Base Load Power Hub (BLPH)

CONTROL VALVES

HYDROSTATIC TEST PROCEDURE

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PROCEDURA DI PROVA IDROSTATICA

HYDROSTATIC TEST PROCEDURE

Rev *Iss*	Data *Date*	Descrizione *Description*	Redatto *Edited*	Controllato *Checked*	Approvato *Approved*
27	04/07/2023	Tabella 1: Valori di prova idrostatica arrotondati per eccesso a 1 barg. Capitolo 4: modificato riferimento da ASME VIII ad ASME XIII Capitolo 8.1: Aggiunto requisito per pH dell'acqua di prova in conformità ad IOGP S-730 Capitolo 8.2.2: modificato riferimento da ASME VIII ad ASME XIII Aggiunto gruppo 3.1 in tabella 1	AC	FC	LP
26	10/03/2022	Aggiornati tempi prova idraulica boccagli e cappucci, aggiunti requisiti di sicurezza. Aggiornati capitoli 7.3 e 7.4	AC	FC	AL
25	27/07/2021	Tab. 2 - Aggiornati valori pressioni di prova PN – Table 2 - Test pressure values updated	A.Perego	F.Chiatto	A.Lapenna
24	08/04/2021	Cambiati criteri per la definizione del tempo di prova dei boccagli. Eliminati i riferimenti alle normative non utilizzate	AC	FC	AL
23	29/05/2019	Aggiornati valori massimi classi PN in accordo a EN 12516-1 ed. 2014 Corretta tabella 6 e aggiunta nota per PSV PN classes maximum pressure updated according to EN 12516-1 ed. 2014 Table 6 corrected and noted for PSV added	AP	FC	AL
22	15/11/2018	Cambiato da "idraulica" a "idrostatica" Changed from "hydraulic" to "hydrostatic"	AC	FC	AL
21	14/12/2017	Aggiornato layout ed aggiunti tempi prova idrostatica per valvole API10000 e API15000	AC	FC	AL
20	26/02/2014	Eliminata tabella del raggruppamento dei materiali, che viene gestita nell'Appendice A	AS	FF	AC
19	08/07/2013	Aggiunti riferimenti ASME VIII-1	AS	FF	AC
18	19/10/2012	Aggiunto requisito per Cloruri e Nitronic 60 UNS S21800	AS	ER	AC
0	12.1990	Emmissione / *First issue*	FC	AL	VC

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1. GENERAL

This procedure contains technical specification for the hydrostatic pressure test.

2. APPLICABILITY

This procedure applies to the pressure containing parts of the valves produced by A.S.T. and specifically:

- For spring loaded safety valve:
  This procedure is applicable to body, bonnet, cap and nozzle.
- For pilot operated safety valve:
  This procedure is applicable to body, nozzle, pilot body and accessory.
- For changeover valve:
  This procedure is applicable to changeover body.
- For control valve:
- This procedure is applicable to body and bonnet.

3. SCOPE

Hydrostatic test is meant to verify tightness and stability of pressure containing components.

4. REFERENCE STANDARDS

Reference standards and AST procedures are the following:

- API 6A Specification for wellhead and christmas tree equipment.
- ASME XIII Rules for overpressure protection.
- ASME B16.5 Steel Pipe Flanges and Flanged Fittings
- ASME B16.34 Steel Valves
- EN ISO 4126-1 Safety devices for protection against excessive pressure- Safety valves
- EN ISO 4126-4 Safety devices for protection against excessive pressure- Pilot operated safety valves
- EN 12516-1 Industrial valves. Shell design strength. Tabulation method for steel valve shells
- AST PI0003 Procedure for the control and the calibration of the gauges

