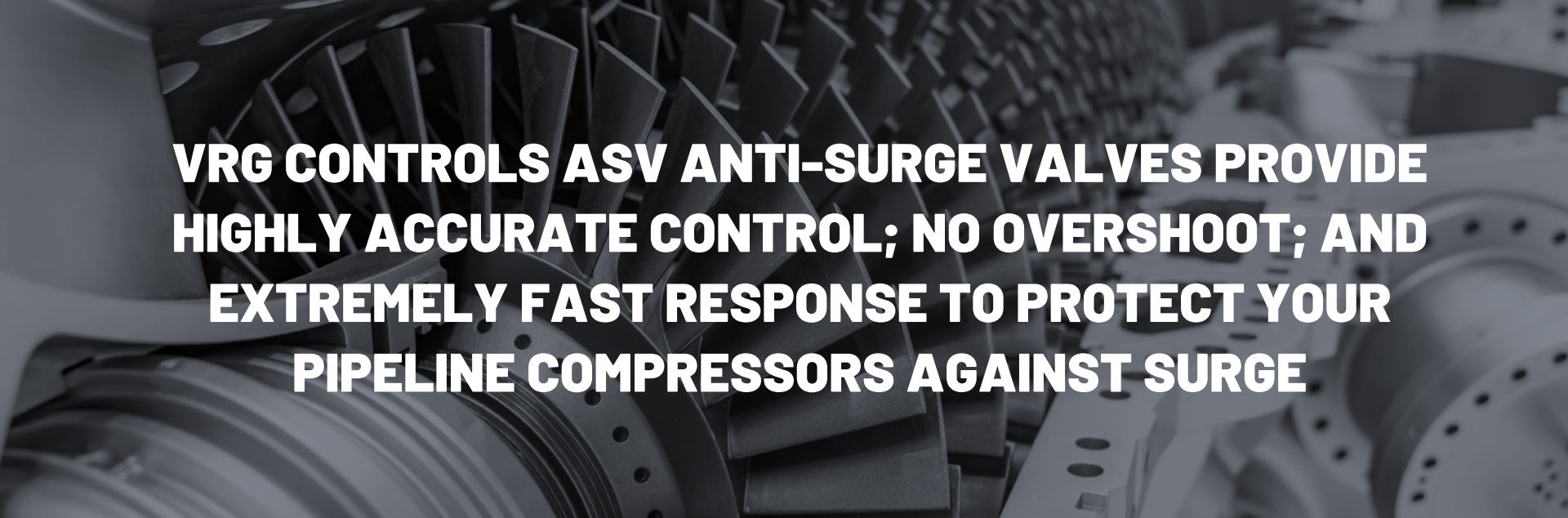


ASV ANTI-SURGE VALVES





VRG CONTROLS ASV ANTI-SURGE VALVES PROVIDE HIGHLY ACCURATE CONTROL; NO OVERSHOOT; AND EXTREMELY FAST RESPONSE TO PROTECT YOUR PIPELINE COMPRESSORS AGAINST SURGE

A centrifugal compressor station is used to boost the pipeline pressure for effective natural gas transportation. Each compressor is typically equipped with an **ASV Anti-Surge Valve** which prevents **potential damage** to the centrifugal compressor caused by surge conditions.

When gas flow through the centrifugal compressor drops to very low volumes the compressor is challenged in its ability to compress the gas. This phenomenon is referred to as the **surge condition**. A **high performance control system is applied to avoid surge conditions**. The **primary component of this system is the ASV Anti-Surge Valve**. The ASV remains closed during normal compressor operation. The ASV is required to open very rapidly connecting the gas compressor inlet and outlet, thereby mitigating surge occurrence and preventing costly damage to compressor components.

Proven Technology with Advanced Control Technology

To prevent damage to the natural gas compressors, VRG Controls manufactures reliable, fast-acting control valves. The control instrumentation to **open the ASV Anti-Surge Valve in less than 1.0 seconds**. The same high-performance control instrumentation provides **highly accurate valve position with minimal overshoot and excellent repeatability during Recycle Mode, Surge Mode or compressor Start Up**. VRG Controls ASV's provide the fastest response of any "surge valve" in the market and exceed performance requirements of most pipeline compressor manufacturers.

Anti-Surge Valves are critical components in a compressor Anti-Surge Control System. **Poor performance of an ASV Valve can adversely affect pipeline compressor operation**, the environment, and your bottom line. VRG Anti-Surge Valves provide top-of-the-line performance to reduce maintenance costs and maintain compressor "up time." Our technologies combine control valve technologies proven over the past 50+ years in tandem with the latest, high performance control instrumentation.



COMMITMENT TO THE ENVIRONMENT



Industry Leading Anti-Surge Performance with ZERO Steady State Emissions



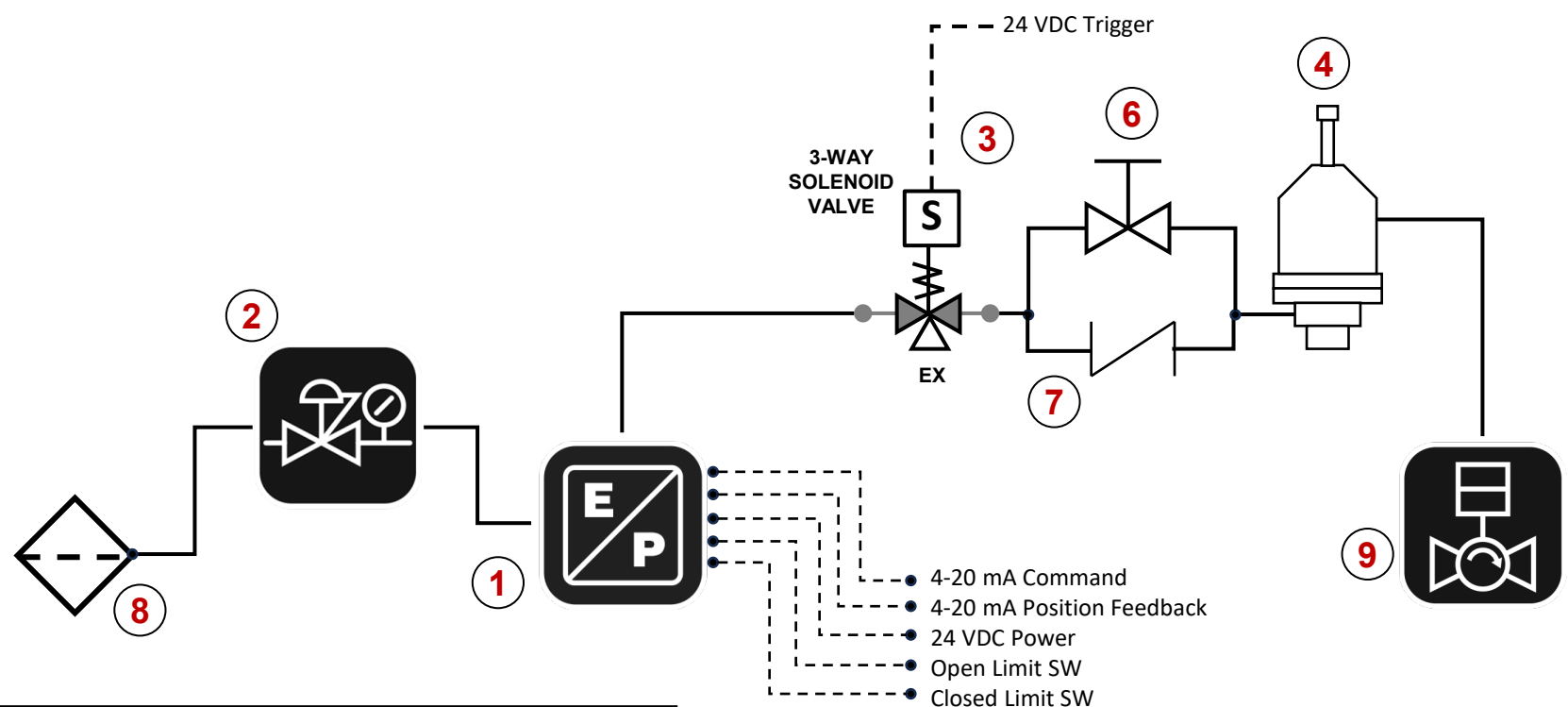
ZERO STEADY STATE EMISSIONS

VRG Controls engineers and manufactures high performance control valve positioners and accessories for use with natural gas control valves. Our RCVC Red Circle Valve Controllers represent the **next generation of high-performance valve positioners** designed to provide industry leading Anti-Surge performance with **ZERO steady state emissions**. Our products lead the industry in non-bleed / low-bleed technology development with performance and operational advancements that set them apart from the competition, minimizing air compressor runtime and maintenance.

