



ISSA Safety Seminar India 2023

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Fluid Power Capabilities

Standard Pneumatics

FLUID POWER PRODUCTS FOR PNEUMATIC SOLUTIONS **ROSS**

GENERAL AUTOMATION PRODUCTS

BASE MOUNTED VALVES AND SERIAL BUS COMMUNICATIONS

- ISO Valves with Serial Communication
- ISO (15407/1, 15407/2, 5599/1, & 5599/II)
- ANSI
- SAE

INLINE MOUNTED VALVES AND MANIFOLDS

- Poppet Valves & Manifolds
- Poppet Valves for High Temperature and Low Temperature Service
- Leak Tight Valves and Valve Manifolds
- In-Line Valves with Namur Interface

MANUAL & MECHANICAL VALVES

- Pendant Control
- Roller & Cam
- Pushbutton & Selector Switch
- Lever
- Pedal & Treadle

VALVES FOR AIR FLOW CONTROL

- Flow Control
- Quick Exhaust
- Shuttle
- Check

AIR PREPARATION PRODUCTS (F-R-L's)

- Drip Leg Drains
- Standard, Coalescing, and Adsorbing Filters
- Standard, Precision, Reverse Flow, High-Relief and Remote Pilot Regulators
- Standard and High Capacity Lubricators
- Combination Units
- Electro-Pneumatic Proportional Valves

ROSS CONTROLS[®] www.rosscontrols.com

Pneumatic Safety

ROSS

FLUID POWER SAFETY PRODUCTS & SOLUTIONS

ROSS CONTROLS

Pneumatic Panels/Systems

FLUID POWER PRODUCTS FOR PNEUMATIC SOLUTIONS **ROSS**

SAFETY-RELATED PRODUCTS

- Manual Lockout L-O-X[®] Valves
- Piloted Valves with L-O-X[®] Control
- Soft Start EEZ-ON[®] Valves
- Explosion-Proof Solenoid Controlled Valves
- Category 2 Sensing Valves
- Category 1 Pilot Operated Check Valves
- Category 2 and 3 Pilot Operated Check Sensing Valves
- Category 4 Control Reliable Double Valves
- Category 4 Double Valves for Cylinder Safe Return
- Safety Clamping Devices
- Control Reliable Hydraulic Double Valve
- AIR-FUSE Flow Diffusers

ROSS/FLEX[®] SOLUTIONS

- Custom Products for Specific Customer Needs

ROSS INTEGRATED SYSTEMS

- Assemblies
- Air Entry Packages
 - With Lockout L-O-X[®] Valves
 - With Sensing Valves
 - With Control Reliable Double Valves
- Valve Boards
- Control Panels
- Valve Stands

Your local ROSS distributor is:

ROSS CONTROLS	USA	781-881-1000 / 800-541-7888 / 800-541-7888	www.rosscontrols.com
ROSS CONTROLS (UK)	UK	01753 500000	www.rosscontrols.com
ROSS ASIA P.T.	Japan	03-5351-1000	www.rosscontrols.com
ROSS DE LUX	France	01 69 10 00 00	www.rosscontrols.com
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Full line pneumatic capabilities with a focus on safety in hot, dirty and rugged environments with the largest size ranges and highest reliability in the industry.

Your Speaker:

- Dietrich Warmbier
- Global Safety Product Manager
- Certified Functional Safety Engineer
- Joined ROSS in 2008



THIS IS WHY

ROSS[™]
a global family

WOMEN LIVE LONGER THAN MEN

The Control system does NOT END with the wire!

It includes all components involved in performing the safety function; sensors, manual input, and mode selection elements, interlocking and decision-making circuitry, and output elements that control machine operating devices or mechanisms.



Safety Math
PL e + PL e + PL e = ?

PL e

**Light Curtain
Safety Input**



**Safety PLC
Logic**



Safety Valve



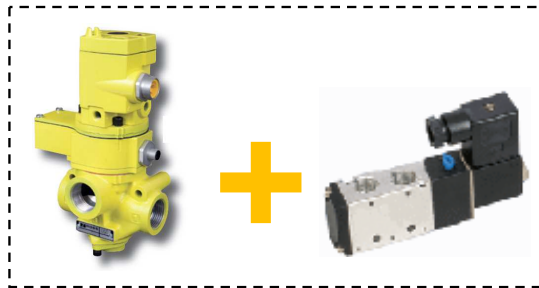
6.2.5 Category 2: Initiating of a safe state

PL a to PL c: whenever practicable, initiation a safe state, otherwise a warning will be sufficient

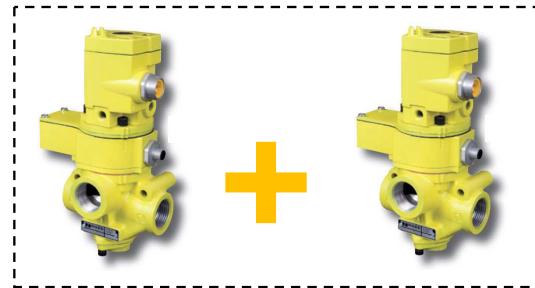


Category 2
PL c

PL d: the Output (OTE) shall initiate a safe state until the fault is cleared!



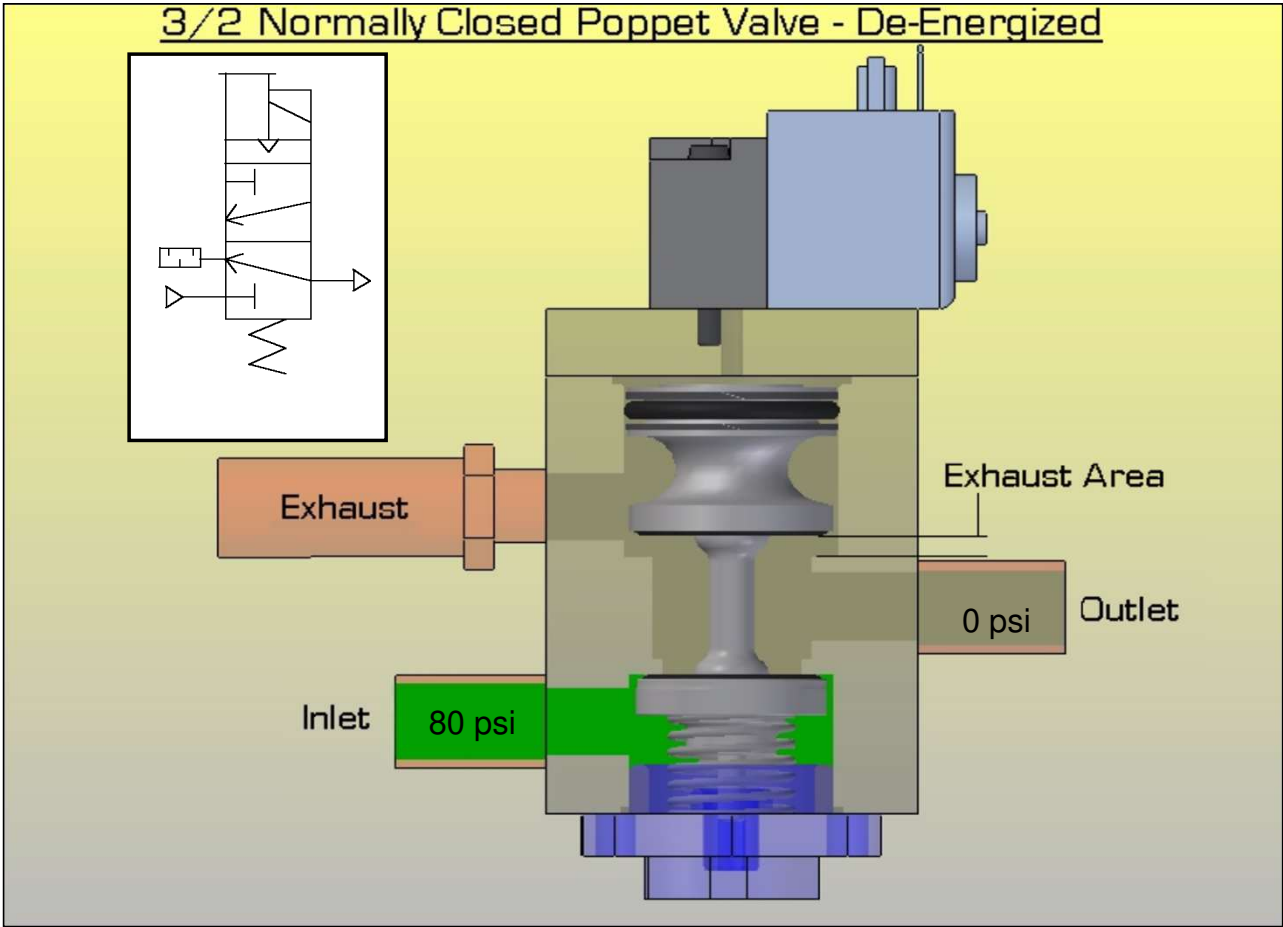
Category 2
PL d

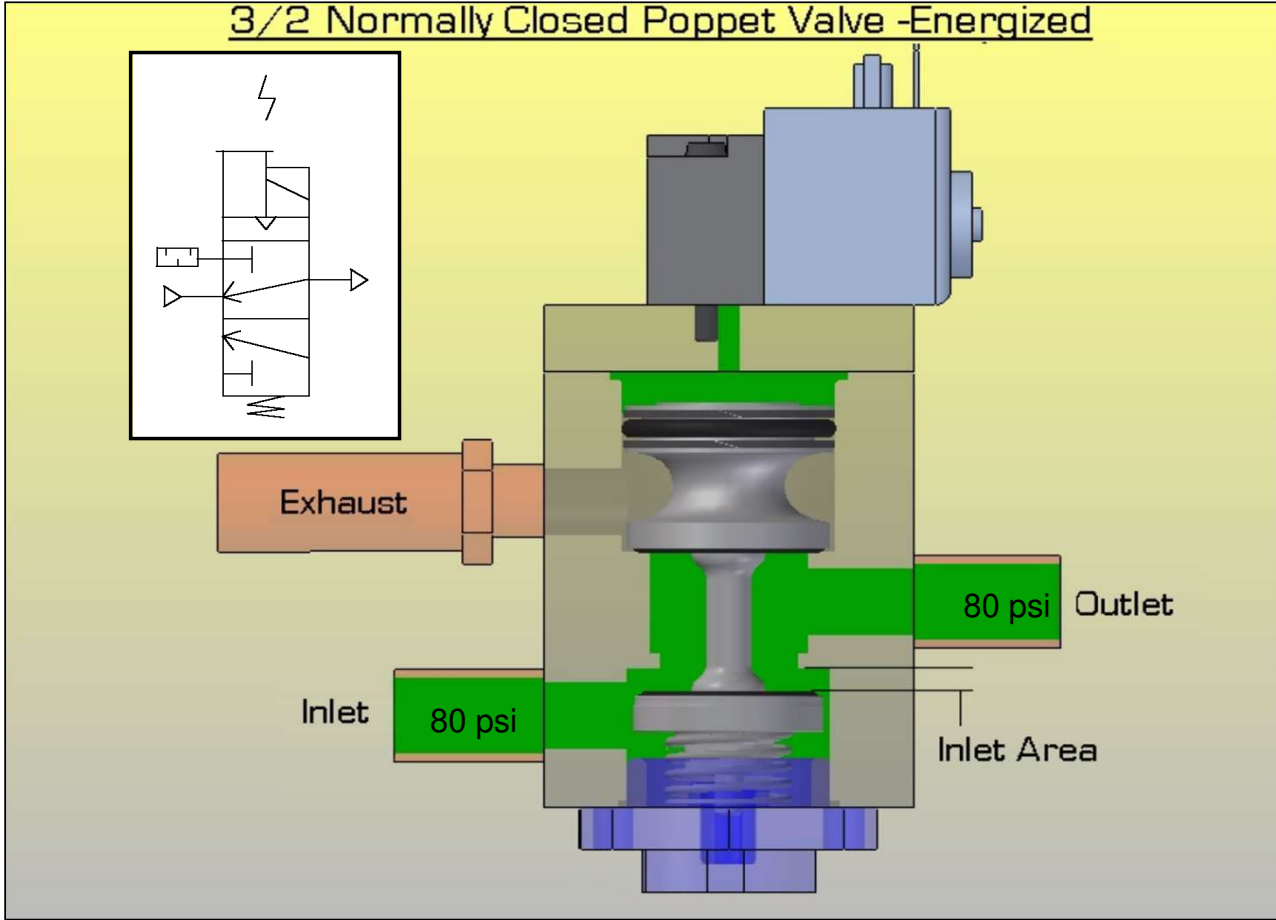


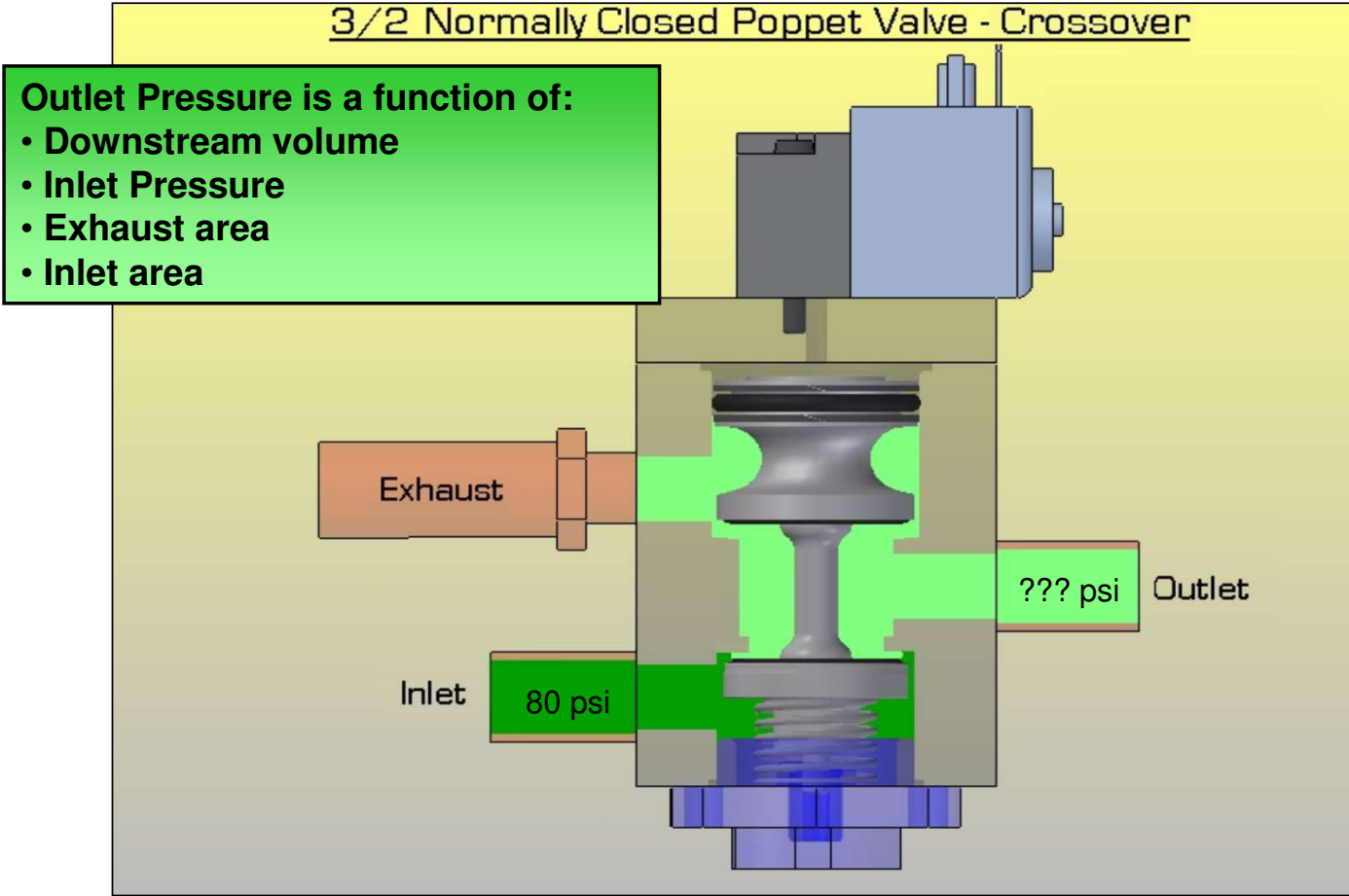
Category 3 / 4
PL d / e



Category 4
PL e



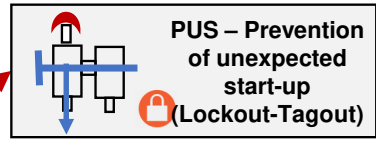






This will never happen?





