

# DAPCO®

Delay Return System

DRS Series

**Custom Systems for  
Delayed Return Operation**



**PED**  
2014/68/EU  
COMPLIANT

## Introduction

DADCO's Delay Return System (DRS) is used in die applications where it is necessary for the return action of the pad or die to remain compressed at the bottom of the die travel when the part forming is complete. Typically this is required in the draw station of the die set, in either upper or lower pads. After the part is formed and the ram clears, the DRS cylinders are released to extend the pads back to the ready position. The DRS is comprised of four main components: Accumulator, Hydraulic Cylinders, Nitrogen Control Panel with Hose Assembly and Hydraulic Hose and Fittings. Accessories for spring-back elimination and active cooling are available. Contact DADCO for your custom system. DRS features include:

- Modular accumulator system
- Reliable leak-free operation
- Controlled travel on return stroke
- No filling or bleeding during installation
- 115 VAC or 24 VDC operation
- Reliable nitrogen pressure control
- Quick connect hydraulic hose and fittings
- Numerous cylinder options

## System Components

### Patented Technology



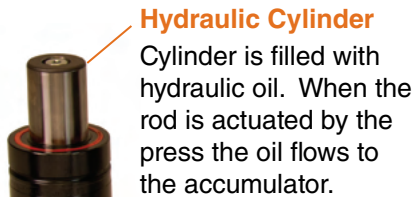
### Control Panel with Hose Assembly

Control panel is connected to the accumulator allowing for filling, draining and monitoring of the nitrogen gas pressure in the system.



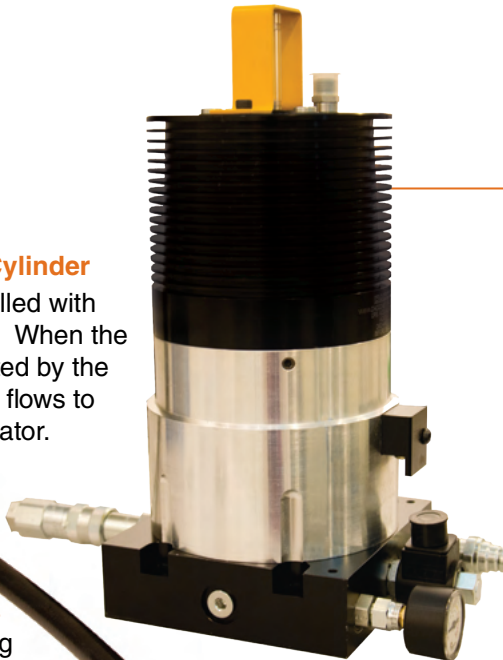
### Die Tag

Includes all system operating specifications.



### Hydraulic Cylinder

Cylinder is filled with hydraulic oil. When the rod is actuated by the press the oil flows to the accumulator.



### Accumulator

Nitrogen gas-over-hydraulic oil accumulator converts nitrogen pressure to oil pressure.

### Hydraulic Hose and Fittings

Highly durable hose and o-ring face seal fittings connect the hydraulic cylinder to the accumulator.

### Quick Disconnects

Zero-leakage quick disconnects facilitate installation and service.



### Coil

### Cordset

### Solenoid Valve

Controls the return flow of hydraulic oil to the hydraulic cylinders. An electrical signal from a press or die controller maintains the system delay.

### Spring-Back Eliminator (SBE)

An optional accessory is available for thin or fragile parts where zero force at the bottom of the stroke is required. This accessory is attached to the accumulator will remove the typical 1-4% cylinder spring-back caused by entrained air and hose expansion.



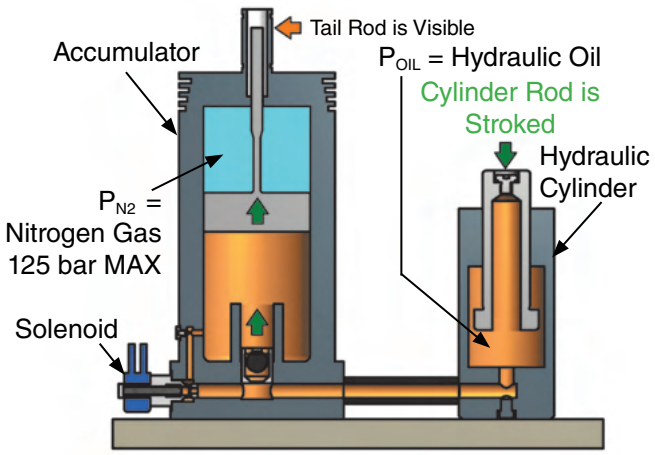
### Active Cooling

Optional electric fan accessory is available for the accumulator to increase cooling capacity during operation. Other custom cooling solutions are available, contact DADCO.