5. HEALTH, SAFETY AND ENVIRONMENT

This chapter must be read carefully in order to reduce the risk of possible health and safety consequences for the personnel involved and to ensure the integrity of the working environment.
All operations described in this procedure must be carried out by competent personnel who have received appropriate instructions and specific training, observing the legal provisions in force in the country in which the valves are tested and the requirements of international standards and internal procedures in the field of health, safety and the environment. When the tests are carried out at AST facilities, the legislative reference is decree 81/08 "Testo Unico sulla Salute e Sicurezza sul Lavoro".
AST is responsible only for operations carried out by its own personnel.
It is not possible to list and evaluate all the possible conditions that may endanger the health and safety of workers, in any case we recommend the following precautions:
- Know and observe all the general safety rules in force in the area to which you must access and work.
- Carefully evaluate the consequences of all the actions you intend to carry out.
- Always wear suitable safety equipment, such as at least safety shoes, gloves and sight protection.
- Check that the valve or component has been connected in accordance with the instructions of the test bench you are using. When using flanges, check that they are of the correct type, of the correct material and that all the studs and nuts are of the correct diameter and material.

- Depressurize before performing any operation on the valve or component under test.
- Before removing a valve or component from the test bench, make sure that it has been depressurized.

6. INSTRUMENTATIONS

All instruments used for hydrostatic test shall be identified uniquely and shall be periodically calibrated in accordance with procedures SGQ008, PI0003 and PI0013.

7. TEST DESCRIPTION

7.1 SAFETY REQUIREMENTS

The test supervisor must ensure that all the personnel participating to the test have read, are aware of and have understood the content of this document before starting the tests.

Company safety regulations shall be adhered to during the tests. Extreme caution shall be exercised during pressure testing, as well as during lifting operations.

The risks mentioned in this paragraph are not exhaustive and are given only as an example.

At the end of every test, ensure that there is no trapped pressure anywhere in the test equipment and in the test devices/tools.

7.2 GENERAL

Test is performed on one part at the time or on two or more parts assembled together.
This test is not meant for verify sealing of joints; it is allowed the use of temporary gaskets. Components under test must not be painted.
The components are tested using suitable equipment for feeding the test fluid, for venting the air and for closing the remaining threaded or flanged connections.
The test fluid is introduced into the part to be tested making sure that the trapped air is completely vented.
For pressure containing parts having different pressure classes (Inlet side at high pressure and outlet side at low pressure), the hydrostatic test must be performed for both sections, according to the applicable pressure class, proceeding as follows:

a) Perform the hydrostatic test of high-pressure side, after isolating it from low pressure side.
b) Perform the hydrostatic test of low-pressure side.

Temporary seals may be used for the test. Figure 1 shows a typical application case (butt-welded safety valve with semi-nozzle).
For valves with heating jacket the hydrostatic test shall be performed with the following procedure:

a) Perform the hydrostatic test of the valve part without heating jacket.
b) Weld the heating jacket on the valve part and perform non destructive examination, if any.
c) Perform the hydrostatic test of heating jacket.

7.3 PARTS WITH PRESSURE CLASS DIFFERENT FROM API 6A

After checking that all air has been correctly vented from the component or components under test, the pressure is slowly increased up to the specified value.
During pressurization, always check that there is no abnormal deformation or leakage between the valve component and the test equipment.
The component or components are kept under pressure for the specified time, after which the inspection is carried out.
Inspection of the pressurized parts take place after careful cleaning and drying of the same. External surfaces may be covered with chalk powder so as to put in evidence leakage and sweating.
At the end of the inspection the pressure is brought to zero and the component or components emptied completely from the test fluid.
The test completion is reported on the work order of the component.

Casted components like caps, bonnets and bodies are properly identified by the operator once test has been completed with satisfactory result; non-compliant components are instead identified with the "HOLD" tag and segregated in separate place.
At the end of the test, throughly dry all the surfaces, apply the protections where and when foreseen and check that the component is correctly identified.