Pneumatic Safety Valve Systems

Manual Lockout Valves

Safe Exhaust

Safe Pressure Select

Safe Return

Safe Load Holding

Safe Dual Pressure Return

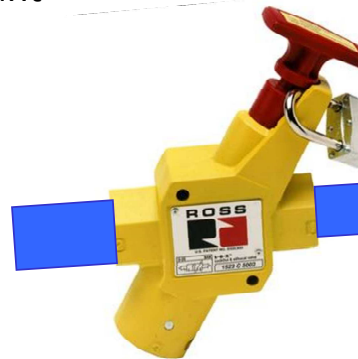
Safety Expertise and Global Support

Superior Value in Pneumatic Safety

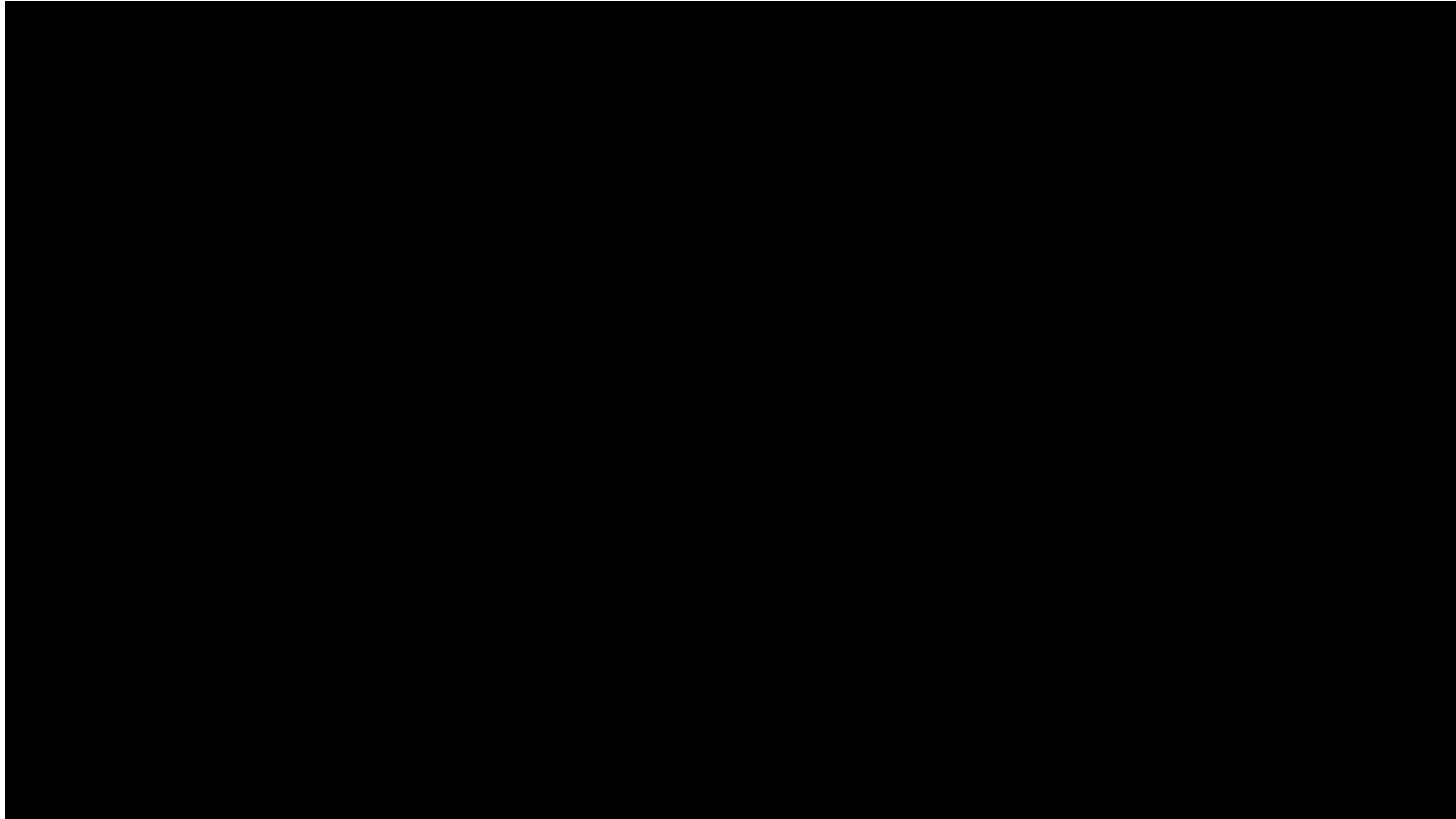
- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Longest lasting valves in the market

Pneumatic Lock-out

- Requirements (ISO 14118)
 - A manually operated valve
 - Not be used for any other function
 - Located outside of hazardous areas
 - Should only be able to be locked in off position
 - Easily identified and operated
 - Tamper resistant



„Napo in ... Safe maintenance!“ Episode „Lock out“



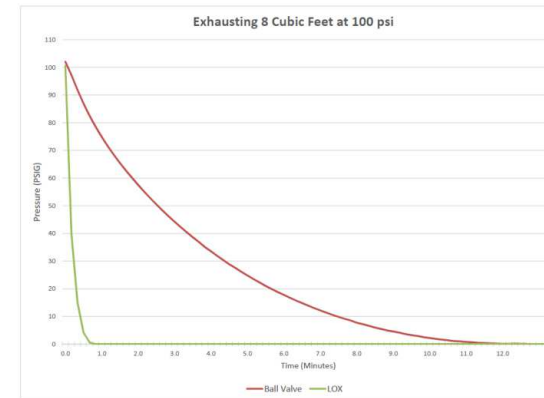
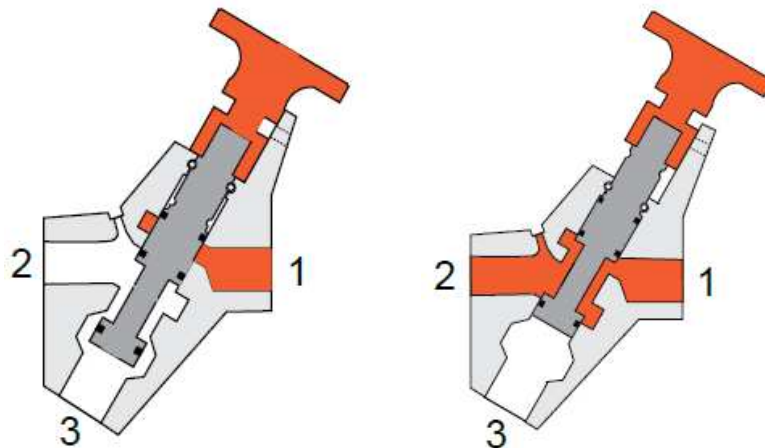
Courtesy of Via Storia, France

Pneumatic Lock-out

- Best Practice (ANSI B11.0 & B155.1)
 - “Positive action” which would indicate only two positions (ON and OFF)
 - A method for the employee to verify that the energy has dissipated after
 - Full diameter exhaust (rapid release of stored energy)

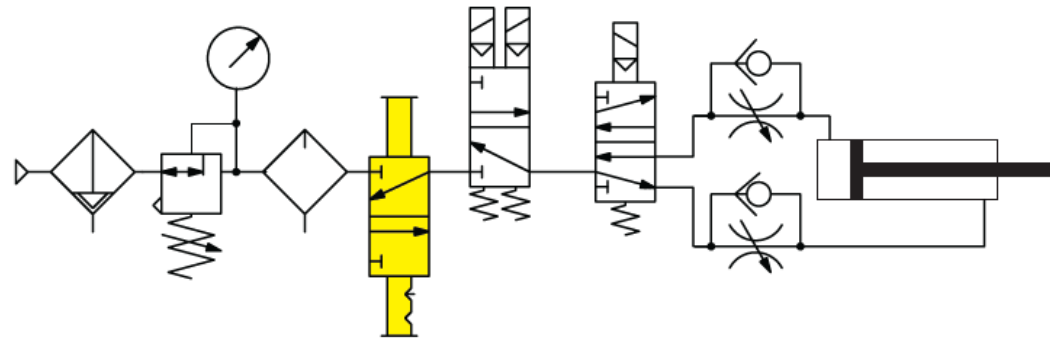
Example: 230l at 7 bar (valve G ½")

- L-O-X[®] - Valve = 35 seconds
- Bleed port > 11 minutes

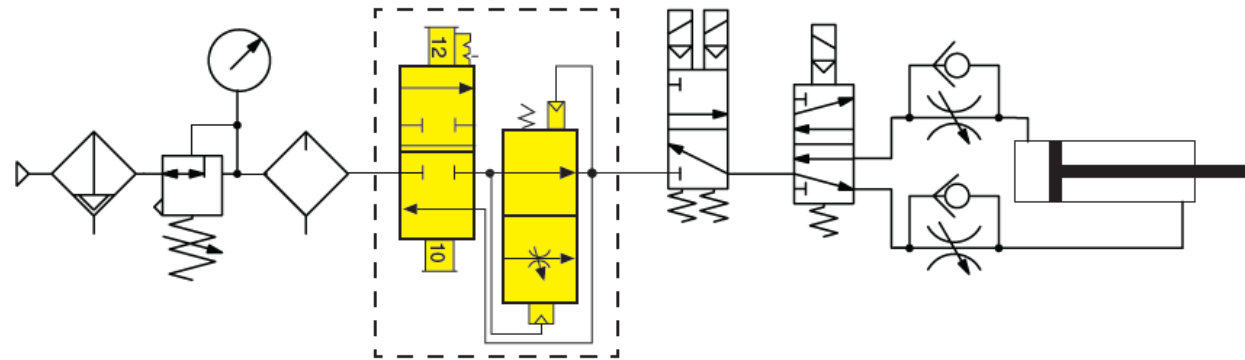


Pneumatic Lock-out

Pneumatic Energy Isolation Example 1 – With standard Lockout valve without Soft-Start



Pneumatic Energy Isolation Example 2 – With standard Lockout valve with Soft-Start



Safety Isolation systems for LOTO (OSHA conform)



**ElectroGuard[™] SIS
Main Control Panel (MCP)**

Electrical Isolation Module
Power Contactors for isolation
and grounding.

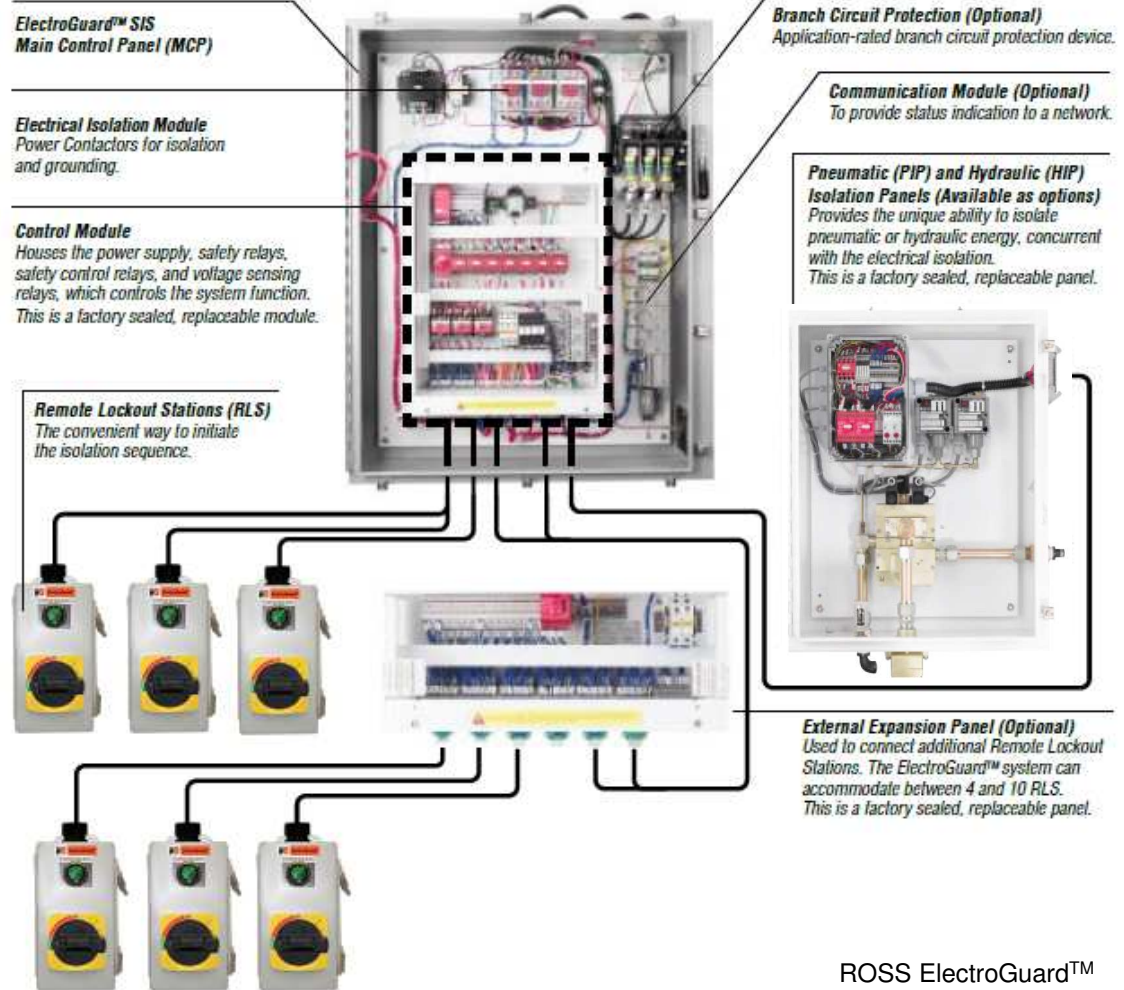
Control Module
Houses the power supply, safety relays,
safety control relays, and voltage sensing
relays, which controls the system function.
This is a factory sealed, replaceable module.

Remote Lockout Stations (RLS)
The convenient way to initiate
the isolation sequence.

Branch Circuit Protection (Optional)
Application-rated branch circuit protection device.

Communication Module (Optional)
To provide status indication to a network.

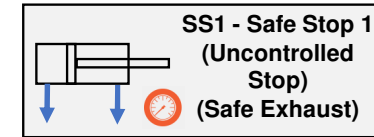
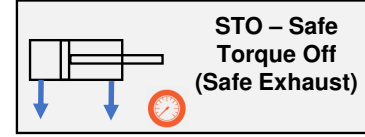
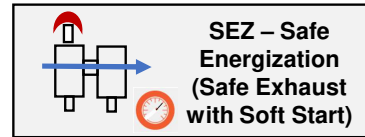
**Pneumatic (PIP) and Hydraulic (HIP)
Isolation Panels (Available as options)**
Provides the unique ability to isolate
pneumatic or hydraulic energy, concurrent
with the electrical isolation.
This is a factory sealed, replaceable panel.



External Expansion Panel (Optional)
Used to connect additional Remote Lockout
Stations. The ElectroGuard[™] system can
accommodate between 4 and 10 RLS.
This is a factory sealed, replaceable panel.