* Image may differ from actual product

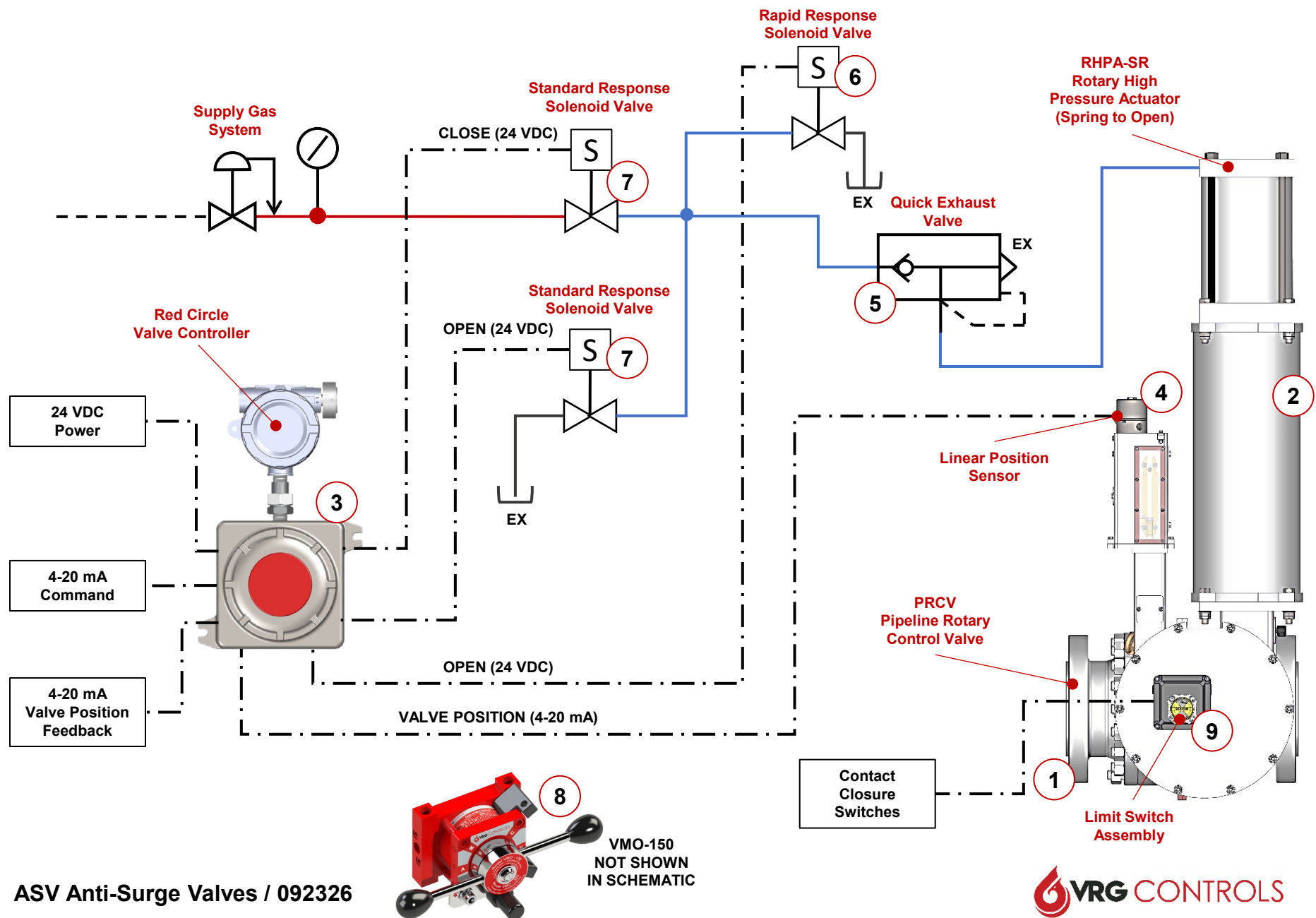


Anti-Surge Assembly - Typical Specifications

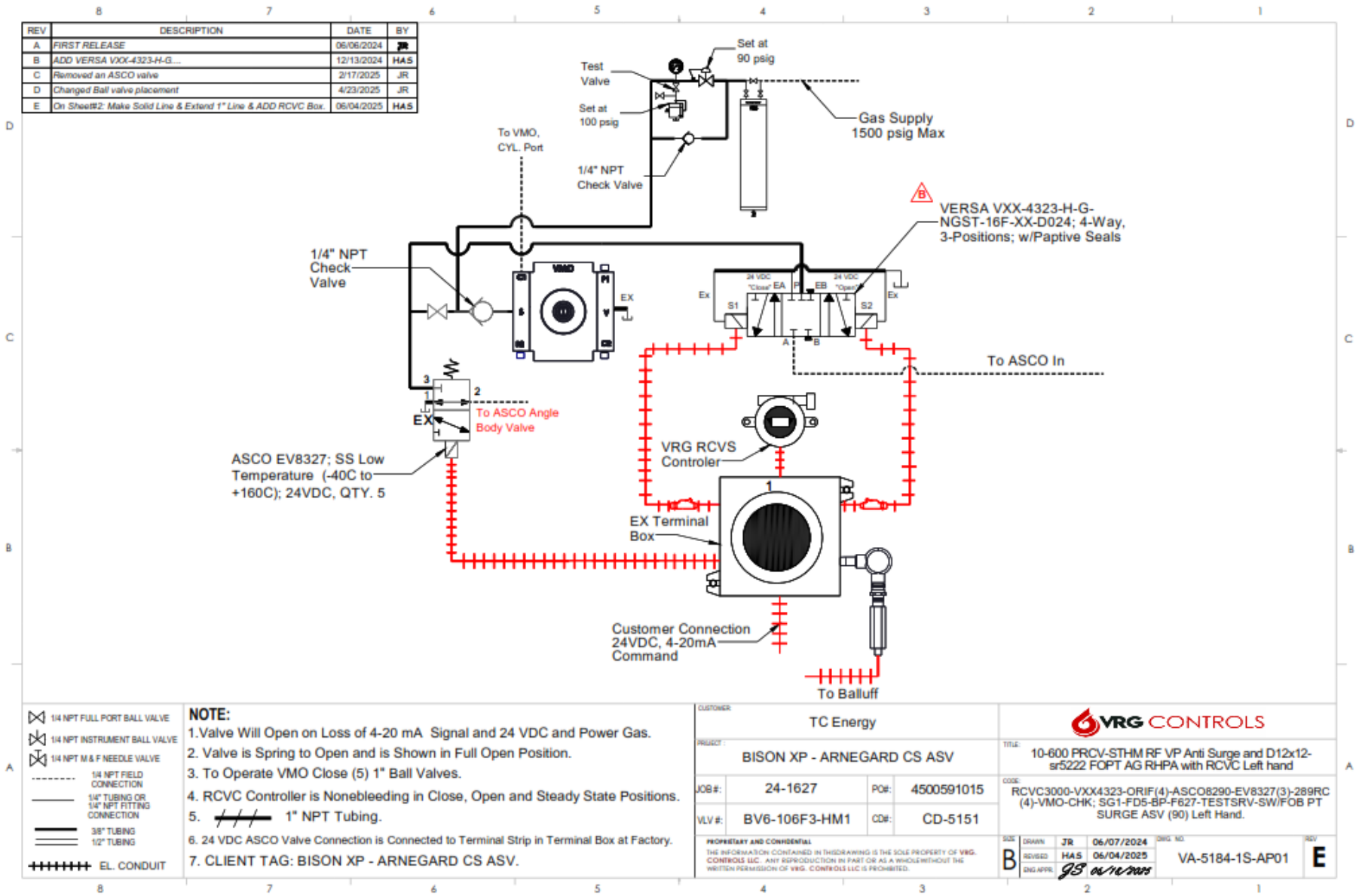


ITEM	DESCRIPTION
1	RCVC Electro-Pneumatic Positioner
2	Supply Regulator
3	3-Way Solenoid Valve 24 VDC
4	RC Exhaust Booster
5	Balluff BTL7 Position Transmitter
6	Adjustable Needle Valve
7	Check Valve
8	Filter
9	VRG ASV Control Valve

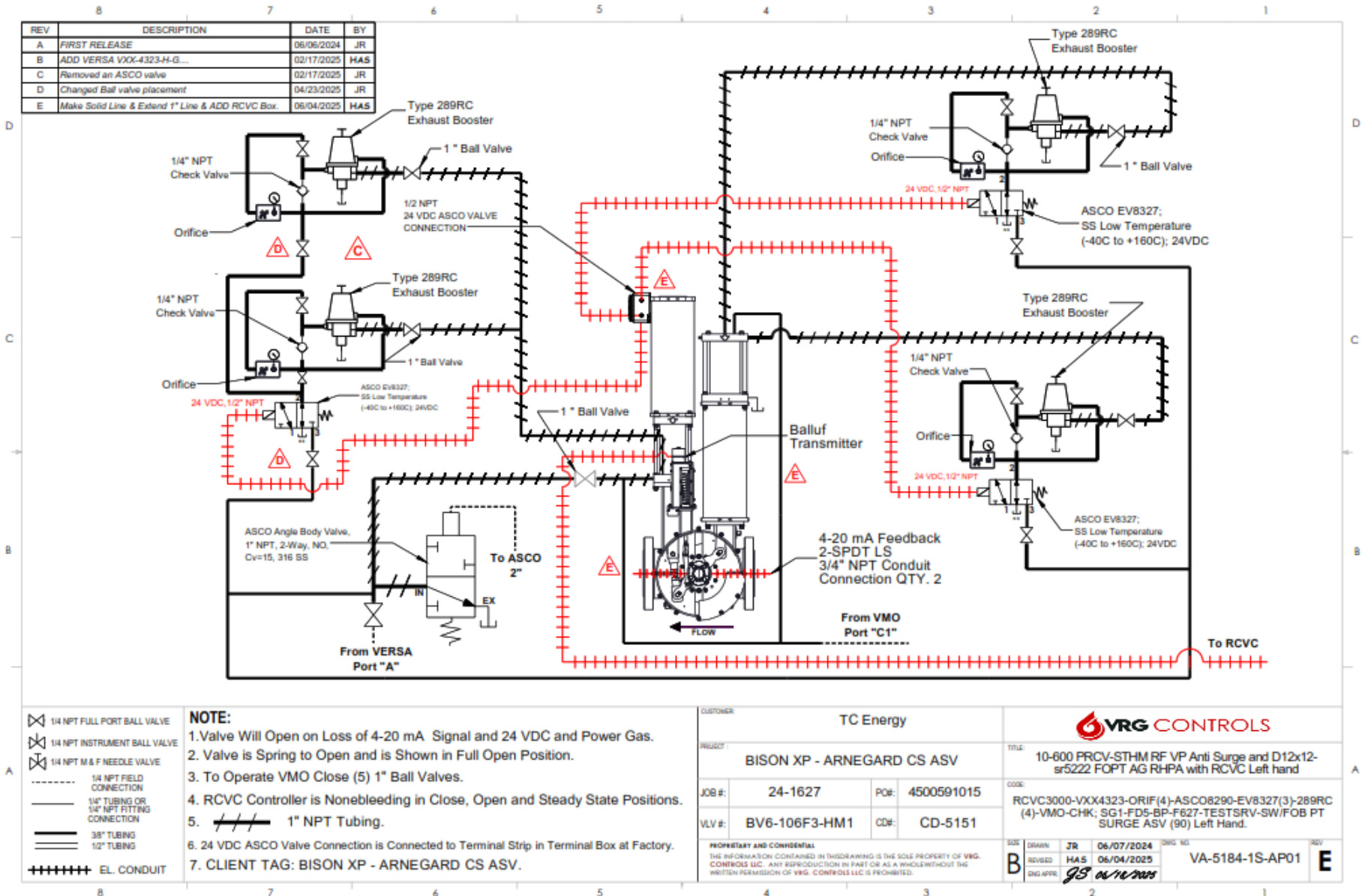
ASV Control Schematic



Anti-Surge Assembly – VRG Instrumentation Schematic



Anti-Surge Assembly – VRG Instrumentation Schematic



ASV Anti-Surge Valves - PRCV

Specifications:

Control Valve(s):	PRCV Pipeline Rotary Control Valve (Surge Spec.)
Actuator Type:	RHPA-SR Rotary High Pressure Actuator – Spring Return (Surge Spec.)
Pressure Ratings:	ANSI Class 150 – 2500
Sizes:	4 in to 16 in (Typical)
End Connections:	RFFE*, RTJ, Weld End
Temperature Range:	-20°F to +350°F (-29°C to 177°C) standard
Performance:	Meets or Exceeds Current Typical Turbines Design Requirements

Industry Standards Available:

- ASME B16.34 Compliant
- PED 27/23/EC EU Pressure Equipment Directive – Valve Only
- ATEX Dir. 94/9/EC Equipment for use in Explosive Atmospheres
- CRN Canadian Registration Number
- NACE MR0175 Petroleum and Natural Gas Industries

ASV Anti-Surge Valves – Red Arrow Axial Flow

Specifications:

Control Valve(s):	Red Arrow Axial Flow Control Valve (Surge Spec.)
Actuator Type:	LHPA-SR Linear High Pressure Actuator – Spring Return (Surge Spec.)
Pressure Ratings:	ANSI Class 150 – 1500
Sizes:	6 in to 24 in (Typical)
End Connections:	RFFE* & RTJ
Temperature Range:	-20°F to +350°F (-29°C to 177°C) standard
Performance:	Meets or Exceeds Current Typical Turbines Design Requirements

Industry Standards Available:

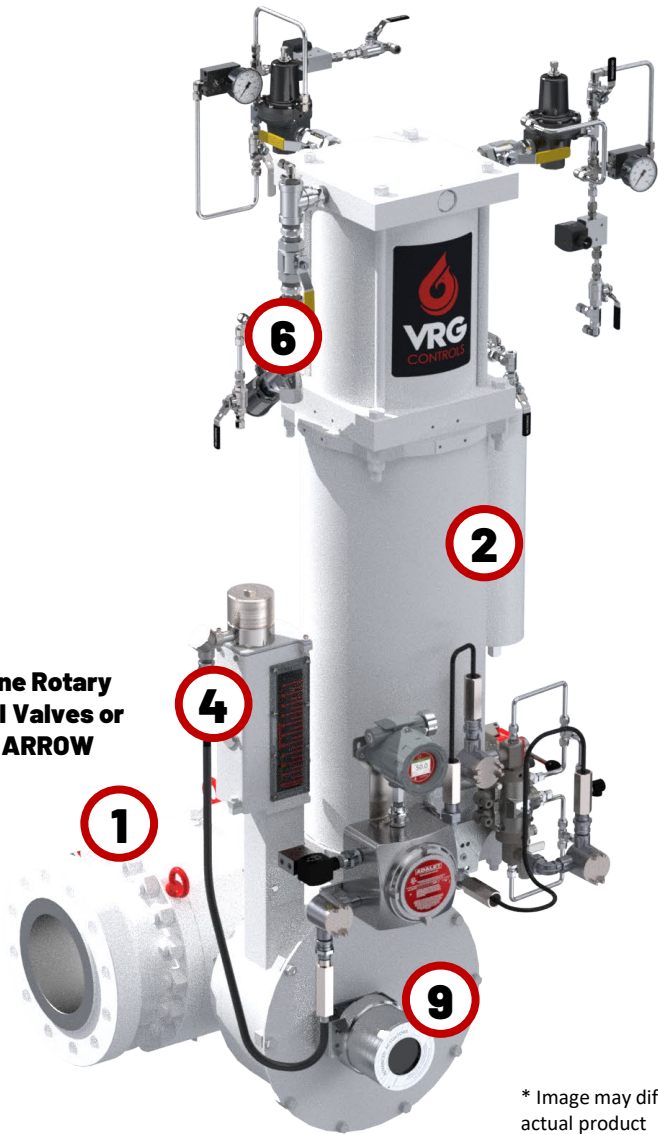
- ASME B16.34 Compliant
- PED 27/23/EC EU Pressure Equipment Directive – Valve Only
- ATEX Dir. 94/9/EC Equipment for use in Explosive Atmospheres
- NACE MR0175 Petroleum and Natural Gas Industries

ASV Anti-Surge Valve – Primary Components

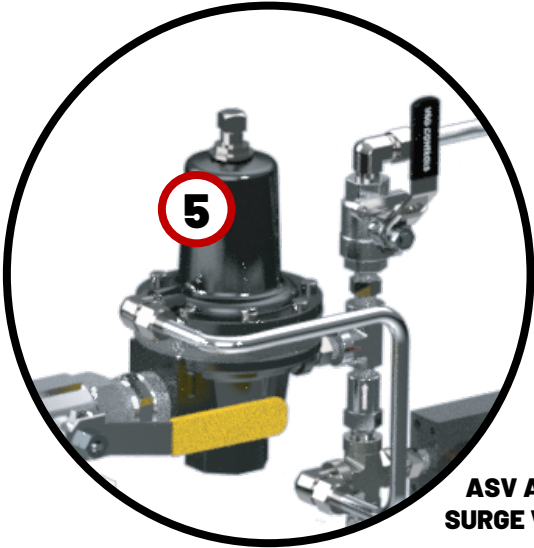
- 1. VRG PRCV or Red Arrow Control Valve (Surge Spec)**
- 2. VRG RHPA-SR or LHPA-SR Piston Actuator (Surge Spec)**
- 3. VRG Red Circle Valve Controller (RCVC)**
- 4. Balluff BTL7 Linear Position Sensor**
- 5. Fisher 289RC Exhaust Booster**
- 6. ASCO Angle Body Rapid Response Valve**
- 7. VERSA VXX-4323 Standard Response Solenoid Valve**
- 8. VRG Valve Manual Override (VMO)**
- 9. Rover Rotary Valve Status Monitor**

