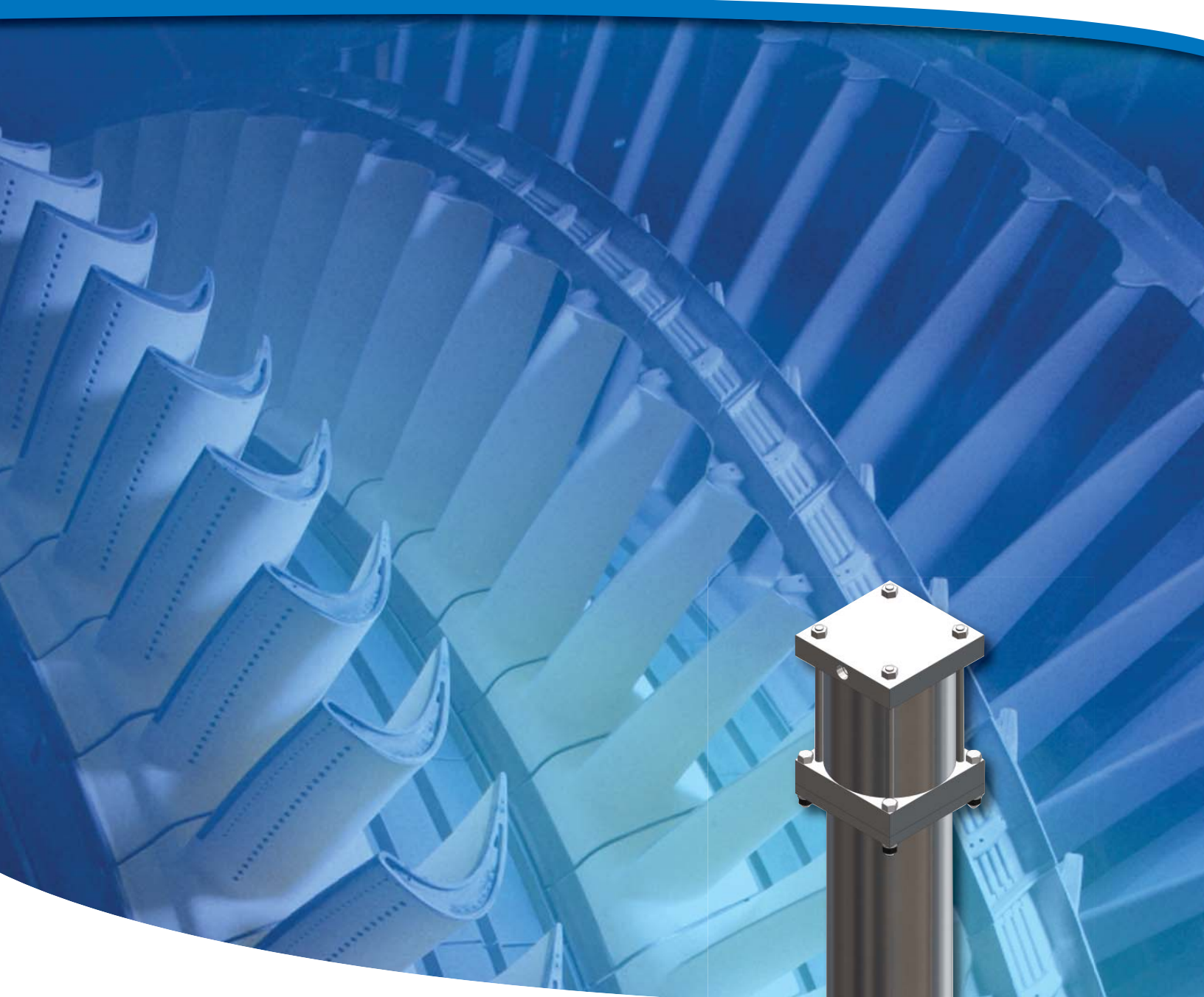




## BECKER ANTI-SURGE VALVE



**T-Ball® Anti-Surge Valve**  
Providing the Complete and Reliable Solution





Background Image: Becker T-Ball® anti-surge valve installed in a Russian natural gas processing plant providing reliable protection for nearly a decade.