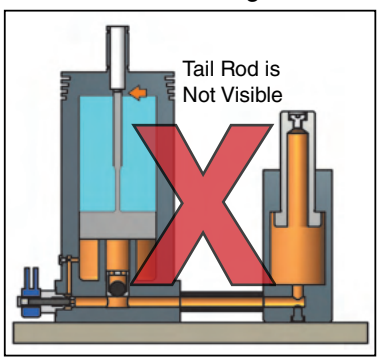
# Operation Overview

## 1 Down Stroke: Part Forming

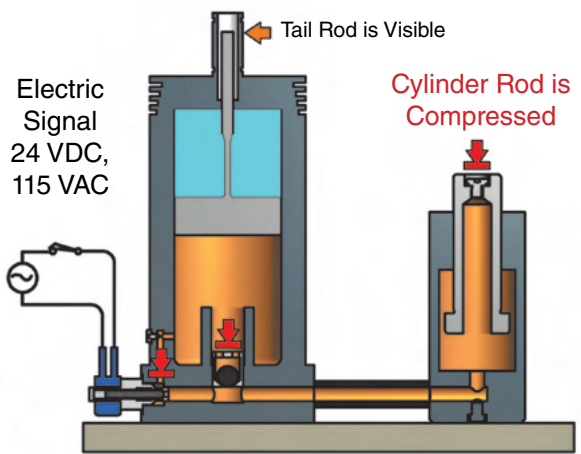


The accumulator is pressurized with nitrogen gas to energize the hydraulic oil to the pressure required for the forming application. The hydraulic cylinder and accumulator have equivalent pressure ( $P_{N_2} = P_{OIL}$ ). During the downstroke of the die, the hydraulic cylinder delivers force like a typical nitrogen gas spring. The oil in the hydraulic cylinder is transferred through the accumulator's main check valve.

**CAUTION:** If tail rod is not visible this indicates the system is low on oil. Do not stroke the cylinder. Maintenance or Service is required.

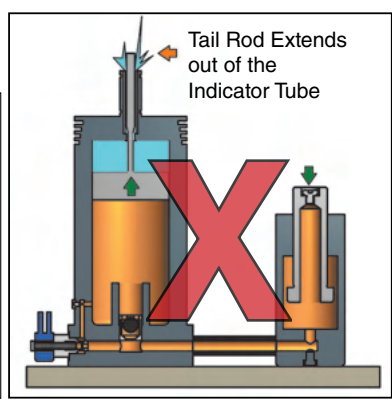


## 2 Bottom of Stroke: Part Complete

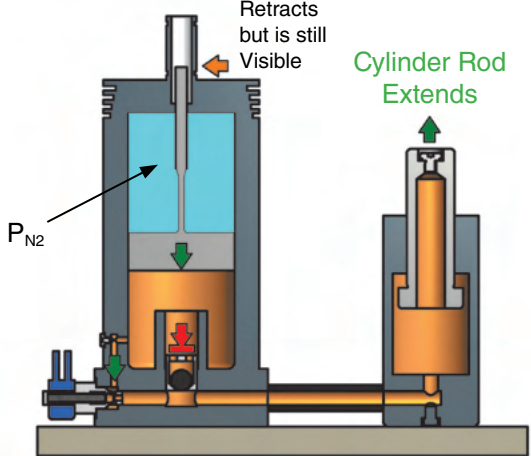


The solenoid valve is energized before the part is completely formed. The main check valve holds the pressurized oil in the accumulator. The hydraulic cylinder's rod will stay compressed as the press opens.

**CAUTION:** If the Tail Rod extends above the top mark, contacts or bends the yellow guard, Stop Operation immediately. This indicates the system has too much oil. Maintenance or Service is required.



