

Cryogenic Pressure Regulating Valve									
Installation, Operation and									
Maintenance Manual									
Reference Number: IOM 003 Date: 28 July 2010 Issue: A									
<image/>									
Bestobell Valves, President Park, President Way, Sheffield, South Yorkshire, S4 7URBestobell Valves Inc, 270 Meadowlands Blvd Washington, PA 15301Tel: +44 (0) 114 224 0000 Fax: +44 (0) 114 278 4974 info@bestobellvalves.comTel: +1 724 746 3750 Fax: +1 724 746 0940 sales@conflowusa.com									
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	Cryogenic F	Pressure Re	gulating Valve		
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					_
		WARNING	!		
BEFORE A	NY INSTALLA	TION AND N	AINTENANCE \	NORK CAN	
COMMENC	E ENSURE TH	E VALVE AN	ID SURROUNDI	NG SYSTEM	
I.	S DRAINED OF	PRESSURE	E AND ISOLATE	D.	
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### Disclaimer

PLEASE NOTE:

If the valves produced by Bestobell Valves/LNG are refurbished by a third party organisation that is not approved by Bestobell Valves/LNG, then the safety and performance will not be guaranteed and the warranty may be invalid.

If unsure about the installation and operation procedures for this valve, please contact Bestobell Valves/LNG.

Bestobell Valves has produced this manual in order to provide engineering personnel with sufficient general information to enable the operation, installation and effective maintenance of the valve manufactured by Bestobell Valves.

In the interest of product development, the designs and specifications for our products are constantly under review and we therefore reserve the right to make changes and improvements without notice.

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# This document has been authorised for use by:

Name:	
Title:	TECHNICAL DIRECTOR
Signed:	k Frehrell,
Date:	16-02-2011

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# Introduction

# Outline

This manual is broken down into separate sections:

### • Introduction

This section provides information about important safety requirements as well as highlighting the precautions taken at Bestobell Valves to ensure the cleanliness of products. Details regarding servicing are also introduced.

#### Installation •

This details the method of installing the valve on site, and includes information on storage, unpacking and inspection. Preparation of the valve and site is also discussed to allow ease of installation and operation.

### **Hardware Description**

Introduces the product as well as providing a more detailed description including operating conditions and suitable media. Any further requirements for the effective operation of the valve are also discussed.

#### Operation

Provides information on how to operate the valve.

### Maintenance

Provides information relating to the on-site maintenance of the supplied valve, as well as discussing common problems and solutions.

# Safety

Read and understand these instructions before installing the valve. Improper installation, operation or maintenance by the owner or operator of this valve can result in personal injury.

Only use genuine Bestobell Valves spares to ensure safe and optimum performance.

Prior to the installation of the valve into the system, ensure the system is de-pressurised and isolated for the duration of the installation and during any subsequent maintenance.

The valve must be installed within a system that has adequate draining and venting provisions.

In cryogenic applications the area of pipe-work to receive the valve must be allowed to reach ambient temperature.

It is essential that the installers and operators are conversant with all of the safety issues relating to the medium within the system, and are fully trained to an adequate standard.

