4.5.8.5.2 Type( s) :~~  
~~1.2.4.5.8.5.3 Working pressure( s) 2/ : MPa-~~  
~~1.2.4.5.8.5.4. Material :~~
- ~~1.2.4.5.8.6. Manual valve : yes/ no 1/~~  
~~1.2.4.5.8.6.1 Make( s) :~~  
~~1.2.4.5.8.6.2 Type( s) :~~  
~~1.2.4.5.8.6.3 Drawings :~~  
~~1.2.4.5.8.6.4 Working pressure( s) 2/ : MPa-~~  
~~1.2.4.5.8.6.4. Material :~~
- ~~1.2.4.5.9. Pressure relief device : yes / no 1/~~  
~~(temperature triggered)~~  
~~1.2.4.5.9.1. Make( s) :~~  
~~1.2.4.5.9.2. Type( s) :~~  
~~1.2.4.5.9.3. Description and drawings :~~  
~~1.2.4.5.9.4. Operating temperature :~~  
~~1.2.4.5.9.5. Material :~~



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1. 2. 4. 5. 10. Filling unit or receptacle : yes/ no 1/  
1. 2. 4. 5. 10. 1. Make( s) :  
1. 2. 4. 5. 10. 2. Type( s) :  
1. 2. 4. 5. 10. 3. Working pressure( s) 2/ : MPa  
1. 2. 4. 5. 10. 4. Description and drawings :  
1. 2. 4. 5. 10. 5. Material :  
  
1. 2. 4. 5. 11. Flexible fuel lines : yes/ no 1/  
1. 2. 4. 5. 11. 1. Make( s) :  
1. 2. 4. 5. 11. 2. Type( s) :  
1. 2. 4. 5. 11. 3. Description :  
1. 2. 4. 5. 11. 4. Working pressure( s)2/ : kPa  
1. 2. 4. 5. 11. 5. Material :  
  
1. 2. 4. 5. 12. Pressure and Temperature : yes/ no 1/  
sensor( s)-  
1. 2. 4. 5. 12. 1. Make( s) :  
1. 2. 4. 5. 12. 2. Type( s) :  
1. 2. 4. 5. 12. 3. Description :  
1. 2. 4. 5. 12. 4. Working pressure( s) : 2/ kPa  
1. 2. 4. 5. 12. 5. Material :  
  
1. 2. 4. 5. 13. CNG filter( s) : yes/ no 1/  
1. 2. 4. 5. 13. 1. Make( s) :  
1. 2. 4. 5. 13. 2. Type( s) :  
1. 2. 4. 5. 13. 3. Description :  
1. 2. 4. 5. 13. 4. Working pressure( s) : 2/ kPa  
1. 2. 4. 5. 13. 5. Material :  
  
1. 2. 4. 5. 14. Check valve( s) or : yes/ no 1/  
non return valve( s)-  
1. 2. 4. 5. 14. 1. Make( s) :  
1. 2. 4. 5. 14. 2. Type( s) :  
1. 2. 4. 5. 14. 3. Description :  
1. 2. 4. 5. 14. 4. Working pressure( s) : 2/ kPa  
1. 2. 4. 5. 14. 5. Material :



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~~1.2.4.5.15. Connection to CNG system : yes/ no 1/  
for heating system~~

~~1.2.4.5.15.1. Make(s) :~~

~~1.2.4.5.15.2. Type(s) :~~

~~1.2.4.5.15.3. Description and drawings  
of installation :~~

~~1.2.5. Cooling system : (liquid/ air) 1/~~

~~1.2.5.1. System description/ drawings :  
with regard to the CNG system~~





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**List of Annexes**

<b>Annex</b>	<b>Subject</b>	<b>Page</b>
A	Approval Samples / Product Range	7 #
B	Drawings	8 -10 #
C	Approval marking	11 #
D	Annex D: Explanation of optional components	12 – 15 #

Westminster, SC  
14-Feb-2013



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Annex A – Approval Samples

Characteristic	HPNGV4CX4HBP150
Outlet Pressure Setting	150 PSI (1035 kPa)
Regulator Body Porting	Style 97120 (see body identification drawing)
Regulator Bonnet Fitting Option	Brass Hose Barb Fitting
Solenoid Type	24 Volt, Normally Closed, Pilot Operated
Sensor Type	0.25 to 4.75 VDC Output / 5000 psi span

Product Range – ITT Enidine can supply an HPNGV series regulator that falls within any of the variables and defined ranges of the listed characteristics and sales options, and retain R110 approval.