ASV Anti Surge Components

Pipeline Rotary
Control Valves or
RED ARROW

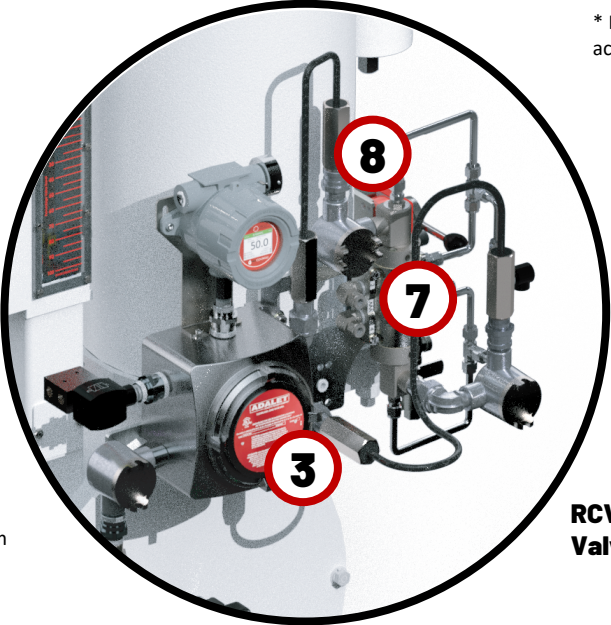


* Image may differ from
actual product



**ASV ANTI-
SURGE VALVE**

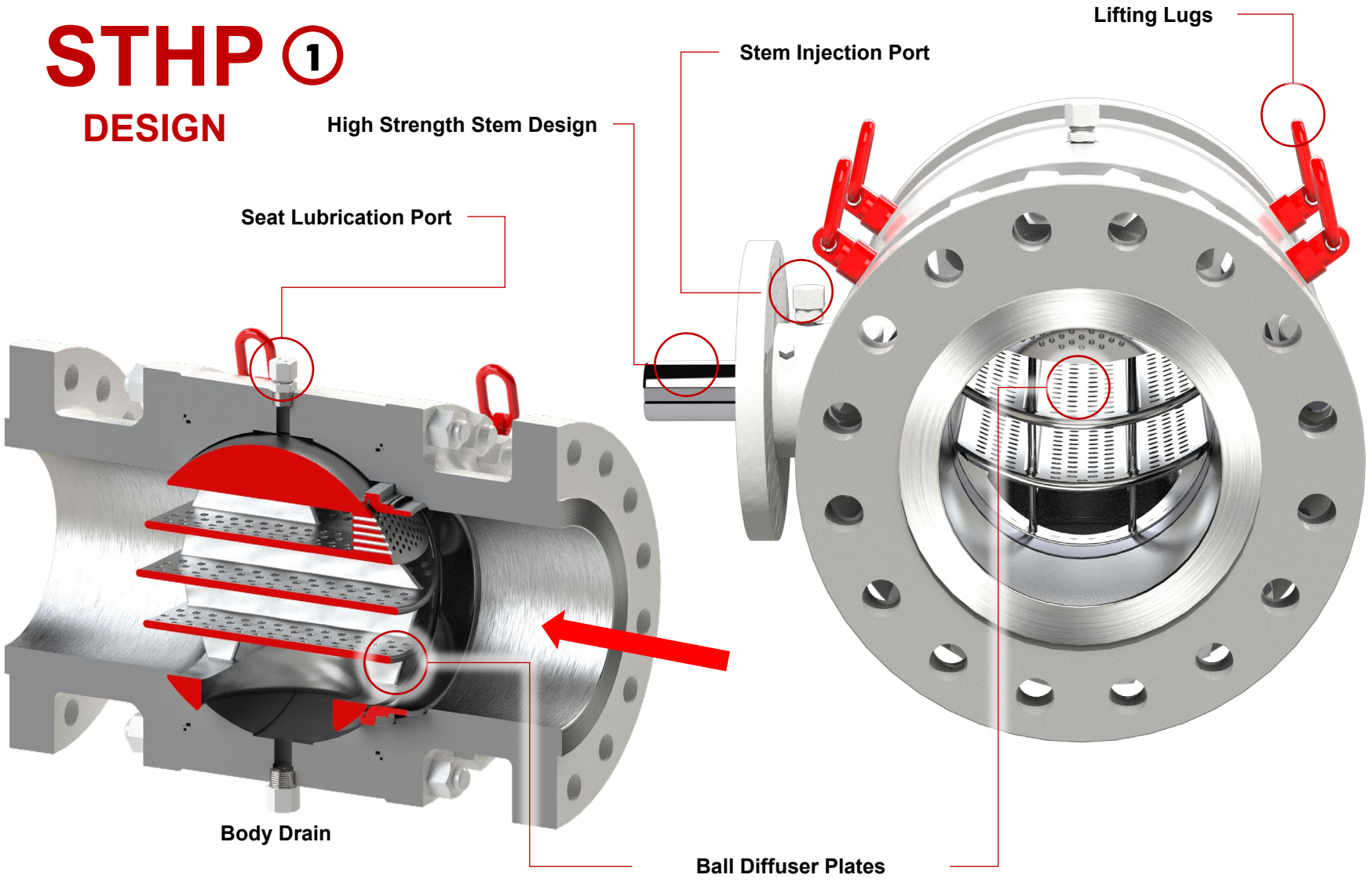
* Image may differ from
actual product



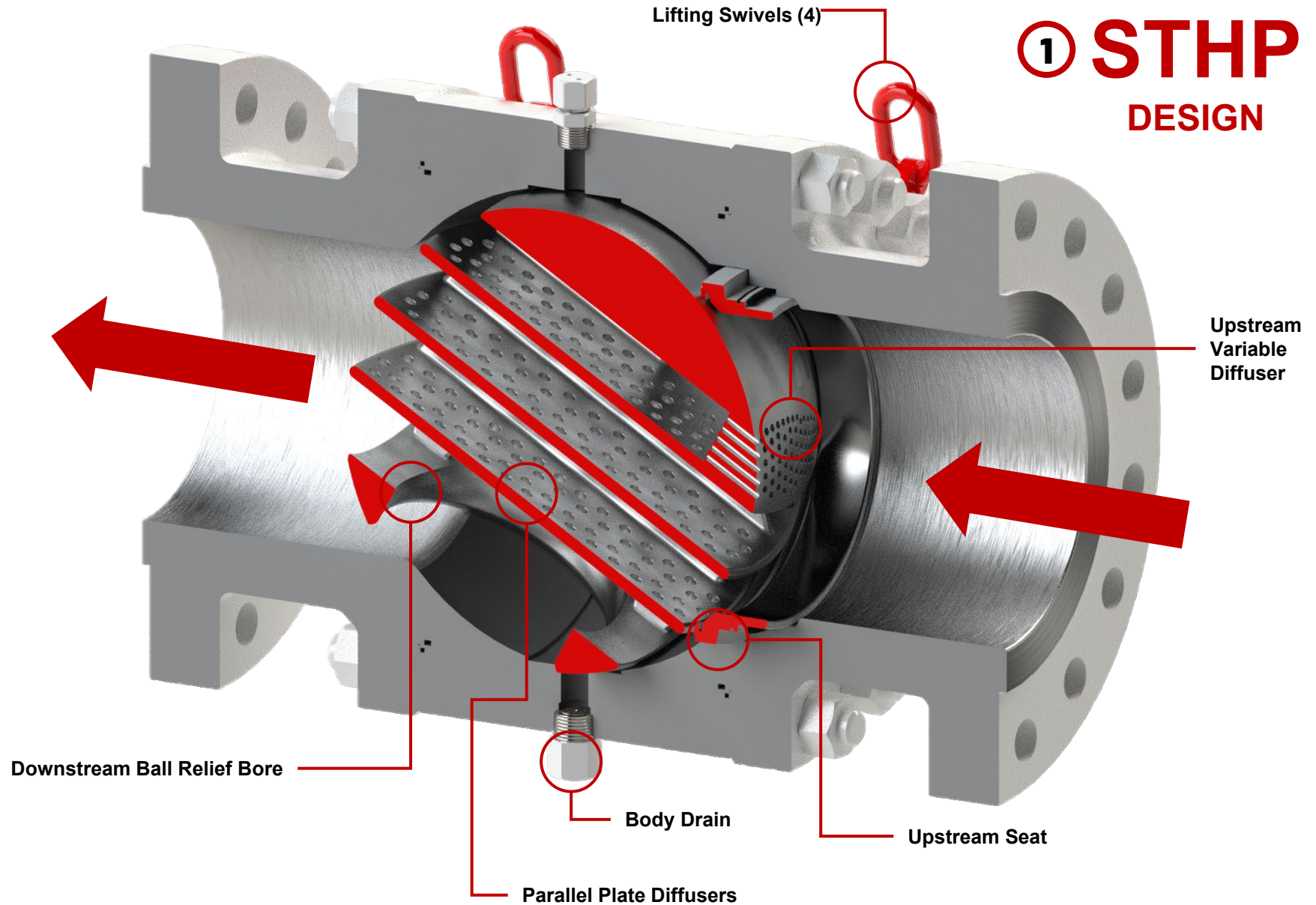
**RCVC Red Circle
Valve Controller**

PRCV-STHP Stealth Trim – Upstream Bore View and Cutaway

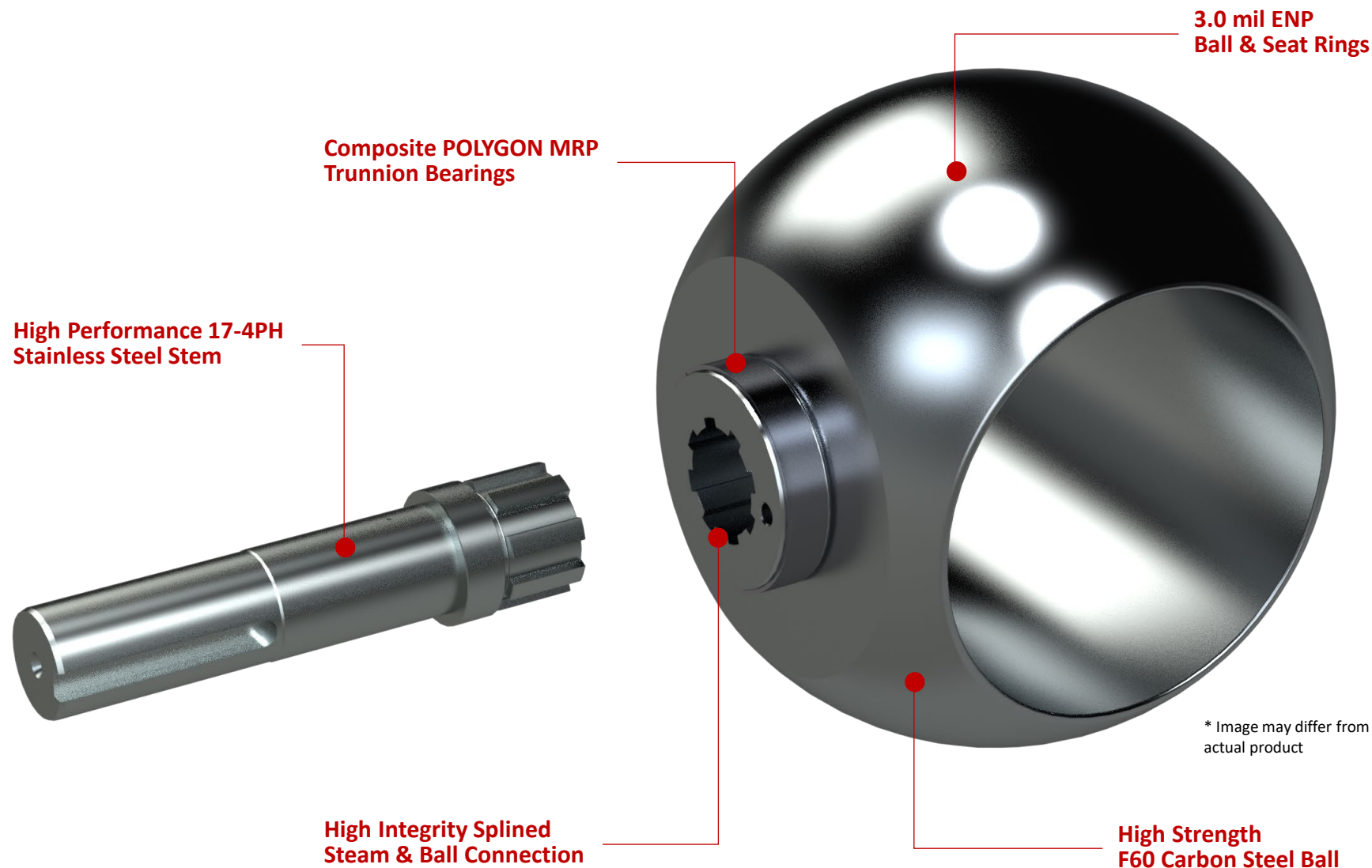
STHP 1 DESIGN



PRCV-STHP Stealth Trim – Cutaway View

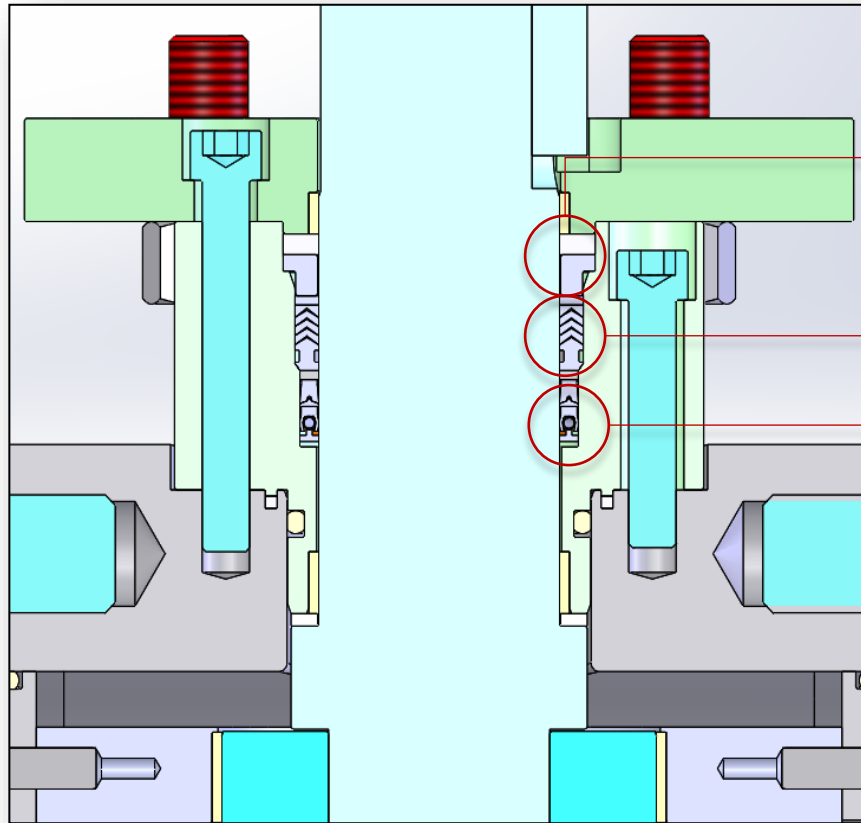


New VP Series – Top Quality Performance at Competitive Price



PRCV-STHP High Performance Stem Seal Design

Stealth Trim – Upstream Bore View and Cutaway



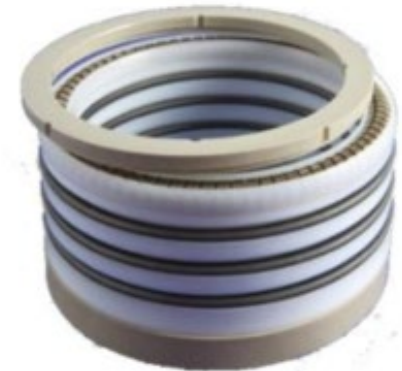
*High Performance V-Pack
Stem Seal Configuration*