## 3 Return Stroke

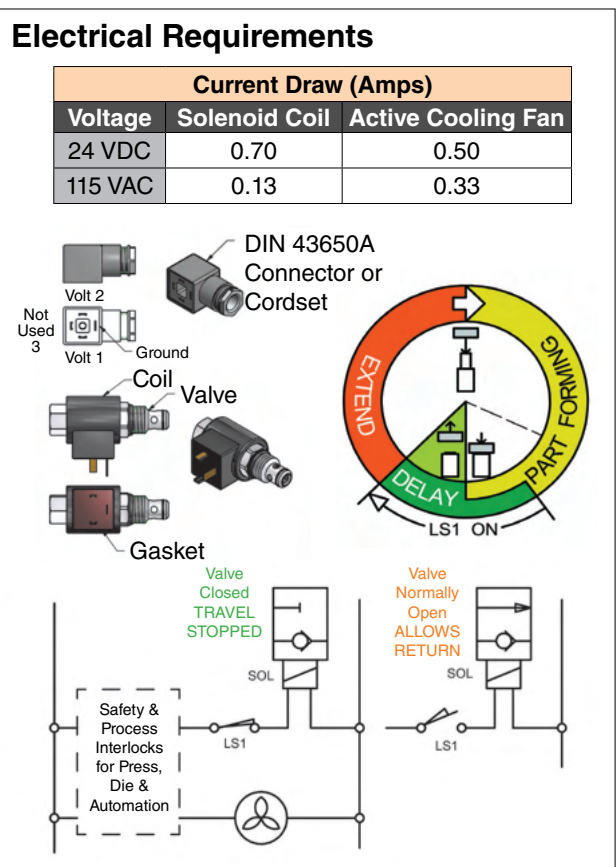
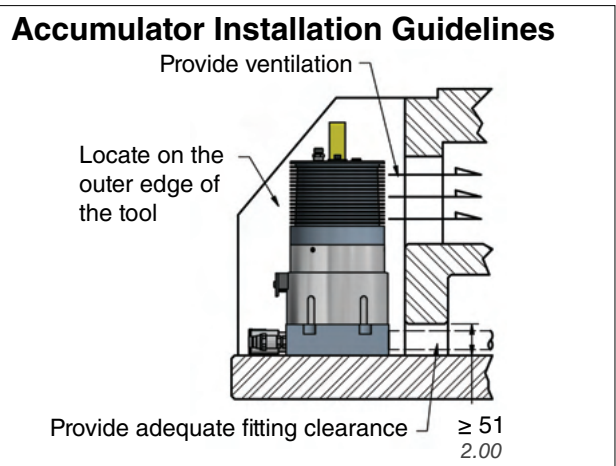
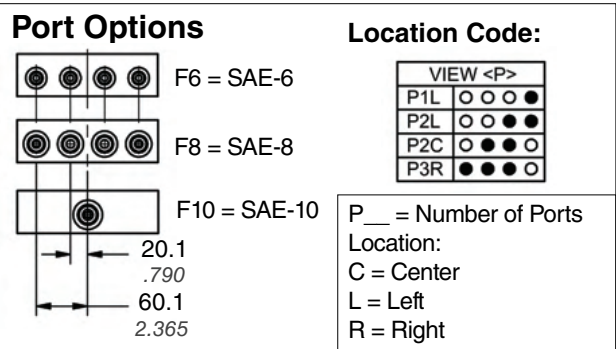
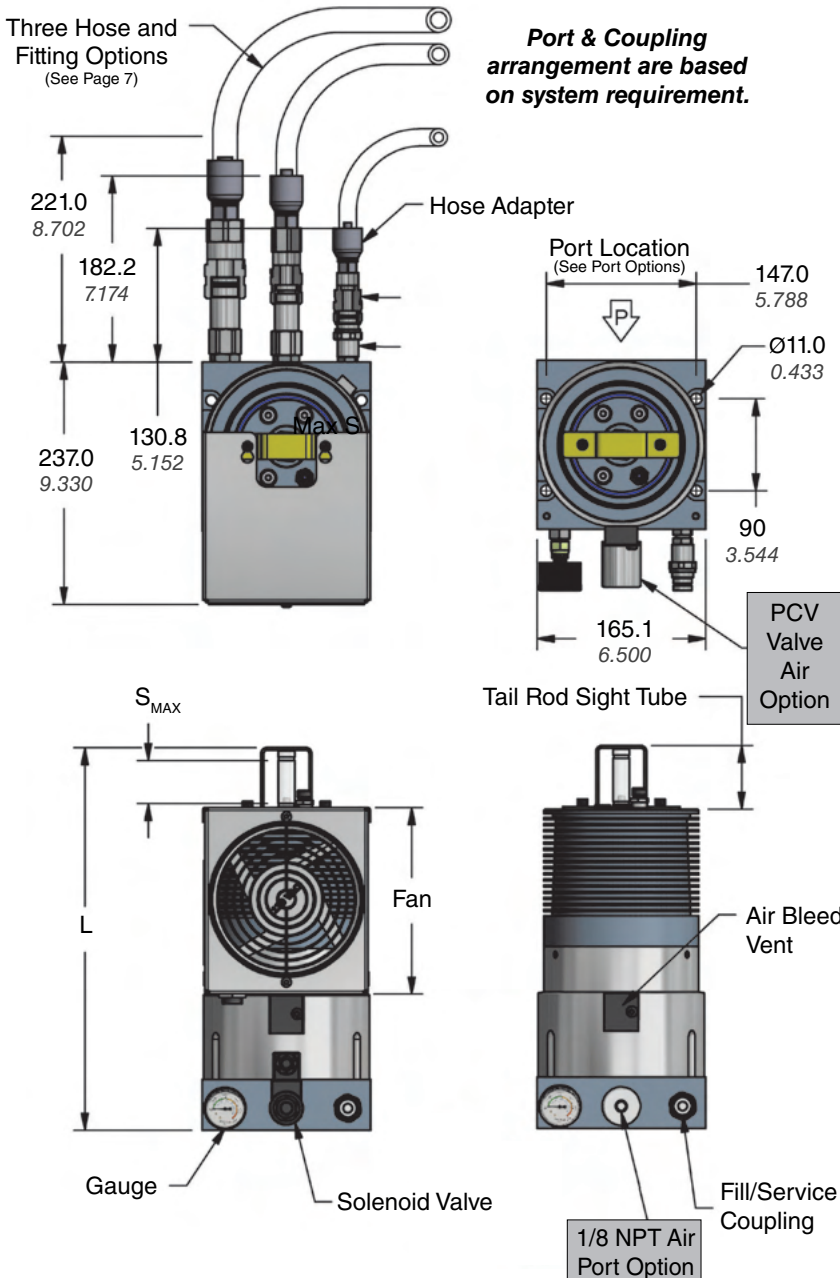