The product range includes the following characteristics:

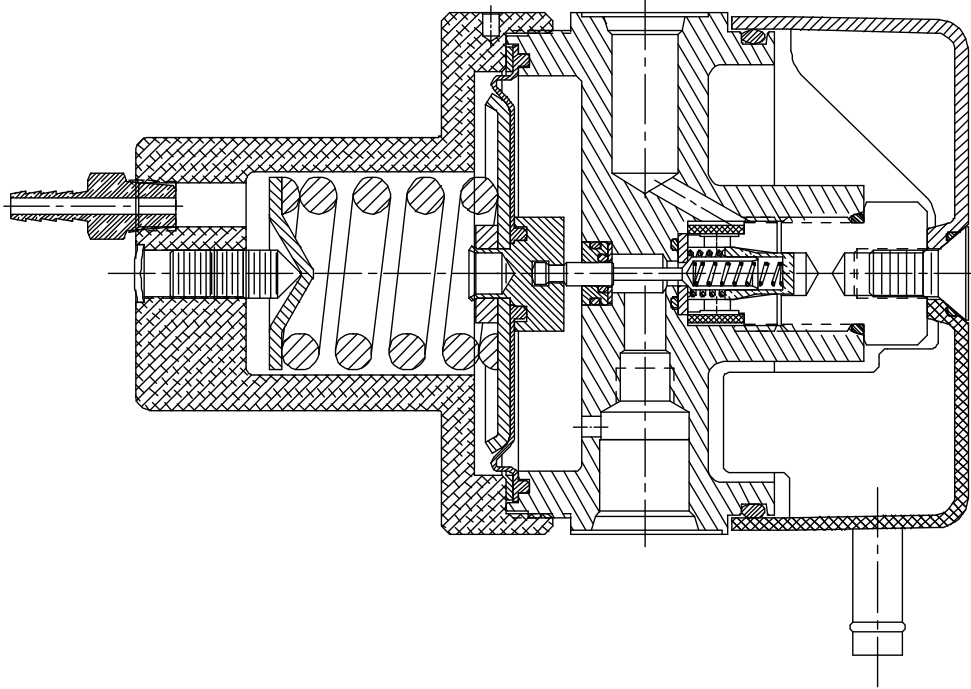
- Output pressure settings to 1035 kPa (150 psi), factory set.
- All configurations rated for 25 MPa (3600 psi) inlet pressure.
- Optional Inlet Pressure solenoid valve in 12 and 24 volt configurations
- Optional inlet pressure sensors in different voltage outputs. All use an SAE J1926 type pressure connection.
- Optional pressure regulator relief valves in differing opening pressures.

A hypothetical example of this would be a regulator that has a 125 PSIG outlet setting, a 350 PSI +- 60 PSI PRD relief range, and the regulator body is ported with the PRD and Inlet on the same face. This regulator would be given a discrete part number and retain R110 approval.

For testing purposes, TUV Rheinland selected a model number for testing which would demonstrate performance of the product family at the maximum set point / outlet pressure, and included the optional solenoid and pressure sensor. All models carry the same Class 0 pressure rating, however the product family permits factory setting of the Class 1 side to 150 psi (1035 kPa) maximum.



Annex B – Drawings

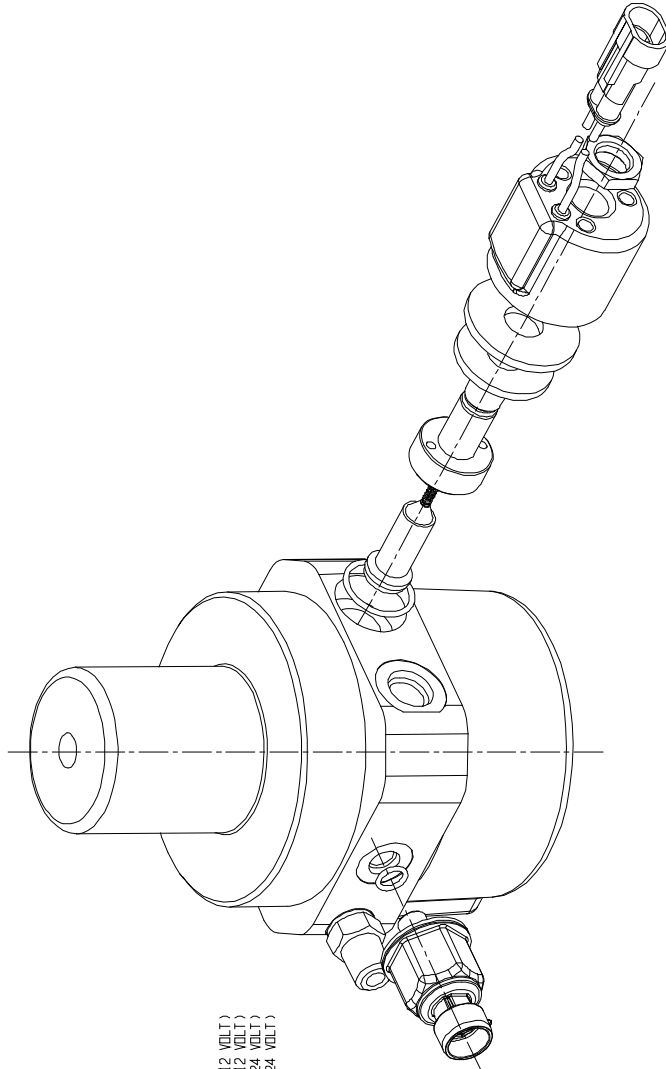


NOTES:

1. CED CODE WILL CONTAIN 14 CHARACTERS. CHARACTER POSITIONS 1-6 ARE HPNGV2.
2. CED CODE CHARACTER POSITION 7 IS FOR THE BONNET AND BIAS CONNECTION.  
 - CHARACTER BONNET FITTING / PLUG  
   S 96201 96502 (POROUS PLUG)  
   C 96203 97422 (STRAIGHT BARB)  
   E 96203 97425 (SWIVEL ELBOW)
3. CED CODE CHARACTER POSITION 8 IS FOR THE BODY. CHARACTER X HAS NO SAE-3 PORT. CHARACTER 3 HAS AN OPTIONAL SAE-3 PORT.
4. CED CODE CHARACTER POSITION 9 IS FOR THE COOLANT BOWL. IF CHARACTER 9 IS T, THEN USE BOWL 96715. IF CHARACTER 9 IS H, USE BOWL 96730 AND INSTALL FITTINGS 97421 WITH 15 TO 30 FT-LB OF TORQUE.
5. CED CODE CHARACTER POSITION 10 IS FOR THE PRO CRACKING PRESSURE. SEE TABLE FOR SPRING PART NUMBER AND CRACK PRESSURE BY CODE.
6. CED CODE CHARACTER POSITION 11 IS FOR THE PRO CONNECTION OPTION. CODE X IS THE STANDARD ATMOSPHERIC DISCHARGE AS SHOWN IN CROSS SECTION. CODE P IS THE 1/4" MALE CAPTURE PIPE. CODE T IS FOR THE 1/2" TUBE STUB CAPTURE PIPE.
7. CED CHARACTERS 12-14 IS THE VALUE OF THE SET PRESSURE. THE REGULATOR SHALL BE SET 2 PSI GREATER THAN THIS SET PRESSURE, AT 3000 PSIG INLET PRESSURE AT LOW FLOW.
8. EXAMPLE: MODEL HPNGV2CXTBX110 HAS  
 - 3/16" HOSE BARB CAPTURE PORT ON BONNET.  
 - BODY 97103 (NO SAE-3 SENSOR PORT)  
 - A THERMOSTAT EQUIPPED COOLANT BOWL  
 - A 270 PSI PRO, WHICH DISCHARGES TO ATMOSPHERE.  
 - A LABELED OUTPUT SETTING OF 110 PSI.  
 - IS SET TO 112 PSI AT 3000 PSI IN AND LOW FLOW.

FIGURE 1 – Basic regulator construction cross section (HPNGV2 Series)

Annex B – Drawings



NOTES:

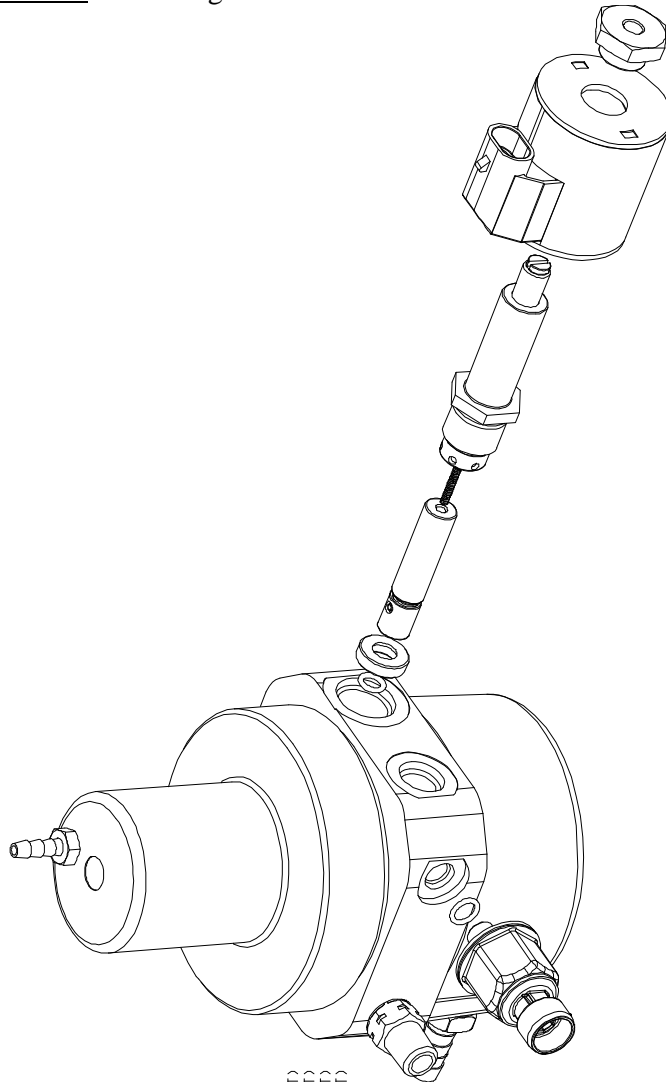
1. CED CODE WILL CONTAIN 15 CHARACTERS. CHARACTER POSITIONS 1-6 ARE HPNGV'S.
2. CED CODE CHARACTER POSITION 7 IS FOR THE BONNET AND BIAS CONNECTION - CHARACTER BONNET FITTING / PLUG  
 C 96201 96502 (ROD/US PLUG)  
 L 96203 97422 (STRAIGHT BARB)  
 E 96203 97425 (SWIVEL ELBOW)
3. CED CODE CHARACTER POSITION 8 & 9 ARE FOR THE SENSOR / SOLENOID OPTIONS.  
 XX - NO SENSOR OR SOLENOID REQUIRED  
 25 - SENSOR ONLY - L0325 (0.25 TO 4.75 VOLT)  
 50 - SENSOR ONLY - L0350 (0.50 TO 4.50 VOLT)  
 12 - SOLENOID ONLY - L0412 (12 VOLT)  
 24 - SOLENOID ONLY - L0424 (24 VOLT)  
 X2 - SENSOR L0325 (0.25-4.75 VOLT), SOLENOID L0412 (12 VOLT)  
 X3 - SENSOR L0350 (0.50-4.50 VOLT), SOLENOID L0412 (12 VOLT)  
 X4 - SENSOR L0325 (0.25-4.75 VOLT), SOLENOID L0424 (24 VOLT)  
 X5 - SENSOR L0350 (0.50-4.50 VOLT), SOLENOID L0424 (24 VOLT)
4. CED CODE CHARACTER POSITION 10 IS FOR THE COOLANT BOWL. IF CHARACTER 10 IS T, THEN USE BOWL 96715. IF CHARACTER 10 IS H, USE BOWL 96730 AND INSTALL FITTINGS 97421 WITH 15 TO 30 FT-LB OF TORQUE.
5. CED CODE CHARACTER POSITION 11 IS FOR THE PRO CRACKING PRESSURE. SEE TABLE FOR SPRING PART NUMBER AND CRACK PRESSURE BY CODE.
6. CED CODE CHARACTER POSITION 12 IS FOR THE PRO CONNECTION OPTION. CODE X IS THE STANDARD ATMOSPHERIC DISCHARGE AS SHOWN IN CROSS SECTION. CODE P IS THE 1/4" MALE CAPTURE PIPE. CODE T IS FOR THE 1/2" TUBE STUB CAPTURE PIPE.
7. CED CHARACTERS 13-15 IS THE VALUE OF THE SET PRESSURE. THE REGULATOR SHALL BE SET 2 PSI GREATER THAN THIS SET PRESSURE. AT 3000 PSIG INLET PRESSURE AT LOW FLOW.
8. EXAMPLE: MODEL HPNGV3C25T8X110 HAS  
 - 3/16" HOSE BARB CAPTURE PORT ON BONNET.  
 - AN L0325 (0.25 TO 4.75 VOLT) PRESSURE SENSOR  
 - A THERMOSTAT EQUIPPED COOLANT BOWL  
 - A 2700 PSI RFD, WHICH DISCHARGES TO ATMOSPHERE.  
 - 1/2" TUBE STUB CAPTURE PIPE (1.5")  
 - IS SET TO 112 PSI AT 3000 PSI IN AND LOW FLOW.
9. USE RANGE SPRING 96601, SEVEN 96612 AND DIAPHRAGM SEAT NUT 96610 WHEN SET POINT IS OVER 140 PSIG.