## Becker T-Ball® Anti-Surge Valve

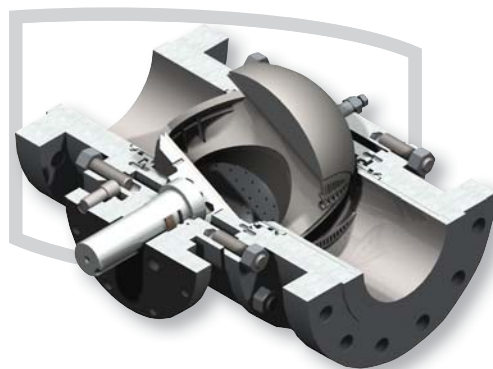
Whether in natural gas processing or transmission pipelines, petrochemical or LNG facilities, many industries rely on large compressors. These systems are some of the most critical pieces of your operation and constitute a significant capital investment. Daily, these compressors are challenged to maximize efficiency by operating as close as possible to the surge limit. Protecting these vital capital assets is paramount – a faulty anti-surge valve can jeopardize or even impair your operation.

### Complete Anti-Surge Control Solution

The Becker anti-surge valve integrates the patented T-Ball® design with our high performance actuator, positioner and accessories. Our expertise in designing and integrating these components into a complete control system provides the reliable and superior performance required through better resolution, fast response, and significant noise and vibration attenuation.

### Combined, these performance features provide the following added benefits:

- Exceptional Continuous Control
- Fast Response and Protection of Critical Equipment
- Improved System Operating Efficiency
- Increased Profitability with Minimal Energy Loss
- Reduced Maintenance and Tuning

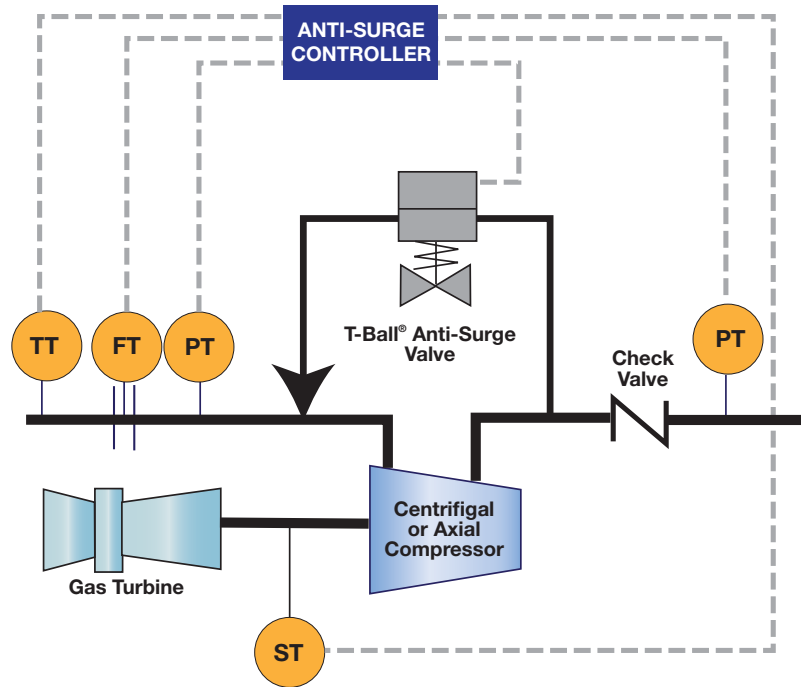


#### Becker T-Ball®

The patented rotary control T-Ball® features a non-clogging quarter-turn design that provides quick and low impact automation. Its high capacity and rangeability combined with multi-stage noise attenuating trims makes it ideal for demanding anti-surge applications.

# Designed for Maximum Reliability

T-Ball® anti-surge valves are custom designed for maximum reliability by utilizing only the best in class materials – keeping your system protected from the damaging effects of surge.



### Typical Anti-Surge System

T-Ball® anti-surge valves can operate in the critical conditions compressor stations demand, from high pressure differentials, extreme temperatures to corrosive media.

