ASCO™

Redundant Control System | for the Process Control Industry

Safety instrumented applications up to SIL 3

Process reliability

Process valve diagnostics

www.asco.com

EMERSON™

RCS

COMPLETE FUNCTIONAL SAFETY WITH ENHANCED RELIABILITY

The Redundant Control System (RCS) is the only pilot valve system that has no single point of failure that could result in an unwanted closure of the process valve. The Redundant Control System is fit for use in **SIL 3** applications and greatly reduces spurious trip rates. RCS achieves a higher level of process safety and reliability by using a redundant, fault tolerant architecture, high diagnostic coverage, and automated testing. A keyed bypass allows on-line maintenance of the RCS without process interruption. The RCS is available in a variety of constructions that provide valve diagnostics through automated, online testing.

The availability and reliability of RCS provides the industry's best choice for process valve diagnostics and actuation.

BOILERS AND FURNACES

ADVANTAGES

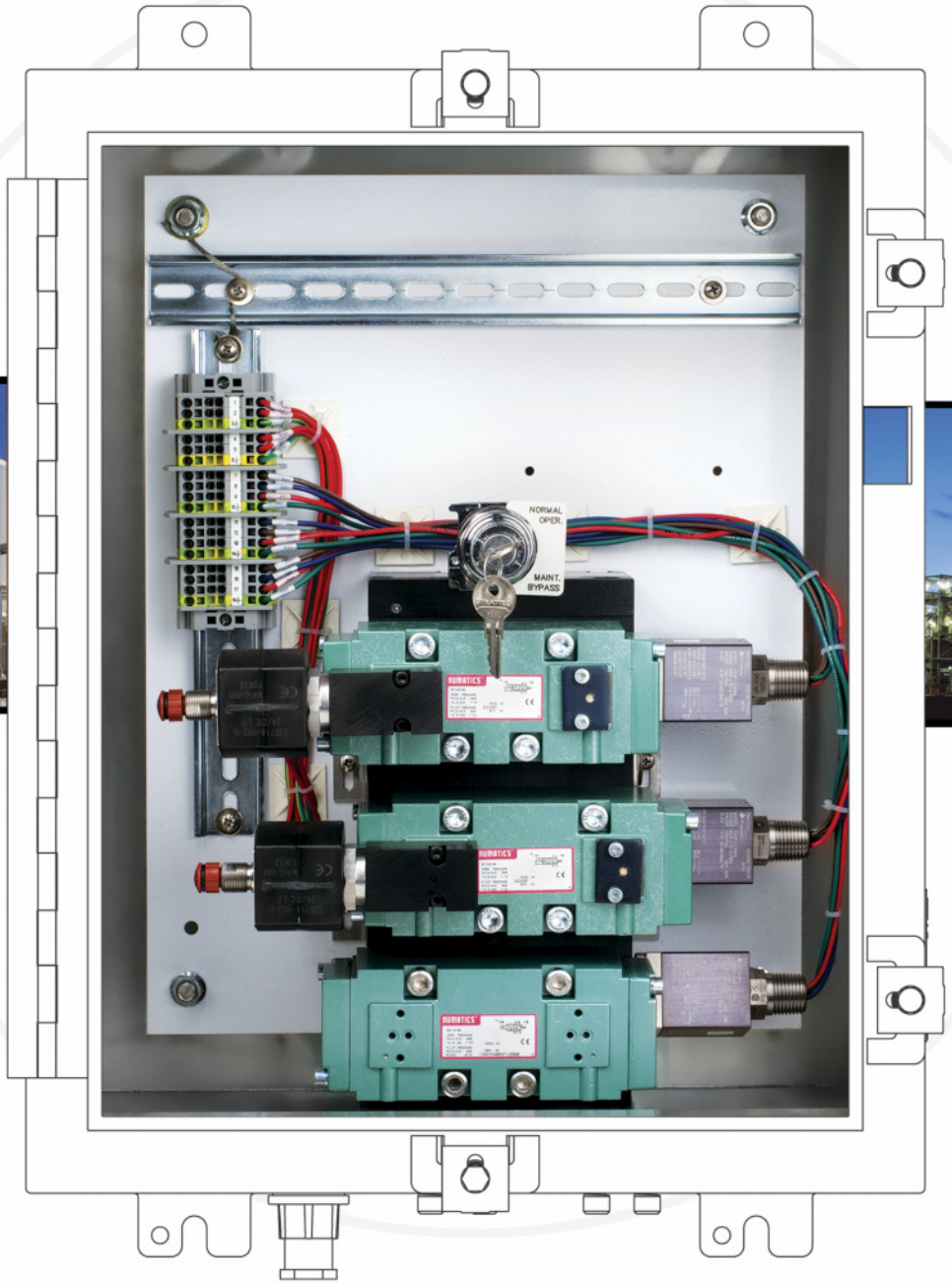
NO NUISANCE TRIPS
EASY ON-LINE MAINTENANCE

