

# Pressure Regulators

## Overview

The Parker Bestobell cryogenic pressure regulator (also known as Cryoreg) regulates the pressure of storage vessels, including static and transportable tanks.

The cryoreg valve combines the following functions:

- Pressure build-up regulator
- Economizer valve
- Thermal relief valve on two ports

To prevent contaminants from entering the regulator, strainers with monel mesh are installed on the inlet and outlet of the regulator. A check valve is fitted on the outlet of the economizer ball to prevent the backflow of the media.

The Parker Bestobell pressure regulator - Cryoreg, is available with a choice of springs to give optimum control in all applications. Set pressure tolerance will normally be held on gas  $\pm 3\%$  and liquid side  $\pm 5\%$ .

Install the Cryoreg with the pressure setting screw downwards; this prevents ice formation inside the cover, which would impede the 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.

A name plate will be fitted on the body of the valve.



Parker Bestobell Cryogenic Pressure Regulator (Cryoreg) in Bronze (Inlet and outlet Ports 1-1/4" BSP-PL c/w 60° Cone; Economizer Port: 3/4" BSP-PL c/w 60° Cone)

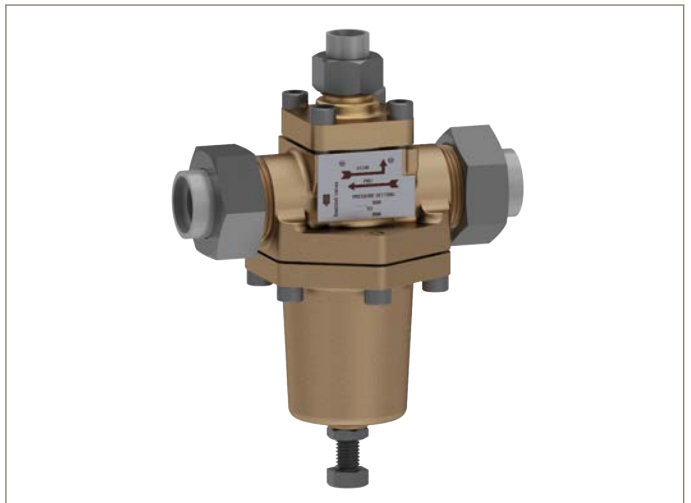
<b>Valve size</b>	DN15
<b>Maximum Working Pressure (MWP)</b>	25 bar (360 PSI) dependent on end connections
<b>Working temperature</b>	-196°C to +65°C (-319°F to +149°F)
<b>End connections</b>	BSP, NPT, Butt Weld
<b>Body materials</b>	Bronze
<b>Suitable for media type</b>	Group 1 gases Cleaned for oxygen service
<b>Design and testing standards</b>	ASTM B31.1, BS EN 1626, BS ISO 21011 Optional full material traceability backed by BS EN 10204 3.1/3.2 certification
<b>Approvals</b>	CRN, UKCA and PED approved
<b>Marking</b>	CE and UKCA marked

### Function:

- Vessel pressure regulation

### Applications:

- Transportation of Liquefied Gases
- Storages of Liquefied Gases
- Gas Processing



Parker Bestobell Cryogenic Pressure Regulator (Cryoreg) in Bronze (1" (Inlet and outlet Ports: 1" NB x Butt Weld Schedule 10; Economizer Port: 1/2" NB x Butt Weld Schedule 10)

### WARNING

The products described in this catalog can expose you to chemicals, including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.p65warnings.ca.gov](http://www.p65warnings.ca.gov).

## Valve Operation

This cryogenic pressure regulator is usually installed after the pressure build-up (PBU) coil of the storage unit and therefore controls the gaseous flow during the pressure build-up phase. There should be a minimum of 200mm head (A) between the highest liquid level and the point at which the economiser outlet joins the customer supply line.

The valve operation is such that it maintains a system pressure on a storage tank during the transfer of gas from the trailer to a storage unit or vice versa. Pressure must be maintained to allow flow at desired rates during transfer. If the regulator is fitted before the PBU coil, the operation is identical, except that liquid will be passed during the pressure build-up phase.