### Product Range

<b>Valve Style</b>	Rotary Control T-Ball®
<b>Actuator Type</b>	Single-Acting/Double-Acting Rotary Piston
<b>Pressure Ratings</b>	ANSI Class 150 to 2500
<b>Sizes</b>	NPS 2 to NPS 42 50 mm - 1,070 mm
<b>Temperature Range</b>	-76°F to 349°F -60°C to 176°C
<b>Shut Off</b>	Soft Seat - Tested Up to Class VI Metal Seat - Tested up to Class V
<b>End Connections</b>	RFFE, RTJ, Weld End

### Performance

<b>Turndown</b>	Over 300:1
<b>Maximum Noise Attenuation</b>	Up to 50 dBa
<b>Stroke Full Open</b>	< 1 second*
<b>Stroke Full Closed</b>	< 5 seconds*

\* Larger valves may result in longer opening and closing times

T-Ball® anti-surge valves are designed for the global market and can meet several international industry standards such as:

Standard	Description
<b>CRN</b>	Canadian Registration Number
<b>NACE MR0175</b>	Petroleum and Natural Gas Industries - Materials for use in H <sub>2</sub> S containing environments in oil and gas production
<b>ATEX Dir. 94/9/EC</b>	Equipment for use in Explosive Atmospheres
<b>PED 27/23/EC</b>	EU Pressure Equipment Directive
<b>GOST-R</b>	Russian Gosstandart Certificate
<b>RTN</b>	Rostechnadzor

NOTE: Due to Dresser's dedication to new product development and enhancement data provided is subject to change.

# Each Component is Engineered to Provide Exceptional Performance.

## Controlled Deceleration

A pneumatic cushion engaged in the last 10% of travel prevents impulse loading from a surge's quick, high force stroking speeds—reducing frictional effects that can occur within the unit.

## Heavy Duty Pneumatic Cylinder

The Becker RPSR actuator assembly utilizes a high pressure durable steel pneumatic cylinder that offers the lowest break loss pressure.

## Superb Fatigue Resistance

Heavy duty spring material manufactured from heat treated 6150H steel alloy provides virtually infinite life.

## Stable Operation

Rotary quarter-turn design provides quick, easy, and low impact automation; eliminating the pressure imbalances that are experienced with standard balanced valve plugs.

## Robust Design

With a single rotating element the T-Ball® is designed to withstand the vibrations exhibited within compressor piping systems.

## Improved Safety

An all-welded spring cartridge configuration prevents operator injury as the design is factory configured and prohibits field disassembly.

## Reduced Maintenance

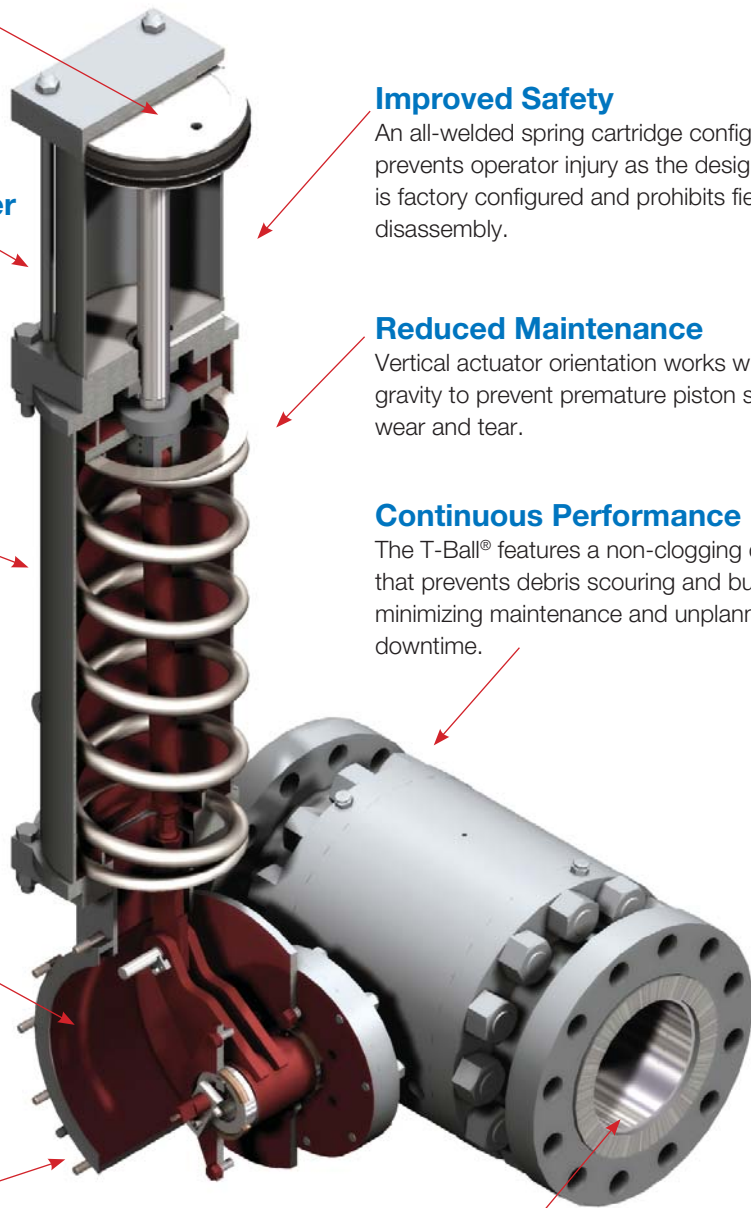
Vertical actuator orientation works with gravity to prevent premature piston seal wear and tear.