STHP DESIGN

Lip Seal

PTFE V-Pack

Graphite Gasket



*High Performance V-Pack
Stem Seal Assembly*



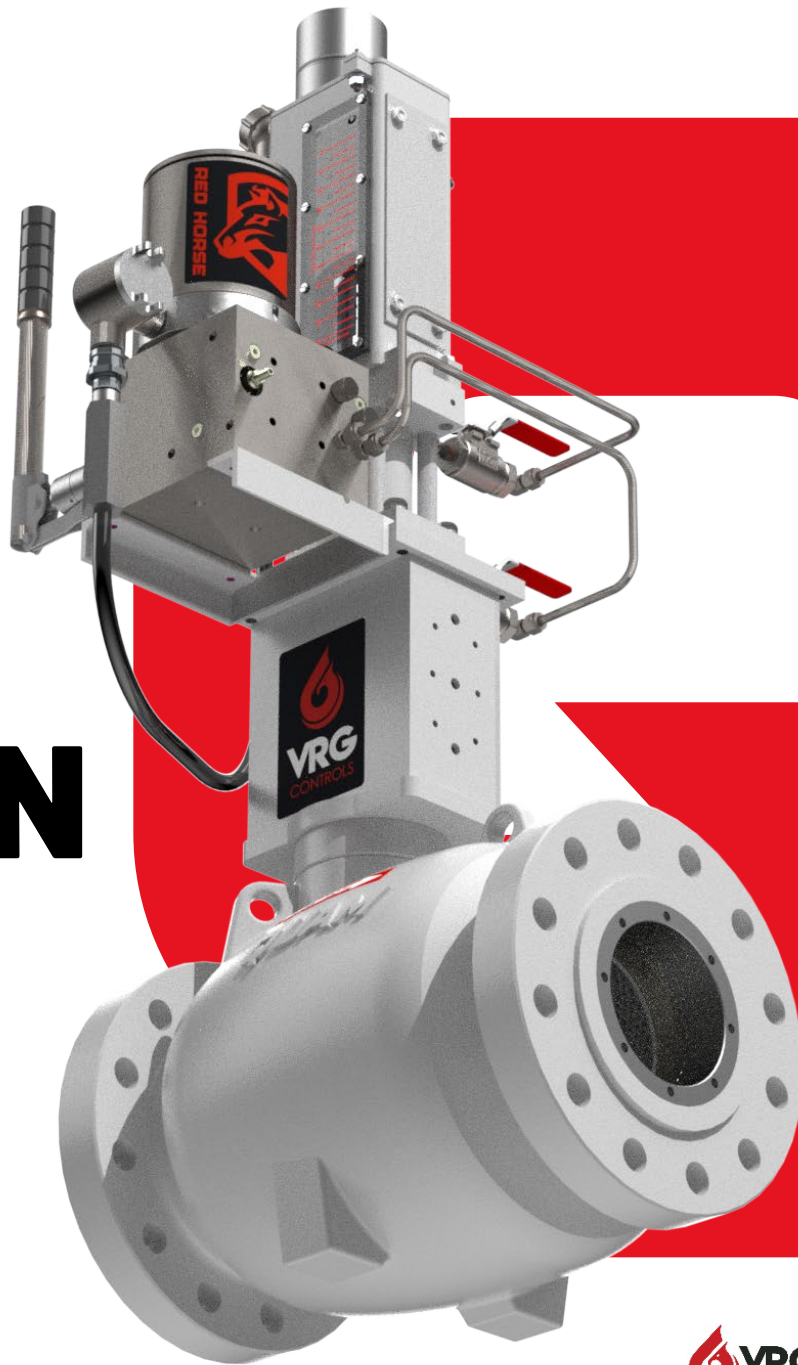
POWER MEETS PRECISION

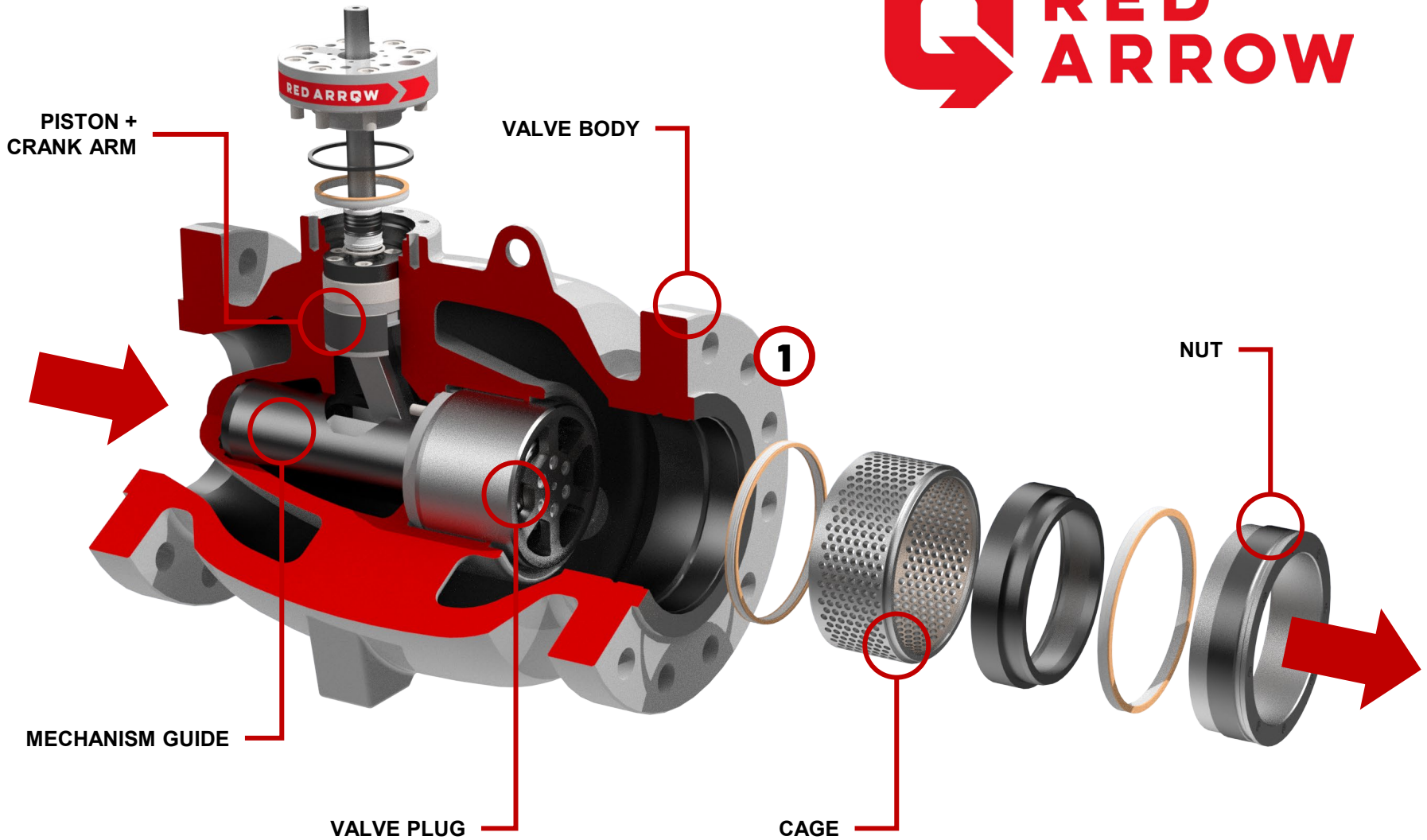
**HIGH CAPACITY AND NOISE ATTENUATION
SOLUTIONS FOR NATURAL GAS PIPLINES**

SOLUTION SHAPED BY QUAM



ASV Anti-Surge Valves / 092326



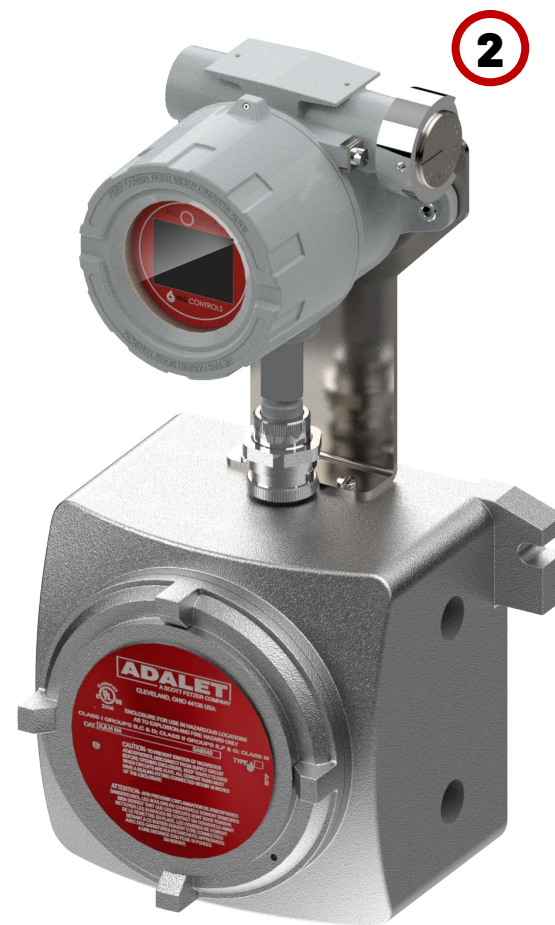


RCVC Red Circle Valve Controller

Model:	RCVC-2000 Red Circle Valve Controller
Installation:	Valve Mount or Remote Installation
Diagnostics:	Onboard Graphical Performance Evaluation
Display:	High Resolution, Programable, Multi-Color Display
Command Signal:	4 – 20 mA Analog 24 VDC Discrete Pulse for Open/Close ONLY
Feedback Signal:	4 – 20 mA (Internal or External Loop Power) Local/Remote Solenoid Count Digital Feedback
Deadband:	Adjustable 0.1% to 2.0% Travel, Typically Set 0.5% Standard
Hysteresis:	0.5% Full Scale (with standard Rotary Position Feedback Module)
Linearity:	0.5% Full Scale (with standard Rotary Position Feedback Module)
Failure Mode:	OPEN, CLOSE, or LOCK on Loss Command Signal
Consumption/ Emissions:	ZERO STEADY-STATE EMISSIONS Bleed to Pressure System Capable
Connections:	½ FNPT Pneumatic Connections Port ¾ FNPT Electrical Connections
Temperature:	-20°F to +120°F (-29°C to +49°C)
Compatibility:	Dimensions, Ports, Connections 100% Compatible with Existing GE/Becker DNGP Replacement
Communication:	USB Computer Interface
Manual Override:	Local Manual Valve Positioning Onboard
Adjustment:	Non-Intrusive Local Thumbwheel Adjustment
Area Classification:	Class 1, Div. 1 EXPLOSION PROOF

**REQUIRES PAIRED SOLENOID VALVE(S) ASSEMBLY
PAIRED VALVE POSITION TRANSMITTER**

ASV Anti-Surge Valves / 092326



RED  **CIRCLE**
VALVE CONTROLLER

 **VRG** CONTROLS

RCVC Red Circle Valve Controller

Hi Resolution Color TFT
Programmable Display with
Intuitive and Easy Read Menu

**PLUG & PLAY
REPLACEMENT FOR
BECKER/GE DNGP
POSITIONER**

Rotary Control Switch Provides
Non-Invasive Menu Navigation and
Setup

4-20 mA Analog Command Signal
Input OR ± 24 VDC Discrete Pulse
Positioning

ZERO Steady State Emissions with
Ability to Discharge to Pressure
System for Complete Atmospheric
Emissions.

Class 1, Div. 1 Ex Proof
Terminal Strip Housing
Provides Generous Room
for Easy Wire Termination

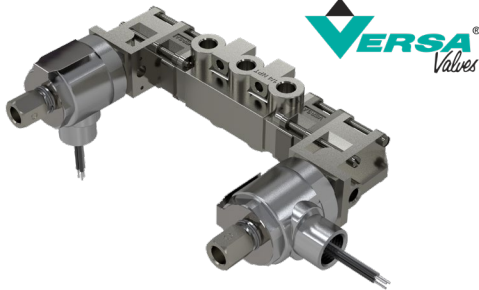
RCVC Electrical Ports and
Mounting Brackets Provide
Flexible Configuration. 100%
Compatible with Existing
Becker/GE DNGP & EFP
Enclosures for Easy Retrofit

RCVC May be Installed
Directly on Control Valve
or Remotely in Control
Cabinet or RTU Building