Figure 2 – Options for HPNGV3 series with sensor and solenoid (lead type solenoid coil)



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Annex B – Drawings



- NOTES:
1. CED CODE WILL CONTAIN 15 CHARACTERS. CHARACTER POSITIONS 1-6 ARE HPNGV4.
  2. CED CHARACTER POSITION 7 IS FOR THE BONNET AND BIAS CONNECTION.
    - CHARACTER BONNET - FITTING / PLUG
      - S 96201 96502 (PORDUS PLUG)
      - C 96203 97422 (STRAIGHT BARB)
      - E 96203 97425 (SWIVEL ELBOW)
  3. CED CHARACTER POSITION 8 & 9 ARE FOR THE SENSOR / SOLENOID OPTIONS.
    - XX - NO SENSOR OR SOLENOID REQUIRED
    - 25 - SENSOR ONLY - L025 (0.25 TO 4.75 VOLT)
    - 50 - SENSOR ONLY - L050 (0.50 TO 4.50 VOLT)
    - 12 - SOLENOID ONLY - L042 (12 VOLT)
    - 24 - SOLENOID ONLY - L0424 (24 VOLT)
    - X2 - SENSOR L025 (0.25-4.75 VOLT), SOLENOID L0412 (12 VOLT)
    - X3 - SENSOR L050 (0.50-4.50 VOLT), SOLENOID L0412 (12 VOLT)
    - X4 - SENSOR L025 (0.25-4.75 VOLT), SOLENOID L0424 (24 VOLT)
    - X5 - SENSOR L050 (0.50-4.50 VOLT), SOLENOID L0424 (24 VOLT)
  4. CED CHARACTER POSITION 10 IS FOR THE COULANT BONNET. IF CHARACTER 10 IS T, THEN USE BONE 96715. IF CHARACTER 10 IS H, USE BONE 96730 AND INSTALL FITTINGS 97421 WITH 15 TO 30 FT-LB OF TORQUE.
  5. CED CHARACTER POSITION 11 IS FOR THE PRO CRACKING PRESSURE. SEE TABLE FOR SPRING PART NUMBER AND CRACK PRESSURE BY CODE.
  6. CED CHARACTER POSITION 12 IS FOR THE PRO CONNECTION OPTION. CODE Y IS THE STANDARD ATMOSPHERIC DISCHARGE AS SHOWN IN CROSS SECTION. CODE P IS THE 1/4" MALE CAPTURE PIPE. CODE T IS FOR THE 1/2" TUBE STUB CAPTURE PIPE.
  7. CED CHARACTERS 13-15 IS THE VALUE OF THE SET PRESSURE. THE REGULATOR SHALL BE SET 2 PSI GREATER THAN THIS SET PRESSURE. AT 3000 PSIG INLET PRESSURE AT LOW FLOW.
  8. EXAMPLE: MODEL HPNGV25TBY110 HAS
    - 3/16" HOSE BARB CAPTURE PORT ON BONNET
    - AN L025 (0.25 TO 4.75 VOLT) PRESSURE SENSOR
    - A THERMOSTAT INTERRUPT COIL ANT BOND
    - A 2700 PSI PROPORTIONAL DISCHARGE TO ATMOSPHERE.
    - A LABELED OUTPUT SETTING OF 110 PSI.
    - IS SET TO 112 PSI AT 3000 PSI IN AND LOW FLOW.

