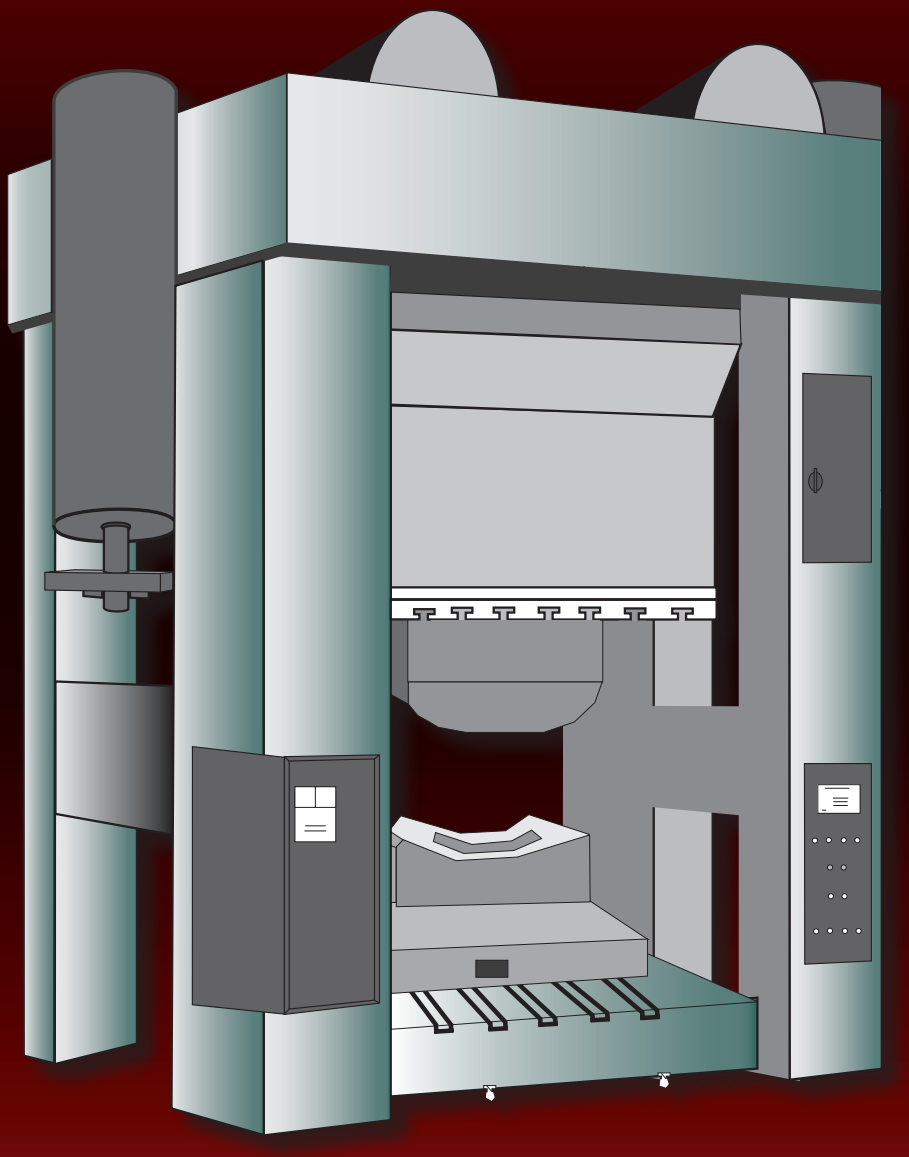
PRINCIPLES OF COUNTERBALANCE SYSTEMS

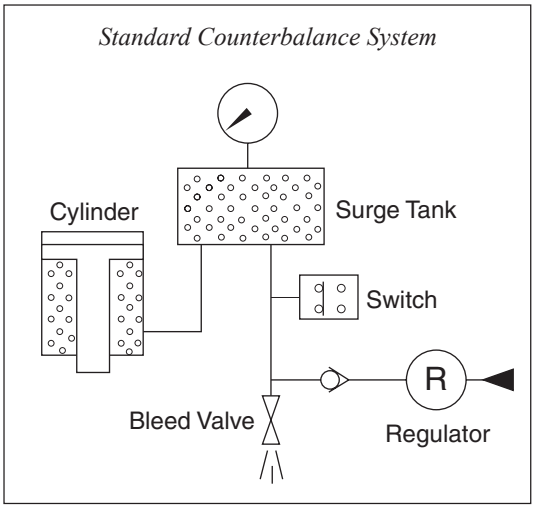


ROSS CONTROLS

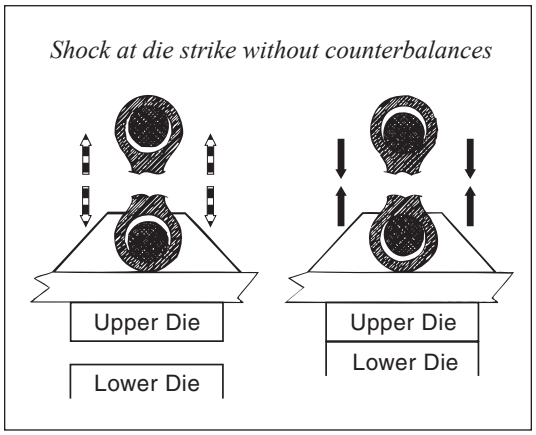
ROSS®
Consider it DONE!

Counterbalance for Mechanical Stamping Presses

A pneumatic counterbalance system compensates for the weight of the slide and upper die on a press. The system also reduces gear and drive component damage that occurs from high force loadings when the slide reverses direction. The standard OEM system includes two or more air cylinders attached between the slide and main frame, a pressure control regulator, a check valve, a surge tank and a manual bleed-off valve. Surge tanks store the air displaced from the cylinders, since it would be cost prohibitive to refill the system with every stroke of the press. The regulator is used to set the correct pressure for the combined weight