HIGH AVAILABILITY
AUTOMATED SOLENOID TESTING

KNOWN TECHNOLOGY
AUTOMATED PARTIAL STROKE TESTING

INDUSTRY'S BEST CHOICE FOR
VALVE ACTUATION AND AUTOMATED TESTING

• EMERGENCY ISOLATION AND VENTING • HIGH INTEGRITY PROTECTION SYSTEMS • FLARING SYSTEMS



DIAGNOSTIC PROCESSOR

WITHOUT ON-BOARD DIAGNOSTIC PROCESSOR

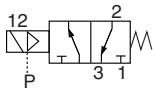
The RCS consists of two solenoid valves (SOV 1, SOV 2), a pneumatically operated bypass valve, and three pressure switches (PS1, PS2, PS3). Two pressure switches provide feedback status of the solenoid valves during on-line testing (Solenoid Valve Test, Partial Stroke Test) and also monitor the status of SOV 1 and SOV 2 (Failure Detection), the third pressure switch detects bypass status. Using a system controller (DCS or Safety PLC), the required I/O count is two digital outputs (SOV 1, SOV 2) and three digital inputs (PS1, PS2, PS3) for the implementation of redundant logic. Functional testing of the solenoid operated valves or partial stroke testing of the process valve is accomplished by programming the controller using IEC 61131 logic flow diagrams provided by ASCO. In its simplest form, the RCS can be implemented using one digital output from the system controller, shared by both solenoid valves and a single digital input back to the system controller for a common alarm which will identify solenoid valve failure, or pressure switch failure or operation in maintenance mode.

WITH ON-BOARD DIAGNOSTIC PROCESSOR

In order to reduce programming and I/O requirements in the user's controller, RCS can be supplied with an on-board diagnostic processor. This on-board processor controls the outputs to the individual solenoid-operated valves and receives the diagnostic information from the pressure switch inputs. Power is supplied to the on-board PLC by user's controller, which executes the safety action by de-energizing the output power to the on-board processor. Consequently, the user's controller is always responsible for the safety action. The on-board processor provides diagnostic and testing information only and can be considered interference free and benign to the safety action. Watchdog relays are provided to prevent de-energizing the solenoid-operated valves due to a lack of on-board processor outputs. The watchdog relays maintain power to the solenoid-operated valves, avoiding spurious trips of the process valve.

CONFIGURATION

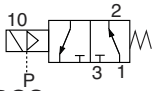
NORMALLY CLOSED VERSION



Operation: The normally closed RCS operates like a standard normally closed 3/2 solenoid operated valve.

Application: The majority of emergency shut down valves are required to close in order to achieve the specified safe state for the process under control (i.e. shut off flow) and they are specified "fail safe" (spring to the safe state) which requires that the solenoid operated valves vent the process valve actuator allowing the process valve to move to a specified safe state on loss of power.

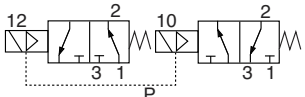
NORMALLY OPEN VERSION



Operation: The normally open RCS operates like a standard normally open 3/2 solenoid operated valve.

Application: The majority of emergency vent valves are required to open in order to achieve the specified safe state for the process under control (i.e. vent off pressure). In order to prevent opening of the process valve due to loss of instrument air, the user may choose to specify the process valve as air to open spring return closed. To move the process valve to the safe state requires the solenoid valves to apply air to the process valve actuator when they are de-energized. This configuration also fulfills the requirement that the process valve will move to the specified safe state on loss of power.

DOUBLE ACTING VERSION (2oo2D operation only)



Operation: The double acting RCS operates like a 4/2 valve controlling air pressure to opposite sides of a double acting actuator, air-to-open/air-to-closed.

Application: The user must determine the desired fail safe position (open or closed) for the process valve on loss of power. One of the solenoid valves act as a normally closed 3 way valve, controlling air to one side of the actuator. The second solenoid valve acts as a normally open 3 way valve, controlling air to the other side of the actuator. This arrangement does not allow for 1oo1HS operation.