## Continuous Performance

The T-Ball® features a non-clogging design that prevents debris scouring and build up, minimizing maintenance and unplanned downtime.

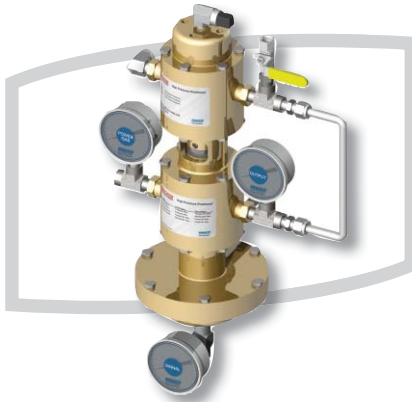
## Low Emissions

Soft or hard seat options with up to Class VI or V minimizes lost energy and improves compressor efficiency. This long lasting shutoff is essential in providing critical equipment protection and maximizing revenue.



# Improve Compressor Operating Efficiency

Combining the superior control of a Becker T-Ball® and rotary actuator with the speed and accuracy of a HPP-SB or SVI® II AP positioner, provides the complete anti-surge valve solution. This enables your compressor to operate as close as possible to the surge line—maximizing efficiency without jeopardizing performance.



HPP-SB

## Features

- Pneumatic Positioner
- Powered by Pipeline Gas
- High Capacity (Cv)
- Rugged Construction
- Frictionless Design
- ZERO BLEED™

## Benefits

Additional equipment not required to power instrumentation

Provides optimum speed of response and control required for anti-surge valves

Vibration resistance maintains calibration, improving overall process performance

Eliminates O-rings and shafts for greater reliability

Standard zero emissions in steady state, full open and full closed control

## Features

- Digital Positioner
- Powered by Instrument Air
- HART® protocol
- Auto Tuning Function
- Modular Construction
- Hazardous Area Approval