After the part is completed and the ram retracts, the solenoid valve is deactivated allowing the cylinder rod to extend at a controlled rate. During operation, the heat generated by the accumulator dissipates and the tail rod will retract into the indicator tube. An electrical fan or other options may be installed with the accumulator to facilitate cooling. **NOTE:** Increasing tonnage, production rates or travel of an existing system may require additional cooling components.

A 1-4% cylinder spring-back may occur during the delayed action. An optional Spring-Back Eliminator (SBE) accessory is available.

## Accumulators

The AC.50 module is a nitrogen-hydraulic accumulator that provides conversion of the nitrogen pressure to oil pressure. Three different accumulator sizes are available to suit different applications. Accumulators are connected to the cylinders with quick-disconnect hose assemblies permitting the cylinders and accumulators to be positioned independently as needed. The solenoid valve control is standard with a PCV Valve Air option. Active cooling may be included with accumulators as an option.



### Accumulator Ordering Example:

**AC.50.24.F6.P4C.115**

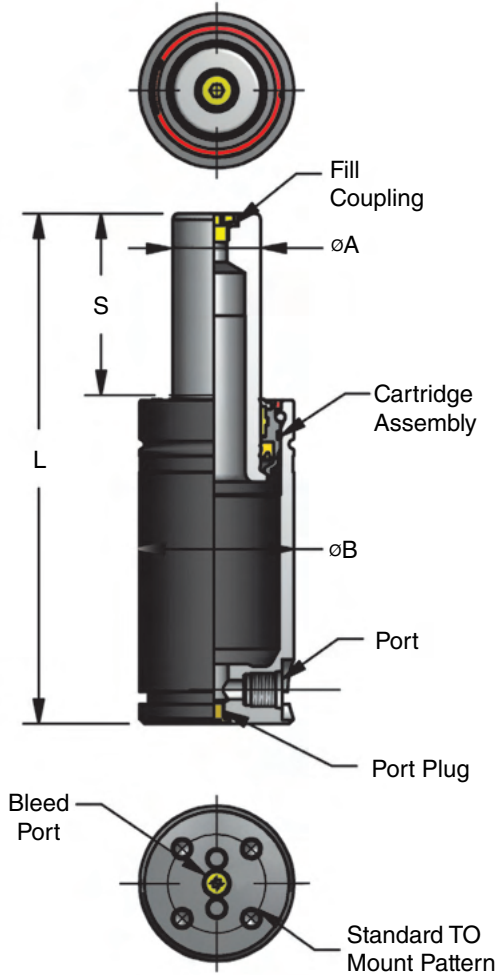
Model	Vol. cu in liter	S mm inch	L	Port	Quantity and Location	Voltage
AC.50.12	12 0.20	25 0.98	325 12.79	F6	P4C	24 VDC
AC.50.24	24 0.40	50 1.97	375 14.76	F8	P2C	115 VAC
AC.50.36	36 0.60	75 2.95	425 16.73	F10	P1C	