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	Cryogonia	Drocouro D						
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	Wear safety glasses and gloves during any installation or operation of the valve.							
Valves must only b	be used in a circuit p	rotected by suitab	e equipment.					
The valve should b	be inspected for wea	r as part of a regu	lar system maintenance	programme.				
Cryogenic burns ca	an occur if the valve	is handled during	or after the valve has op	perated.				
			build up in a confined a tmosphere or a well ven					
If valve is to be ins Valves Ltd.	talled in hazardous o	climatic conditions	or seismic areas, pleas	e inform Bestobell				
Identify the intende	ed flow direction and	match the valve of	prientation with its flow d	irection arrow.				
			nd that the pipe work is and system pipe work.	supported to reduce				
	ing materials / comp ill not cause any dete		g the installation of the law	valve are				
•	$D_2$ , the internal atmost be affected by carbo	•	y and moisture free as a	ny bronze				
DO NOT check lea	aks with hands.							
Cleanliness								
Immediately after assembly in a controlled clean room, the valve is sealed in an airtight plastic bag to maintain cleanliness. As such, it is essential to maintain this cleanliness throughout all stages of installation. Particular care should be taken not to contaminate the internals of the valve with grease, moisture, grinding dust, weld/brazing spatter etc.								
Clean practices will save time later with reduced 'flushing' and maintenance.								
			Bestobell Valves Inc, 270 Mea Washington, PA 15301 Tel: +1 724 746 3750 Fax: +1 sales@conflowusa.com www	724 746 0940				
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	Bestobell valves							
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Service Intervals	Service Intervals							
Bestobell Valves recommends that a major service is carried out on its valves in line with the procedures contained in this manual every 2 years.								
In addition to this, a recondition.	egular inspection sho	ould take place	to ensure correct opera	itional				
Regular inspections a carried out in line with		•	nd maintenance work sl	nould be				
It is recommended that service interval.	at the Service Recor	d Sheet enclos	ed be fully completed a	t every				
Installation								
Personnel carrying ou hold the necessary ap	, ,	g / Welding / Ins	spection must be adequ	ately trained and				
Ensure that environm materials.	ental conditions (atm	nospheric pollu	tion) are compatible with	n the valve				
(NOTE: Ensure there refit of the headwork /	<b>e</b> .	ound the valves	installed position to all	ow the removal and				
Installation Overv	/iew							
	instructions is there	fore recommer	care taken to ensure go ded, as properly installe					
The most critical point in the lifetime of a valve is the time of installation, therefore, proper care at this stage and during any maintenance will increase the probability of trouble free valve service.								
It is important to maintain cleanliness throughout all stages of the installation, with particular care being taken not to contaminate the internals of the valve with grease, moisture, grinding dust, weld / brazing spatter or other foreign matter.								
Clean practices will save time later with reduced 'flushing' and maintenance.								
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#### STORAGE:

The equipment packing cases are **NOT** waterproof and should be stored in a weatherproof location before use.

#### **UNPACKING:**

It is recommended that before any item is unpacked, it should be moved as close as possible to its installed position. This will minimise the possibility of damage during handling.

It is further recommended that each item should only be unpacked immediately before it is required.

Before installation the engineer should check for:

- Damaged Packaging
- Bent or Distorted Items
- Scratches, Dents or Damage

Particular attention should be paid to the sealing faces on the end connection flanges.

#### TOOLS REQUIRED:

No special tooling is required for the installation of this valve.

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**Cryogenic Pressure Regulating Valve Reference Number:** IOM\_003 Date: 28 July 2010 Issue: Preparation WARNING! **BEFORE ANY INSTALLATION AND MAINTENANCE WORK CAN** COMMENCE ENSURE THE VALVE AND SURROUNDING SYSTEM IS DRAINED OF PRESSURE AND ISOLATED. Identify the intended flow direction and match the valve orientation with its flow direction arrow. Ensure that all end connections to the valve are in line and that the pipe work is supported to reduce unwanted stresses, loading and vibration on the valve and system pipe work. Ensure that all joining materials / components used during the installation of the valve are compatible, and will not cause any deterioration to the valve structure. Bestobell Valves, President Park, President Way, Bestobell Valves Inc, 270 Meadowlands Blvd Sheffield, South Yorkshire, S4 7UR Washington, PA 15301 Tel: +1 724 746 3750 Fax: +1 724 746 0940 Tel: +44 (0) 114 224 0000 Fax: +44 (0) 114 278 4974 info@bestobellvalves.com www.bestobellvalves.com sales@conflowusa.com www.bestobellvalves.com

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# **Cryogenic Pressure Regulating Valve**

The Cryogenic Pressure Regulating Valve (Cryoreg) is designed to provide all pressure regulator

Designed for use on all cryogenic pressure vessels including static and transportable tanks; the

\* The Cryoreg provides thermal relief for the PBU inlet and vents this to the economiser outlet. If a stop valve is fitted on all three lines and were all closed then liquid lock would occur, therefore a thermal relief valve must be fitted to the economiser line or the gas (outlet) side of the Cryoreg.