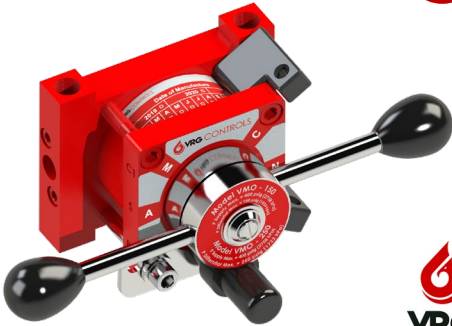


RED CIRCLE
VALVE CONTROLLER

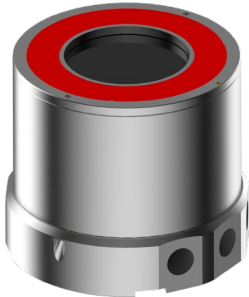
Primary Components – Solenoid Valves

	RCVC ASV Solenoid Pack Standard Response	Double Acting Standard Pressure Solenoid Pack	Angle Body Valve
	3	4	5
	 ASCO®	 VERSA® Valves	 ASCO®
Model	ASCO EV8327G052 (QTY 2)	Versa VXX-4323-316-H2-ME-S-XXL-44-D024	ASCO Angle Body Valve - 8290A398. 1" NPT
Voltage	24 VDC	24 VDC	N/A
Supply	41 - 150 psig	20 – 150 psig	0 – 240 psig
Type	2-Position, 3-Way One Port Plugged 2/2	4-Way, 3-Position, Blocked Center Double Solenoid-Pilot Spring Center	2 Way, Direct Acting, Normally Open
Other Specs	Cv 0.50, 24 VDC, 2-Position, 3-Way (One Port Plugged), Low Temp. (-40F), Stainless Steel Body, Universal, UL CSA CE Approved, Ex Proof Cl. 1 Div. 1., Buna N Elastomers, 0.250 NPT Ports, Tapped Exhaust. One (1) for CLOSE and One (1) for OPEN.	Cv 1.8, 24 VDC, 4-Way, 3-Position, Blocked Center Double Solenoid-Pilot Spring Center, Internal Pilot, Mod. Temperature (-20F), 316SS Construction, Cl I, Grps C,D - Cl II, Grps E,F,G - Cl I, Div 2, Grps A,B,C,D - Cl II, Div 2, Grps E,F,G, Buna N Elastomers, 0.250 FNPT Primary Ports, Tapped Exhaust	Cv=15, 316 SS

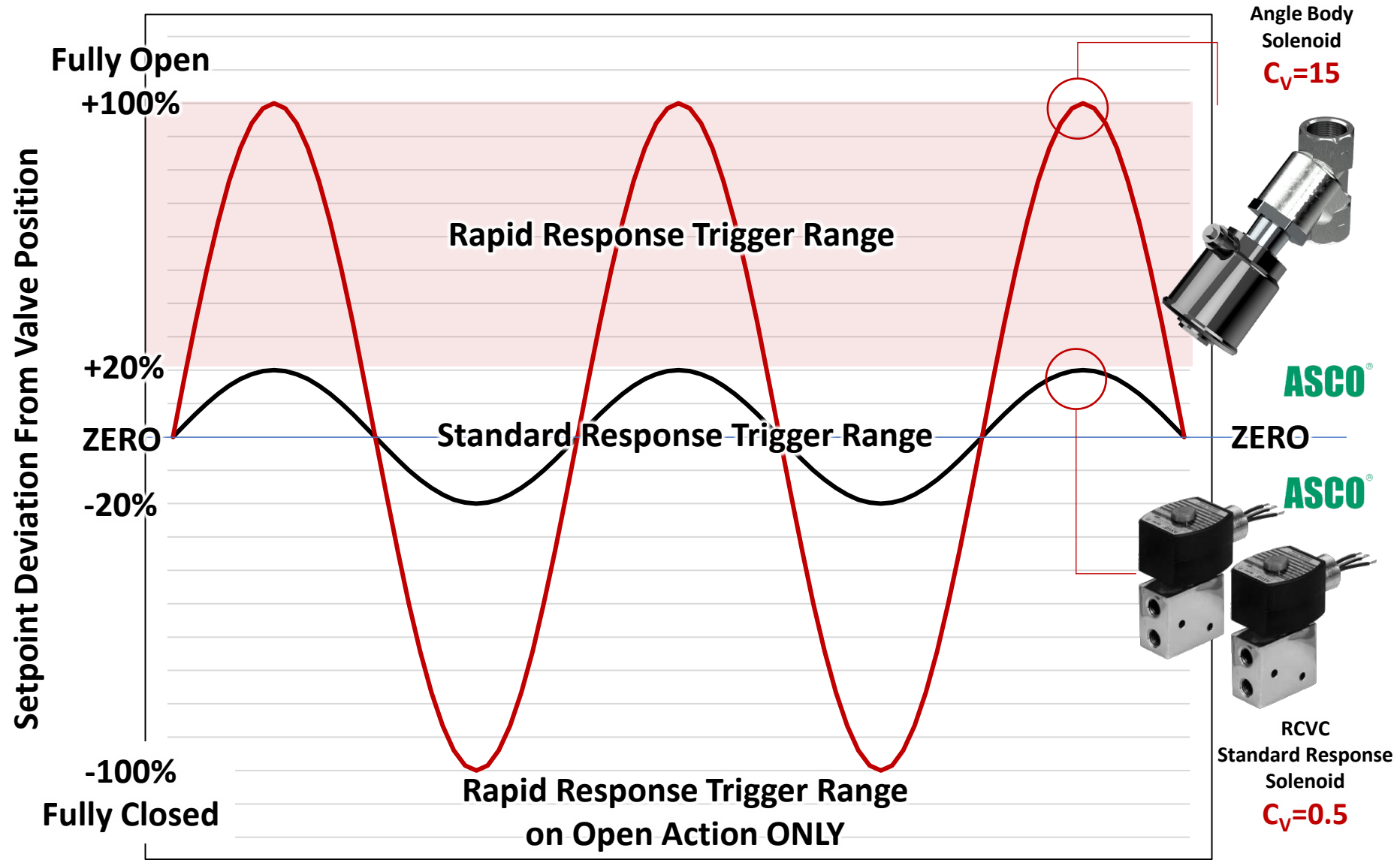
Primary Components – Exhaust Booster & Manual Override

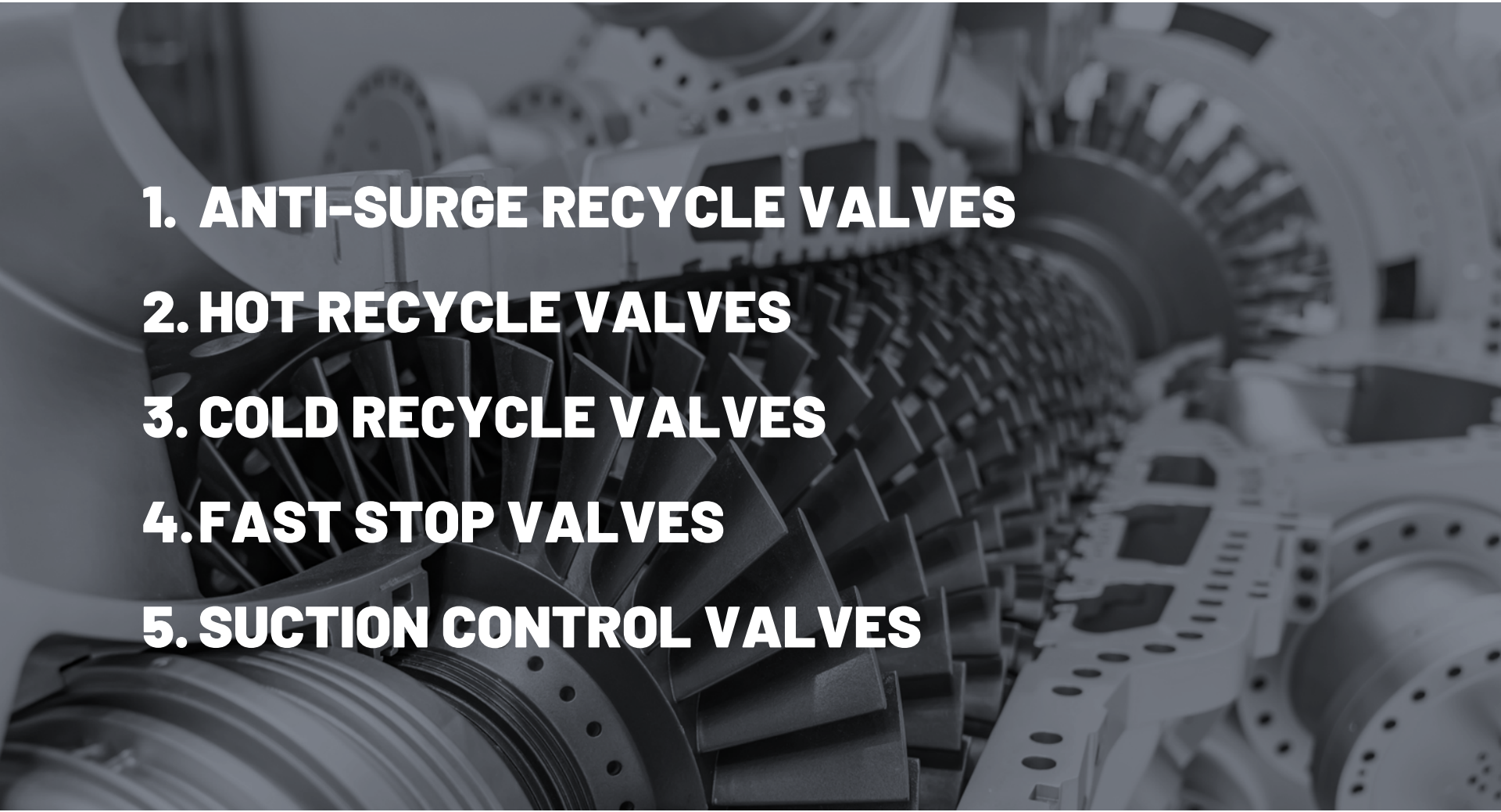
	Series 289RC Exhaust Booster	VMO Valve Manual Override
		
Model	289RC (QTY 1)	VMO-150
Supply Pressure	100 psig Max	150 psig Max**
Operating Temperature	-20 – 180° F	-50 – 200° F
Type	Exhaust Booster	Pneumatic Manual Override
Other Specs	Cv 22, Inlet/Outlet 1.00 IN FNPT, Signal Port 0.250 FNPT, Body, Cover: Aluminum Die Cast, Valve, O-Rings & Gaskets: NBR	Cv 0.40, 0.250 FNPT Ports Body: Carbon Steel Bolting: 316 SS, Internals: 304 SS O-Rings: Buna-N

Primary Components – Valve Status Monitor and Position Sensor

	Rover Rotary Valve Status Monitor	Balluff BTL Linear Position Sensor
	 8	 9
Model	Rover Rotary Valve Status Monitor	Balluff BTL7-E501-M0153-J-DEXC-TA12
Type	Rotary Limit Switch Assembly	Micropulse Linear Position Sensor
Limit Switches	Mechanical Close (1) & Open (1) – Adjustable	Not Available
Visual Indicator	Beacon High Visibility Position Indicator	Linear Travel Scale (10% Increments)
Other Specs	VRG ROVER EXd Rotary Feedback w Limit Switches / AA ID: A-HR-FSH2M3NVUS-522 / 4-20 mA + Mechanical Limit Switches (2) / HART / CSA + IECEx / Visual Indicator	4-20 mA Micropulse Transducer, 0.250 FNPT Elec. Connections, UL CSA CE Approved, Ex Proof Cl. 1 Div 1, Stroke Lengths Available: 4, 6, 8, 12 and “SHORT LENGTH” 2.0 IN or less adjustable, Linear Feedback Mounting Kits Available