*Options available with all models.*



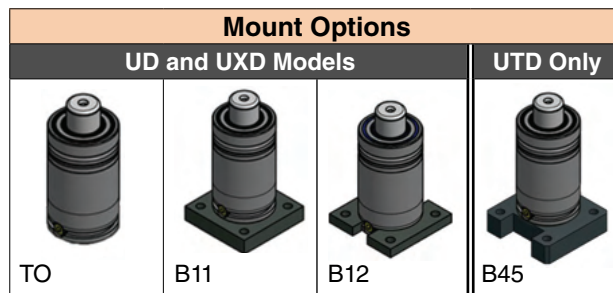
# Hydraulic Cylinders

Delay Return System cylinders are available in several standard force models; however, cylinders may vary by system. Refer to the system documentation for actual cylinder part numbers. Cylinders may ship with the hydraulic hose connected. Mount the cylinders in the die then attach the hose to the Accumulator.



Model*	$\phi A$	$\phi B$	S mm	L	On-Contact Force**	
					kN	lb.
UD.1000.__.TO.G	28 1.10	50 1.968	025 038 050 063 075 080 100 125	(2 x S) + 52	7.70	1,730
UD.1600.__.TO.F6	36 1.42	63 2.480		(2 x S) + 58	12.72	2,860
UD.2600.__.TO.F6	45 1.77	75 2.953		(2 x S) + 59	19.88	4,470
UD.4600.__.TO.F8	60 2.36	95 3.740		(2 x S) + 72	35.34	7,945
UD.6600.__.TO.F10	75 2.95	120 4.724		(2 x S) + 87	55.22	12,410
UTD.2600.__.B45.F6	45 1.77	75 2.953		(2 x S) + 89	19.88	4,470
UTD.4600.__.B45.F8	60 2.36	95 3.740		(2 x S) + 92	35.34	7,945
UTD.6600.__.B45.F10	75 2.95	120 4.724		(2 x S) + 107	55.22	12,410
UTD.9600.__.B45.F10	90 3.54	150 5.960		(2 x S) + 113	79.52	17,876
UXD.1600.__.TO.F6	36 1.42	63 2.480		150 175	(2 x S) + 105	12.72
UXD.2600.__.TO.F6	45 1.77	75 2.953	200 250	(2 x S) + 118	19.88	4,470
UXD.4600.__.TO.F8	60 2.36	95 3.740	300	(2 x S) + 130	35.34	7,945

\*UTD Models are only available with the B45 Mount attached.  
 \*\*System Charging Pressure is 125 bar / 1800 psi.



Refer to the UH, UX or UT Series Catalogs for mount information.