ROSS ElectroGuard[™]

Pneumatic safe-exhaust



Pneumatic Safety Valve Systems

Manual Lockout Valves



Safe Exhaust



Safe Pressure Select



Safe Return



Safe Load Holding



Safe Dual Pressure Return



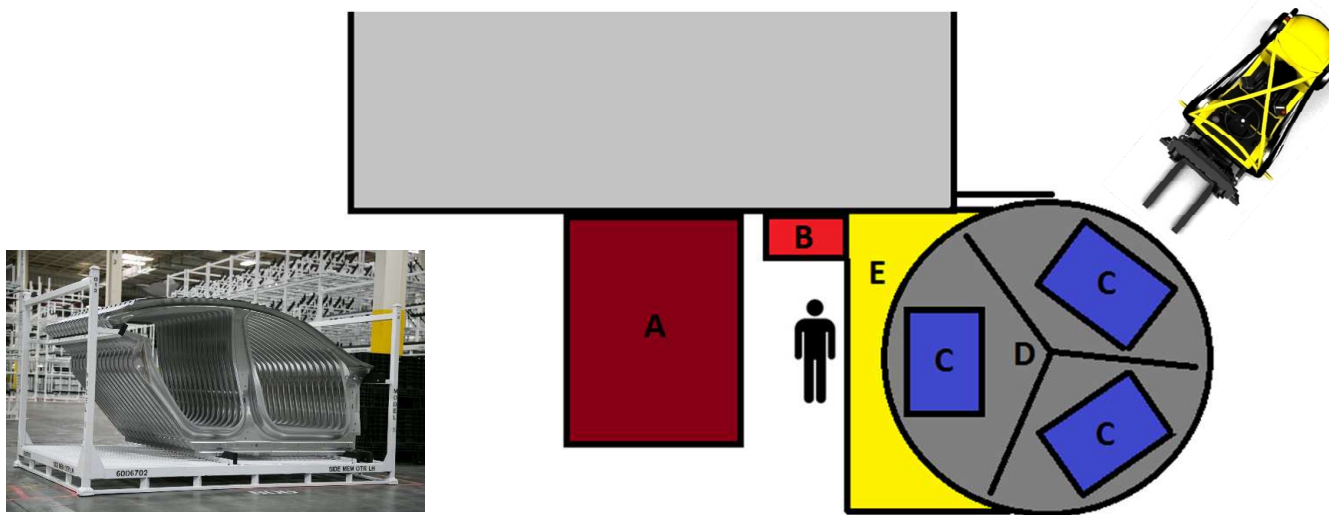
Safety Expertise and Global Support

Superior Value in Pneumatic Safety

- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Internally or externally Monitored
- Soft-start options
- Longest lasting valves in the market

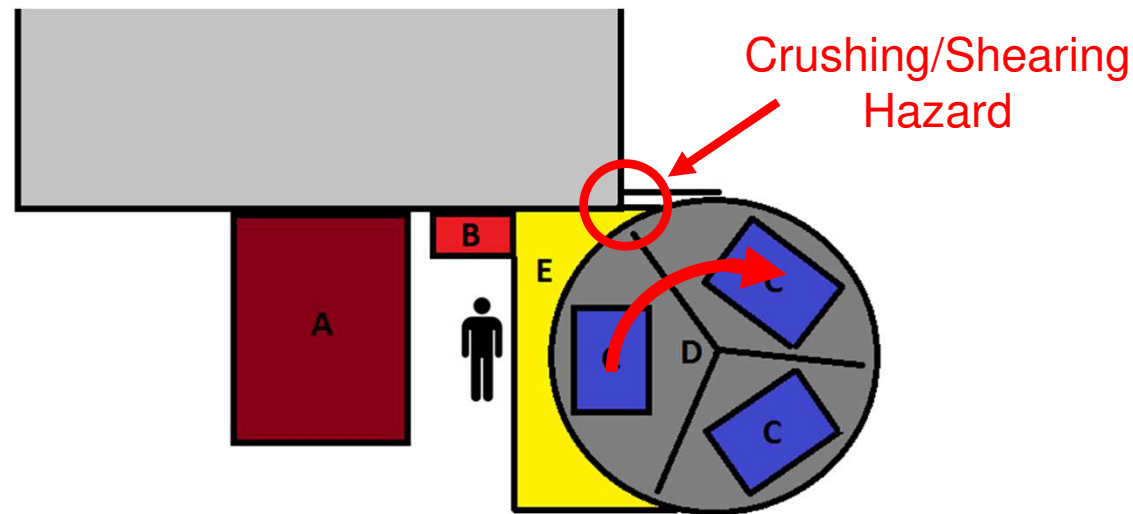
Pneumatic safe-exhaust - Example

- Transfer press line part removal
 - Operator removes part from conveyor A
 - Part is placed on rack C
 - Fork trucks remove full racks, load empty racks



Pneumatic safe-exhaust - Example

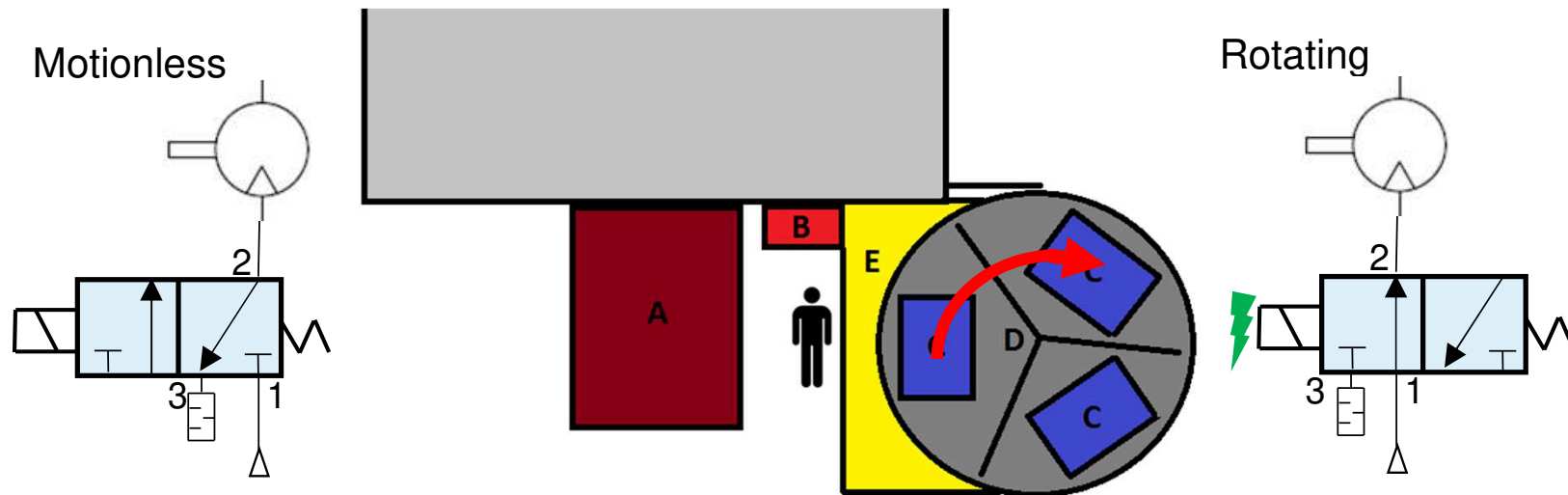
- Hazardous situation
 - Once rack C is full table D must rotate
 - Operator controls 3/2 NC valve at control panel B
 - Rotation creates crushing/shearing hazard



Pneumatic safe-exhaust - Example

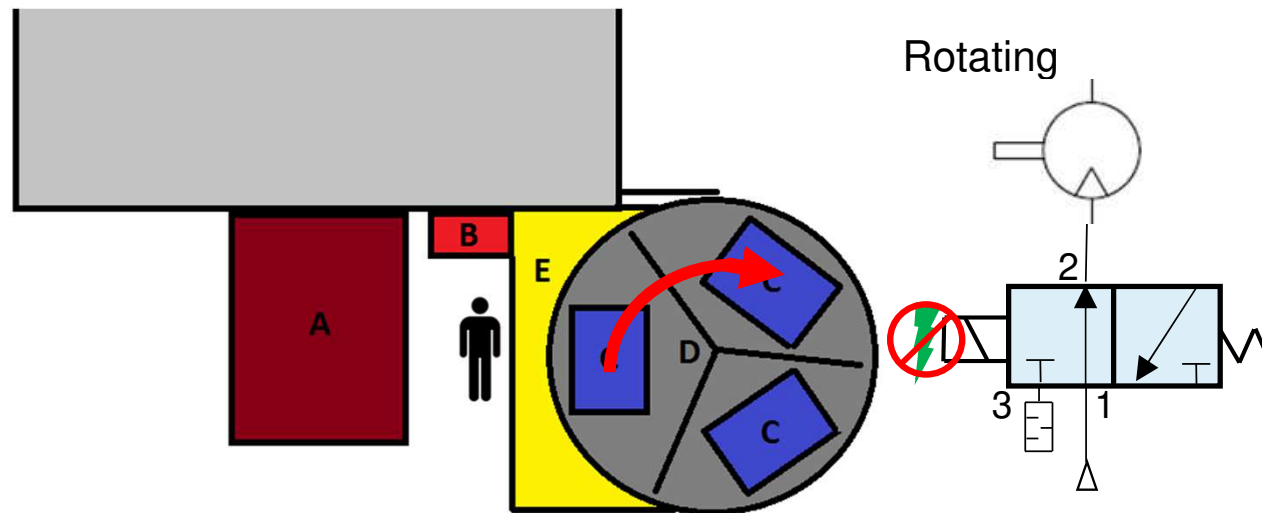
- Safety controls

- Electrical push button controls 3/2 NC valve
- Valve supplies air motor controlling rotation
- Light Curtain E ensures no exposure to crush point



Pneumatic safe-exhaust - Example

- Valve failure mode – Stuck in shifted position
 - Rotation continued
 - Light Curtain & relay had no effect



Pneumatic safe-exhaust - Example

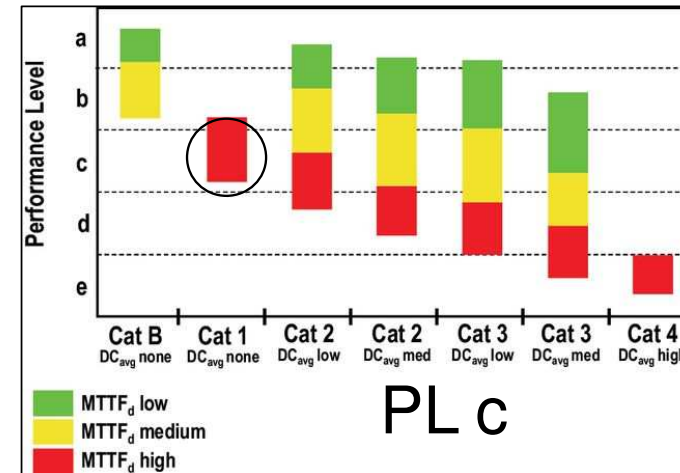
- Light curtain cycle rate = every 1 minute
- Valve cycle rate = every 15 minutes



	Light Curtain	Valve
cycle time (sec)	60	900
hours per day	8	8
days per week	5	5
weeks per year	52	52
cycles per year	124800	8320

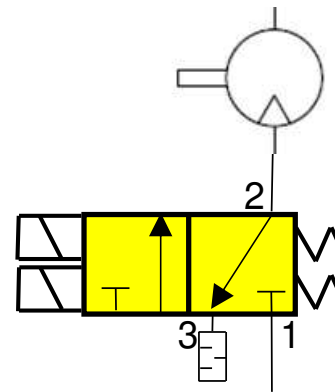
	Input	Logic	Output
Description	Safety Mat	Safety Relay	Valve
B_{10D}			20000000
n_{op}	124800		8320
MTTF_D	100	100	100
DC	99%	99%	0%
Category	4	4	1

System MTTF_D	33	High
System DC	66%	Low
System Category	1	
PL	c	



Pneumatic safe-exhaust - Example

- Fluid power solution
 - Redundant, internal or external-monitored double-valve
 - Fail safe (exhaust)
 - Removes supply when de-energized (stops rotation)



Pneumatic safe-exhaust - Example

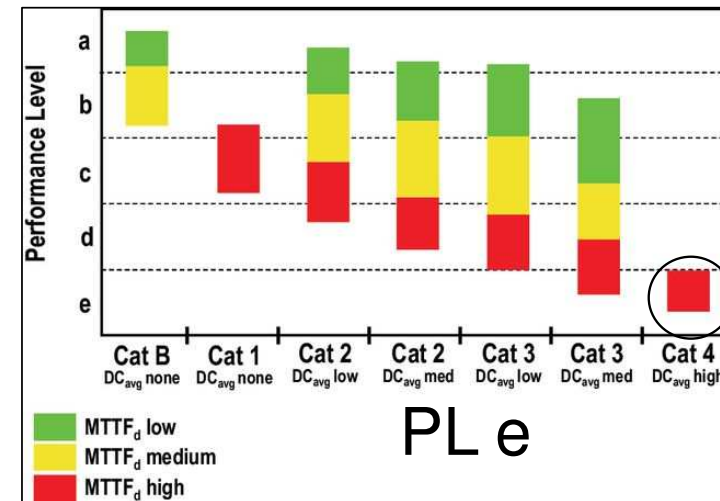
- Safety light curtain cycle rate = every 1 minute
- Valve cycle rate = every 15 minutes



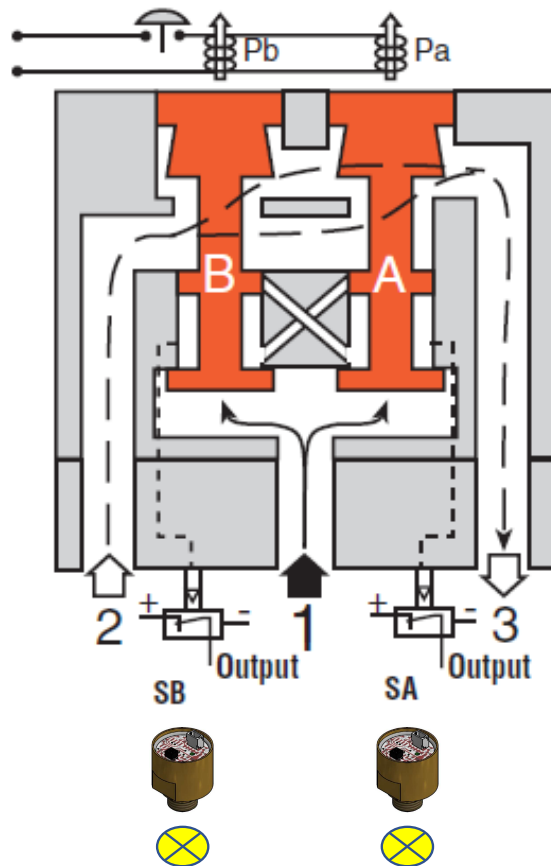
	Light Curtain	Valve
cycle time (sec)	60	900
hours per day	8	8
days per week	5	5
weeks per year	52	52
cycles per year	124800	8320

	Input	Logic	Output
Description	Light curtain	Safety Relay	Valve
B10_D			20000000
n_{op}	124800		8320
MTTF_D	100	100	2500
DC	99%	99%	99%
Category	4	4	4

System MTTF_D	49	High
System DC	99%	High
System Category	4	
PL	e	



M35 – Valve Operation

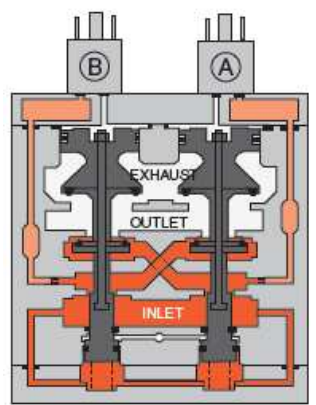


Conditions at Start:

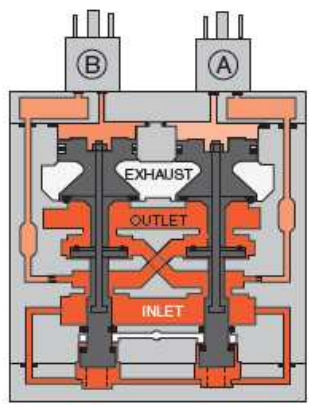
Inlet 1 is closed to outlet 2 by both valve elements A and B. Outlet 2 is open to exhaust 3. Pressure signals at both sensors SA and SB are exhausted. Sensors outputs SA and SB are on.



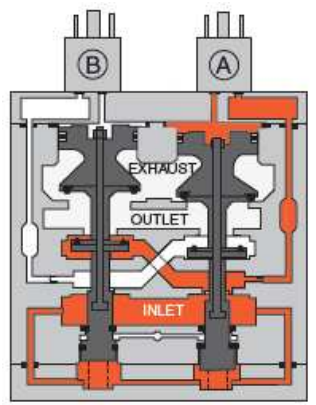
Comparison DM¹ – DM²



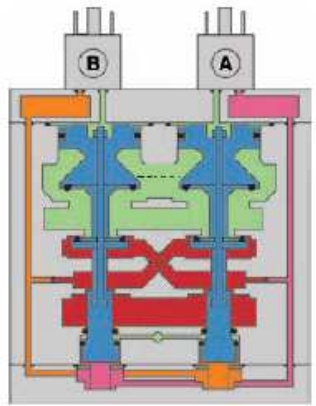
Valve ready to run



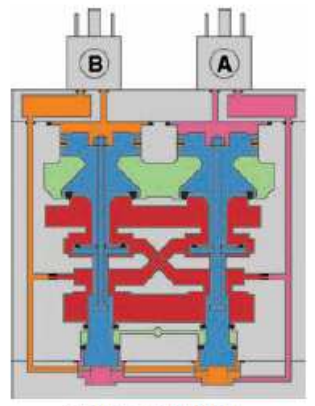
Valve actuated



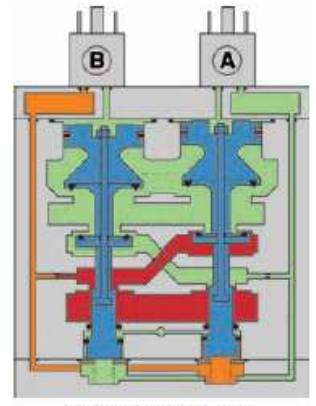
Valve locked out



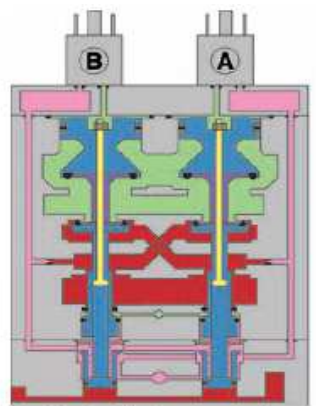
Valve ready to run.