7.4 PARTS WITH API 6A PRESSURE CLASS

After checking that all air has been correctly vented from the component or components under test, the pressure is slowly increased up to the specified value.
During pressurization, always check that there is no abnormal deformation or leakage between the valve component and the test equipment.
The component or components are kept under pressure for the specified time, after which the inspection is carried out.
The pressure is then reduced to zero and the component or components are pressurized a second time to the specified value and kept under pressure for the specified time, after which the second inspection is carried out.
Inspections of the pressurized parts take place after careful cleaning and drying of the same. External surfaces may be covered with chalk powder so as to put in evidence leakage and sweating.
At the end of the inspection the pressure is brought to zero and the component or components emptied completely from the test fluid.
The test result is reported on the working order of the component. Test report shall include the pressure chart, shall identify the recording device, shall be dated and shall be signed.
Casted components like caps, bonnets and bodies are marked with a stamp of eligibility.
Non-compliant components are identified with the "HOLD" tag.
At the end of the test, throughly dry all the surfaces, apply the protections where and when foreseen and check that the component is correctly identified.

8. TEST SPECIFICATION

8.1 GENERAL SPECIFICATION

Water with corrosion inhibitor, with a pH between 6 and 8.5 and with a chloride content not exceeding 15 parts per million shall be used and checked at least quarterly or during the replacement of the fluid in the tank. Testing fluid shall be at room temperature.

8.2 PARTS WITH PRESSURE CLASS DIFFERENT FROM API 6A

8.2.1 PRESSURE MEASURING DEVICES

The pressure measurement must be carried out by means of pressure transducers or pressure gauges such as to guarantee an accuracy on the test pressure equal to 0 / + 5%.

8.2.2 TEST PRESSURE

As specified by ASME B16.34, ASME XIII 3.6.1 and EN ISO 4126 parts 1 and 4 the hydrostatic test pressure must be 1,5 times the design pressure.
Specifically, the hydrostatic test pressure shall be in accordance with the following criteria:

1. For parts with pressure class in accordance with ASME B16.34 refer to table 1. Hydrostatic test pressure depends on pressure class and material group of the part. Refer to Appendix A for the link between the material used by AST for the pressure containing parts and the relevant material group.
2. For parts with pressure class in accordance with EN ISO 12516-1, refer to table 2. Hydrostatic test pressure depends on pressure class and material group of the part. Refer to Appendix A for the link between the material used by AST for the pressure containing parts and the relevant material group.
3. For pilot body pressure classes are indicated in table 4. For hydrostatic test pressure refer to the above point 1 and 2.

4. For valve parts not included in the above points, the hydrostatic test shall be performed at a pressure equal to 1,5 times the design pressure at room temperature.

8.2.3 TEST DURATION

Minimum test duration is specified by Table 6. It is possible to proceed with the inspection only after waiting for the indicated time.

8.3 PARTS WITH API 6A PRESSURE CLASS

8.3.1 PRESSURE MEASURING DEVICES

Pressure measurement must be carried out by means of pressure transducers or pressure gauges with an accuracy class of at least +/- 2% of the full scale. If pressure gauges are used instead of pressure transducers, the pressure reading must be made between 20% and 80% of the full scale.
If a product specification level (PSL) of 3 or 4 is specified, a pressure recording system must be used for the overall duration of the hydrostatic test.

8.3.2 TEST PRESSURE

The hydrostatic test pressure is 1.5 times the maximum design pressure at room temperature, the test pressure can never be higher than the values shown in table 3, that is accordance with API 6A.
The pressure classes of the pilot bodies are shown in table 4. The hydrostatic test pressure is 1.5 times the design pressure, the test pressure can never be higher than the values shown in Table 3.

8.3.3 TEST DURATION

The minimum duration of each test is specified in Table 7. It is possible to proceed with the inspections only after waiting for the indicated time.

9. ACCEPTANCE CRITERIA

There must not be any visible leakage or sweating through the boundary walls.