## Part Number Detail:

**UD.1600.050. TO. F6**

**Part Number:**  
Includes Series, Model and Stroke Length.

**Port Size:**  
G 1/8, F6, F8 or F10. See the Cylinder Configurations above for options based on the Series and Model.

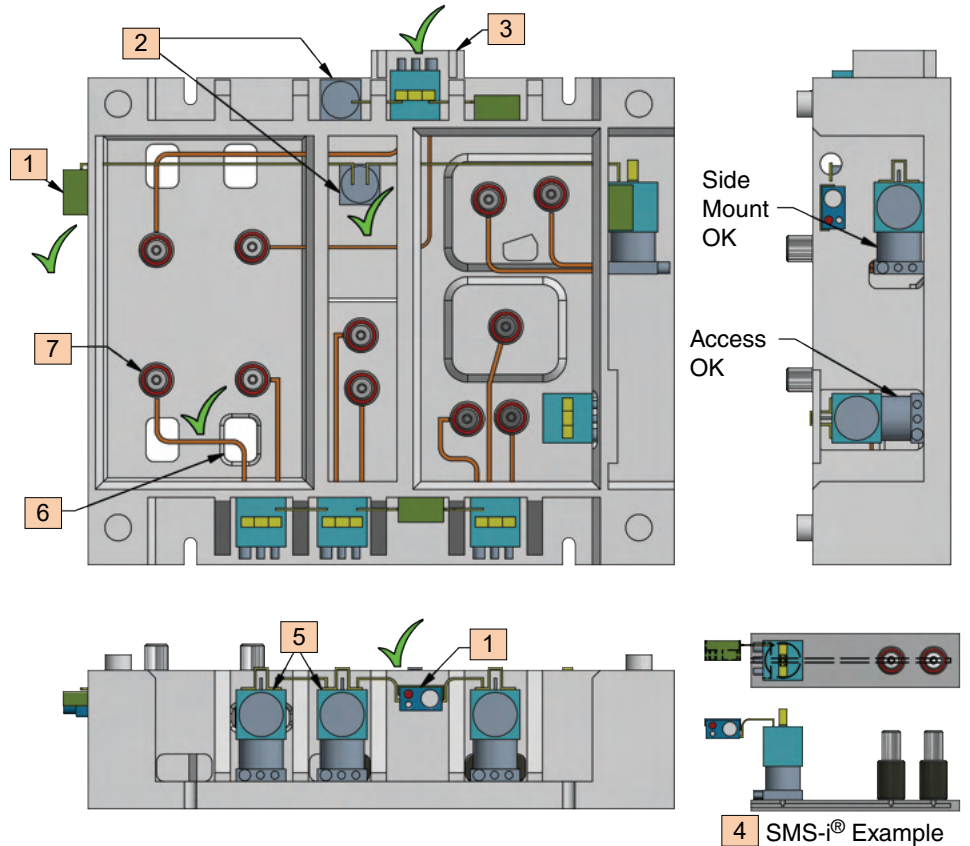
**Mount Option:**  
TO = Basic Model.  
B11, B12, B45 mounts options available;  
B45 is required with the UTD Series.

## System Design Guidelines

DADCO recommends following the guidelines below when designing a Delay Return System layout to maximize cost-savings. Contact DADCO for more information.

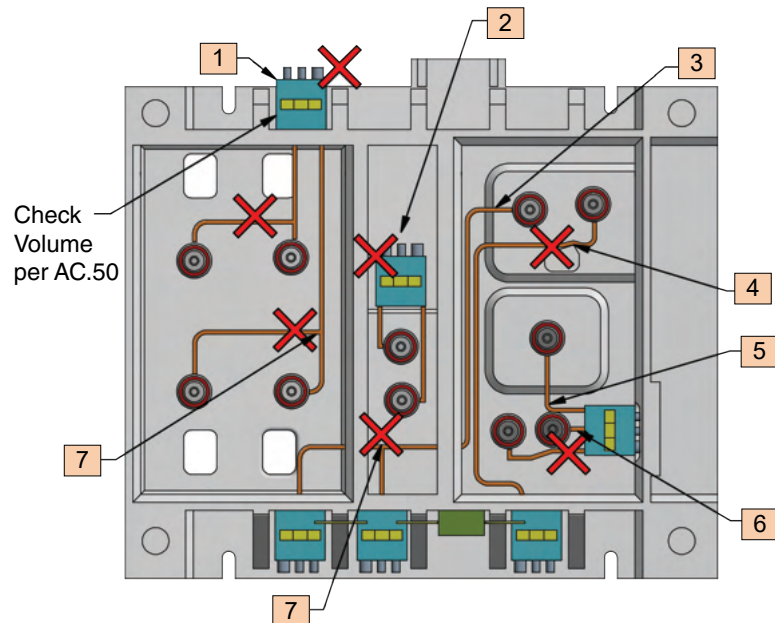
### Recommended Design Layout

1. Make sure control panels are easily accessible
2. Use a surge tank when needed
3. Position the AC.50 for the best hose layout
4. SMS-i® system for hose routing solutions
5. Active cooling option for any AC.50 is recommended.
6. Hose paths should be free from sharp edges
7. One cylinder per hose



### Design Layout Aspects to Avoid

1. AC.50 should not be positioned outside of die without protection
2. Access to the AC.50 is restricted, fan is blocked, impeding airflow; avoid placing inside casting
3. Hose runs are too long
4. Hose uneven not protected
5. Confirm design allows for proper hose radius
6. AC.50 and hydraulic cylinder are too close
7. Tee style connection fittings should be avoided



# Replacement Parts

Below is a list of recommended system parts to stock for general maintenance. For internal service and refurbishment, please return to the factory for evaluation.