Valve actuated.

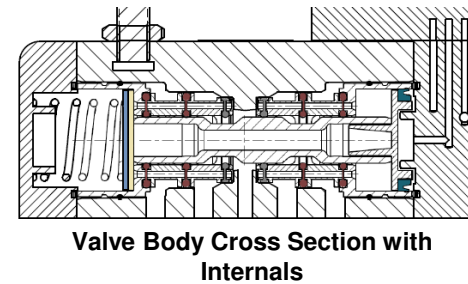
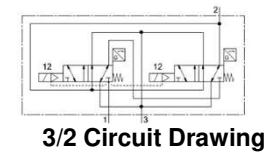
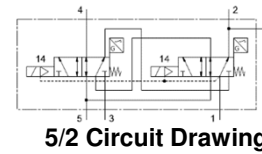
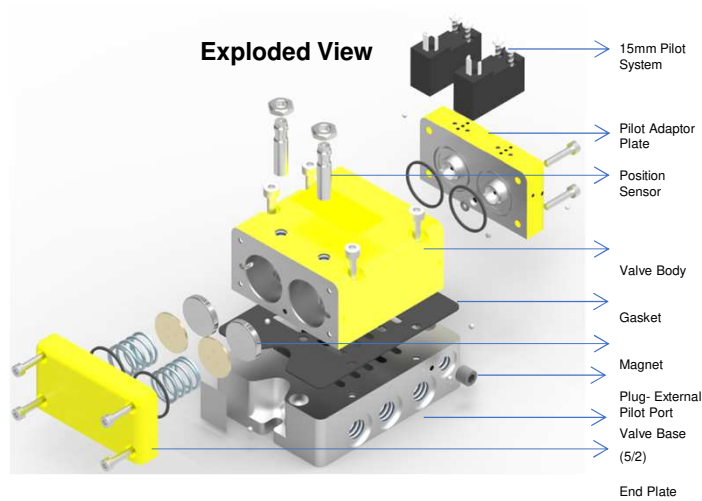


Valve locked out.

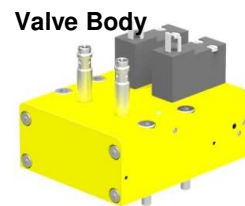


Valve being reset.

RSe - Design Concept (G-1/4")



- ✓ Same Valve Body for Both 3/2 and 5/2 Control Block.
- ✓ Same Control Block for Both Internal Pilot Supply & External Pilot Supply functionality.



3/2 Control Block (Base)



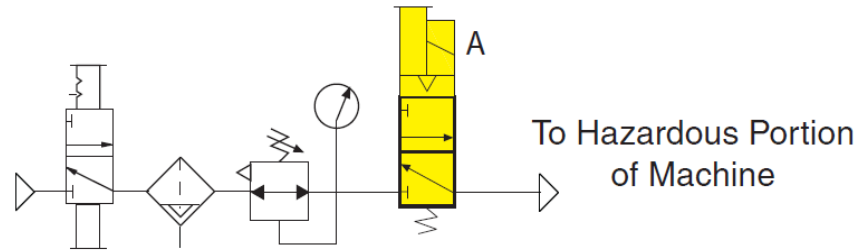
5/2 Control Block (Base)



Safe exhaust / block & bleed examples

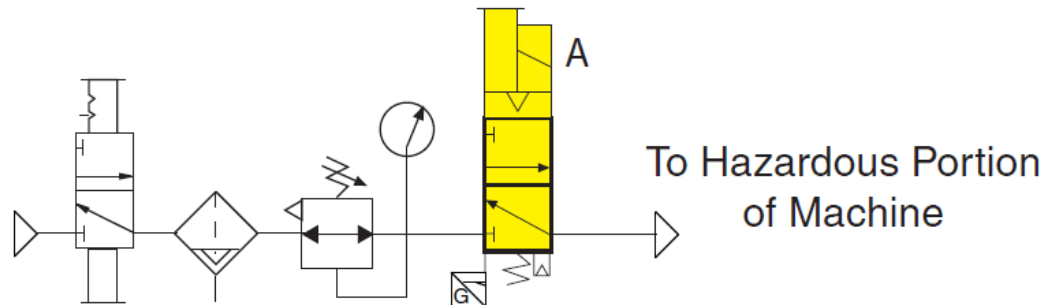
Pneumatic Safe Exhaust Example 1 – Category 1

3/2 single channel solenoid-operated spring return control valve with no feedback. A Category 1 control system may not require a safe exhaust valve for general operation but may be needed for emergency stop or removing the air supply to vacuum systems or other air driven devices.



Pneumatic Safe Exhaust Example 2 – Category 2

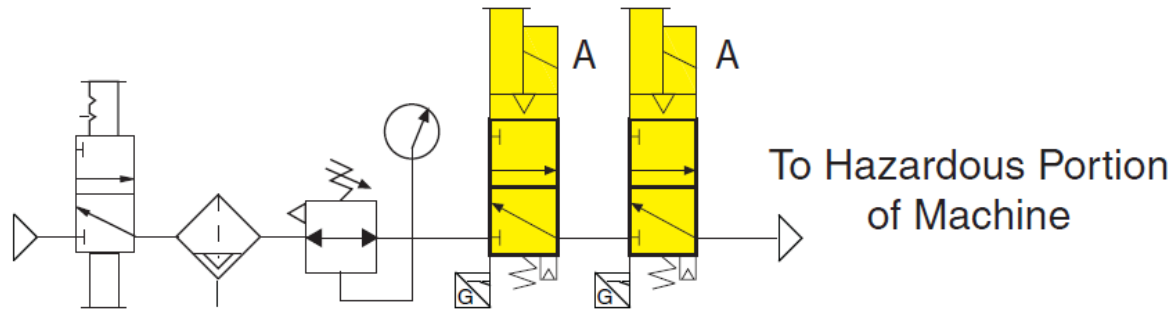
3/2 single channel solenoid-operated spring return control valve with feedback - must be monitored by the safety controller.



Safe exhaust / block & bleed examples

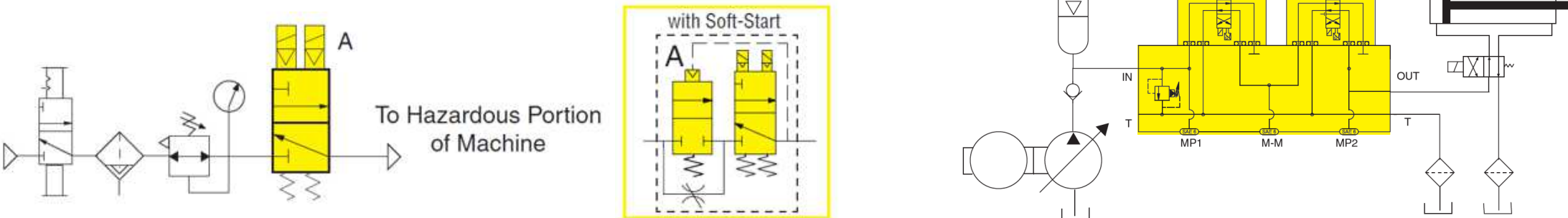
Pneumatic Safe Exhaust Example 3 – Category 3 or 4

Two 3/2 single channel solenoid-operated spring return control valves with feedback - must be monitored by the safety controller.



Pneumatic Safe Exhaust Example 4 – Safe Block & Bleed Example 1 – Category 4

3/2 dual channel solenoid-operated spring return control valve – monitoring may be internal or external depending on valve series selected.



3/2-safety Cat 4/ PL e valve solutions

Internally monitored



with reset



w/o reset

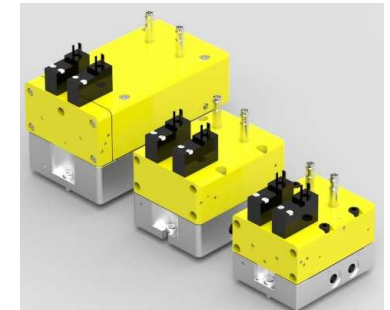
Externally monitored



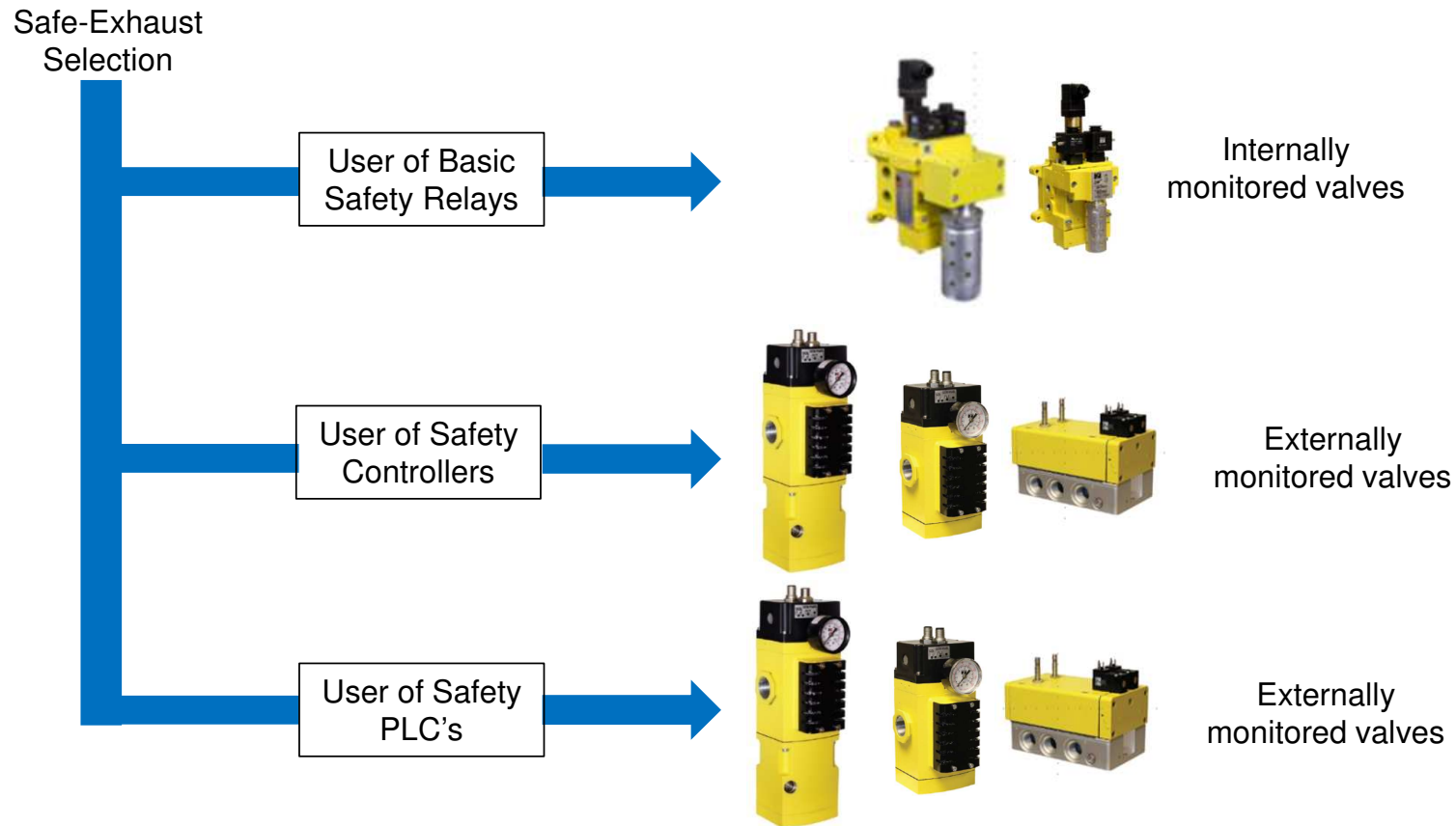
with soft-start



w/o soft-start



Which exhaust valve to use and when?



The externally monitored products are the cheapest and smallest of the 3 ROSS types.

Pneumatic Safe-Dual Pressure Select solutions



Pneumatic Safety Valve Systems

Manual Lockout Valves



Safe Exhaust



Safe Pressure Select



Safe Return



Safe Load Holding



Safe Dual Pressure Return



Safety Expertise and Global Support

Superior Value in Pneumatic Safety

- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Externally Monitored
- Longest lasting valves in the market

Moderate, Serious & Catastrophic injuries require the use of safety solutions that meet Performance Levels C, D and E according to ISO13849

• Per EN 16092-4 here is a Risk of injury if:

Force > 150 N (33.8 lbf)
Weight of tooling > 15 kg (33 lbs)



• Per ANSI B11.0 the Risk is:

Moderate	150 N (33.7 lbf) < Force < 400 N (90)	PLc
Serious	400 N (90 lbf) < Force < 2000 N (450)	PLd
Catastrophic	Force > 2000 N (450 lbf)	PLe

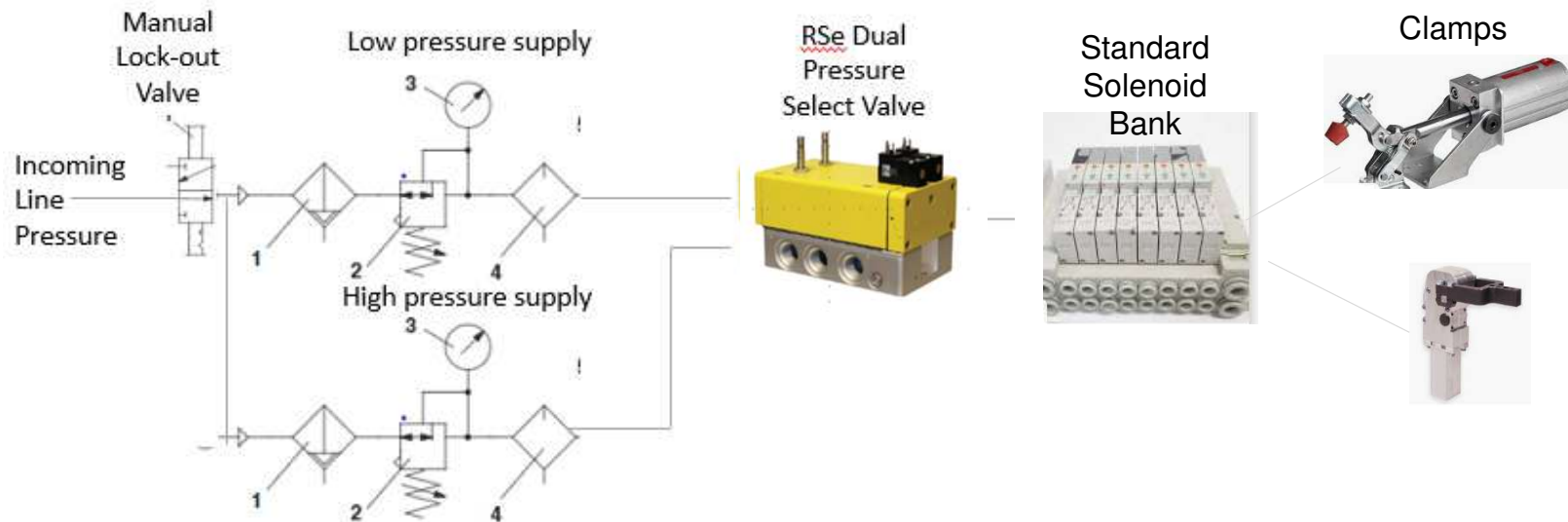
Bore	Area	Force (60 psi)	Force (80 psi)	Force (100 psi)
0.75	0.44	27	35	44
1	0.79	47	63	79
1.25	1.23	74	98	123
1.5	1.77	106	141	177
2.5	4.91	295	393	491
3	7.07	424	565	707
4	12.57	754	1005	1257

Bore	Area	Force (5.5 BAR)	Force (7 BAR)	Force (10 BAR)
14	153.94	85	108	154
22	380.13	209	266	380
27	572.55	315	401	573
50	1963.49	1080	1374	1963
63	3117.24	1714	2182	3117
80	5026.54	2765	3519	5027

If fluid power hazards are moderate, serious or catastrophic the safety solution has to meet PLc, PLd or PLe.