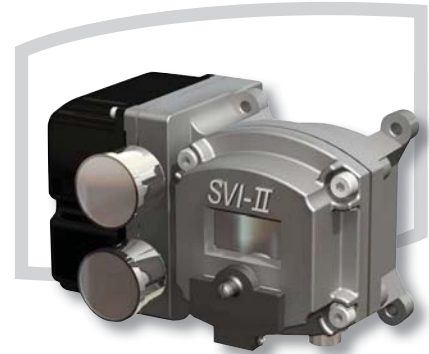
## Benefits

Versatile local or remote communication configurations

Maintains accurate positioning while limiting service and repair visits

Provides ease of maintenance as well as platform for upgrades

Including but not limited to: ATEX, CSA, FM



SVI® II

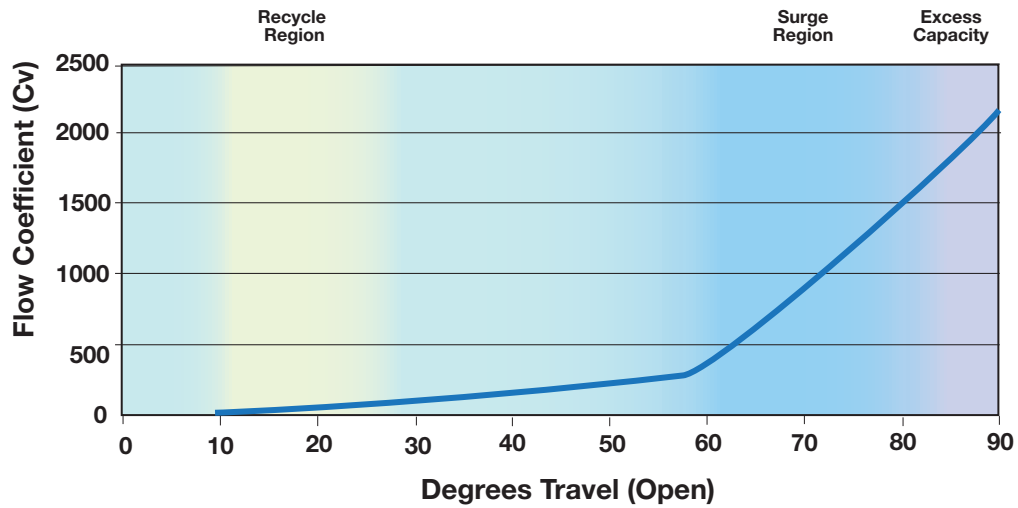
In 2007, a major Italy-based integrated energy company carried out a campaign to monitor fugitive emissions from three turbo-compression stations on one of their natural gas transmission pipelines. Engineers discovered that flanges and instrumentation were responsible for 80 percent of the station's emissions\*.

The ZERO BLEED™ feature of the HPP-SB can help eliminate a significant amount of compressor station emissions, protecting your assets and the environment.

\*Categories monitored: valves, safety valves, flanges and instrumentation

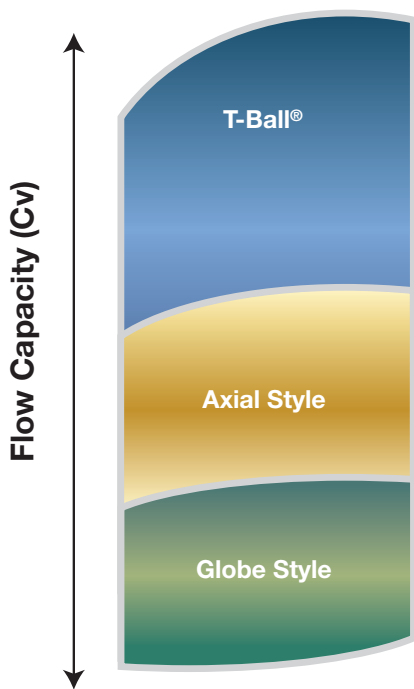
# Maximized Control and Capacity

Flow Profile for 8" (200 mm) QTCV-T2



Many cage style valves achieve fast operating speeds by sacrificing the dynamic performance of the valve at low flow conditions. The equal percentage characteristic of a T-Ball® offers uncompromising control at both start-up (low flow/high  $\Delta P$ ) and surge.

Additionally, because of the T-Ball®'s unique flow characteristic it is able to perform the functions of both a recycle valve and an anti-surge valve, with excess capacity for the most extreme conditions.



A single T-Ball® exhibits the same capacity as two axial or three globe valves.

One of the most common problems experienced with anti-surge valves is inadequate capacity for all service conditions. The high capacity T-Ball® design combined with high rangeability allows a single valve to accomplish what would typically require two or three valves.

In fact major turbine and compressor manufacturers recommended ball style control valves for anti-surge control.

“For equal percentage characteristic, globe valve capacity (Cv) is approximately equal to travel squared. Noise attenuating ball valves have a characteristic where capacity (Cv) is approximately equal to travel cubed. As such, noise attenuating ball valves are a superior single valve choice.”

-Major U.S. Turbine and Compressor Manufacturer

# A Perfect Fit

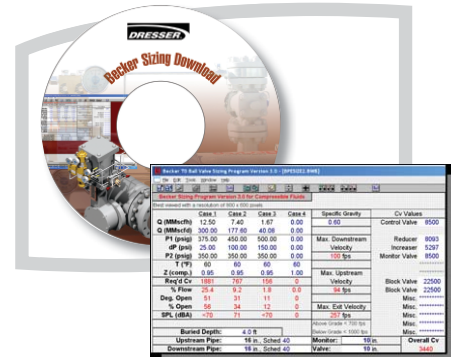
Although all control valves are sized according to process conditions, anti-surge applications require particular attention.