**Active Cooling Option  
AC.50.CM.\_\_\_\_**  
(115 VAC or D24 VDC)



Be sure to drain nitrogen from the system before performing any maintenance.



**Liquid Filled Gauge  
DPG-3RL**

Pressure Range: 0-450 bar (0-5000 psi)

**Hydraulic Service  
Union**

**Indicator Guard A595M \_\_\_\_**  
(025, 050, 075)

**Indicator Tube  
A585T \_\_\_\_**  
(025, 050, 075)



**Indicator Tube  
Cartridge  
AZ003265**

**Nitrogen Gas Port Adapter  
90.505.115**

Part Number	Components
<b>SV08 Solenoid Cartridge: AZ511652</b>	
<b>Valve Solenoid, Coil only: AZ541354 – 24 VDC AZ541655 –115 VAC</b>	
<b>Cordset with LED: AZ541614 – 24 VDC AZ541613 –115 VAC</b>	
<b>Modular DIN Connector: AZ541653</b>	

## Oil Pump - DRS.FPA6

Air powered oil pump with 2 gallon plastic container used for filling and replacing system oil. Service union required for filling cylinders.

Air Supply: 3-8 bar (40-150 psi)  
Reservoir: 7.5 L (2 gallon)  
Flow: 1.2 L/min (75 in<sup>3</sup>/min)  
at 7 bar (100 psi)  
inlet pressure



## Air Bleed Tube and Fitting Kit - AZ003399

Used to bleed the air from the hydraulic oil in the system during filling. Includes 90.607.065 G 1/8 reducer.



## Fittings, Flush Couplings & Hose Specifications

All hydraulic hose and fittings supplied are ORFS and use zero leakage flush couplings. Hydraulic hose and fittings are predetermined and designed based on the application requirements. Hose assemblies are custom per system and will ship as components of the DRS order. For more information on replacement hose, fittings or hose assemblies contact DADCO. To make your own hose assemblies you will need a crimper and dies; please contact DADCO.

	Straight	Straight Reducer	Union	Plug	Female	Male	Service Union	Part Number	OD		ID		Bend Radius		
									inch	mm	inch	mm	inch	mm	
Hose Size															
- 6	PF6F5OLO	PF4-6F5OLO	PF6F5OHAO	PF6HP5ON	AZ531657	AZ531656	6/6	AZ001656	PH451TC-6	.68"	17	.375"	10	2.50"	63
- 8	PF8F5OLO	PF6-8F5OLO	PF8F5OHAO	PF8HP5ON	AZ531658	AZ531659	6/8	AZ001659	PH451TC-8	.80"	20	.500"	12.5	3.50"	89
- 10	PF10F5OLO	PF8-10F5OLO	PF10F5OHAO	PF10HP5ON	AZ531661	AZ531660	6/10	AZ001660	PH451TC-10	.94"	24	.625"	16	4.00"	102

## Custom System Requirements

Each DRS is designed based on customer requirements and is factory tested to ensure proper operation prior to shipment. To request a quote for a system, details about the tonnage, travel and production rate of the application are required. Contact DADCO Engineering for a proposal.