Combined pressure build-up regulator and economiser functions for simpler pipe work and fewer

• High accuracy/low dead band allows higher tank pressure – reduced boil-off in pipelines.

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The standard body material is bronze; however, stainless steel bodies are also available.

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Hardware Description

functions within one valve.

Features and Benefits

joints.

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Cryoreg valve combines each of the following functions in one unit:

1. Pressure build up regulator

3. Thermal relief\* on two of the ports

• High flow characteristics – for closer control of tank pressure.

• Single adjustment for both functions – for simpler tank setting.

Dual thermal relief valve action – for added system protection.

Operates on liquid or gas – to suit every installation.

Strainer fitted as standard on inlet and outlet.

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Ball check fitted to economiser outlet as standard.

2. Economiser valve

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С

### Operation

In the following explanation, it is assumed that the Cryoreg is fitted downstream of the pressure build-up coil and will therefore be controlling a gaseous flow during the pressure build-up phase of its operation. Operation is identical when fitted upstream of the PBU coil except that liquid will be passed during the pressure build-up phase.

Date:

### Function One – Pressure Build-up Regulator

As liquid or gas is drawn from the tank, the pressure inside the tank will fall. To compensate for this, the Cryoreg will open to allow liquid to pass through the pressure build-up coil. Sufficient gas will thus be generated to bring the tank back to its normal working pressure.

In this phase of operation, flow is from port A to port B via the pressure build-up seat on the multi-function disc away from the main seat. This upward movement arises as a result of the force in the pressure setting spring overcoming the pressure force acting over the sensing diaphragm. As soon as the pressure in the tank has recovered, the diaphragm assembly is pushed back down again, stopping the flow.

# Function Two – Economiser Valve

When heat leaks into a cryogenic storage tank, liquid will revert to its gas phase leading to a pressure rise in the tank. Left unchecked, the process may continue until the relief valve lifts, wastefully venting gas to the atmosphere.

The function of an economiser valve is to divert excess gas into the supply line. Providing the customer is drawing gas, diverting the flow in this manner will prevent the relief valve lifting, avoiding waste and reducing the overall cost of storing the liquefied gas.

To accomplish this, a flow path is formed within the Cryoreg to allow gas to pass from port B, up through the centre of the valve to exit via the economiser port C. The flow path is formed from the downward movement of the diaphragm (which senses tank pressure), having overcome over the force in the pressure setting spring. This occurs when the tank pressure exceeds the valve set pressure by more than 0.54 barg.

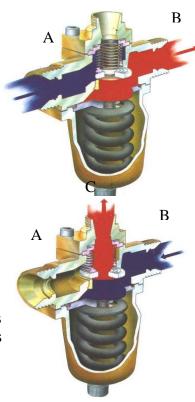
Note that this mechanism is also used to provide thermal relief into the economiser from outlet B.