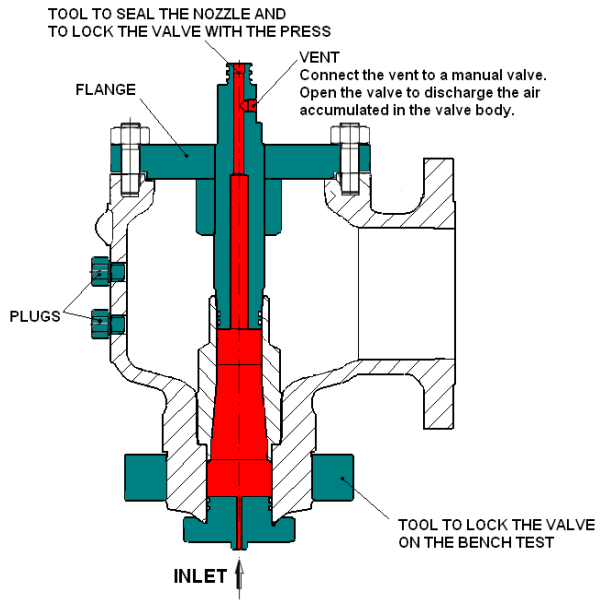
10.CERTIFICATION

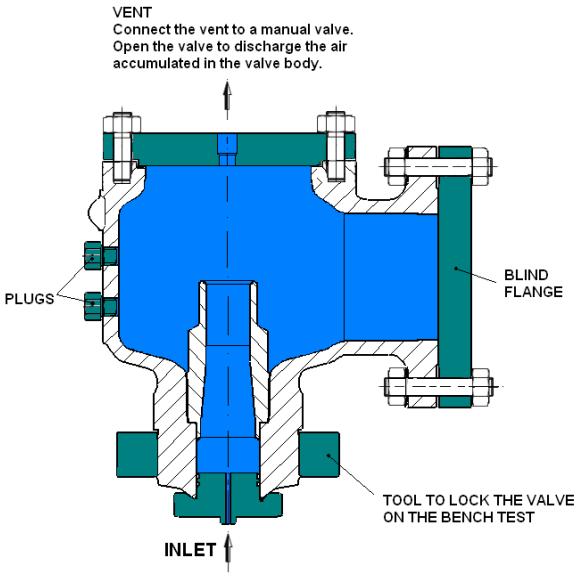
The results and the test parameters are recorded on the valve certificate, issued by the quality department (QUA). For parts with pressure class according to API 6A and PSL3 or PSL 4 requirements, the test report, which includes the pressure diagram, the recording device, the date and the signature, shall be considered part of the certificate.

Figura1 / *Figura 1*

Esempio di valvola con due classi di pressione

Typical valve with two pressure classes





Procedere con la prova idrostatica delle parti soggette all'alta pressione (flangia di ingresso corpo e boccaglio) con l'ausilio di opportuni attrezzi (adattatore flangia, tappo idrostatico etc.)
La zona ad alta pressione deve essere isolata da quella a bassa.

Perform hydrostatic test on pressure containing parts subject to high pressure (inlet valve flange and nozzle) with suitable tools and or equipment (flange adaptor, hydrostatic plug, etc.).
High pressure side shall be isolated from low pressure side.

Procedere con la prova idrostatica delle parti soggette alla bassa pressione (flangia di uscita e corpo) con l'ausilio di opportuni attrezzi (adattatore flangia, coperchio corpo etc.)

Perform hydrostatic test on pressure containing parts subject to low pressure (outlet valve flange and body thickness) with suitable tools or equipment (flange adaptor, body cap, etc.).