Anti-surge valves typically must meet two sizing requirements:

- 1. Enough capacity to recycle the compressor, yet not be oversized which can choke the flow to the compressor**
- 2. Capacity to depressurize the discharge in less than one second**

Through taking your compressor's performance into account from start-up to surge, Becker has mastered the art and science of sizing anti-surge valves.

The T-Ball®'s combination of high capacity and high turndown allows a valve to meet both requirements providing the following benefits:



Benefit	T-Ball®	Cage Style
<b>Superior capacity</b> protects equipment throughout the compressor's speed range	✓	
<b>Exceptional turndown</b> allows for the combination of the anti-surge and recycle valve functions into a single source	✓	
<b>High reliability</b> decreases downtime due to unplanned maintenance	✓	
<b>Rotating control element</b> eliminates pressure imbalances and excess vibration experienced with plug designs	✓	
<b>Uncompromising control</b> reduces depressurization time by 50%	✓	
<b>Quarter-turn stroke</b> enables precise control with fast speed of response	✓	
<b>Compact design</b> minimizes infrastructure size and weight issues	✓	
<b>Robust construction</b> provides extended service life in extreme conditions	✓	

# Optimized Trim Selection

The T-Ball® is offered in a series of noise attenuating trims to optimize performance and durability.



T-Ball® Model	FPCV-T0	QTCV-T1	QTCV-T2	QTCV-T4	Attenujet®
<b>Noise Attenuation</b>	Baseline	7 dBa	17 dBa	25 dBa	20 dBa

# Assuring Your Needs are Met

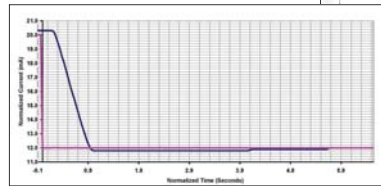
We understand how critical it is to keep your system up and running. When it comes to protecting your compressor, Becker makes no compromises.

In order to guarantee exceptional performance in the field, each T-Ball® anti-surge valve undergoes several validation tests before leaving our factory.

Upon test completion you will be provided with a customized performance analysis to confirm our anti-surge valve has met all performance requirements.

The table below provides a sample of our recommended dynamic parameters.

ACTUATION PERFORMANCE ANALYSIS Anti-Surge Control Valve	
Purchase Order Number:	B-930-M-34
Drawing Number:	92084
Manufacturer Part Number:	44-340125-3
Serial Number:	0208135R
Date:	8-14-08
Opening time resulting from de-energizing the solenoid valve: Requirement: less than 416 milliseconds Actual: 341 milliseconds	
Opening time resulting from a closed to half open command (20 to 12 mA) to positioner: Requirement: less than 616 milliseconds Actual: 503 milliseconds	



Test Case	Test Type	Test Result	Requirement	Actual
1	Opening time resulting from de-energizing the solenoid valve	341 milliseconds	less than 416 milliseconds	341 milliseconds
2	Opening time resulting from a closed to half open command (20 to 12 mA) to positioner	503 milliseconds	less than 616 milliseconds	503 milliseconds
3	Full opening by automatic control in response to step change from 20mA to 4mA	≤ 2 sec.	≤ 2 sec.	≤ 2 sec.
4	Partial opening to 80% by automatic control in response to step change from 20 to 4mA	≤ 1.5 sec.	≤ 1.5 sec.	≤ 1.5 sec.
5	Full closing by automatic control in response to step change from 4mA to 20 mA	≤ 5 sec.	≤ 5 sec.	≤ 5 sec.
6	Full opening by solenoid valve trip	1 sec	1 sec	1 sec
7	Opening dead time	≤ 0.3 sec.	≤ 0.3 sec.	≤ 0.3 sec.
8	Maximum restriction of valve movement in response to continuous change of control signal from 4 to 20 and 20 to 4 mA.	≤ 1%	≤ 1%	≤ 1%

Test Parameter	Value
Full opening by automatic control in response to step change from 20mA to 4mA	≤ 2 sec.
Partial opening to 80% by automatic control in response to step change from 20 to 4mA	≤ 1.5 sec.
Full closing by automatic control in response to step change from 4mA to 20 mA	≤ 5 sec.
Full opening by solenoid valve trip	1 sec
Opening dead time	≤ 0.3 sec.
Maximum restriction of valve movement in response to continuous change of control signal from 4 to 20 and 20 to 4 mA.	≤ 1%

## See for Yourself

Want to know more? We can arrange a live demonstration of our T-Ball® anti-surge valve via webcam.