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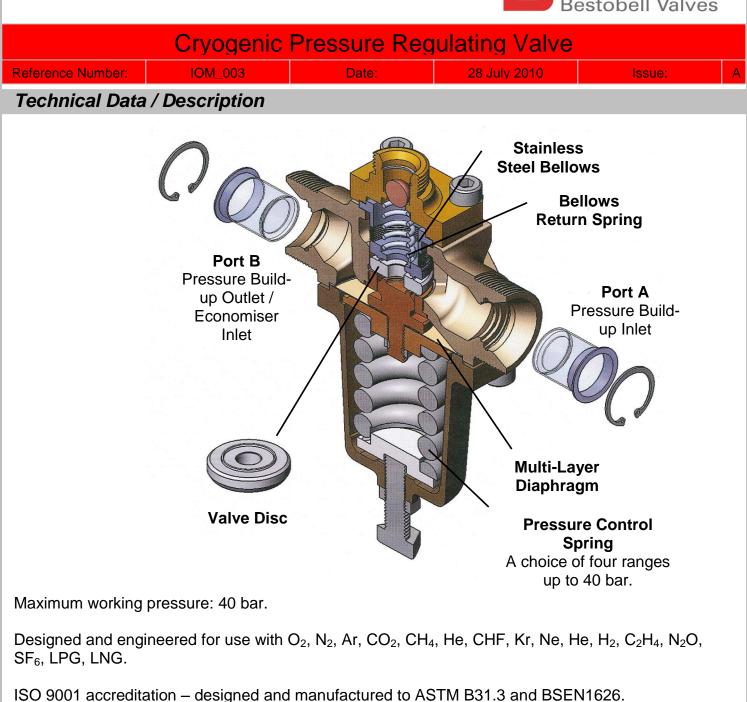
Cryogenic Pressure Regulating Valve								
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Function 3 – Thern	nal Relief			С				
	e of the valve supplyi I trapped between the	•	•	B				
associated pipe wo trapped liquid. This automatically vent	A thermal relief valve would normally be required to protect the coil associated pipe work from the high pressures generated by warming of the trapped liquid. This function, however, is built into the Cryoreg, which will automatically vent the gas into either the economiser line (port C) or the gas supply line to the tank (port B).							
This function is accomplished by the differential pressure across the bellows assembly forcing it to compress, leaving the multi-function disc in place. This allows a flow path to form from port A, up through the centre of the bellows to exit from the economiser port.								
Remember that thermal relief is provided on port B by the economiser function described above, giving protection under all foreseeable circumstances.								
	o seen in its ability to coil, or gas when fitte		• •					

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Optional full material traceability backed by BSEN 10204 3.1/3.2 certification.

Marking according to Pressure Equipment Directive 97/23/EC.

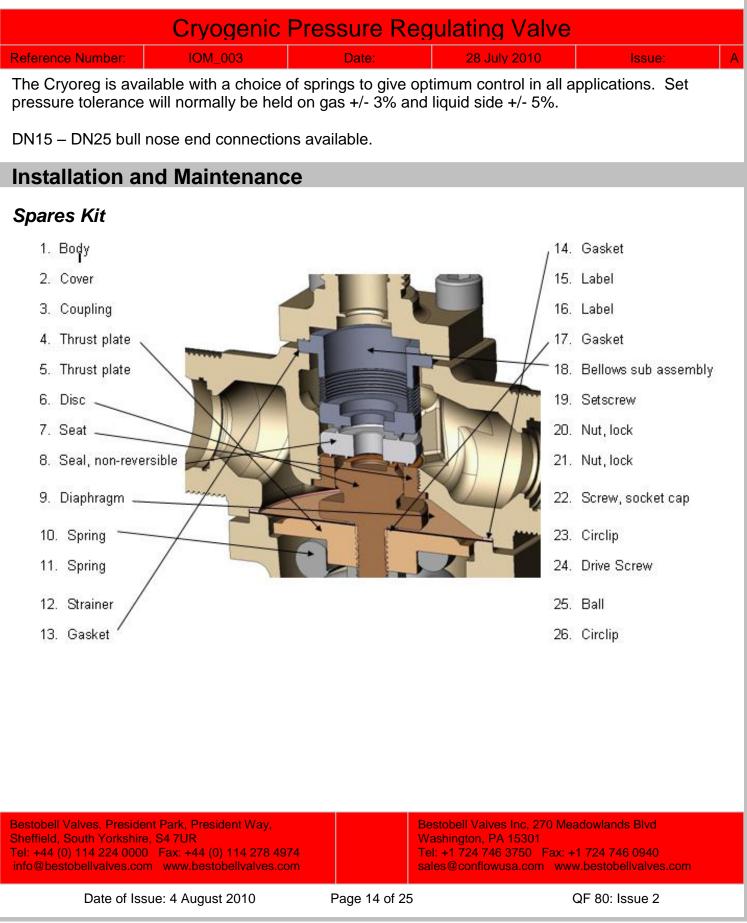
Marking to Directive 99/36/EC only on written request complete with purchase order.