Tabella1 / *Table 1*

Pressioni di prova / *Test pressures*

In accordo a ASME B16.34 / *In accordance with ASME B16.34*

Material Groups	Pressioni Pressures		Class						
			150	300	600	900	1500	2500	4500
1.1	*Press di progetto Design pressure*	[bar]	19,7	51,0	102	153,1	255,5	425,4	765,9
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**30**	**77**	**153**	**230**	**384**	**639**	**1149**
1.2 - 1.9 - 1.10 - 1.13 1.14 - 1.15 - 1.17 - 2.8 - 3.1 - 3.5 - 3.7 - 3.8	*Press di progetto Design pressure*	[bar]	20	51,7	103,4	155,1	258,6	430,9	775,7
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**30**	**78**	**156**	**233**	**388**	**647**	**1164**
1.3 - 1.5	*Press di progetto Design pressure*	[bar]	18,4	48	96	144,1	240,1	400,1	720,3
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**28**	**72**	**144**	**217**	**361**	**601**	**1081**
1.6 - 1.16	*Press di progetto Design pressure*	[bar]	15,6	40,6	81,3	121,9	203,1	338,6	609,4
	Press. prova idrost. Hydrost. test pressure	+1,7/-0	**24**	**61**	**122**	**183**	**305**	**508**	**915**
2.1 - 2.2 - 2.4 - 2.5	*Press di progetto Design pressure*	[bar]	19,0	49,6	99,3	148,9	248,2	413,7	744,6
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**29**	**75**	**149**	**224**	**373**	**621**	**1117**
2.3 - 3.4 - 3.17 - 3.15	*Press di progetto Design pressure*	[bar]	15,9	41,4	82,7	124,1	206,9	344,8	620,5
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**24**	**63**	**125**	**187**	**311**	**518**	**931**
3.12	*Press di progetto Design pressure*	[bar]	17,8	46,3	92,7	139	231,7	386,1	695
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**27**	**70**	**140**	**209**	**348**	**580**	**1043**
1.4	*Press di progetto Design pressure*	[bar]	16,3	42,6	85,12	127,7	212,8	354,6	638,3
	Press. prova idrost. Hydrost. test pressure	0 / +1.7	**25**	**64**	**128**	**192**	**320**	**532**	**958**

Tabella 2 / *Table 2*

Pressioni di prova / *Test pressures*

In accordo a EN ISO 12516-1 / *In accordance with EN ISO 12516-1*

Material Groups	Pressioni Pressures		Class										
			PN6	PN10	PN16	PN25	PN40	PN63	PN100	PN160	PN250	PN320	PN400
1C1 - 1C2 1C9 - 1C10 1C13 - 1C14 2C8 10E0 - 16E0 1C3 - 1C5 1C6 - 1C8 2C1 - 2C2 2C4 - 2C5 2C3 - 2C6	***Press di progetto*** ***Design pressure***		6	10	16	25	40	63	100	160	250	320	400
	Pressione prova idrostatica **Hydrostatic test pressure**	**[bar]** 0 / +1.7	**9**	**15**	**24**	**38**	**60**	**95**	**150**	**240**	**375**	**480**	**600**

Tabella 3 / *Table 3*

Classi di pressione e pressione di prova idrostatica in accordo ad API 6A

Pressure rating class for hydrostatic test in accordance with API 6A

Classe di Pressione ***Pressure Class***		**Pressione di prova idrostatica** ***Hydrostatic test pressure***
psi	**bar**	**bar**
2 000	138	207
3 000	207	311
5 000	345	518
10 000	690	1 035
15 000	1 035	1 553
20 000	1 380	2 070

Tabella 4 / *Table 4*

Classi di pressione per i corpi piloti [min]

Pressure rating class for pilot body [min]

Modello pilota ***Pilot type***	**Classe di Pressione** ***Pressure Class***
7210	ASME B16.34 Class 2500
7220	ASME B16.34 Class 300
7230	ASME B16.34 Class 600
7240	ASME B16.34 Class 900
7250	ASME B16.34 Class 2500
7250-HP	API 6A Class 15000 psi