Let's take a look at a welding station

Most welding work-cells uses clamps that are actuated by foot-pedals. These systems are generally operated at full line pressure (100psi), most companies dump pneumatic pressure when the operator is loading parts.

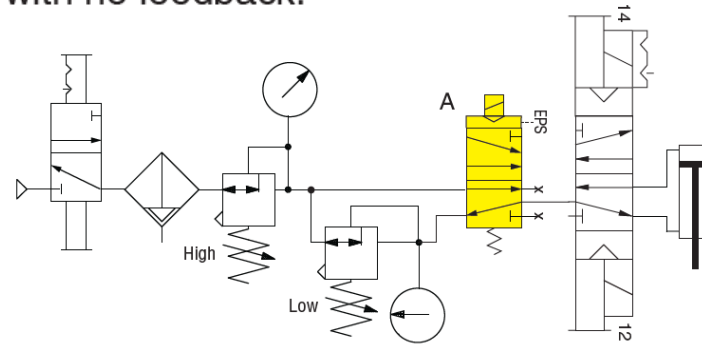
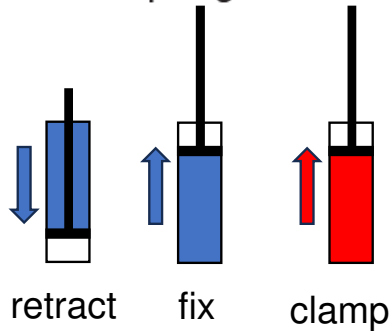


Welding and riveting machine manufacturers are using safe pressure select valves to switch between high and low pressure when operators are in the load area.

Safe pressure select examples

Safe Pressure Select Example 1 – Category 1

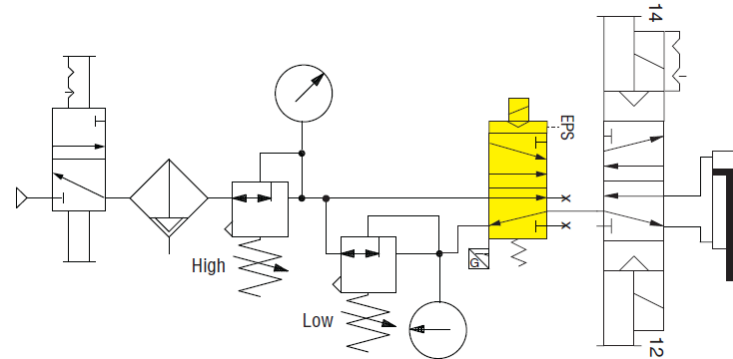
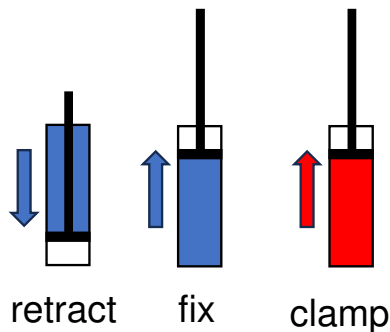
5/2 single solenoid-operated spring return control valve with no feedback.



NOTE:
The use of Safe Pressure Select solutions requires the force to be reduced to below the safe limited force of 150N.

Safe Pressure Select Example 2 – Category 2

5/2 single channel solenoid-operated spring return control valve with feedback - must be monitored by the safety control system.

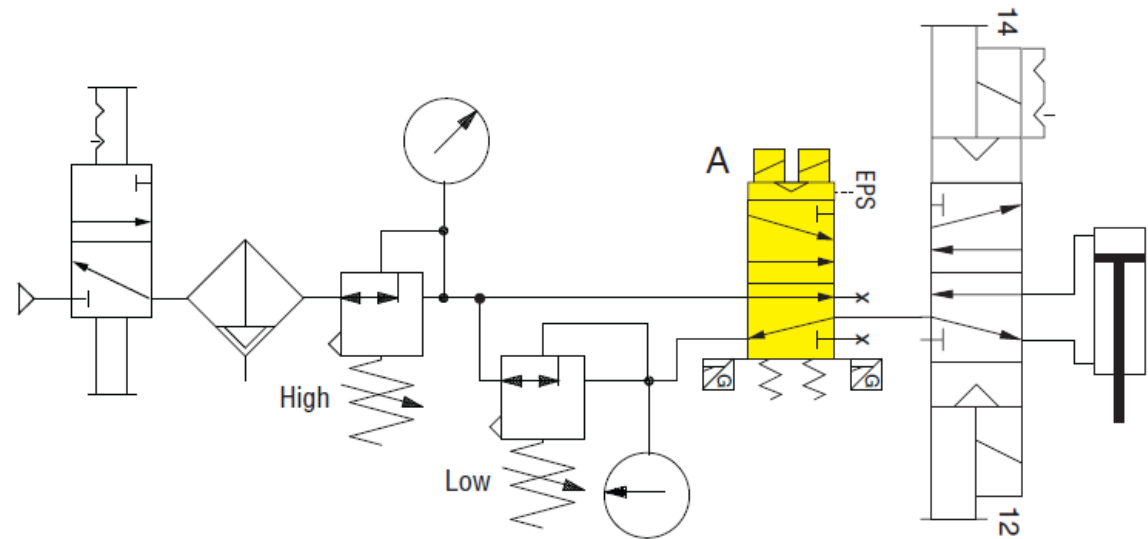
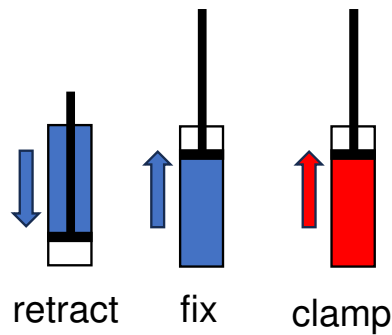


NOTE:
The use of Safe Pressure Select solutions requires the force to be reduced to below the safe limited force of 150N.

Safe pressure select examples

Safe Pressure Select Example 3 – Category 4

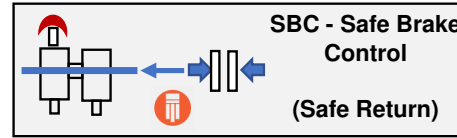
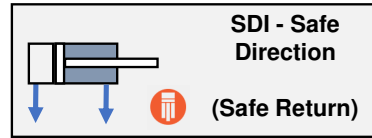
5/2 dual channel solenoid-operated spring return control valve with feedback - must be monitored by the safety controller.



NOTE:

The use of Safe Pressure Select solutions requires the force to be reduced to below the safe limited force of 150N.

Pneumatic safe-return valve solution



Pneumatic Safety Valve Systems

Manual Lockout Valves



Safe Exhaust



Safe Pressure Select



Safe Return



Safe Load Holding



Safe Dual Pressure Return



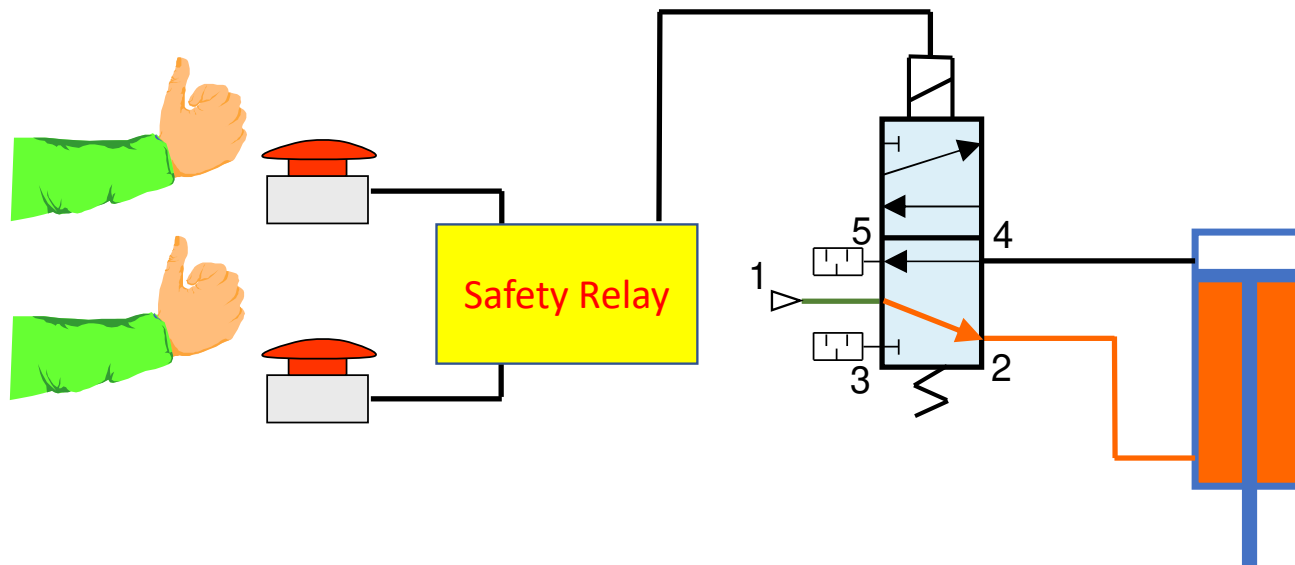
Safety Expertise and Global Support

Superior Value in Pneumatic Safety

- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Internally or externally Monitored
- Longest lasting valves in the market