of the slide plus the die. The OEM provides a chart for the proper pressure setting of any given die weight. A check valve keeps pressure within the system, while a bleed-off valve allows for manual removal of system pressure for maintenance or repair.

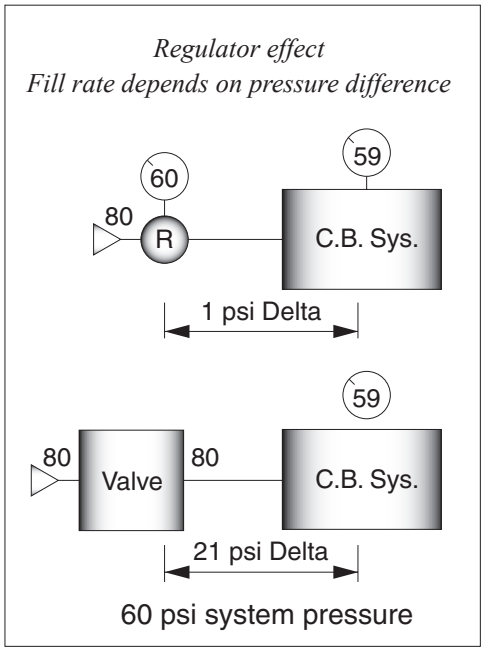


During the downward stroke of the press, gravity acts upon the slide and die, pulling them away from the press drive and opening up many small tolerances. When the upper and lower dies meet, the upper die decelerates until these openings close and the drive begins to "push" through the work. After this initial "shock-loading", the die forms the part and is then immediately reversed to "pull" the die back up, which opens up all of the tolerances once again. This shock-loading occurs twice on every stroke of the press, causing additional wear and damage to drive components and dies.