Tabella 6 / *Table 6*

Durata minima della prova [min] / *Minimum test duration [min]*

Componente di contenimento della pressione ***Pressure containing parts***	**Dimesioni** ***Dimensions***	**Minima durata prova idrostatica** ***Hydrostatic test minimum duration***
Corpi[2] ***Bodies[2]***	Fino a NPS 2 – DN 50 *Up to NPS 2 – DN 50*	1 min
	Oltre NPS 2 - DN 50 fino a NPS 8 - DN 200 *From NPS 2 – DN 50 to NPS 8 – DN 200*	2 min
	Da NPS 8 – DN 200 fino a NPS 12 – DN 300 *From NPS 8 – DN 200 to NPS 12 – DN 300*	3 min
	Oltre NPS 12 - DN 300 *Over NPS 12 - DN 300*	5 min
Cappucci e corpi pilota ***Caps and pilot bodies***	Tutte le dimensioni *All sizes*	3 min
Boccagli[3] ***Nozzles[3]***	Fino a NPS 1 – DN 25 *Up to NPS 1 – DN 25*	1 min
	Oltre NPS 1 - DN 25 fino a NPS 2 - DN 50 *From NPS 1 – DN 25 to NPS 2 – DN 50*	2 min
	Oltre NPS 2 - DN 50 fino a NPS 8 - DN 200 *From NPS 2 – DN 50 to NPS 8 – DN 200*	5 min
Cappelli[4] ***Bonnets[4]***	Fino a 80 mm, escluso *Up to 80 mm, excluded*	1 min
	Da 80 mm fino a 190 mm *From 80 mm to 190 mm*	2 min
	Oltre 190 mm *Over 190 mm*	3 min

1) La durata della prova è sempre uguale o maggiore a quanto prescritto da ASME B16.5 e ASME B16.34.
   Test duration is equal or longer than what is required by ASME B16.5 and ASME B16.34.
2) Per le valvole di sicurezza riferirsi alla dimensione della flangia di uscita
   For safety valves refer to the size of the outlet flange.
3) Le dimensioni si riferiscono alla dimensione nominale del boccaglio.
   Dimensions refer to the nominal pipe size of the nozzle
4) Le dimensioni si riferiscono al diametro dell'imposta guida.
   Dimensions refer to liner external diameter

Tabella 7 / *Table 7*
Durata minima della prova [min] / *Minimum test duration [min]*

	PSL 1 & PSL 2	PSL 3 & PSL 4
Primary pressure-holding period	3 min	3 min
Secondary pressure-holding period	3 min	15 min

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ANNEX - A _add to AST "HT" Hydro-test Procedure _ CV2400221

Item	Type	Valve Tag	Serial nr.	Valve Service	Valve Model	Body Size	leackage CLASS	SHUTOFF [Bar G]	FAIL POS	Body Material	Rating	Finish	Actuator Size	HYDROSTATIC TEST PRESSURE [Bar G]	HT MINIMUM TEST DURATION [min]	TEST HT MEDIUM	HT LEAKAGE
10	Control Valve	25-FV-031	2400583	-	CV-8407	1"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
10	Control Valve	25-FV-032	2400584	-	CV-8407	1"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
10	Control Valve	25-FV-033	2400585	-	CV-8407	1"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
10	Control Valve	25-FV-034	2400586	-	CV-8407	1"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
10	Control Valve	25-FV-036	2400587	-	CV-8407	1"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
10	Control Valve	25-FV-038	2400588	-	CV-8407	1"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
20	Control Valve	25-PV-035	2400589	H2 Service	CV-8407	2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
20	Control Valve	25-PV-037	2400590	H2 Service	CV-8407	2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
20	Control Valve	25-PV-040	2400591	H2 Service	CV-8407	2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
20	Control Valve	25-PV-043	2400592	H2 Service	CV-8407	2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
20	Control Valve	25-PV-046	2400593	H2 Service	CV-8407	2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
20	Control Valve	25-PV-049	2400594	H2 Service	CV-8407	2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD09R	75	1	WATER	0
30	Control Valve	25-PV-055A	2400595	H2 Service	CV-8407	1 1/2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD11R	75	1	WATER	0
40	Control Valve	64-PV-031A	2400597	-	CV-8407	1"	V	10	CLOSE	A350 LF2	150#	RF - LUG	SD09R	30	1	WATER	0
40	Control Valve	64-PV-031B	2400598	-	CV-8407	1"	V	10	CLOSE	A350 LF2	150#	RF - LUG	SD09R	30	1	WATER	0
50	Control Valve	25-PV-055B	2400596	H2 Service	CV-8407	1 1/2"	VI	40	CLOSE	A351 CF3M	300#	RF	SD11R	75	1	WATER	0