The following explanation of the cryoreg assumes that it is fitted after the pressure build-up coil of the storage unit. It will therefore control a gaseous flow during the pressure build-up phase of its operation.

### Pressure build-up regulator function:

As liquid or gas is drawn down 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 of the storage tank. Sufficient gas will thus be generated to bring the tank back to its normal working pressure.

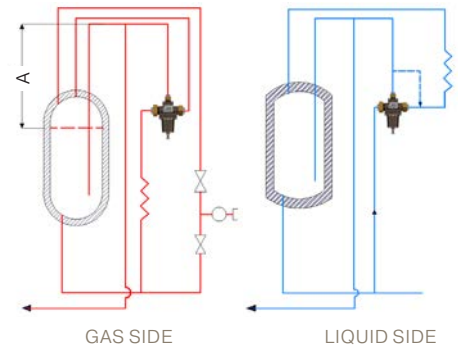
When media is drawn down, the outlet pressure drops slightly, allowing the pressure setting spring to extend. A sensitive diaphragm assembly, connected to the spring, will lift the multi-function disc away from the main seat. This allows flow through the body, from port A to port B, via the pressure build-up seat on the multi-function disc to the downstream system.

As soon as the pressure in the tank has recovered, the diaphragm assembly is pushed back down again, closing off the flow path.

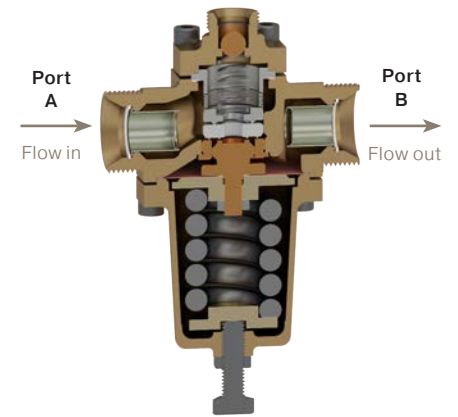
### Economizer valve function:

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

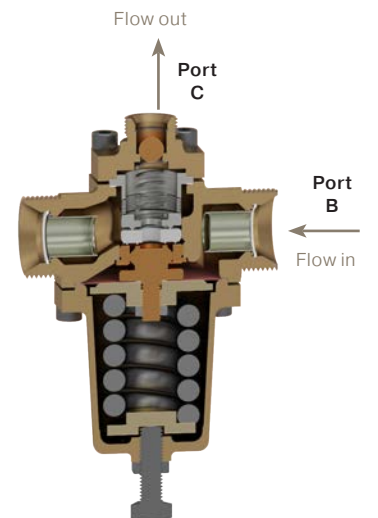
The economizer valve diverts excess gas into the customer's supply line. Diverting the flow in this manner will prevent the relief valve from lifting, avoiding waste, and reducing the cost of storing the liquefied gas. To accomplish this, inside the Cryoreg is a flow path that allows gas to pass from port B up to the economizer port C. This occurs when the tank pressure exceeds the valve set pressure by more than 0.54 barg. A diaphragm assembly sensitive to tank pressure will be moved down having overcome the force of the pressure setting spring; it opens a flow path from port B up through the center of the valve to exit via the economizer port C. This mechanism is also used to provide thermal relief into the economizer port C from outlet B.