<b>Tonnage</b>	Estimate tonnage required for the holding force on-contact. If particular cylinder sizes are known, provide the quantity, model, stroke and pressure. Advise of any special requirements.			
<b>Travel</b>	Actual pad travel is required. The travel is used to determine the volume of the system, system pressure and maximum operating speed of the system. Provide information about potential spring-back issues.			
<b>Production Rate Estimate</b>	<p><b>PR = Production Rate in Parts per Minute</b></p> <p>The DRS can be designed to meet a wide range of production rates. Additional cooling features may be required depending on the system requirements. Use the formulas to the right to determine the maximum acceptable rate of production.</p>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>Imperial</b></p> <math display="block">PR = \frac{400,000 \times A}{(S \times F)}</math> <p><b>F</b> = On-Contact Force (lb.)</p> <p><b>S</b> = Pad Stroke (inch)</p> <p><b>A</b> = Number of Accumulators Required</p> </td> <td style="width: 50%; vertical-align: top;"> <p><b>Metric</b></p> <math display="block">PR = \frac{46,000 \times A}{(S \times F)}</math> <p><b>F</b> = On-Contact Force (kN)</p> <p><b>S</b> = Pad Stroke (mm)</p> </td> </tr> </table> <p style="text-align: center; font-style: italic;">Formulas based on system with active cooling option.</p>	<p><b>Imperial</b></p> $PR = \frac{400,000 \times A}{(S \times F)}$ <p><b>F</b> = On-Contact Force (lb.)</p> <p><b>S</b> = Pad Stroke (inch)</p> <p><b>A</b> = Number of Accumulators Required</p>	<p><b>Metric</b></p> $PR = \frac{46,000 \times A}{(S \times F)}$ <p><b>F</b> = On-Contact Force (kN)</p> <p><b>S</b> = Pad Stroke (mm)</p>
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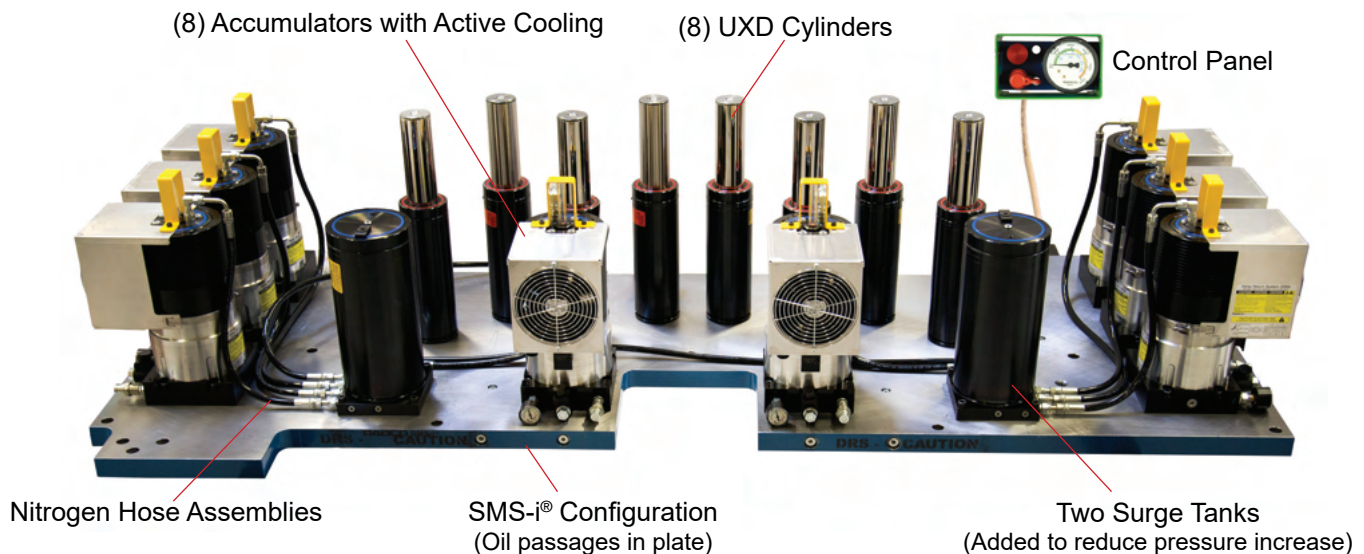
Please adhere to the following general operating specifications for all Delay Return Systems. Specific operating conditions will be assigned per system; refer to the documentation included with your system for more information.

### General Operating Specifications

Charging Medium:	Nitrogen Gas	Maximum Velocity:	1 m/sec (39 inch/sec)
Maximum Charging Pressure:	125 bar (1800 psi)	System Oil:	ISO 32-68
Maximum Operating Temperature:	63°C (145°F)	<i>Specific operating conditions will be assigned per system.</i>	



**The operation parameters of production rate, pressure and travel must not be exceeded. Exceeding parameters will overheat the system. DADCO's Engineering department must approve any change in conditions from the original design specification. For more information refer to the maintenance manual.**



**The global leader in nitrogen gas spring technology**

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