Rapid Response Solenoid Triggers on Large Setpoint Deviation





1. ANTI-SURGE RECYCLE VALVES

2. HOT RECYCLE VALVES

3. COLD RECYCLE VALVES

4. FAST STOP VALVES

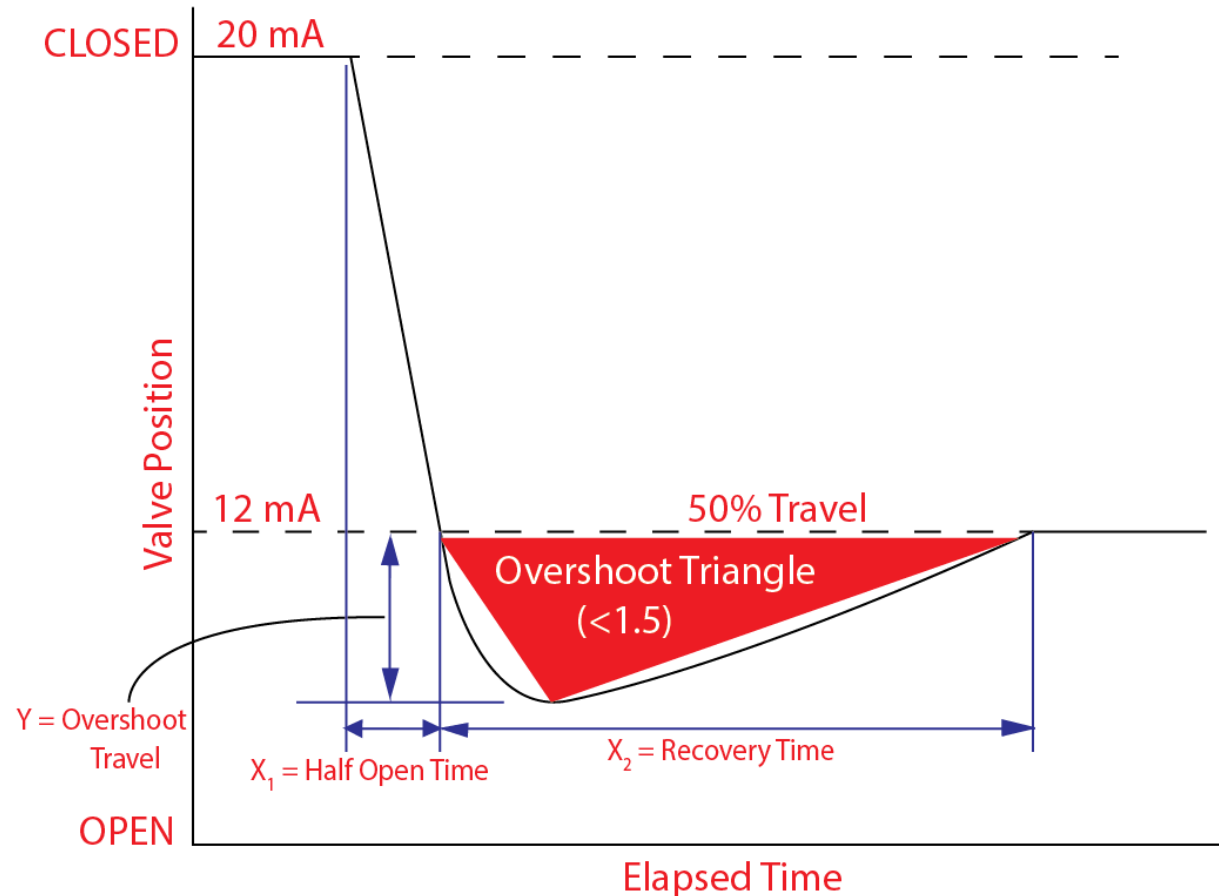
5. SUCTION CONTROL VALVES

- **Higher Pressure Supply (125 psig) Allows Smaller, More Cost Effective Actuators**
- **Nat Gas Supply Protects Actuator Seals**
- **VRG Control Instrumentation Exhibits ZERO SS Venting**
- **If Using Plant Air, ZERO SS Venting Saves Lessens Compressor Operation and Saves Money**

ASV Valve Performance Specifications – Typical Specifications

Four (4) Key Performance Criteria: The ASV must operate very rapidly with minimal error in position accuracy, and maximum stability

- **Rapid Response Time (Not Shown)** Acceptable Positioning at Maximum Recovery Time
- **Half Open Stroke Time (X_1)**
- **Overshoot (Y)**
- **Overshoot Triangle**



ASV Valve Performance Specifications – Typical Specifications

Rapid Response Time

The valve shall meet or exceed the opening speed/time requirements from fully closed position. Opening time requirement as a result of the solenoid being de-energized as follows:

Anti-Surge Valve: The valve must reach 63.2% open:

$$T_{\text{Rapid Response}} = 100 + 100 \sqrt{D_{\text{Valve}}}$$

$T_{\text{Rapid Response}}$ = Rapid Response Time (msec)

D_{Valve} = Bore ASV Valve (in)

ASV Size (Bore)	T_{Stroke}
4.0 in	300 msec
6.0 in	345 msec
8.0 in	383 msec
10.0 in	416 msec
12.0 in	446 msec

ASV Valve Performance Specifications – Typical Specifications

Half Open Time

The valve shall meet or exceed the opening speed/time requirements from fully closed position. With positioner command step change from 20 to 12 mA:

Anti-Surge Valve: The valve must reach 50% open:

$$T_{Half\ Open} = 300 + 100 \sqrt{D_{Valve}}$$

$T_{Max\ Half}$ = Half Open Stroke Time (msec)

D_{Valve} = Bore ASV Valve (in)

ASV Size (Bore)	T_{Stroke}
4.0 in	500 msec
6.0 in	545 msec
8.0 in	583 msec
10.0 in	616 msec
12.0 in	646 msec

ASV Valve Performance Specifications – Typical Specifications

Overshoot

The valve shall not overshoot by more than 60% and have a maximum excursion not to exceed 80% open.

$$H = 100 \times \frac{(\text{Max Excursion} - \text{Final Position})}{(\text{Final Position} - \text{Starting Position})}$$

H = Overshoot

Max Excursion = Maximum Valve Travel Half Stroke Test

Final Position = 50% for Half Stroke Test

Starting Position = 0% (Full Closed) for Half Stroke Test

Example: Valve goes from FULL CLOSED to 80% Travel and Return to 50% Travel

Starting Position = 0%, Max Excursion=80%, Final Position= 50%

$$H = \text{Overshoot} = 100 \times \frac{(80 - 50)}{(50 - 0)} = 60\%$$

ASV Valve Performance Specifications – Typical Specifications

Overshoot Triangle

After the Overshoot the valve shall return to its Final Position (50% Open) in less than 10 times its Half Open Time.

The area beyond the ultimate destination (overshoot triangle) shall be less than 1.5:

$$Area_{overshoot} = \left(\frac{Recovery\ Time}{Half\ Open\ Time} \right) \times \left(\frac{H}{2} \right)$$