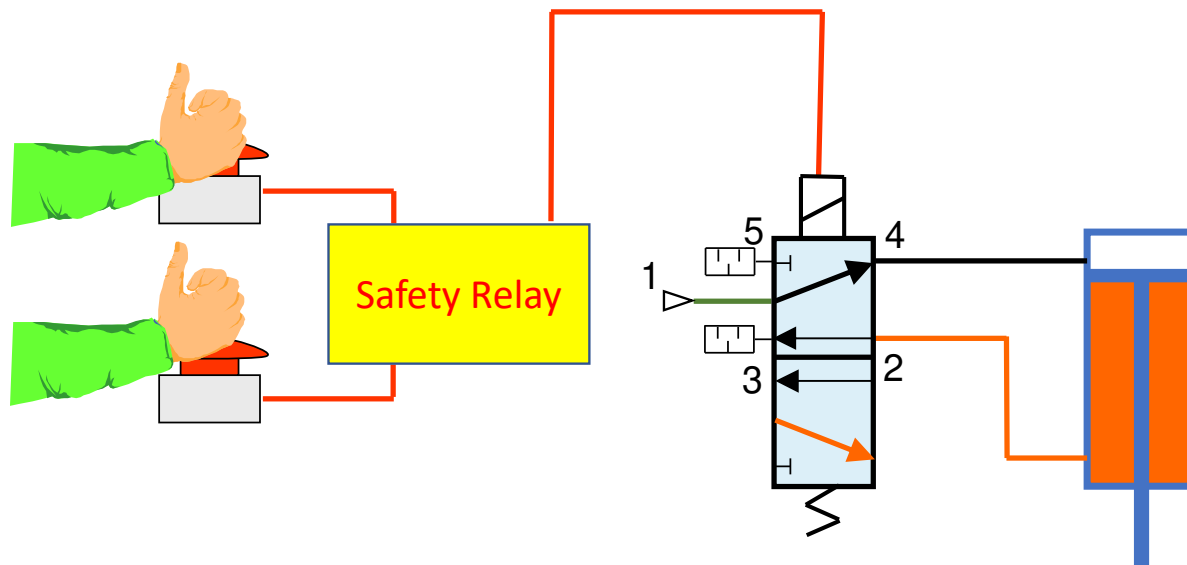
Safe return example – Vertical Cylinder

- Single channel example



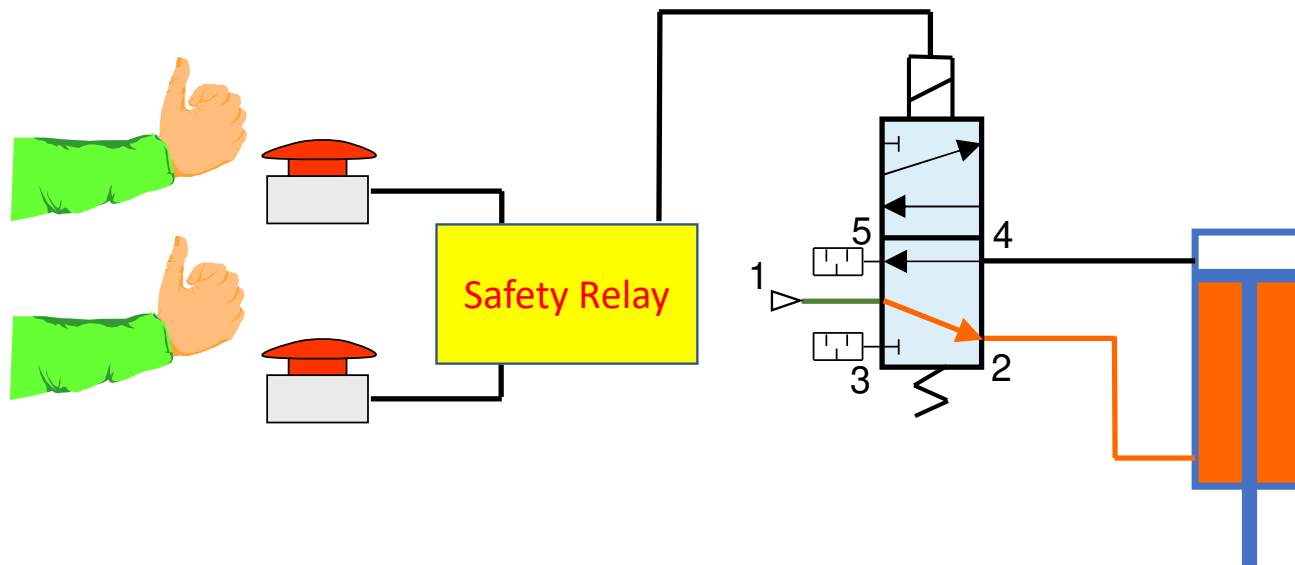
Safe return example – Vertical Cylinder

- Single channel example



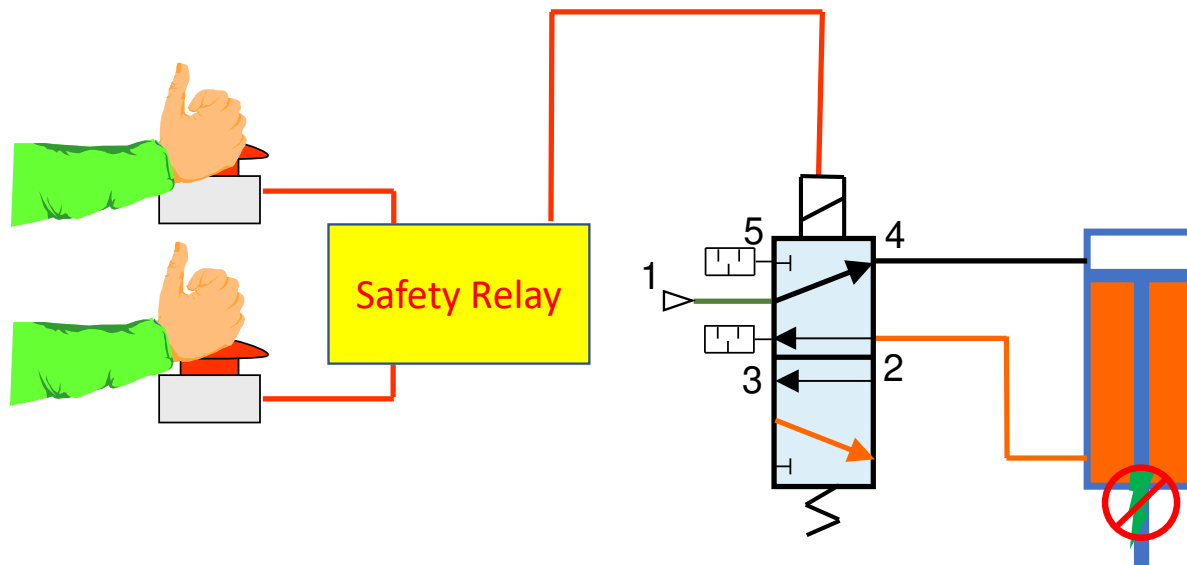
Safe return example – Vertical Cylinder

- Single channel example



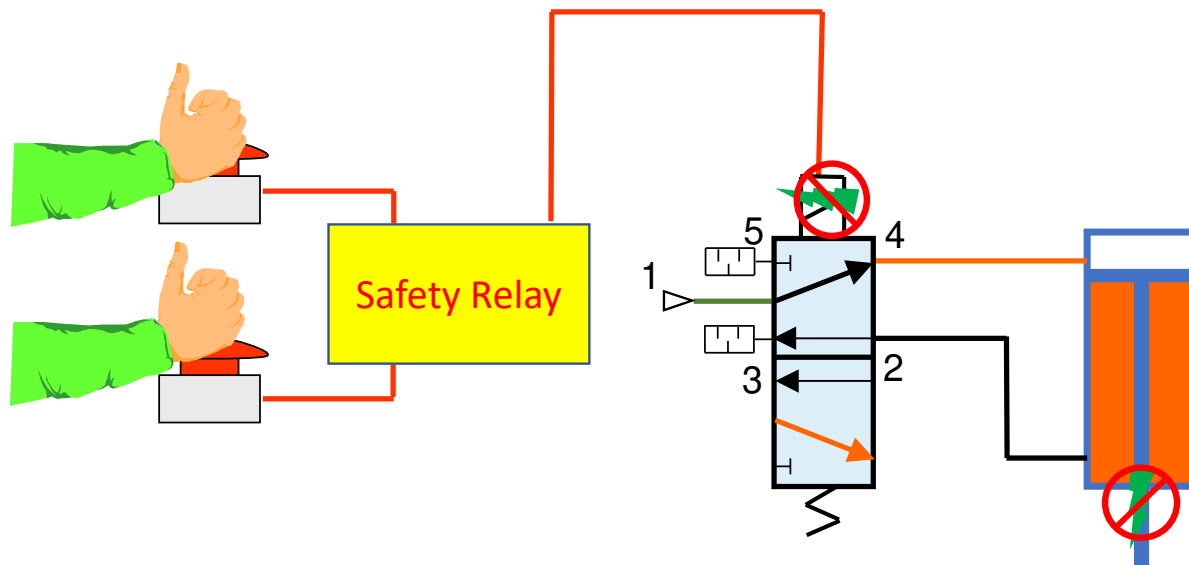
Safe return example – Vertical Cylinder

- Single channel **failure** example



Safe return example – Vertical Cylinder

- Single channel **failure** example



pinched

Safe return example – Vertical Cylinder

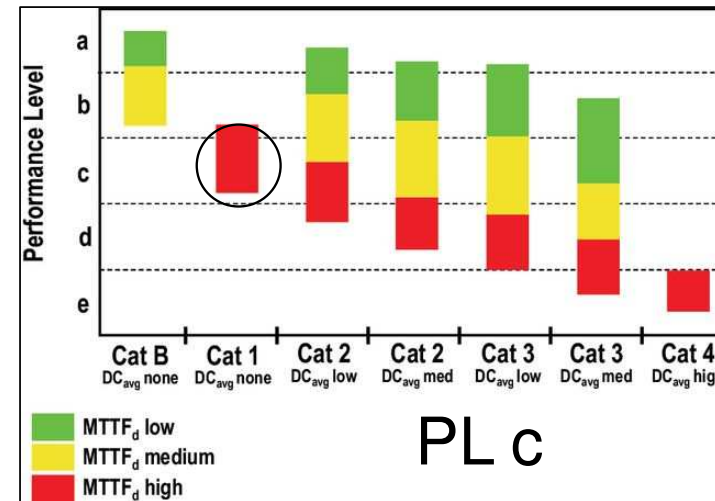
- Two hand control system = 1 min cycle rate



Cycles	Two Hand	Valve
cycle time (sec)	60	60
hours per day	8	8
days per week	5	5
weeks per year	50	50
cycles per year	120000	120000

	Input	Logic	Output
Description	Two Hand	Safety Relay	Valve
B10_D	1000000		20000000
n_{op}	120000		120000
MTTF_D	83	100	100
DC	99%	99%	0%
Category	4	4	1

System MTTF_D	31	High
System DC	68%	Low
System Category	1	
PL	c	

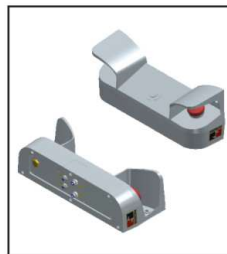


Safe return example – Vertical Cylinder

- Two hand control
- Valve to extend cylinder
- Dual safety circuit



KATEGORIE
4
DIN EN ISO 13849



KATEGORIE
4
DIN EN ISO 13849

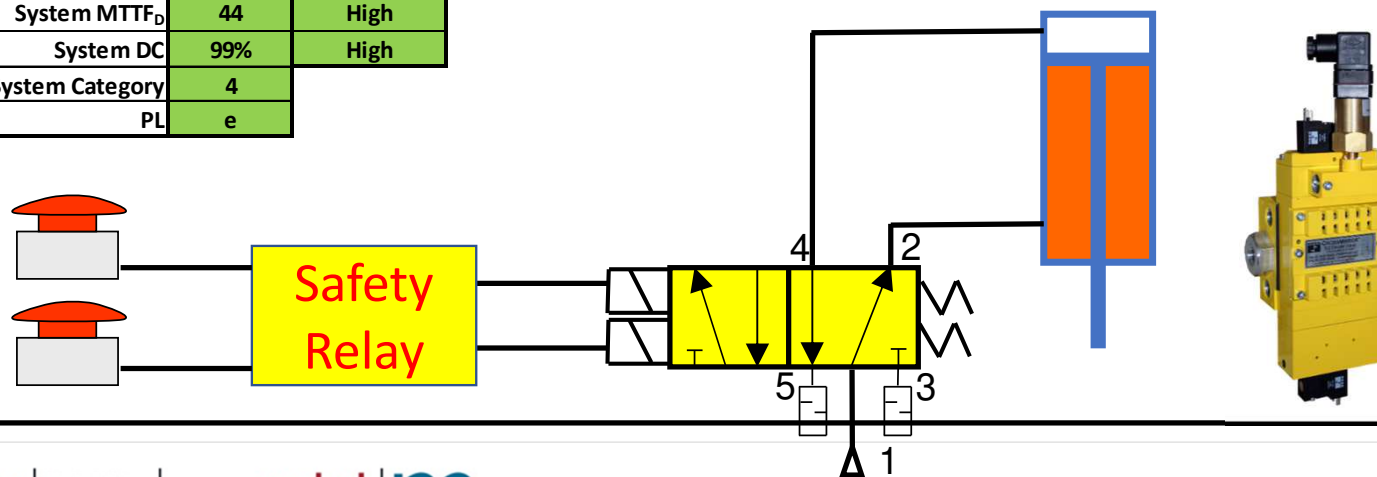
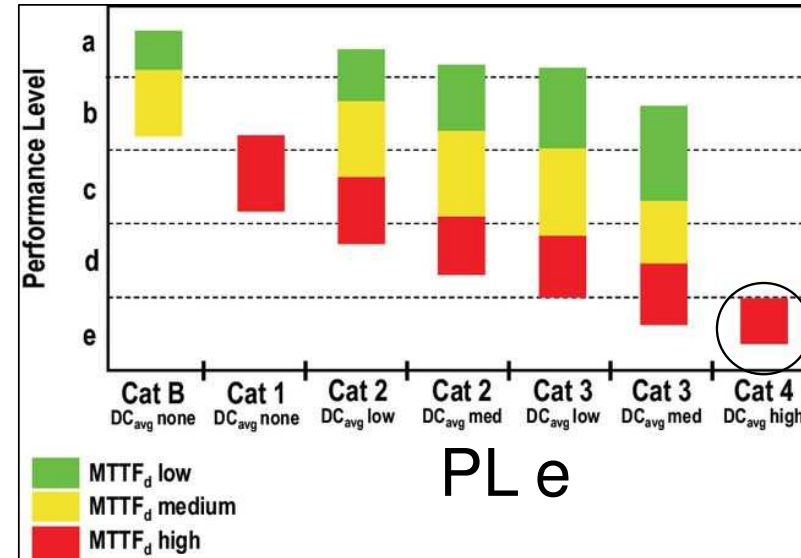


Safe return example – Vertical Cylinder

	Two Hand	Valve
cycle time (sec)	60	60
hours per day	8	8
days per week	5	5
weeks per year	50	50
cycles per year	120000	120000

	Input	Logic	Output
Description	Two Hand	Safety Relay	Valve
B10 _D	1000000		20000000
n _{op}	120000		120000
MTTF _D	83	100	1667
DC	99%	99%	99%
Category	4	4	4

System MTTF _D	44	High
System DC	99%	High
System Category	4	
PL	e	



5/2-safety Cat 4/ PL e valve solutions

Internally monitored

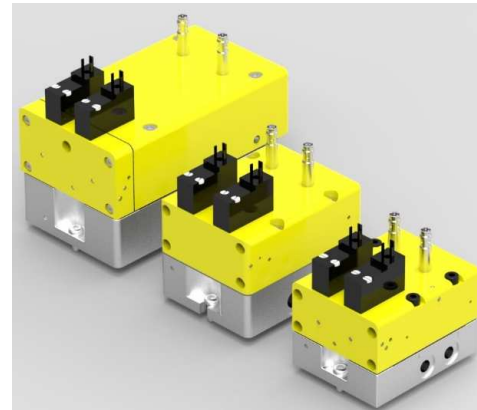


with reset



w/o reset

Externally monitored



Which safe return valve to use and when?

Safe-Exhaust
Selection

User of Basic
Safety Relays



Cross Mirror
Internally
monitored valves

User of Safety
Controllers



RSe with 5/2 Base
Externally
monitored valves

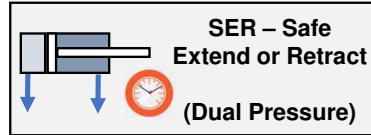
User of Safety
PLC's



RSe with 5/2 Base
Externally
monitored valves

The externally monitored products are the cheapest and smallest of the ROSS cylinder return valves.

Pneumatic safe dual pressure return valve solution



Pneumatic Safety Valve Systems

Manual Lockout
Valves



Safe Exhaust



Safe Pressure
Select



Safe Return



Safe Load Holding



Safe Dual
Pressure Return



Safety Expertise and Global Support

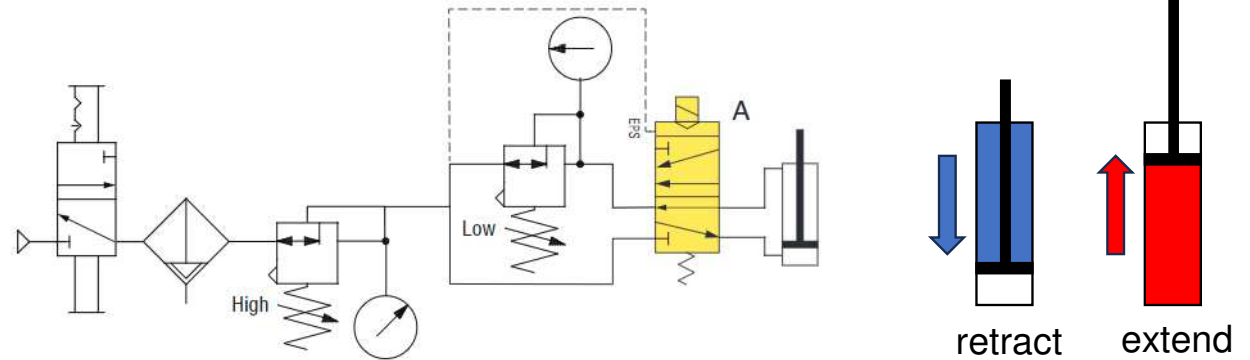
Superior Value in Pneumatic Safety

- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Externally Monitored
- Longest lasting valves in the market

Safe return Dual Pressure Examples

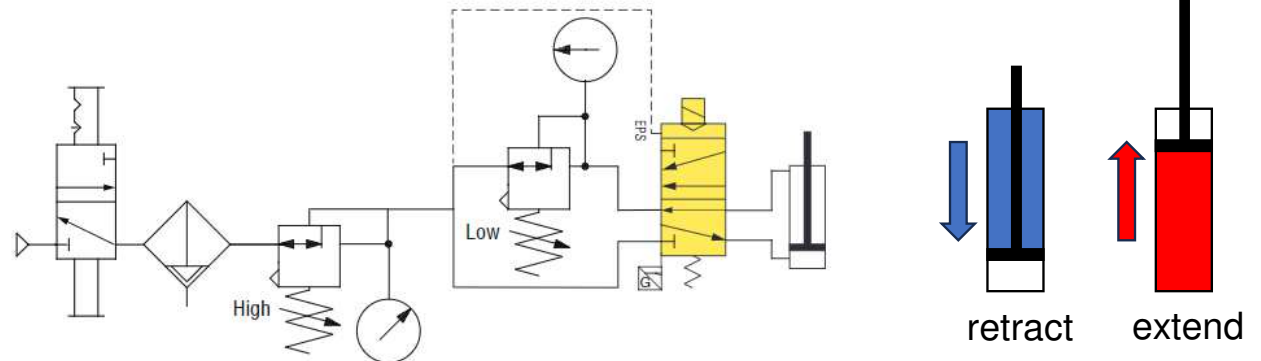
Safe Return Dual Pressure Example 1 – Category 1

5/2 single solenoid-operated spring return control valve with no feedback.



Safe Return Dual Pressure Example 2 – Category 2

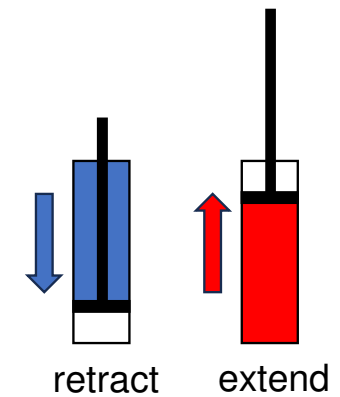
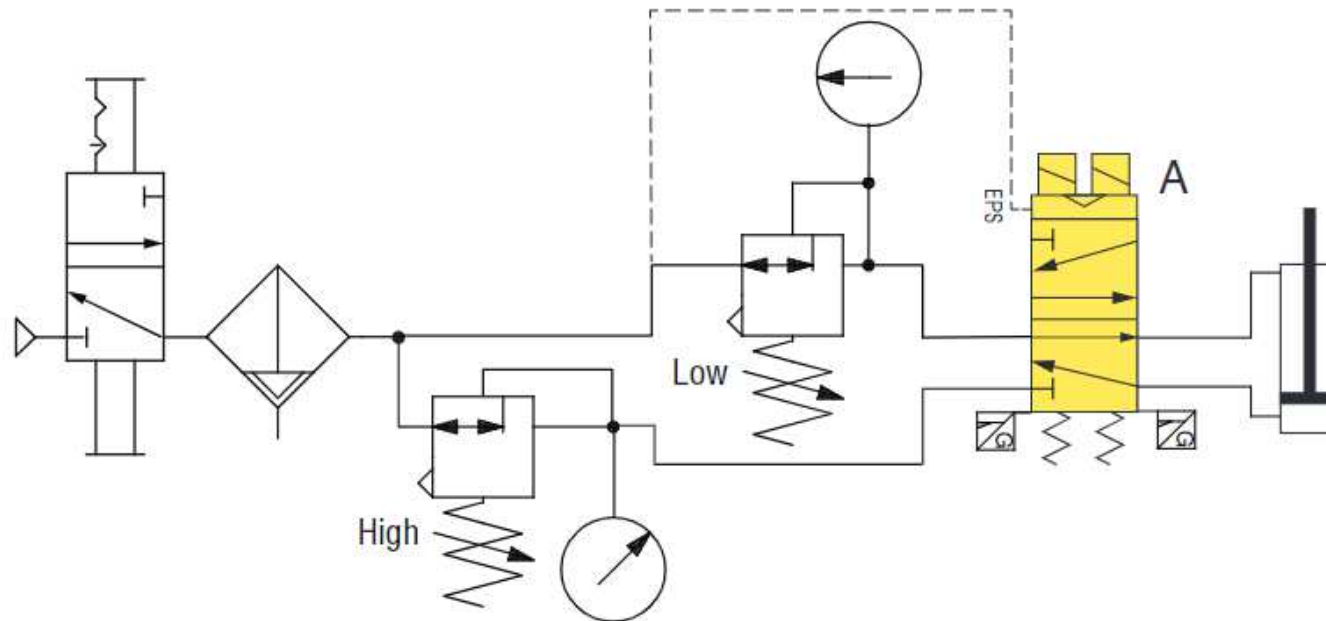
5/2 single solenoid-operated spring return control valve with feedback - must be monitored by the safety controller.