This gives you the opportunity to see our anti-surge valve in action as well as have an in-depth technical discussion with our highly qualified engineers, without having to leave your office.

To arrange a demonstration, contact your local Becker sales representative or e-mail: [becker@dresser.com](mailto:becker@dresser.com)





## Field Proven in Some of the Most Inhospitable Environments

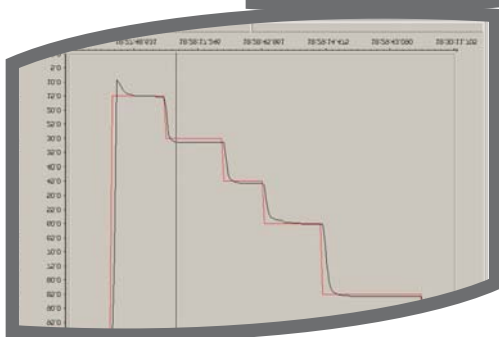
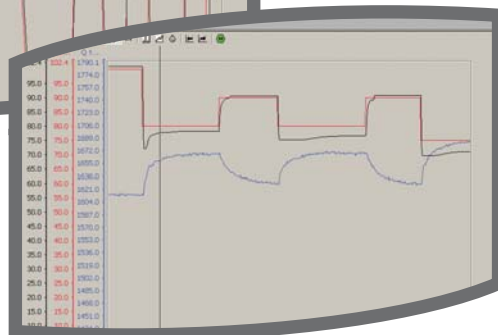
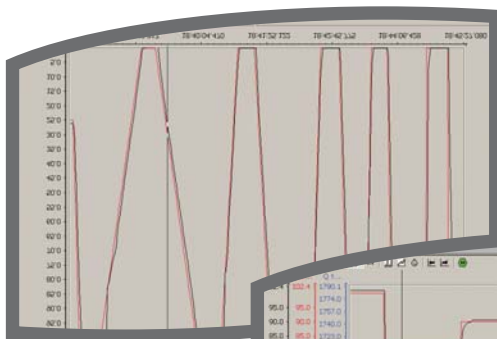
**Location:** Russia

**Application:** Natural Gas Production Field

**Installation:** (Qty. 4) 12" (300) 600 ANSI QTCV-T2

T-Ball® anti-surge valves were selected to protect the compressors of one of the world's largest natural gas production fields. Located in the remote subarctic zone, temperatures are below freezing over 250 days of the year – it is not uncommon for temperatures to drop below -65°F (-55°C). For an operation of this scale, the customer relied on Becker to provide the technology that is critical to maintaining continuous and stable control.

Becker engineers traveled to the site to conduct a field test of the valves in service – the results further validated the T-Ball® anti-surge valves' superior and reliable performance.



### Quick Response

Field test data proved T-Ball® anti-surge valves utilizing a HPP-SB pneumatic positioner maintain precise no stick, no slip control. In less than a second, the anti-surge valve reached the capacity required to protect the compressor.