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Kit Number	Name	Contents				]			
CKCSP1	SEAL KIT	1 SEAL 2 GASKETS							
		1 BELLOWS							
	BELLOWS/SEAL	1 SPRING							
CKCSP2	KIT	1 SEAL							
		2 GASKETS							
	DIAPHRAGM KIT	1 DIAPHRAGM ASSY							
CKCSP3	(HP) (10.0 - 25.0 BAR)	1 GASKET	N	DTE:					
	DIAPHRAGM KIT	1 DIAPHRAGM ASSY	PI	ease ensure that w	hen ordering				
CKCSP4	(LP) (1.5 to 12.0 BAR)	1 GASKET	Spares the parts being ordered match						
	MAINSPRING KIT	1 SPRING		e pressure rating of	parts eitner				
CKCSP5	(HP) 10.0 top 25.0 BAR)	1 GASKET	fitted, or being fitted.						
	MAINSPRING KIT	1 SPRING	F	a					
CKCSP6	(MP) (4.0 to 12.0 BAR)	1 GASKET	Cł	E.g. CK30A1REPKITHP or CKCSP3 mi			K30A1REPKITHP or CKCSP3 mus		
	MAINSPRING KIT	1 SPRING	or	ly be used in conju	nction with				
CKCSP7	(LP) (1.5 to 4.0 BAR)	1 GASKET	CKCSP5.	CKCSP5.		CKCSP5.			
CKCSP8	GASKET SET	2 GASKETS							
CRCSFO	GASKET SET	1 GASKET							
	REPAIR KIT (HP)	1-CKCSP3							
CK30A1REPKITHP	(10.0 to 25.0 BAR)	1 SEAL	]						
		2 GASKETS	_						
	REPAIR KIT (LP)	1-CKCSP4	_						
CK30A1REPKITLP	(1.5 to 12.0 BAR)	1 SEAL	_						
		2 GASKETS							

#### Installation Method

Install the value in the pipe work with the connections as shown in either of the figures on the following page.

Ensure that the direction arrows on the valve are pointing in the correct direction.

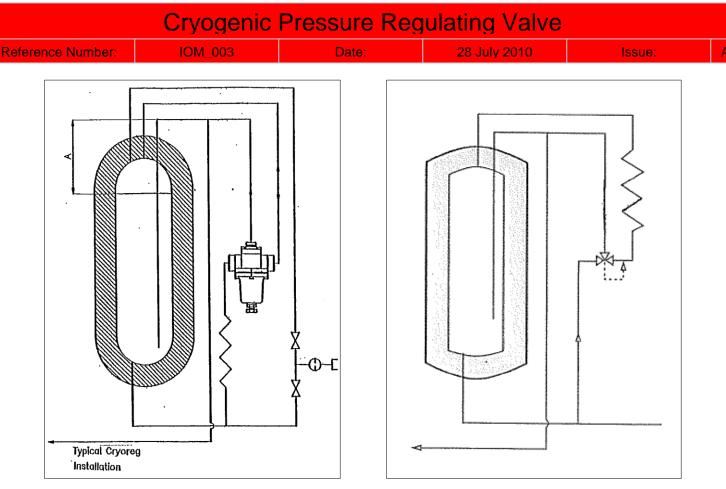
Ensure that the physical environment will not cause the drain hole in the cover to become blocked.

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Gas Side

Liquid Side

The valve may be fitted on either the liquid or gas side of the pressure build up coil at the discretion of the customer.

Ensure that there is a minimum of 200mm head between the highest liquid level and the point at which the economiser outlet joins the customer supply line.

Install the Cryoreg with the pressure setting screw downwards; this prevents ice formation inside the cover which would impede correct operation of the valve.