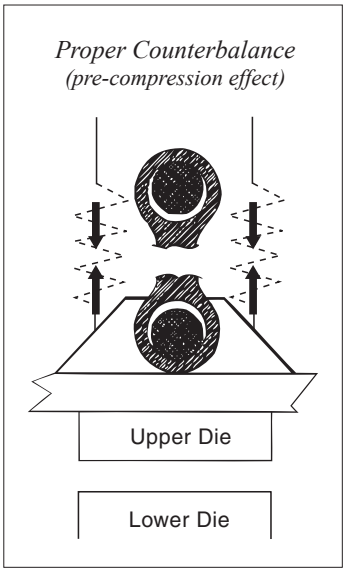
An "underbalanced" counterbalance system allows for tremendous shock loads to occur and increases operating costs because of the heavier load that must be picked up by the motor. An "overbalanced" counterbalance system consumes a great deal of flywheel energy, reducing tonnage available at the part as well as the possibility of the press becoming "stuck on bottom" ... where there is not enough flywheel energy available to overcome the die separation, loading and reversal forces of the press.

The ROSS automatic counterbalance system integrates modern air valve technology with electrical controls to monitor and maintain appropriate counterbalance pressures. Is there anything wrong with the equipment that came on the press? No, but it is a system with minimal performance characteristics. It is desirable to correct pressures as quickly as possible and to maintain them. The standard OEM system does not do this.



The recovery time to increase pressure is long with the regulator and it has no way of decreasing pressure. Because the regulator set pressure is the same as the counterbalance setting, flow through the regulator is very slow and even minor pressure changes take much time.

The ROSS automatic counterbalance system allows for the maximum amount of "fill" air per cycle because valves are adjusting pressures. A unique check valve design feature eliminates the need to de-energize the fill valve during a press cycle and eliminates "back flushing" of air into the plant air system.



So what is the correct counterbalance pressure? A slightly overbalanced pressure maintains mechanical tolerances of the press drive components in a closed state. This improves ram parallelism, minimizes wear, reduces strain on the press, reduces operating costs, enhances safety and most importantly ... improves parts quality.

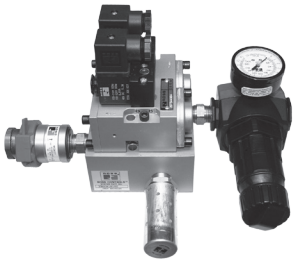
Counterbalance for Mechanical Stamping Presses

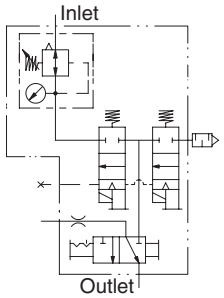
3900A1018Z (110 volts AC)
3900A1018W (24 volts DC)

Economy 3/4" fill-dump.

Dimensions inches (mm)			Weight
Height	Width	Length	lb (kg)
4.2 (107)	7.5 (191)	5.7 (145)	6.0 (2.8)

* For BSPP threads add "D"prefix to the model number, e.g., D3900A1018W.



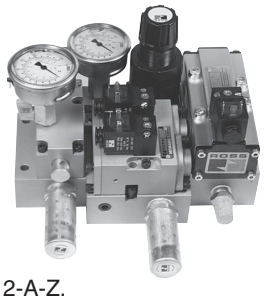


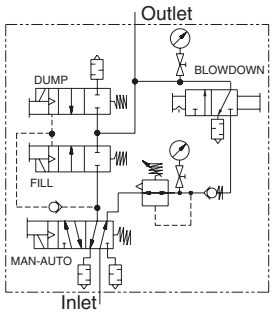
PFD-MPARX-N12-A-Z (110 volts AC)
PFD-MPARX-N12-A-W (24 volts DC)

3/4" fill-dump with auto-manual select and parallel manual circuit.

Dimensions inches (mm)			Weight
Height	Width	Length	lb (kg)
7.1 (181)	10.0 (254)	11.7 (298)	20.0 (9.1)

* For BSPP threads change "N" to "B" in the model number, e.g., PFD-MPARX-B12-A-Z.