Figure 3 – Options for HPNGV4 series with sensor and solenoid (socket on coil type)



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Annex C – Approval marking

The approval marking will be printed on a label and applied to the regulator exterior in a prominent location as illustrated below.

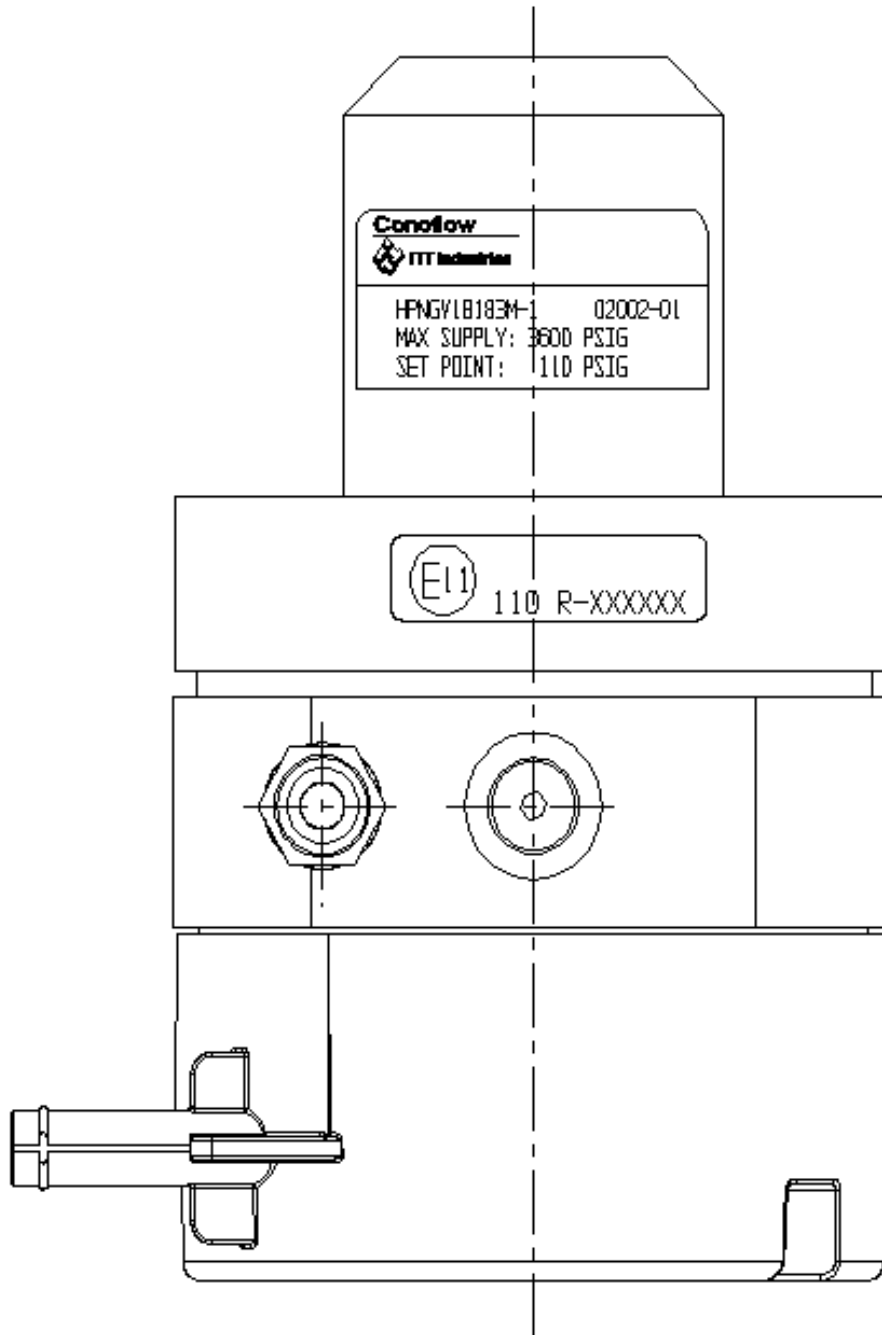


Figure 4 – Location of nameplate and Approval



Annex D: Explanation of optional components

There are multiple options for the configuration of the regulator include the following components, identified in the following figures:

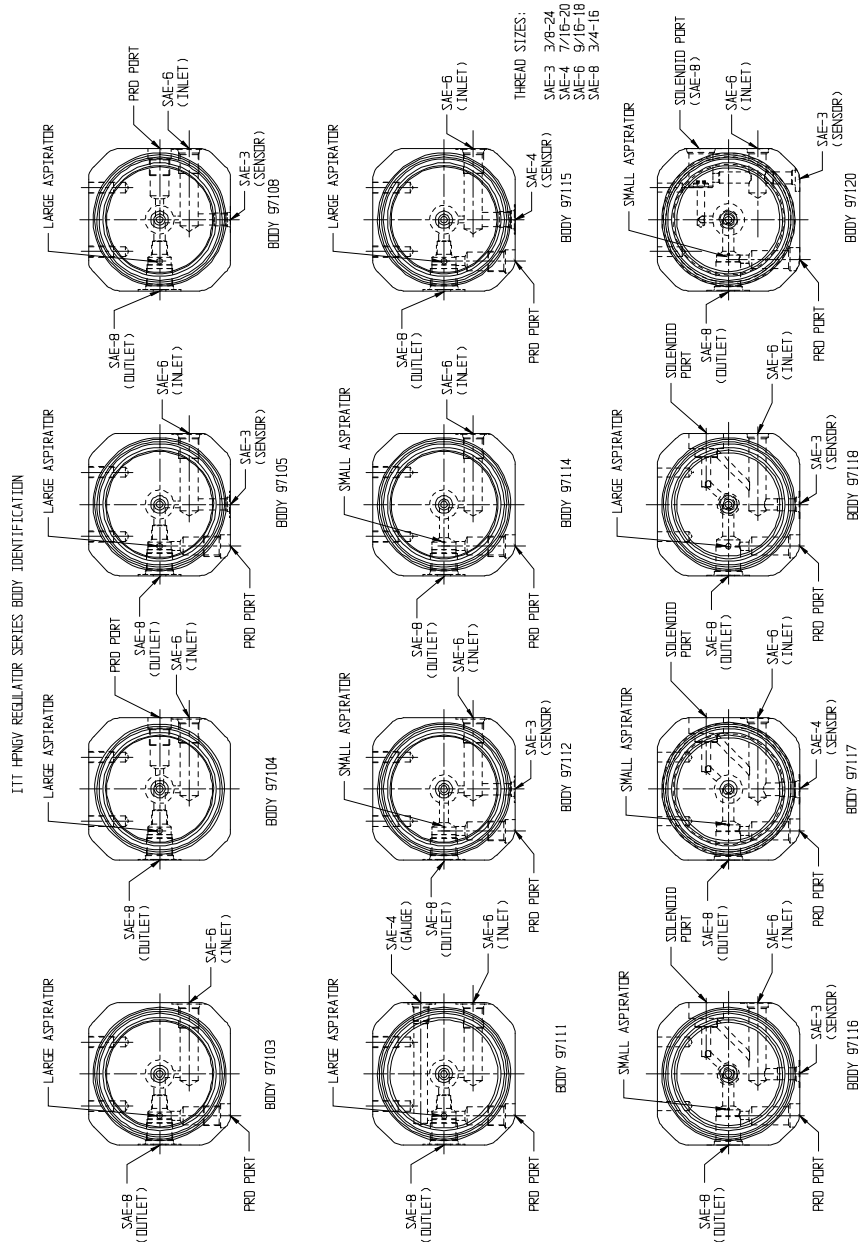
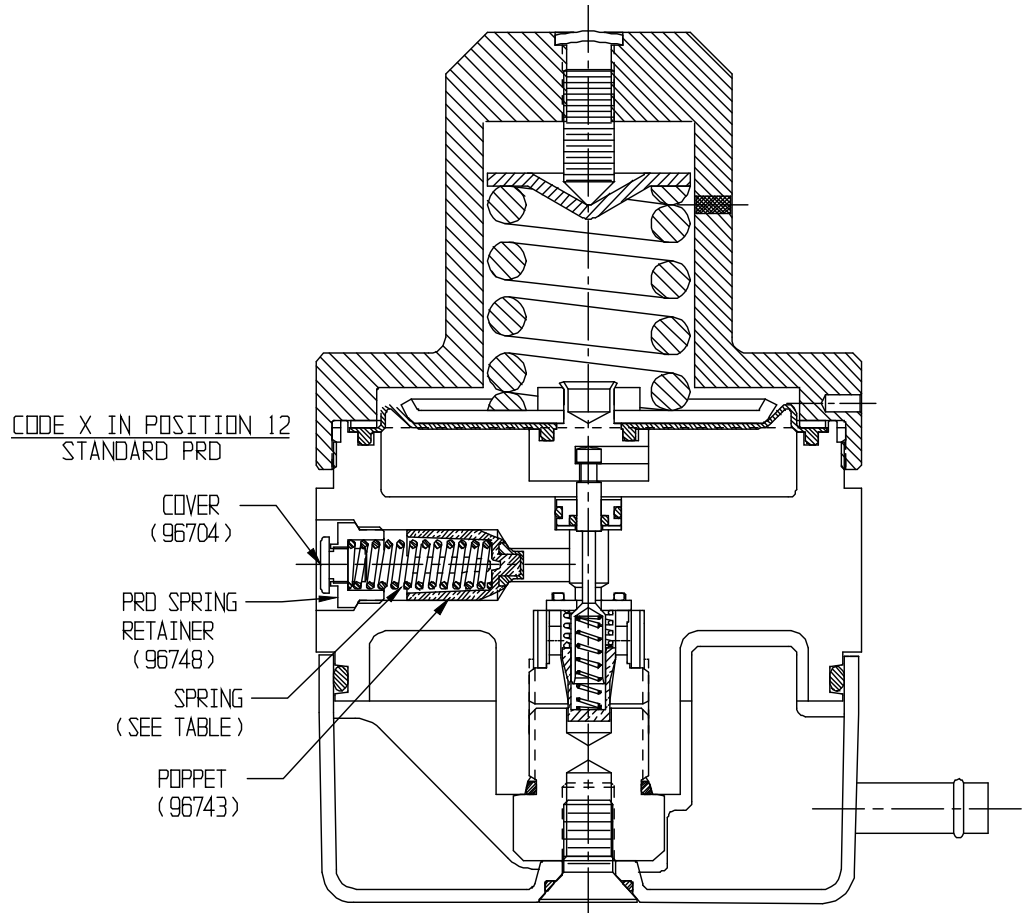
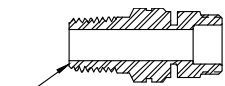