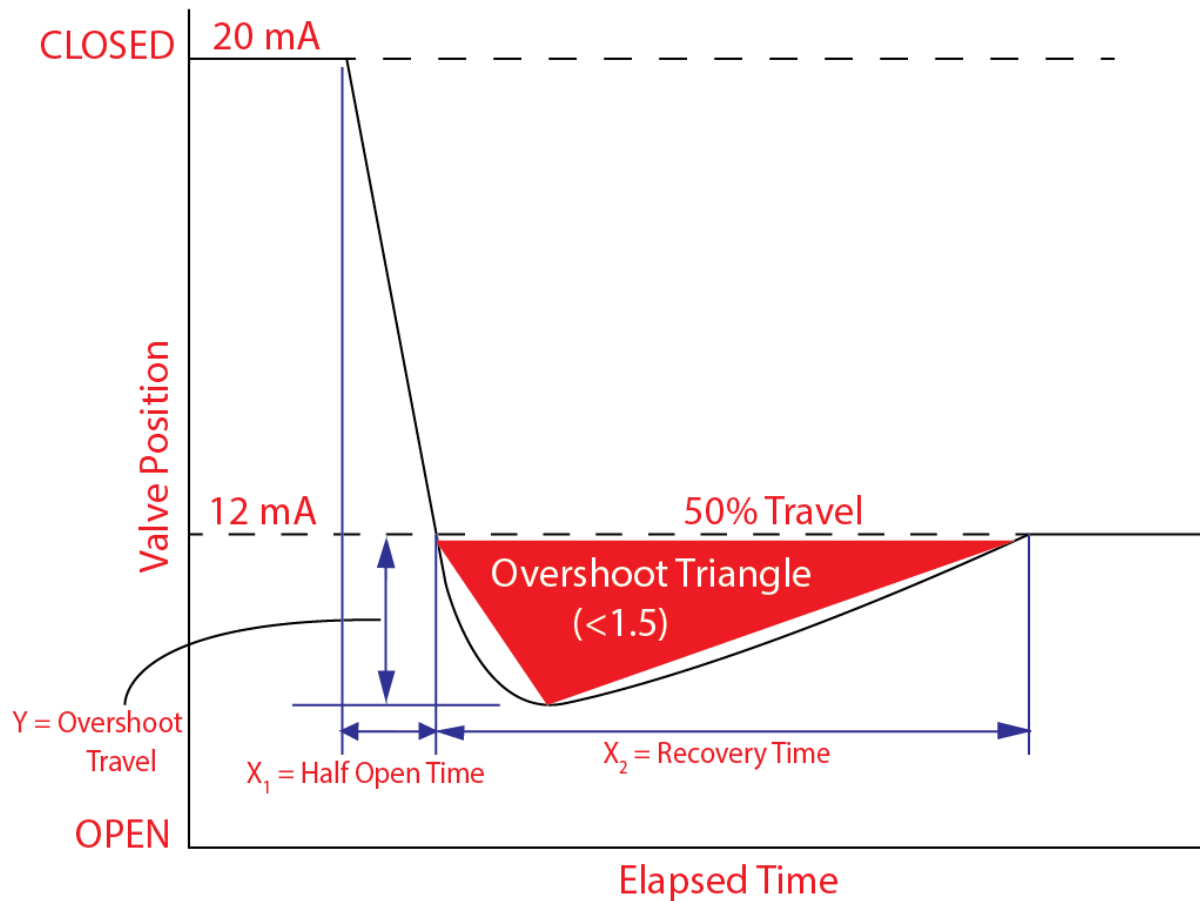
Recovery Time = X_2

H = Overshoot Half Stoke Test

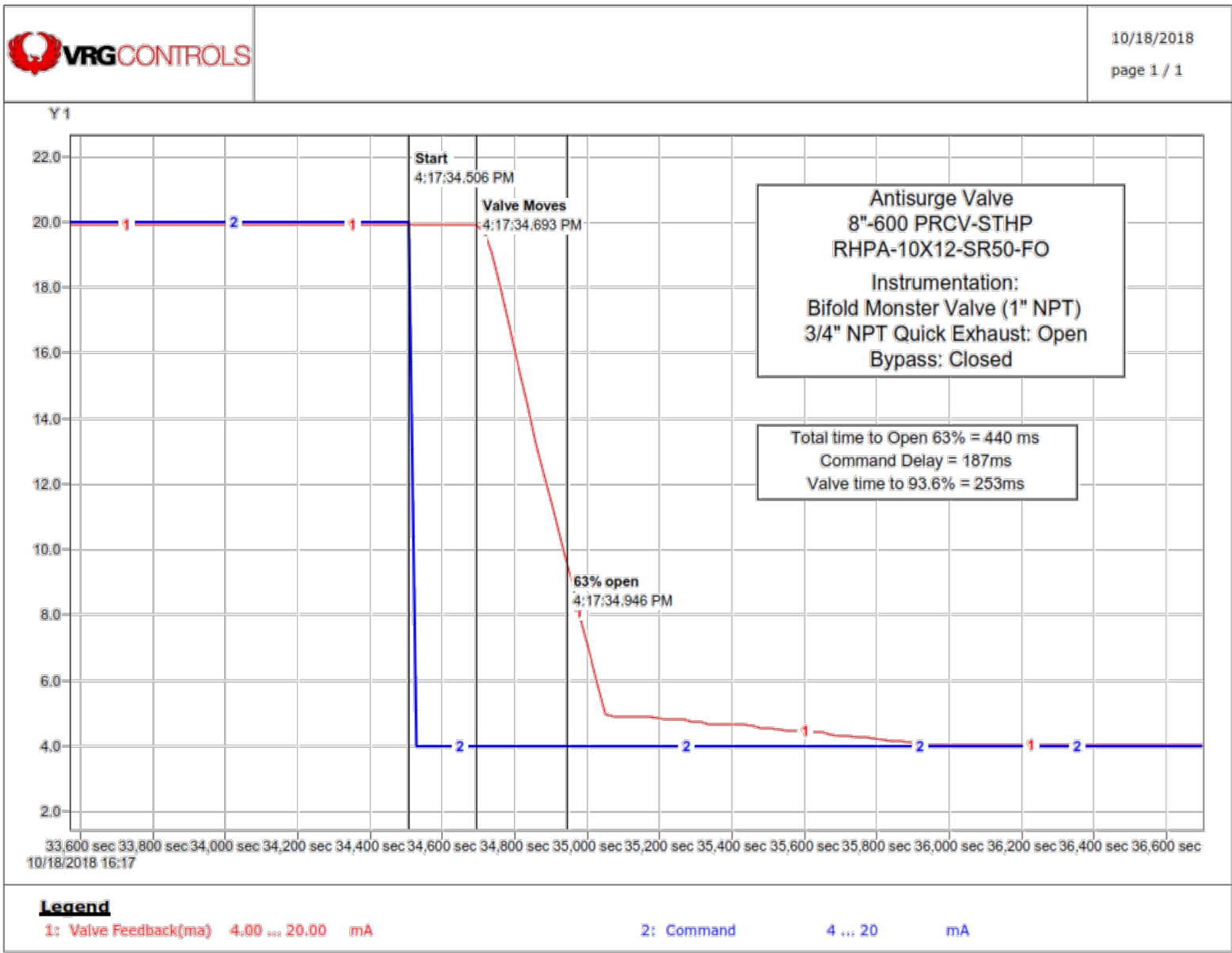
Example: A 4" valve, 4.375 port, at maximum overshoot, must return to its ultimate destination in 5.09 seconds, and at maximum recovery time, must have no more than 30% overshoot.

ASV Valve Performance Specifications – Typical Specifications

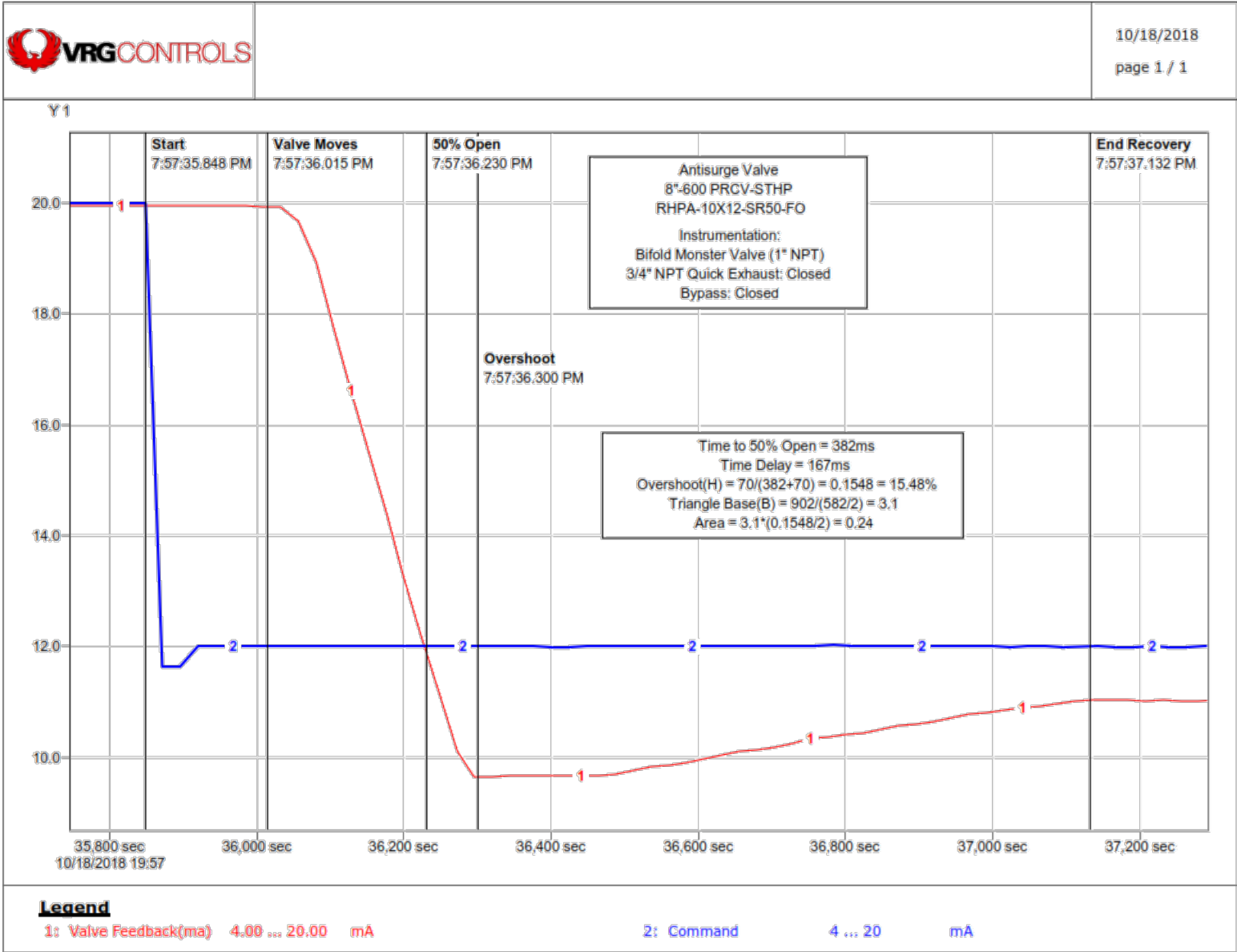
Acceptable Positioning at Maximum Recovery Time



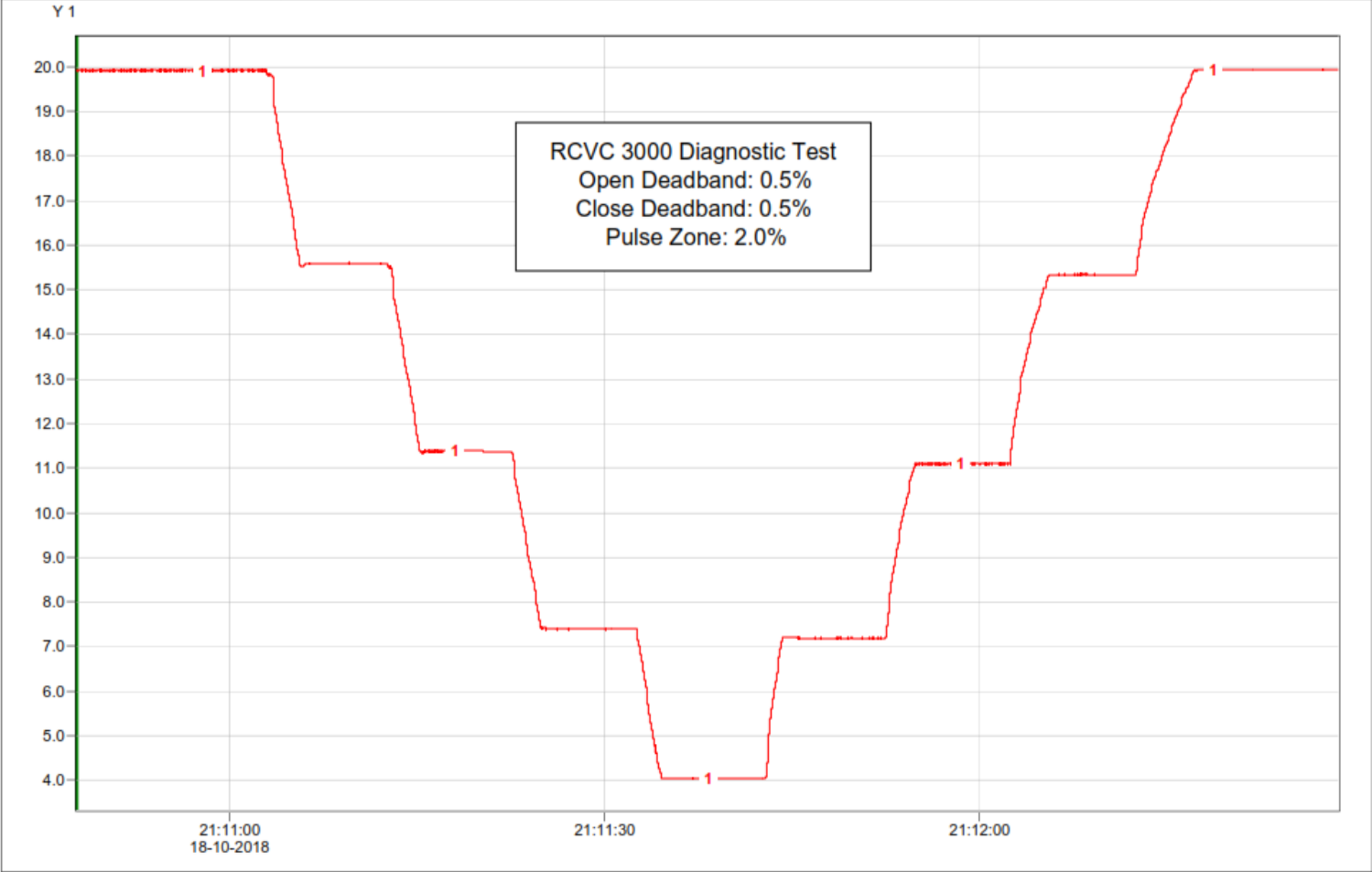
Rapid Response Test Results – 8.0 in ASV



Overshoot & Overshoot Triangle Test Results – 8.0 in ASV



RCVC Diagnostic Test Results – 8.0 in ASV



Legend

1: Valve Feedback(ma) 4.00 ... 20.00 mA



Our Customers





VRG Controls, LLC
1199 Flex Court, Unit B
Lake Zurich, Illinois 60047 USA



**ISO 9001:2015
CERTIFIED COMPANY**



VRG Controls, LLC
Toll-Free: +844-FLOW-VRG (USA & CANADA)
e-Mail: Sales@VRGControls.com
www.VRGControls.com

ASV Anti-Surge Valves / 092326