Typical Cryoreg installation



Pressure build-up regulator function



Economizer valve function

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# Pressure Regulators

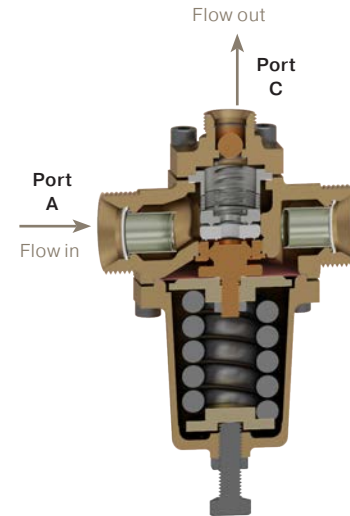
## Overview

### Thermal relief valve function:

When liquefied gases are trapped between two closed valves, supplying the pressure build-up coil and the cryoreg (a situation known as a liquid lock), the reheating and consequent boiling can lead to a dangerous rise in pressure. A thermal relief valve would usually be required to protect the coil-associated pipework from the high pressures generated by warming the trapped liquid. This function, however, is built into the Cryoreg, which will automatically vent the gas into either the economizer line (port C), if the valve operates in pressure build-up function, or into the gas supply line to the tank (port A) when the regulator is in the economizer function mode. As described above, this gives protection under all foreseeable circumstances.

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 from port A, up through the center of the bellows to exit from the economizer port C.

Note that if an isolating valve is fitted in the economizer line, it will be necessary to fit a separate thermal relief valve between the economizer port C and the isolation valve. This is not necessary if a Parker Bestobell check valve is installed.



Thermal relief valve function when operating as a pressure build-up valve

## Features, Benefits and Values

Feature	Benefit	Value
Combined pressure build-up regulator and economizer	Simpler pipework Fewer joints Reduced leakage Added system protection	Safety Performance Reliability Lower overall cost
High flow characteristic	Precision pressure control Flow capability	Performance
Single adjustment for PBU and economizer functions	Simpler tank setting	Performance
High accuracy/low deadband	Reduced boil-off in pipelines	Safety Performance Reliability

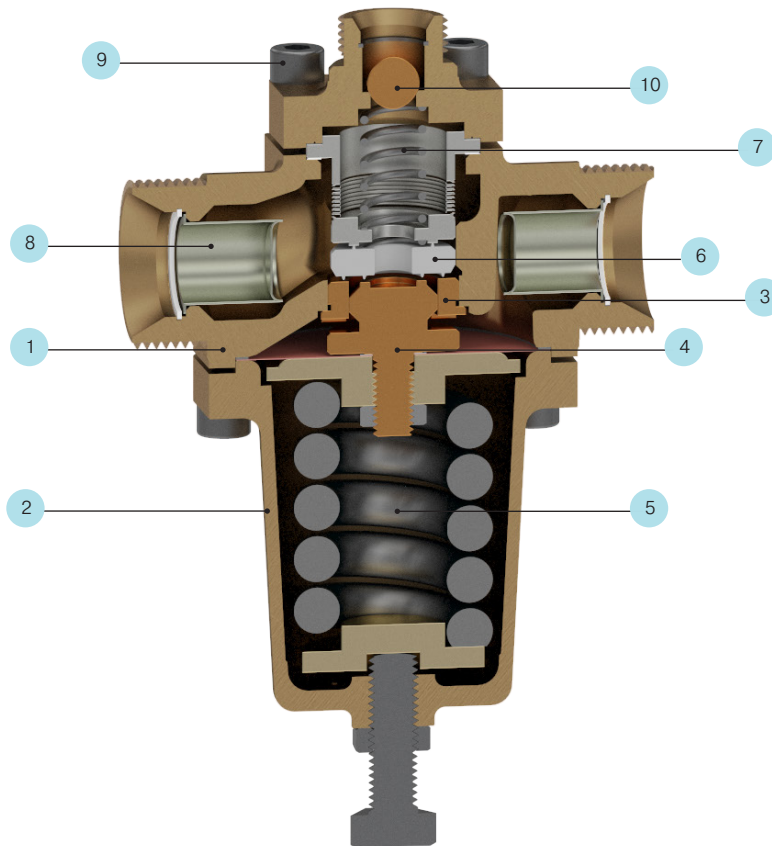
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## Technical Information

### Bill of Materials

	Description	Bronze CK Series
1	Body	Gunmetal BS EN1982 CC491K
2	Spring Housing	Gunmetal BS EN1982 CC491K
3	Seat	Phosphor Bronze BS EN 12163 CW451K
4	Disc Assembly	Beryllium Copper/Phosphor Bronze
5	Spring	Stainless Steel Series 300
6	Seal	Virgin PTFE
7	Bellows Assembly	Stainless Steel Series 300
8	Strainer	Monel
9	Fasteners	Stainless Steel BS6105 A2/A4 Gr.70
10	Ball	Phosphor Bronze BS EN 12163 CW451K