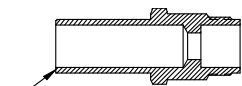
Figure 5 – Optional regulator body porting by part number (top view)



PRD SPRING	NOMINAL CRACK PRESSURE	CED CODE IN POSITION 11
96710	1.38 MPa (200 psi)	A
96702	1.86 MPa (270 psi)	B
96807	2.41 MPa (350 psi)	C



OPTIONAL CAPTURE PIPE WITH 1/4 NPT EXTERNAL CONNECTION. COVER 96704 NOT USED WITH THIS OPTION. CODE P IN POSITION 12 OF CED.



OPTIONAL CAPTURE PIPE WITH 1/2" TUBE CONNECTION. COVER 96704 NOT USED WITH THIS OPTION. CODE T IN POSITION 12 OF CED.

Figure 6 – Cross section showing PRD (regulator pressure relief device) construction and options



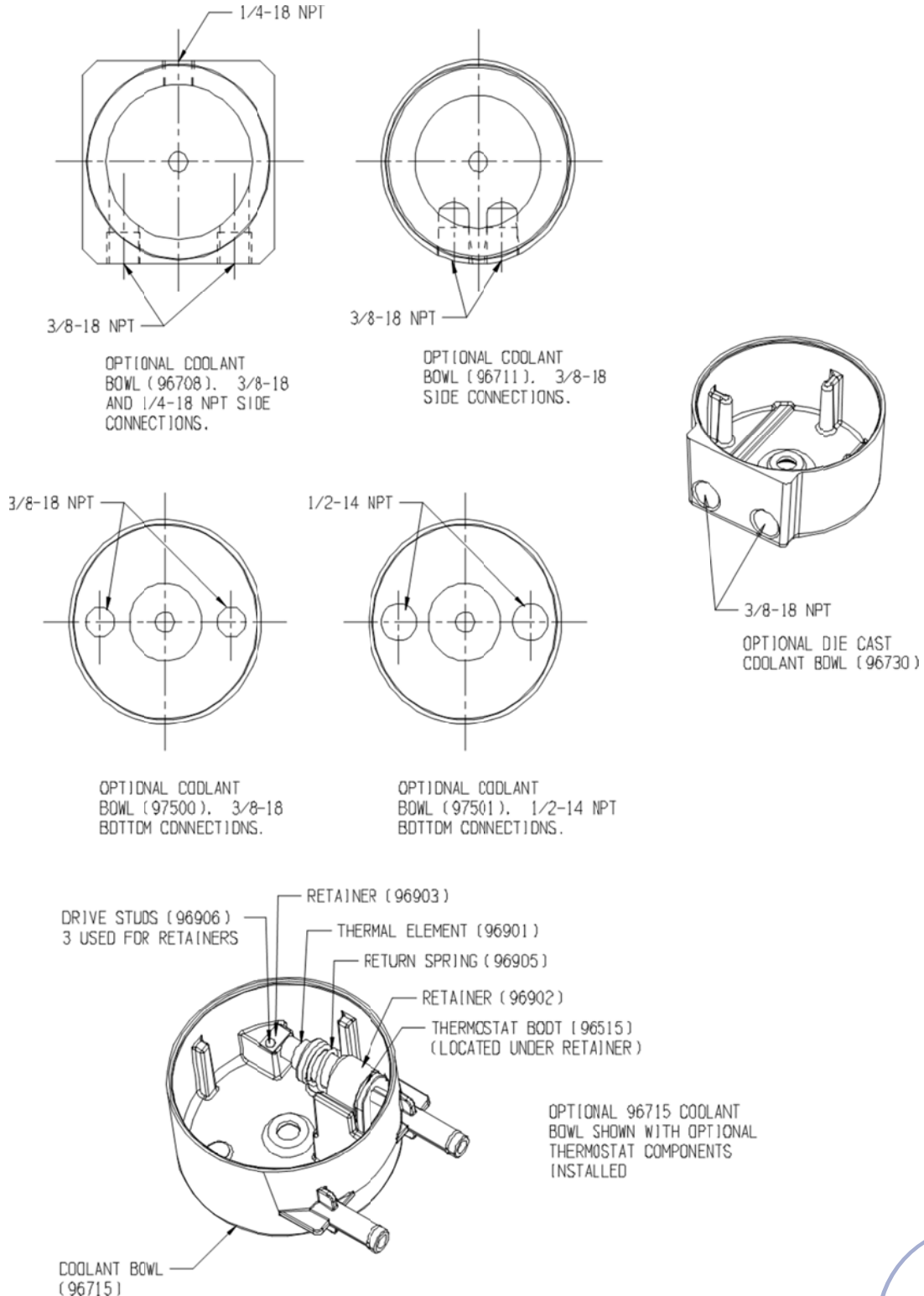
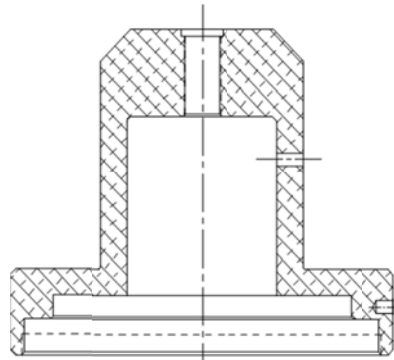
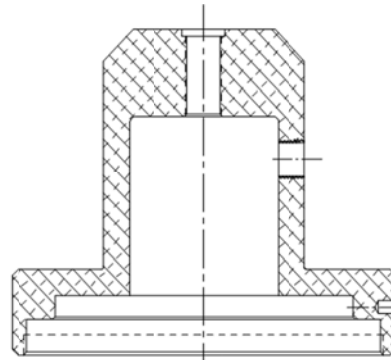


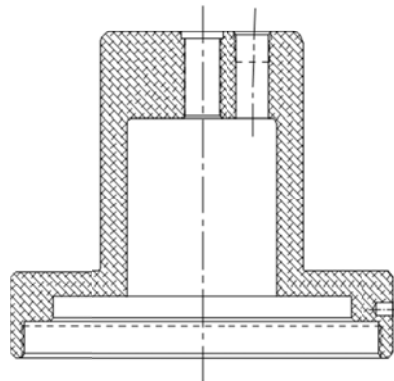
Figure 7 – Coolant bowl options. Customer specified fittings may also be installed.



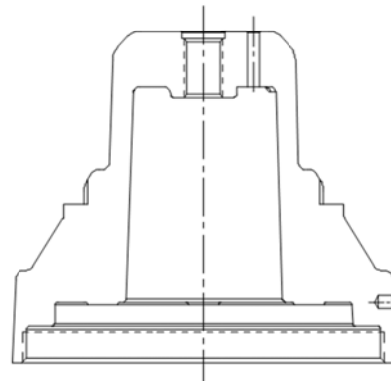
BONNET 96201



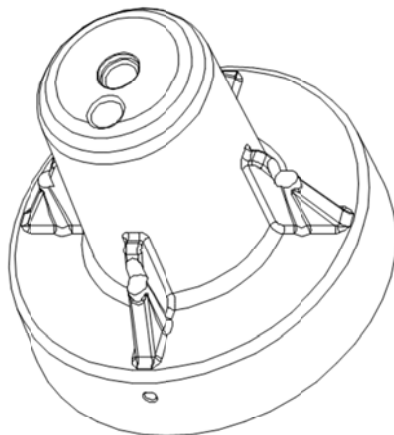
BONNET 96202



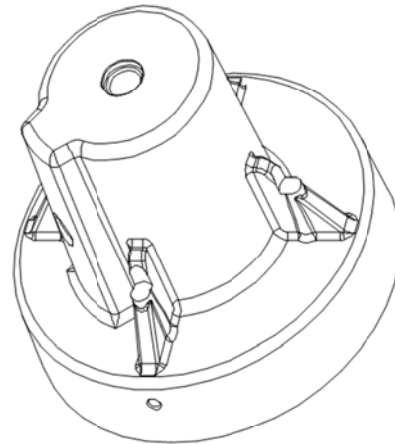
BONNET 96203



BONNET 96206



BONNET 96205



BONNET 96210

BONNETS 96201, 96202, 96203 ARE MACHINED FROM BAR OR FORGINGS.  
BONNETS 96205, 96206 AND 96210 ARE MACHINED FROM DIE CASTINGS.

Figure 8 – Bonnet options