OPERATIONAL MODES

2oo2D MODE

In the 2oo2D mode, both solenoids are online during normal operation. Both solenoid valves must be de-energized for shutdown. Pressure switches are used to individually alarm if either solenoid valve goes to the vent state when not commanded, thereby reducing the potential for spurious trips. The pressure switches are also used for signaling during automatic, on-line testing.

1oo1HS MODE

In the 1oo1HS mode, only one solenoid valve is on-line during normal operation. Any spurious trip of the on-line solenoid valve is detected by the logic solver, due to a signal being sent from an associated pressure switch. The response to the trip is to energize the second solenoid valve thereby maintaining air supply to the process valve. For functional testing, both solenoid valves are energized. Each solenoid valve is de-energized individually with pressure switch confirmation of successful venting. No bypassing is required for functional testing.

Both 1oo1HS and 2oo2D are certified SIL 3 Capable per IEC 61508:2010

OPTIONAL FEATURES

ASCO offers many standard optional features. These features are available individually as well as in many different combinations. Special constructions containing customer specified features are also available. Please contact your ASCO representative for availability.

Some optional features automatically come with lights and/or push buttons located in pre-assigned locations for local initiation and local indication. They are as follows:

- **Common Alarm** – option includes (1) green light to indicate system status, illuminated when conditions are 'normal'. Function is logic driven. Logic to reside in either user's PLC/DCS, which requires an additional output to the RCS, or resides within the optional RCS on-board processor.
- **Local Initiation of SOV Test** – option includes (1) pushbutton and (2) red lights. Allows for local initiation of SOV testing via door mounted pushbutton, however the functionality of SOV Testing is logic driven. Logic to reside in either user's PLC/DCS, which requires one additional input and two additional outputs to the RCS, or resides with in the optional RCS on-board processor.
- **Local Manual Reset** – option includes (1) red-lighted pushbutton and internal relays. After a trip, the RCS will not re-energize solenoid valves until power is restore to the unit and the reset pushbutton is depressed. For units with out on-board processor, a separate power supply is required to illuminate light when unit is tripped
- **Bypass indication** – option includes (1) red light. Used to indicate when the RCS is in the maintenance bypass mode. Function is logic driven. Logic to reside in either user's PLC/DCS, which requires an additional output to the RCS, or resides within the optional RCS on-board processor.

Stainless steel constructions available for applications in corrosive environments.

- 316 Stainless Steel valve bodies and pressure switches
- Optional FKM seals

GENERAL SPECIFICATIONS

Total weight: Approx. 75 lbs (standard unit), 120 lbs (unit w/stainless steel internals)

Media: Dry instrument air

Filtration Requirement: Dry instrument air, filtered to 40 microns
(5 micron particulate and .3 micron coalescing filtration recommended)

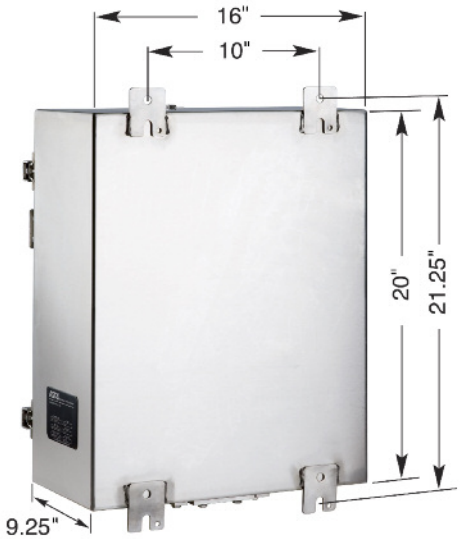
Ambient Temperatures:
RCS-5R (without on-board diagnostic processor): -40˚F to 140˚F (-40˚C to 60˚C)
RCS-5L (with on-board diagnostic processor): -4˚F to 131˚F (-20˚C to 55˚C)

Wiring: Maximum wiring size 14 awg

Cv: 2.0 Typical for NC

Assembly Approvals: (for units without on-board diagnostic processor)

ATEX - Ex d e mb IIC Gb



ENCLOSURE

304 or 316 Stainless Steel, Fiberglass Type 4, 4X, IP56

SOLENOID VALVE (2 UNITS)