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# Pressure Regulators

## Technical Information

### Maximum Flow through regulator to give pressure build kg/hr

Bar g	2	4	6	8	10	12	14	16	18	20	25	30	35	40
PSI g	29	58	87	116	145	174	203	232	261	290	362.5	435	507.5	580
LIN kg/hr	513	499	477	460	445	431	418	407	393	378	347	310	-	-
LOX kg/hr	728	711	686	667	651	636	622	609	595	581	551	524	495	467
LAR kg/hr	888	888	837	813	792	774	757	741	726	704	669	634	597	563
CO2 kg/hr	-	-	758	746	727	715	703	692	681	672	648	627	607	586

### Maximum gas withdrawal from tank M3/hr

Bar g	PSI g	LIN M3/hr	LOX M3/hr	LAR M3/hr	CO2 M3/hr	Liquid Density kg/M3				Vapour Density kg/M3			
						LIN	LOX	LAR	CO2	LIN	LOX	LAR	CO2
2	29	25313	48940	43151	-	LIN	LOX	LAR	CO2	LIN	LOX	LAR	CO2
4	58	14544	28991	25388	-	780	1106	1350	-	12.45	11.4	15.4	-
6	87	9434	18940	16929	24155	758	1080	1319	-	20.24	18.2	24.8	-
8	116	6708	13798	12359	17835	725	1043	1272	1152	28.19	25.8	34.3	18
10	145	5014	10680	9494	13646	699	1014	1235	1134	36.35	33.2	43.9	23.5
12	174	3861	8533	7549	11184	676	989	1204	1105	44.8	40.4	53.8	29
14	203	3040	6998	6141	9379	655	966	1176	1086	53.7	47.9	63.9	34
16	232	2436	5805	5080	8006	636	946	1150	1068	63.1	55.4	74.3	39
18	261	1938	4867	4267	6786	618	925	1126	1051	72.8	63.2	85.1	44
20	290	1537	3991	3552	5968	597	904	1103	1035	83.3	71.2	96	50
25	362.5	877	2664	2409	4285	574	883	1070	1021	94.3	81.6	107	55
30	435	507	1841	1669	3281	527	838	1017	985	126.6	106.0	137	70
35	507.5	-	1262	1131	2522	471	796	963	953	154.6	132.2	169	84
40	580	-	853	750	1901	-	752	907	922	-	162.0	207	100
						-	710	855	890	-	196.8	253	120

$Q = kw \sqrt{\Delta p} / \rho$  where  
 $Q$  = Actual flow in m<sup>3</sup>/h  
 $\Delta p$  = Pressure drop in bar  
 $\rho$  = Liquid density in kg/m<sup>3</sup>

### Cryoreg Flow Data

Cryoreg on liquid side of vapouriser.  
 Flow rates given are in kg/hr with 1 meter liquid head in vessel.  
 For change in liquid head multiply flow by square root liquid head.