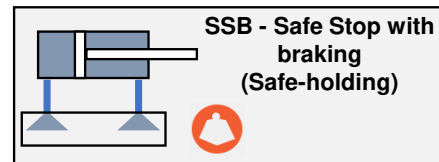
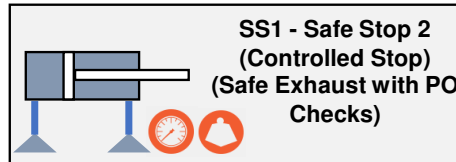
Safe pressure select examples

Dual Safe Return Dual Pressure Example 3 – Category 4

5/2 dual channel solenoid-operated spring return control valve with feedback - must be monitored by the safety controller.



Pneumatic safe load holding valve solution



Pneumatic Safety Valve Systems

Manual Lockout Valves



Safe Exhaust



Safe Pressure Select



Safe Return



Safe Load Holding



Safe Dual Pressure Return



Safety Expertise and Global Support

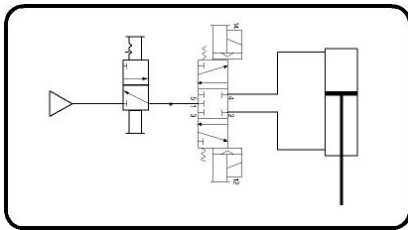
Superior Value in Pneumatic Safety

- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Externally Monitored
- Trapped pressure release
- Longest lasting valves in the market

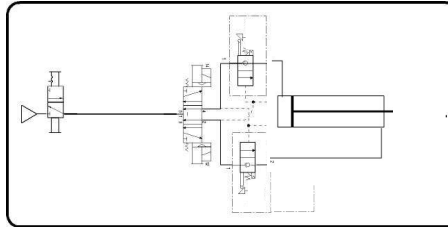
Pneumatic safe load holding valve solutions

- Load holding with one of the most difficult areas for pneumatic safety to implement because there are a number of solutions depending on the safety level that needs to be reached.

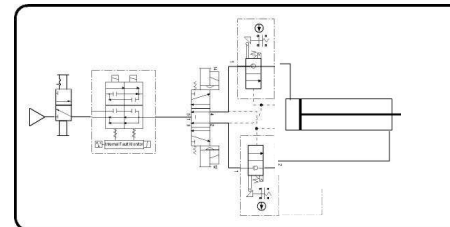
Current CAT B/1 Solution



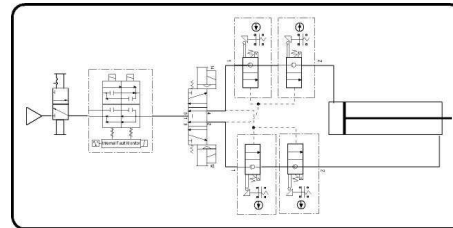
Current CAT B/1 Solution



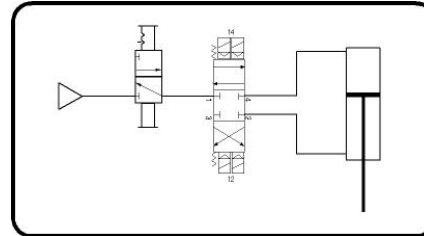
Current CAT 2 Solution



Current CAT 3 Solution



New CrossCheck CAT 3/4 Solution



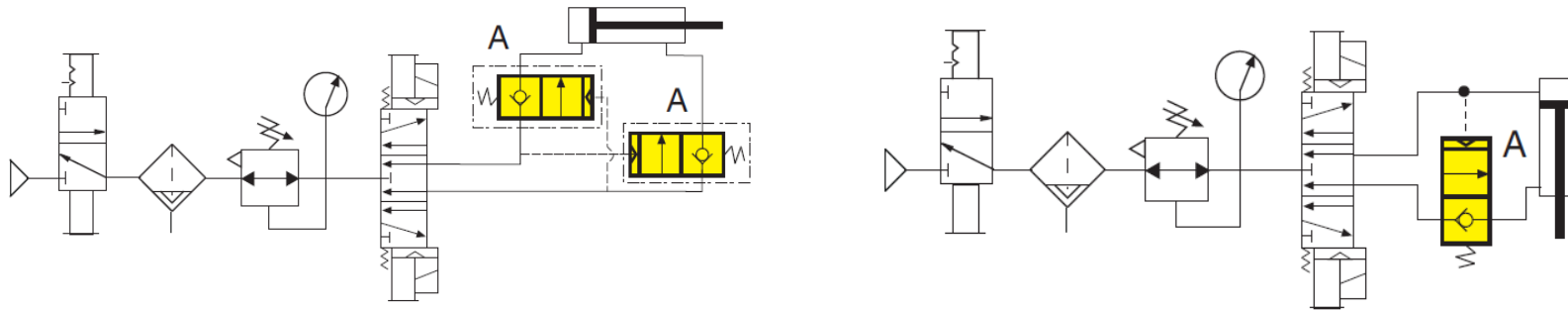
These will be explained in more detail in the following slides.

Load holding in the most complex application that you will see and most people do it wrong!

Safe Load holding examples

Pneumatic Safe Load Holding Example 1 – Category 1

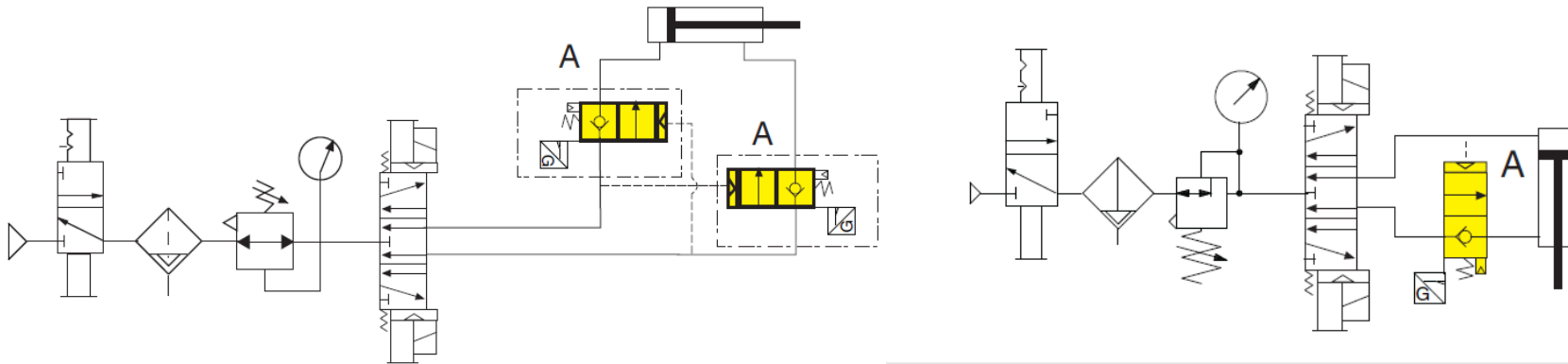
Single channel pilot-operated check valve with no feedback.



NOTE:
Horizontal applications may need PO check valves on both the rod and cap ends of the cylinder to prevent movement

Pneumatic Safe Load Holding Example 2 – Category 2

Single channel pilot-operated check valve with feedback - must be monitored by the safety controller.

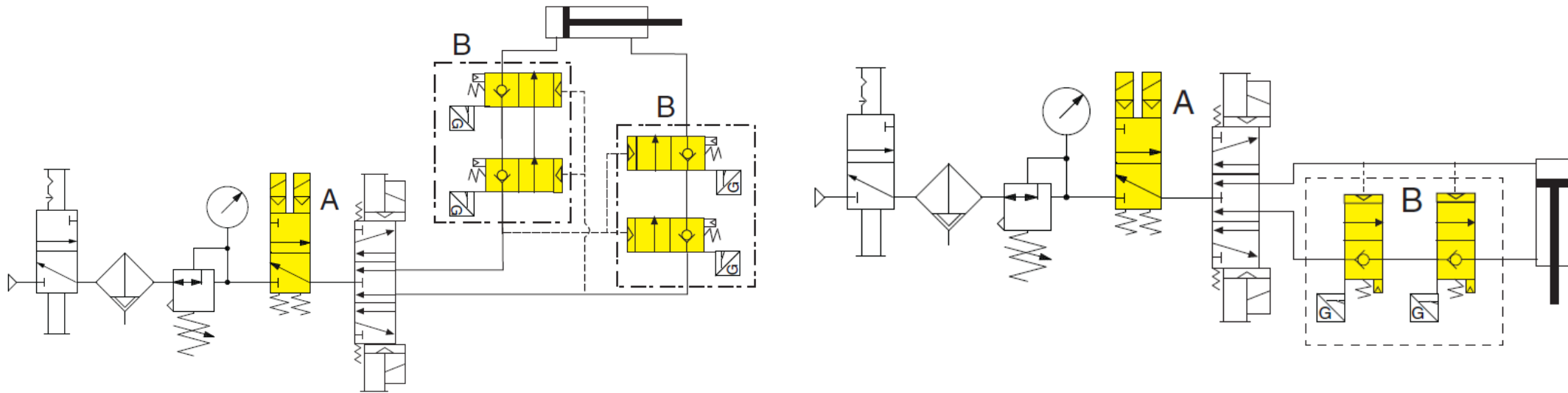


NOTE:
Horizontal applications may need PO check valves on both the rod and cap ends of the cylinder to prevent movement

Safe Load holding examples

Pneumatic Safe Load Holding Example 3 – Category 3

Redundant pilot-operated check valves with feedback - must be monitored by the safety controller. Addition of the safe exhaust valve ensures a failure of the control valve does not override the PO check function. Open-center directional valves are recommended because closed-center valves can hinder operation of the pilot-operated check(s).

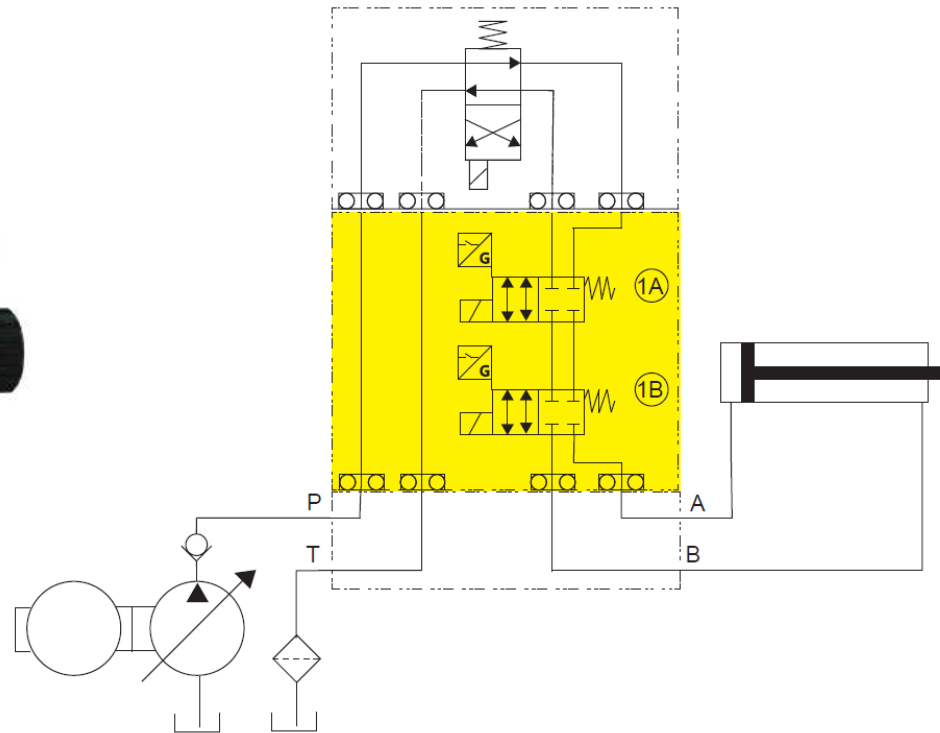


NOTE:
Horizontal applications may need PO check valves on both the rod and cap ends of the cylinder to prevent movement

Hydraulic Dual Safe Block & Stop example

Dual Safe Block and Stop Example – Category 4

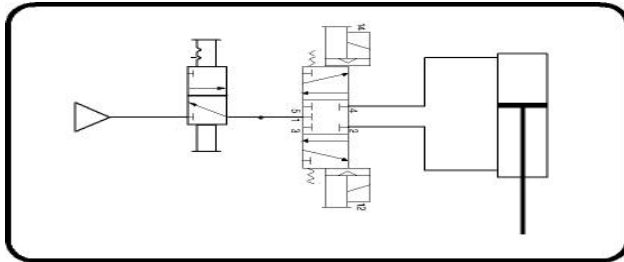
Redundant dual channel solenoid-operated Block and Stop valve with feedback – used to block both cylinder lines - must be monitored by the safety controller.



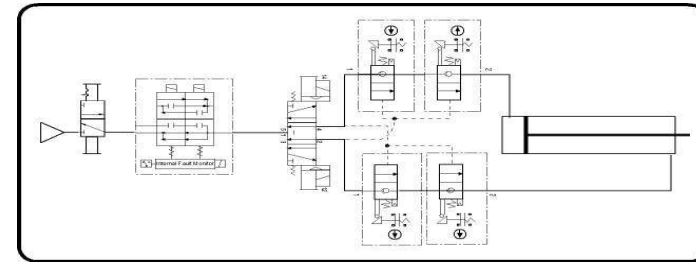
NOTE:
Dual Block & Stop valves are often used with an emergency stop to isolate supply pressure going to the valves that control machine actuators. Dual Block & Stop valves are also typically used on individual actuators to protect one area of a machine/system

CC4 Application

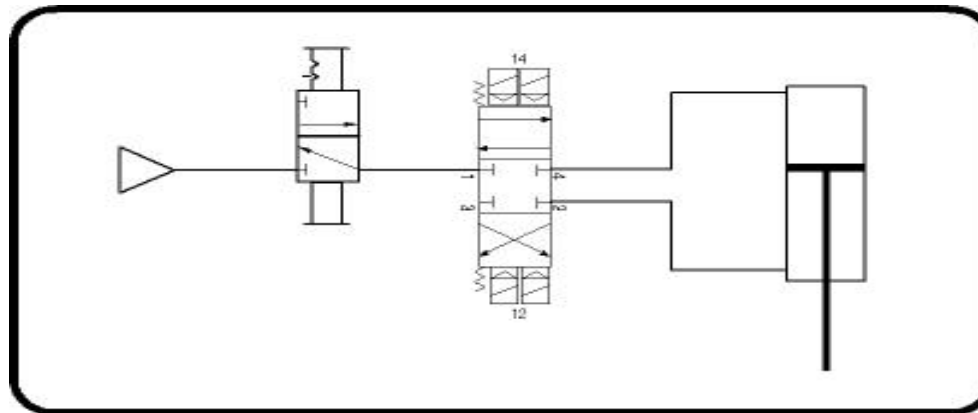
Old Solution – CAT 1



Recent Solution – CAT 3



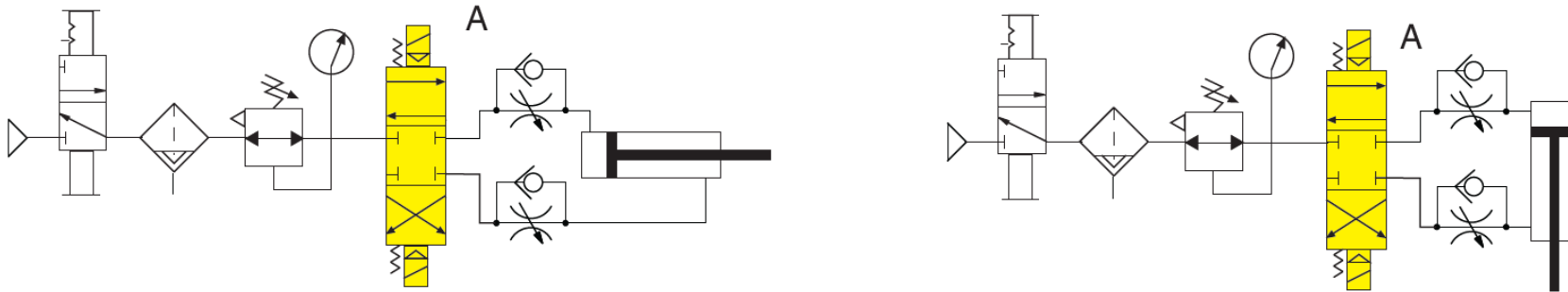
New Solution – CAT 4
CROSS-CHECK



Safe return examples

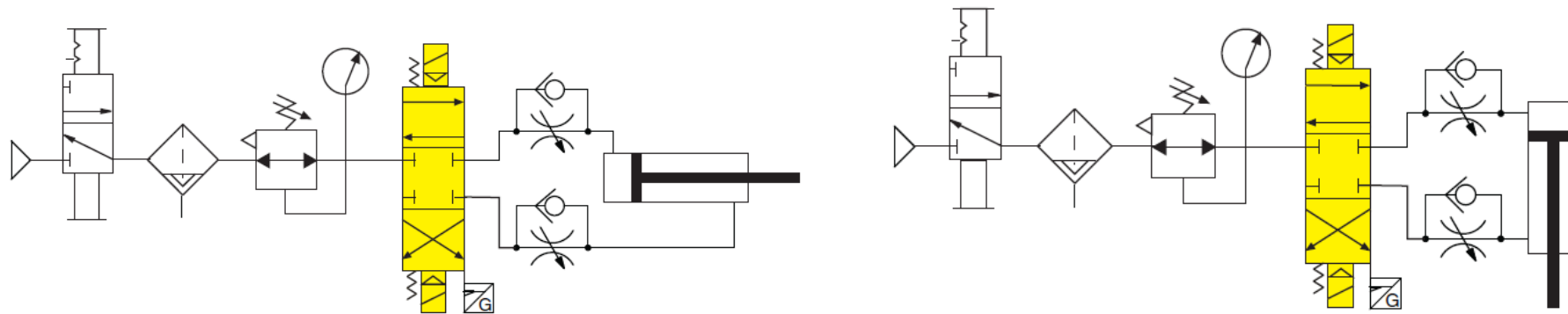
Pneumatic Safe Control and Stop Example 1 – Category 1

4/3 (or 5/3) single channel double solenoid-operated closed-center valve.