To set the valve at the correct pressure (it is usually supplied with the pressure setting screw at mid spring range unless otherwise requested) slacken off the setting screw locknut. Screw the pressure setting screw into the valve until the correct working pressure is obtained.

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Cryogenic Pressure Regulating Valve								
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Care should be taken to ensure that safe working pressures are not exceeded.								
As an indication and to assist in the initial setting of the valve the approximate rates of adjustment shown below apply for the three available springs.								
	Spring Range Bar) Sensitivity (Bar/Turn)							
	1.5 to	5	0.75					
	4.0 to 1							
	10.0 to 25.0 5							
Refit / Refurbishment Method								
	crew from the top of							

**Step 2:** Unscrew each of the six socket cap screws and lift off the cover.

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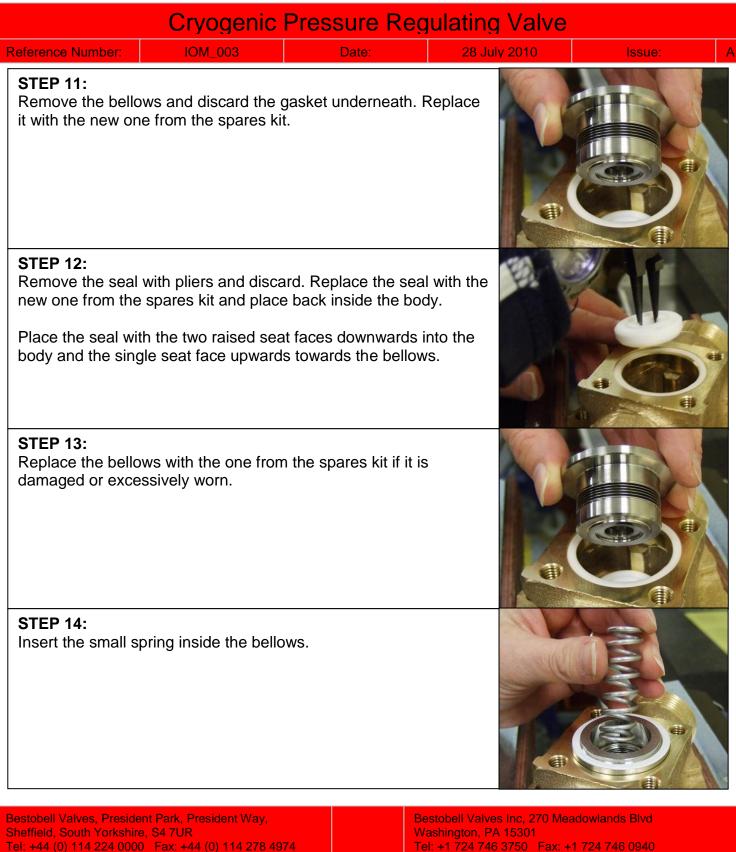
					DC	Stobell valves
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STEP 3: Remove the larg diaphragm asser		st plate over	the top of	the		
STEP 4: Remove the diap	hragm assembly	r from the bod	ly.			
STEP 5: Remove the lock NOTE: Hold the soft jaws to preve the lapped seat f	square below the ent damage to th	e diaphragm d	liscs in a v	vice with		
<u> </u>	in good condition on top to 33Nm ing Pressure: - 5.0	re-use, if not (24 lb.ft). Number		<u> </u>		
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STEP 7: Unscrew each so	ocket cap screw from	the coupling.				
STEP 8: Remove the circli coupling.	ip from the groove in	side the threads o	of the			
one from the spa	from the coupling – r res kit.	eplace this if wor	n with the			
STEP 10: Remove the sma	II spring from inside t	he bellows.				
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<b>STEP 15:</b> Reinsert the ball into the coupling.			XL				
Secure the ball in place by re-attaching	the circlip.						
STEP 16: Replace the coupling ensuring that the or Tighten the socket cap screws to 12NM alternately on opposite corners to apply face, to secure the coupling to the body.	(9 lb.ft), working equal pressure to						
<b>STEP 17:</b> Invert the body. Remove and discard the replace with the new one from the spare		et and					
STEP 18: Replace the diaphragm assembly into the second se	ne body.						
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Destobell valves						
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STEP 19: Replace the large diaphragm asser	e spring and thrust pla nbly.	ate over the top of	the			
STEP 20: Place the cover of screws back into	onto the spring. Screw the body.	each of the six s	ocket cap			
	lly tighten each screw; /s are tightened to the					
	ew back into the valve nut is then secured in		a nut.			
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Troubleshooting							
SYMPTOM:	FAULT:		SOLUTION:				
PRESSURE CONTINUES TO BUILD UP.		PRESSURE SETTING SCREW NOT SET CORRECTLY.		SET THE PRESSURE SETTING SCREW TO THE CORRECT PRESSURE (SEE PAGE 9).			
PRESSURE CONTINUES TO BUILD UP.	IF LINES A AND B AND THE OUTSIDE OF THE VALVE AT THESE PORTS ARE FROSTY BUT THE ECONOMISER OUTLET (PORT C) IS NOT FROSTY THIS COULD INDICATE THAT FOREIGN MATTER OR ICE IS PRESENT AROUND THE SEAL.		ENSURE THAT ALL MAINTENANCE IS CARRIED OUT IN A CLEAN ENVIRONMENT AND THAT NO FOREIGN MATTER IS ALLOWED INTO THE SYSTEM.				
PRESSURE CONTINUES TO BUILD UP.	IF PORTS B AND C ARE FROSTED BUT PORT A IS NOT, THIS COULD INDICATE THAT REVERSE FLOW OR SIPHONING IS OCCURRING. EITHER THE CHECK VALVE OR THE ECONOMISER IS FAULTY.		REPAIR OR REPLACE THE FAULTY CHECK VALVE.				
PRESSURE CONTINUES TO BUILD UP.	A CHECK VALVE IS NOT FITTED.		FIT A CHECK VALVE				
Bestobell Valves, President Park, President Way, Sheffield, South Yorkshire, S4 7UR Tel: +44 (0) 114 224 0000 Fax: +44 (0) 114 278 49 info@bestobellvalves.com www.bestobellvalves.com	74	Bestobell Valves Ind Vashington, PA 153 Fel: +1 724 746 375	801 0   Fax: +				