Body Material: Die-cast Aluminum (Standard); 316 Stainless Steel (optional)

Solenoid Operators: 1.4 watt (DC), 1.8 watt (DC), 10.1 watt (AC), UL listed, CSA certified
Class I, Division 2, Groups A,B,C, & D - Nonincendive (DC only)
Class I, Division 1, Groups A,B,C, & D - Explosion-proof AC & DC
CE (EMC directive 2014/30/EU)

PRESSURE SWITCH (3 UNITS)

Housing Material: Aluminum (Standard); 316 Stainless Steel (optional)
Stainless Steel Wetted Parts - FM, CSA, ATEX: Ex d IIC, CE (PED directive 2014/68/EU)

Electrical Rating: Gold contacts (std) 1 amp suppressed resistive load; .5 amp inductive load @ 28 VDC
Silver contacts (opt) 5 amps suppressed resistive load; 3 amps inductive load @ 28 VDC

ON-BOARD DIAGNOSTIC PROCESSOR (RCS-L)

European Community (CE) Low Voltage Directive 2014/35/EC
EN 61131-2: Programmable controllers - Equipment requirements
UL 508 Listed (Industrial Control Equipment) (NRAQ, file E75310)
Meets CSA C22.2 Number 142 (Process Control Equipment), UL Canadian certified (NRAQ7, file E75310)
FM Class I, Division 2, Groups A,B,C, & D Hazardous Locations T4A and Class I, Zone 2 IIC, T4

SIL 3 Capable

RCS in 1oo1HS and 2oo2D configurations without an on-board processor are fit for use in SIL 3 applications per IEC 61508:2010 for low demand mode applications. Third party certified by Exida. For more information, consult the RCS safety manual.

PNEUMATIC CONNECTIONS

Recommended piping for the inlet and outlet pneumatic connections to the RCS is 1/2" stainless steel tubing.
The length of tubing between the RCS and the process valve should be kept as short as possible for the fastest response of the process valve actuator.

Normally Closed / Normally Open

Inlet: 1/2" NPT, 3-150 psi max.
Pilot: 1/8" NPT, 40-150 psi max
Process: 1/2" NPT
Exhaust: 1/2" NPT

Double Acting

Inlet: 1/2" NPT, 3-150 psi max.
Pilot: 1/8" NPT, 40-150 psi max.
Process: (2) 1/2" NPT
Exhaust: 1/2" NPT