Pneumatic Safe Control and Stop Example 2 – Category 2

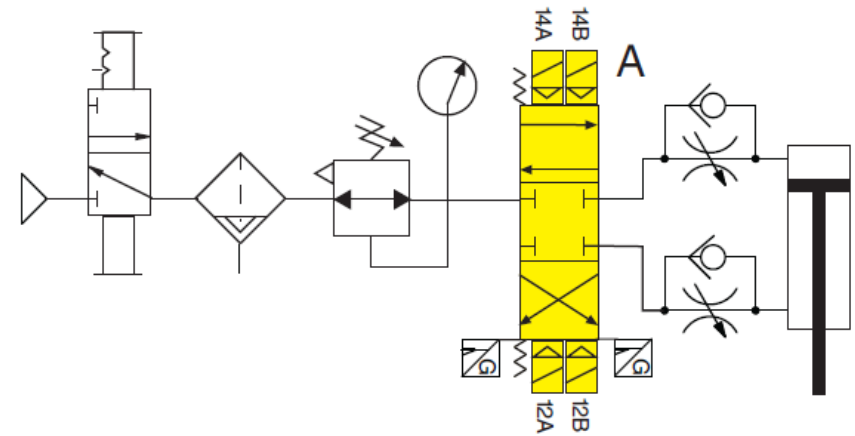
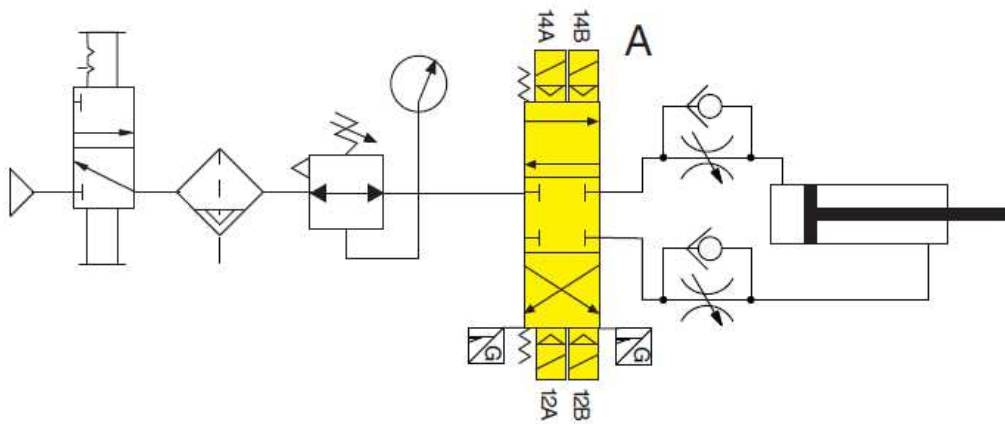
4/3 (or 5/3) single channel double solenoid-operated closed-center valve with feedback - must be monitored by the safety controller.



Safe return examples

Pneumatic Safe Control and Stop Example 3 – Category 4

4/3 dual channel double solenoid-operated closed-center valve with feedback - must be monitored by the safety controller.



CC4 - Series



NEW

PRODUCT DATA SHEET INFORMATION

CrossCheck™ CC4 Series Double Valve

Safety Directional Valve 4/3 – Closed Center
CAT 4, PL e For Safe Cylinder Control and Load Holding
Port Size 1/4 thru 3/4



ROSS' new CrossCheck™ CC4 Series Safety directional valve is a redundant, externally monitored 4-port, 3-position (closed center) pneumatic valve for Category 4, PL e applications, where stopping and holding a cylinder is necessary for safe operator access during production-related tasks. The valve is constructed with tight-sealing, dirt-tolerant poppet-type valve internals.

Features & Benefits:

- Closed Center Valve Function - allows full control of double-acting cylinders, including jog and load-holding functions
- Redundant control with position feedback - can achieve Category 4, PL e, when used with proper safety controls
- Designed for external monitoring - allows full safety control and feedback monitoring of cylinder control circuit
- Mid-position sensing - for detection of safe, closed center position
- ROSS poppet technology - fast, reliable, dirt-tolerant, face-sealing, low friction
- LED indicators on solenoids - aids troubleshooting






CAT 4, PL e
(certification pending)

HOW TO ORDER
(Choose your options (in red) to configure your valve model number.)

Series	Basic Size	Voltage	Communication	Position Limit
Manual M	0 2	24 Vdc DC A	None X	Standard S
Pressure Release	2 4	Thread	Monitoring	Starward
M	0 2	NPT N	External E	S
M	0 2	NPT N	External E	S
M	0 2	NPT N	External E	S

Standard Specifications

Port Size	Basic Size	C _v			Weight lb (kg)
		1-2	1-4	2-3	
1/4	1/4	0	1	0.8	0.8 (1.2)
3/8	3/8	0	1	0.8	0.8 (1.2)
1/2	1/2	2	2	1.9	18.3 (8.3)
3/4	3/4	2	2	1.9	18.3 (8.3)

APPLICATIONS: Category 4 applications - e.g., cylinder stop & load holding applications. The CrossCheck™ CC4 Series valve is designed to be controlled by a safety controller or safety relay with dual channel outputs and the capability of monitoring the mid-position feedback sensors. The valve is a redundant valve and is driven by 4 solenoid pilot valves - two for extending and two for retracting.

Standard Specifications

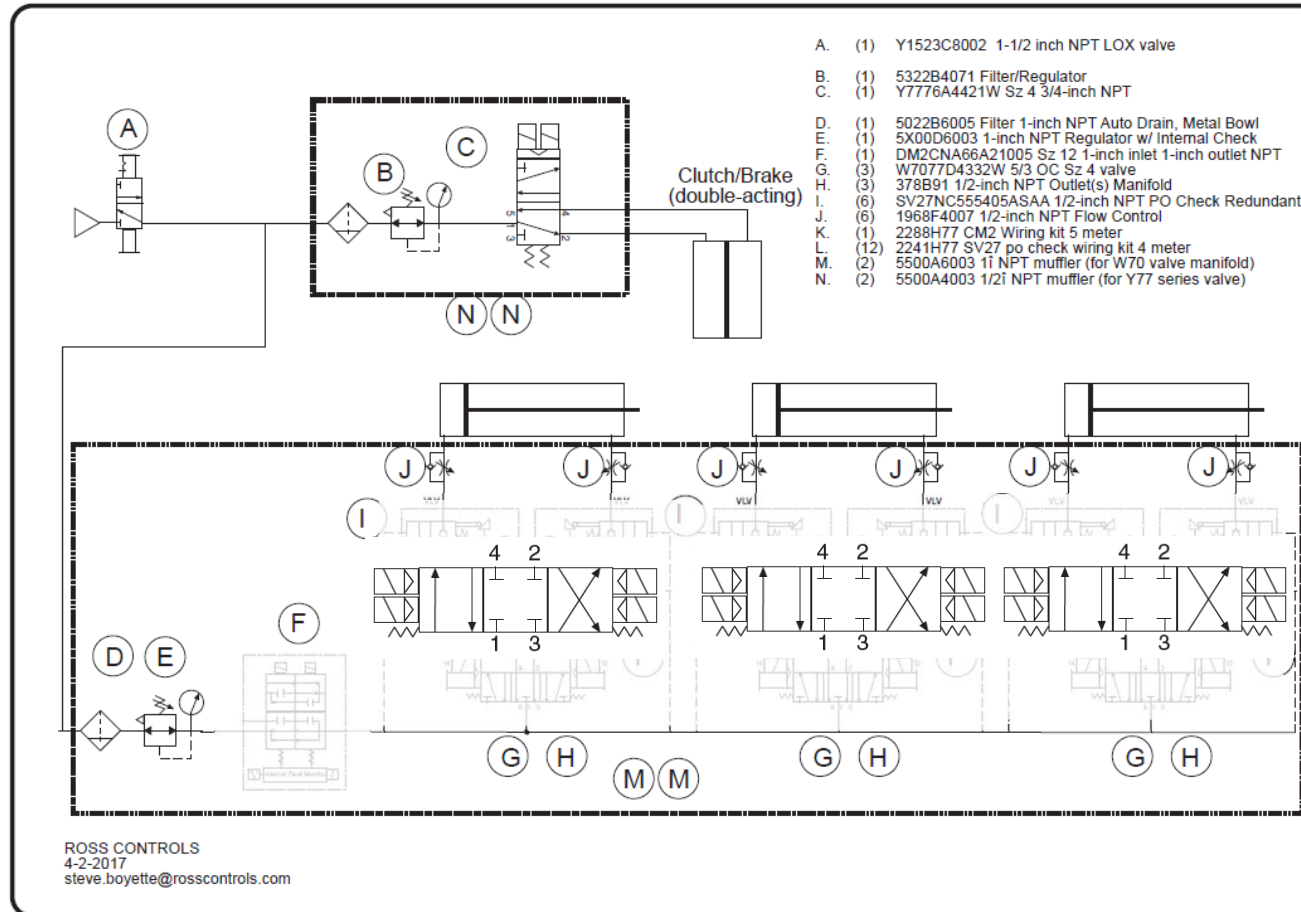
<p>Construction: Redundant dual 4/3 closed center, poppets.</p> <p>Mounting Type: Sub-base mounted.</p> <p>Pilot Solenoid: Version as per VDE 0680. Rated for continuous duty.</p> <p>Enclosure rating according to DIN 400 60 IP 66.</p> <p>Standard Voltages: 24 volts DC.</p> <p>Pilot Solenoids Power Consumption (each solenoid): 3.5 watts.</p> <p>Electrical Connections: Three 5-pin, M12 connectors.</p> <p>Ambient Temperature: 40° to 140°F (+4°C to 60°C).</p> <p>Medium Temperature: 40° to 175°F (+4°C to 80°C).</p> <p>Flow Media: Compressed, filtered air according to ISO 8573-1:2010 [7.4.4].</p>	<p>Inlet Pressure: With Internal Pilot Supply: 60 to 120 psig (4 to 8 bar).</p> <p style="padding-left: 20px;">With External Pilot Supply: 0 to 120 psig (0 to 8 bar).</p> <p>Pilot Supply Pressure: 60 to 120 psig (4 to 8 bar). Must be equal or greater than inlet pressure.</p> <p>Static Pressure: 0 to 150 psig (0 to 10 bar).</p> <p>Mounting Orientation: Any, but horizontally with solenoids on top is preferred.</p> <p>Monitoring: Dynamic, cyclical, external with customer supplied equipment. Monitoring should check state of both valve mid-position sensors with any and all changes in state of valve control signals.</p> <p>Functional Safety Data: Pending.</p>
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This valve is not designed for controlling clutch/brake mechanisms on mechanical power presses, see DM2 series D for mechanical power press applications.

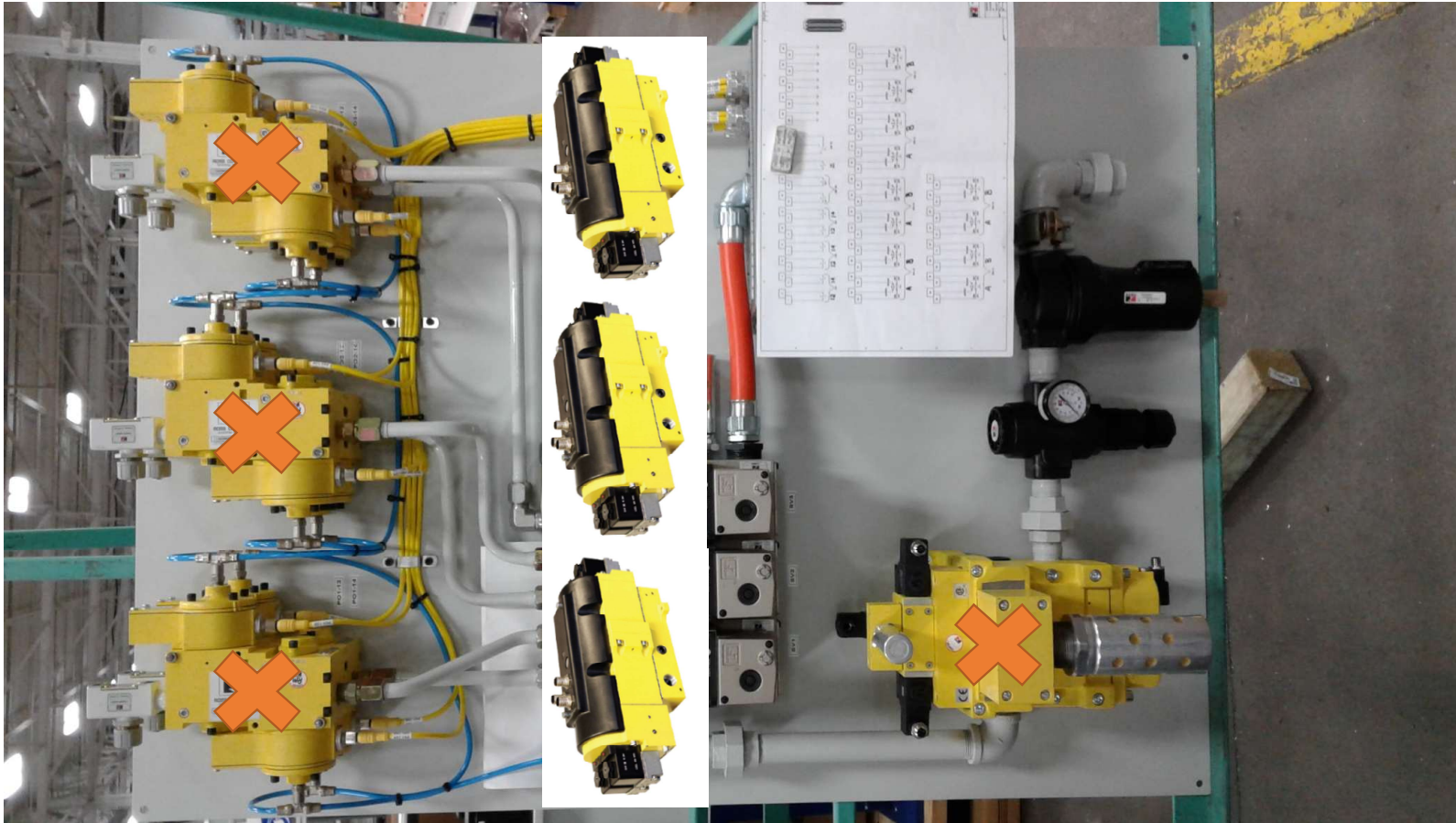
ROSS CONTROLS®

www.rosscontrols.com

CC4 Application



CC4 Application





Thanks

Dietrich Warmbier

FS Eng (TÜV Rheinland, #13530/16, Machinery)
Global Safety Product Manager



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