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# Ordering Information

## Pressure Regulators - Bronze CK Series

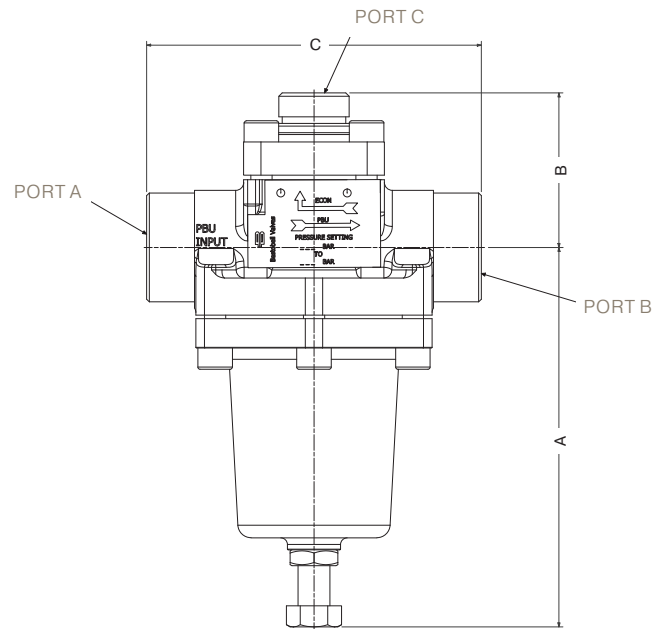
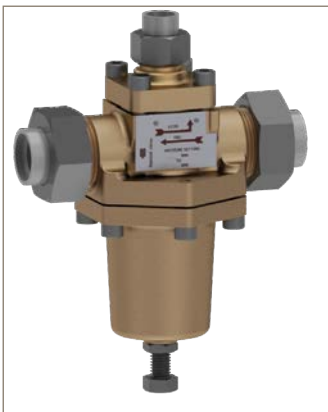
<b>CK</b>	<b>DN15</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>1</b>				
<b>Series</b>	<b>Valve Size</b>	<b>Inlet Connection Port A</b>		<b>Outlet Connection Port B</b>		<b>Economizer Port Port C</b>		<b>Pressure Range</b>	
Cryogenic Pressure Regulator - Bronze	15 mm <b>DN15</b>	1-1/4" BSP-PL c/w 60° Cone	<b>T</b>	1-1/4" BSP-PL c/w 60° Cone	<b>T</b>	3/4" BSP-PL c/w 60° Cone	<b>L</b>	22-58 PSI (1.5-4.0 bar)	<b>1</b>
<b>CK</b>		1/2" NPT Female	<b>J</b>	1/2" NPT Female	<b>J</b>	3/8" NPT Female	<b>H</b>	59 - 145 PSI (4.1 - 10.0 bar)	<b>2</b>
		1" NPT Female	<b>R</b>	1" NPT Female	<b>R</b>	1/2" NPT Female	<b>J</b>	146-363 PSI (10.1 - 25.0 bar)	<b>3</b>
		1/2" NB x Butt Weld Schedule 10	<b>M</b>	1/2" NB x Butt Weld Schedule 10	<b>M</b>	3/4" NPT Female	<b>K</b>		
		1" NB x Butt Weld Schedule 10	<b>P</b>	1" NB x Butt Weld Schedule 10	<b>P</b>	1/2" NB x Butt Weld Schedule 10	<b>M</b>		

**Note:**

Inlet and outlet connections can be of different types.

## Specifications

Dimension		
A	mm	134.0
B	mm	57.5
C	mm	126.0
Weight	kg	3.5



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# Spares Kits

## Pressure Regulators

### Pressure Regulators - Bronze

#### CK Series

Valve Pressure Rating	22-58 PSI (1.5-4.0 bar)	59 - 145 PSI (4.1 - 10.0 bar)	146-363 PSI (10.1 - 25.0 bar)
Gasket/Seal Kit	CKRDN15		
Bellow/Seal Kit	CKBDN15		
Diaphragm Kit	CKDLN15	CKDMDN15	CKDHDN15
Main Spring Kit	CKSLDN15	CKSMDN15	CKSHDN15

Gasket/Seal Kit	
Content	Quantity
Gasket	1
Seal	1



Gasket & Seal Kit for Parker Bestobell Cryogenic Pressure Regulators

Bellow/Seal Kit	
Content	Quantity
Seal	1
Bellows Seal assembly	1
Gasket	2
Spring	1



Bellow & Seal Kit for Parker Bestobell Cryogenic Pressure Regulators

Diaphragm Kit	
Content	Quantity
Gasket	4
Seal	2
Anti-vibration disc	1
Diaphragm	4
Nut lock	1
Plate Thrust	1



Diaphragm Kit for Parker Bestobell Cryogenic Pressure Regulators

Main Spring Kit	
Content	Quantity
Gasket	1
Spring	1



Main Spring Kit for Parker Bestobell Cryogenic Pressure Regulators

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