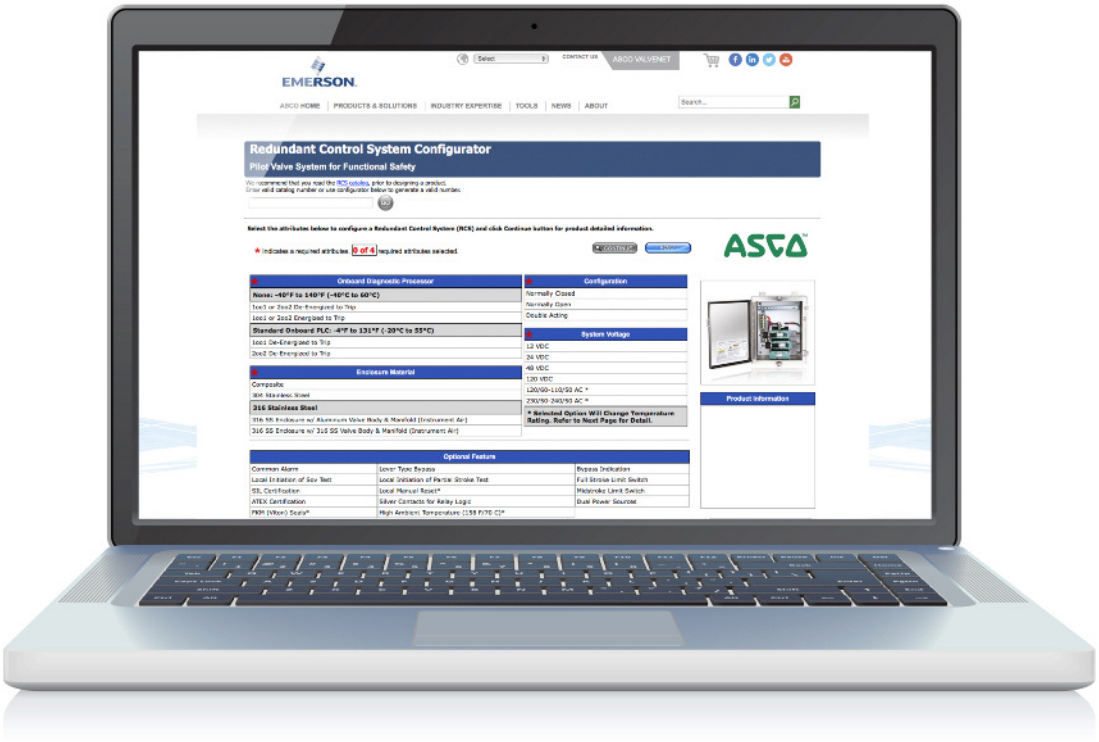
OPERATIONAL RELATIONSHIP OF THE RCS TO THE PROCESS VALVE

De-energize to Trip			
	Normally Closed	**Normally Open**	**Double Acting**
Coils Energized (Normal)	Supplies air to PV	Exhaust PV	Supplies air to (C2), Exhaust (C1)
Coils De-energized (Trip)	Exhaust PV	Supplies air to PV	Exhaust (C2), Supplies air to (C1)
Bypass	Supplies air to PV	Exhaust PV	Supplies air to (C2), Exhaust (C1)
Energize to Trip			
	Normally Closed	**Normally Open**	**Double Acting**
Coils De-energized (Normal)	Supplies air to PV	Exhaust PV	Supplies air to (C2), Exhaust (C1)
Coils Energized (Trip)	Exhaust PV	Supplies air to PV	Exhaust (C2), Supplies air to (C1)
Bypass	Supplies air to PV	Exhaust PV	Supplies air to (C2), Exhaust (C1)

CONFIGURATOR | Redundant Control Pilot Valve Systems

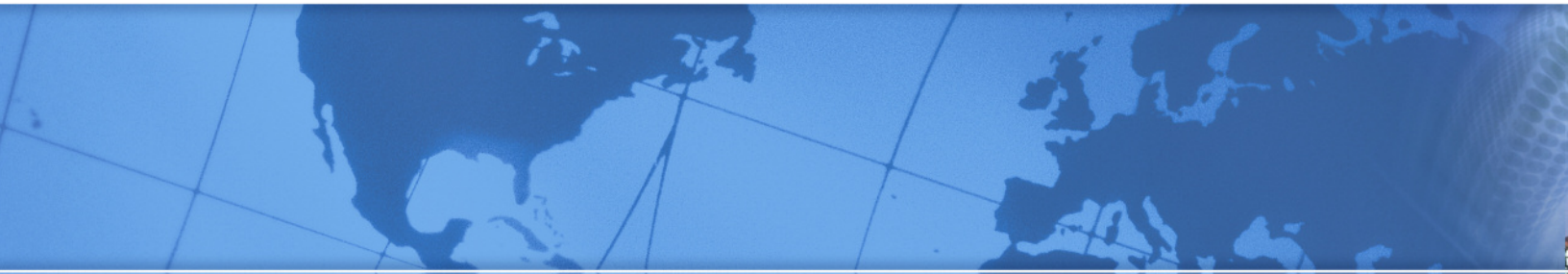
ASCO has simplified the RCS product selection process with an online catalog number configurator. Once you have determined the features required, you can easily construct a catalog number by clicking on each feature required and then clicking the **View Details** button. A second screen appears providing the product catalog number, product attributes, and various drawings. The configurator is programmed to accept only valid constructions.

In addition to creating a catalog number, the configurator can also decipher a catalog number. Type a valid 5RC or 5LC catalog number into the window next to the **Enter Catalog Number** button (CAPs only). The configurator automatically highlights the appropriate construction features.



To use the online configurator go to:

www.asco.com/RCSconfigurator



Global Contacts

Australia	(61) 2-9-451-7077	France	(33) 2-37-24-42-24	Netherlands	(31) 33-277-7911
Brazil	(55) 11-4208-1700	Germany	(49) 7237-9960	Singapore	(65) 6556-1100
Canada	(1) 519-758-2700	India	(91) 44-39197300	South Korea	(82) 2-3483-1570
China	(86) 21-3395-0000	Italy	(39) 02-356931	Spain	(34) 942-87-6100
Czech Republic	(420) 235-090-061	Japan	(81) 798-65-6361	United Kingdom	(44) 1695-713600
Dubai - UAE	(971) 4 811 8200	Mexico	(52) 55-5809-5640		