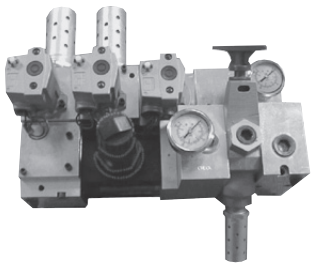
PFD-MSARX-N16-A-Z* (110 volts AC)
PFD-MSARX-N16-A-W* (24 volts DC)

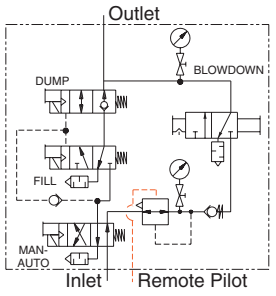
1" fill-dump with auto-manual select and parallel manual circuit.

**For remote pilot regulator insert a "1" after "R" in the model number, e.g., PFD-MSAR1X-N16-A-Z.*

Dimensions inches (mm)			Weight
Height	Width	Length	lb (kg)
8.3 (211)	15.4 (392)	12.1 (308)	45.0 (20.5)

* For BSPP threads change "N" to "B" in the model number, e.g., PFD-MSARX-B16-A-Z.



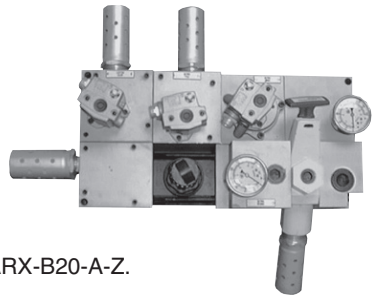


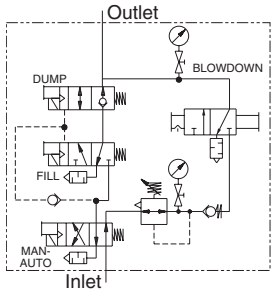
PFD-MSARX-N20-A-Z (110 volts AC)
PFD-MSARX-N20-A-W (24 volts DC)

1¼" fill-dump with auto-select and parallel manual circuit.

Dimensions inches (mm)			Weight
Height	Width	Length	lb (kg)
10.4 (264)	26.5 (673)	19.2 (488)	87.0 (39.5)

* For BSPP threads change "N" to "B" in the model number, e.g., PFD-MSARX-B20-A-Z.





Three Function Transducer with Integral Pressure Switch and Digital Gauge

Single Function Unit (transducer only)
Part Number: **935H30**

Three Function Unit
Part Number : **911H30**

5 Meter Cord
Part Number: **936H30**

Three Function Unit illustrated

Pressure set-point range	7.5 to 150 psi (0.52 to 10.3 bar)
Overpressure limit	700 psi (48.3 bar)
Burst pressure	2000 psi (137.9 bar)
Port connection	1/4 NPT female
Supply voltage	18 to 30 volts DC
Outputs	Programmable NO or NC & 4–20 mA output
Switch point accuracy	± 1.5% of full range
Programmable switch delay	0 to 50 seconds
Repeatability	± 0.25% of full range
Wetted parts	304 stainless steel, Viton O-ring
Protection rating	NEMA 3, 4, 12, 13, IP65
Electrical connections	Quick disconnect MICRO DC type

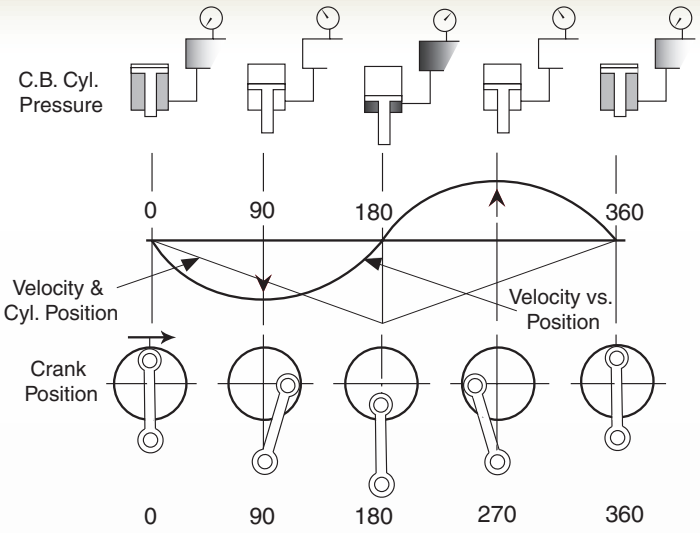
STANDARD SPECIFICATIONS (for valves on this page)**:**
Ambient Temperature: 40° to 120°F (4° to 50°C).
Media Temperature: 40° to 175°F (4° to 80°C).
Flow Media: Filtered air; 5 micron recommended.
Inlet Pressure: 30 to 150 psig (2.1 to 10.3 bar).