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Bestobell Valves						
Cryogenic Pressure Regulating Valve						
Reference Number:	IOM_003	Date:	28 July 2010	Issue: A		
Contact Detai	ils					
For further maintenance instructions and spares contact:						
United Kingdom Er	nquiries:					
Bestobell Valves/L President Park, President Way, Sheffield, South Yorkshire, S4 7UR, England.	NG					
United States Enqu	uiries:					
Bestobell Valves Ir 270 Meadowlands Washington, PA 15301.						
Tel: +1 724 746 3 Fax: +1 724 746 0 Email: <u>sales@conf</u> Web: <u>www.bestobe</u>	940 Iowusa.com					
			Bestobell Valves Inc, 270 Mea Washington, PA 15301 Tel: +1 724 746 3750 Fax: + sales@conflowusa.com www	1 724 746 0940		

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Cryogenic Pressure Regulating Valve						
Reference Number:	IOM_003	Date:	28 July 20			
Service Record						
Valve Tag Number:		Date:	Date:	Date:	Date:	
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Bestobell Valves, President Park, President Way, Sheffield, South Yorkshire, S4 7URBestobell Valves Inc, 270 Meadowlands Blvd Washington, PA 15301Tel: +44 (0) 114 224 0000 Fax: +44 (0) 114 278 4974 info@bestobellvalves.comTel: +1 724 746 3750 Fax: +1 724 746 0940 sales@conflowusa.com				0940		
Date of Issu	ue: 4 August 2010	Page 25 of 25	25 of 25 QF 80: Issue 2			