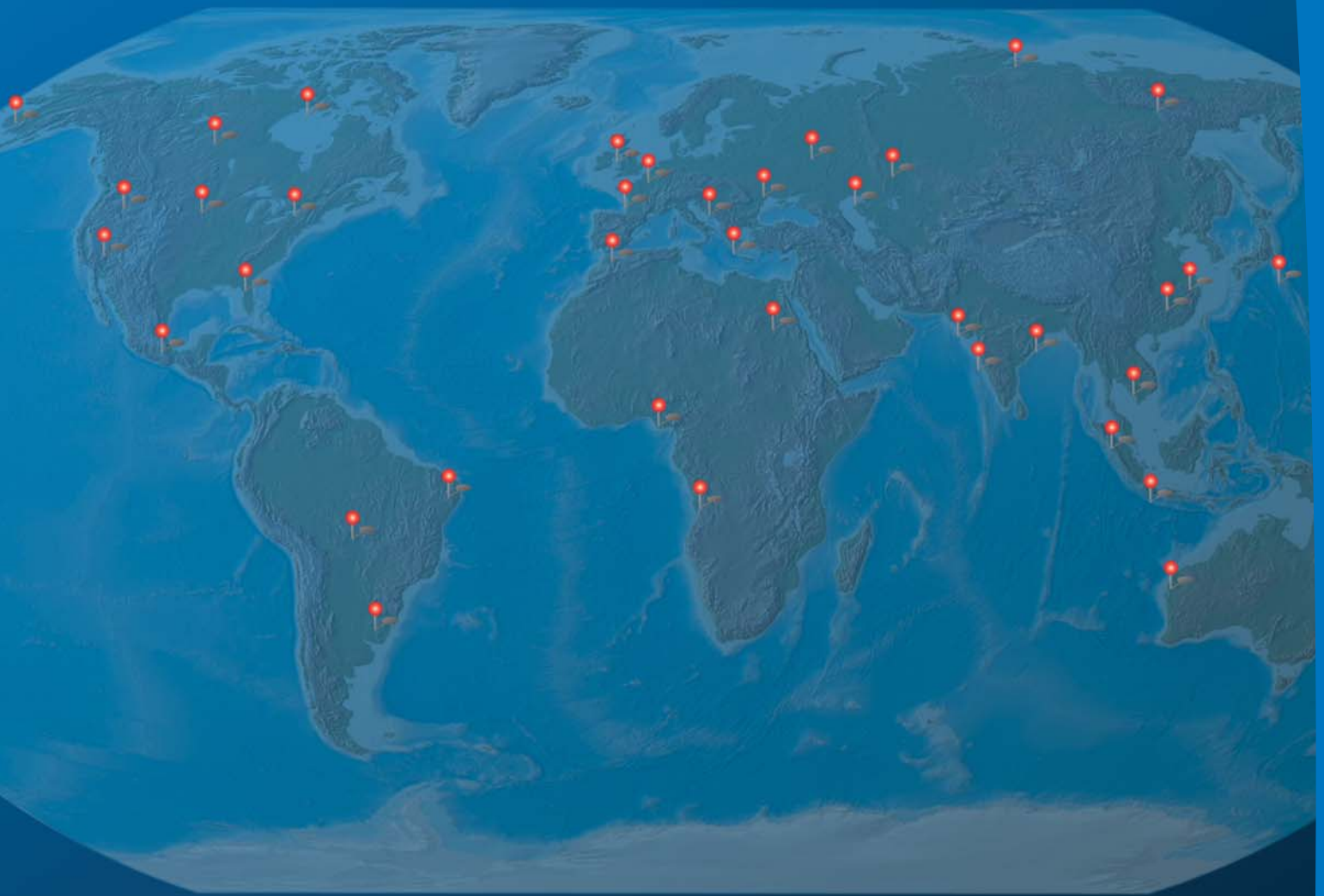
### Nominal Turbulence

As soon as the compressor was brought on line, the T-Ball® anti-surge valve stabilized the flow without high turbulence. The inherent rangeability of a T-Ball® allows control at both start up and surge conditions.

### Negligible Overshoot

Step response performance tests in the field proved T-Ball® anti-surge valves react quickly to the step changes for small and large steps with negligible overshoot. As a result, the installed valves met all stroke time requirements with accurate control.

**T-Ball® anti-surge valves were selected to protect the compressors  
in some of the industry's most critical operations.**



**\*These are only some of our successful installations**

# DIRECT SALES OFFICE LOCATIONS

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## About Dresser® Products

Dresser brand products are highly engineered, technically superior and are designed to help global customers meet and exceed requirements for mission critical energy applications.

## About Dresser, Inc.

Dresser, Inc. is a leader in providing highly engineered infrastructure products for the global energy industry. The company has leading positions in a broad portfolio of products, including valves, actuators, meters, switches, regulators, piping products, natural gas-fueled engines, retail fuel dispensers and associated retail point-of-sale systems, and air and gas handling equipment. Leading brand names within the Dresser portfolio include Dresser Wayne® retail fueling systems, Waukesha® natural gas-fired engines, Masoneilan® control valves, Consolidated® pressure relief valves, and Roots® blowers. It has manufacturing and customer service facilities located strategically worldwide and a sales presence in more than 100 countries.

**Dresser, Inc.**

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