Automatic Pressure Control Applications

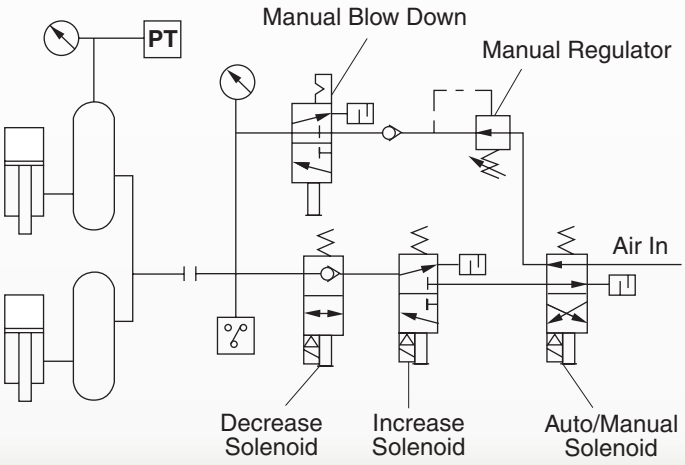
- Interfaces with press controls and transducer to monitor/maintain correct counterbalance pressure
- 3/4" units require DIN Form A electrical connections
- 1" & 1¼" units require Brad Harrison connectors

What is Happening When.....

During a press cycle the counterbalance system increases in pressure during the downstroke when the cylinder pistons are driven down by the slide. Press manufacturers have allowed for this in their calculations and have provided a chart of proper counterbalance pressure, per die weights, on the press. Heavier die sets require more counterbalance pressure to run efficiently and reduce motor loads. All counterbalance pressures are referenced and set at TDC (top dead center).



The ROSS automatic counterbalance system contains both an automatic as well as manual pressure circuit running in parallel. A manual/automatic select valve determines which circuit is used, with the default condition (de-energized) being the manual mode. For automatic operation, the auto select valve is energized which allows the fill and dump valves to be operated by the press controls, keeping counterbalance pressures optimal. During each cycle the press controls check the pressure transducer reading at TDC on the accumulator, compare it to the pre-set optimal pressure setting, and make appropriate pressure adjustments. Adjustment and fault windows can be set up around the desired set pressure to within +/- 1 psi (0.068 bar).



Press Counterbalance Systems

Why not dump the C.B. air to atmosphere on each stroke and eliminate the surge tanks?

A 1,000 ton double acting press contains an average of 180 cu. ft. of air. The horsepower (H.P.) to produce air is 5 scfm per H.P. To refill the system of the 1,000 ton press in one minute would take **45 H.P.** At 40 strokes per minute (spm), there is 1/80 minute to fill the system, so the required H.P. is: **2,880 H.P.!!**

Cost justification for Automatic Counterbalance Systems

- ***Conserved electric costs (to run the flywheel)***
- ***Conserved air costs (to run the compressor)***
- ***Cost of die repair***
- ***Reduced scrap savings***
- ***Savings of die repairs***
- ***Cost reductions of labor due to higher part yield***
- ***Profit from added production***
- ***Total savings= JUSTIFIED***

ROSS Consider it DONE!

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