SK Series

Description

Fluids are practically incompressible and cannot therefore store pressure energy. The compressibility of a gas *(nitrogen)* is utilized in hydro-pneumatic accumulators for storing fluids. HYDAC piston accumulators are designed on this principle, using nitrogen as the compressible medium.

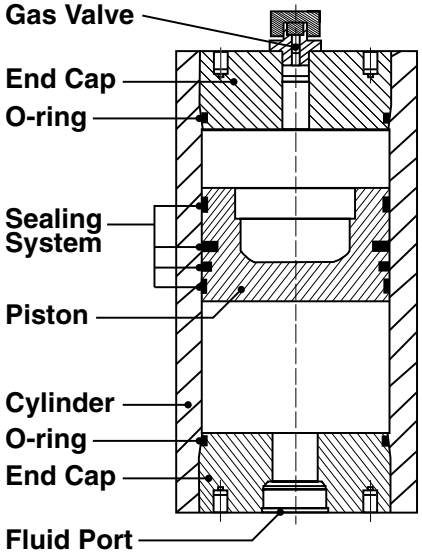
A piston accumulator consists of a fluid section and a gas section with the piston acting as a gas proof screen. The gas section is precharged with dry nitrogen gas.

The fluid section is connected to the hydraulic circuit so that the piston accumulator draws in fluid when the pressure increases thus compressing the gas. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

Construction

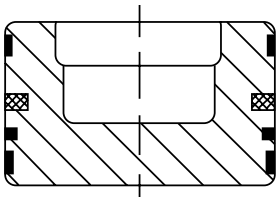
HYDAC piston accumulators consist of:

- A cylinder with a finely finished internal surface
- An end cap on the gas side and fluid side, sealed with o-rings
- A light weight metal piston
- A variety of sealing systems are available depending on the application



Piston Types

TYPE 2

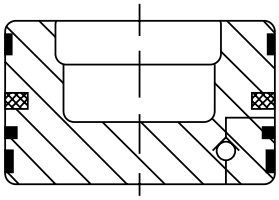


Application:

Low-friction design for higher piston speeds, slow movements without stick-slip effect and high number of actuations (millions). Actual cycles achieved will vary with operating parameters.

Notes: Filtration Õ10 µm absolute. (ISO 18/16/13)
Max. continuous velocity = 12 fps

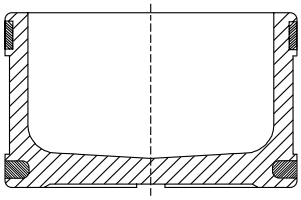
TYPE 2 with Check Valve



Application:

The addition of a check valve drastically reduces the oil pumping to the gas side of the piston.

TYPE 3



Application:

Actual cycles achieved will vary with operating parameters.

Notes: Filtration ≤ 10 µm absolute. (ISO 18/16/13)

Max. continuous velocity = 3 fps

Sealing Systems

Precise information about the proposed operating conditions is required in order to select the most appropriate sealing system. Important criteria for this selection are:

- Number of actuations or cycles
- Piston speed
- Temperature fluctuation
- Operating fluid
- Cleanliness of fluid
- Maintenance requirements

Seal Materials

The following sealing elastomers are available, depending on the operating conditions:

- NBR (acrylic nitrile butadiene rubber)
- FPM (fluoro-elastomer)
- PUR (polyurethane)

Suitable materials are also available for low temperature applications.

Corrosion Protection

For use with certain aggressive or corrosive fluids, or in a corrosive environment, HYDAC offers protective coatings and corrosive resistant materials (i.e. stainless steel) for the accumulator parts that come in contact with the fluid, or are exposed to the hostile environment.

System Mounting

HYDAC piston accumulators may operate in any position. Vertical installation is preferable with the gas side up. We recommend the use of our mounting components, which are detailed on page 33, to minimize risk of failure due to system vibrations.

Advantages of HYDAC Piston Accumulators

- Complete size range from 1 qt. to 100 gallons nominal volume
- High ratios possible between precharge pressure and maximum working pressure
- High flow rates - up to 4700 gpm from one accumulator
- Power savings.
- Gas-proof and leak-free.
- No sudden discharge of gas when seal is worn.
- Space efficient.
- Piston location monitoring available.

Advantages of Using the Low-friction Sealing System (type 2):

- Minimum friction.
- Suitable for low pressure differentials.
- No start-up friction, no stick-slip.
- Low noise, no vibration.
- High piston speeds up to 12 fps continuous
- Improved accumulator efficiency.
- High life expectancy
- Low maintenance requirements.

Effects of Seal Friction

The permissible piston velocity depends on the sealing friction. Higher piston velocities are possible where there is less
sealing friction.

HYDAC piston accumulators with low friction piston seals allow continuous operating velocities of up to 12 fps with short excursions to 15 fps *(see type 2 piston)*.

Small pressure differentials between gas and oil side improve the effectiveness of HYDAC piston accumulators. To emphasize the friction effect on the pressure curve

during an accumulation cycle, measurements with various sealing systems are illustrated.

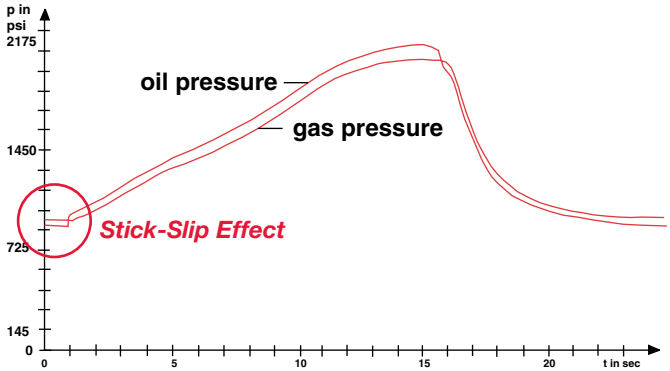
The measurement graphs below are a true representation of the gas and oil pressure of piston accumulators with

different sealing systems. The comparison of these two measurements clearly shows the difference in the pressure differential between gas and oil side:

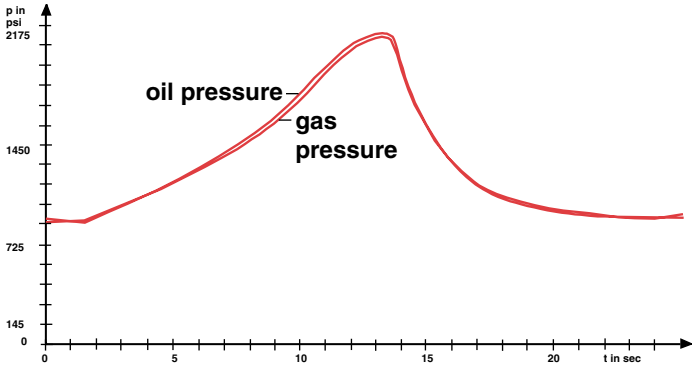
Graph 1: Δp max. ≈ 125 psi

Graph 2: Δp max. ≈ 14.5 psi

The effect of the sealing friction on the working pressure is particularly striking in traditional piston designs. Abrupt piston movements *(the stick-slip effect)* are caused by the seal friction as shown in Graph 1. The low sealing friction of HYDAC type 2 pistons drastically reduces the stick-slip effect therefore maximizing piston responsiveness.



Graph 1: Traditional piston designs



Graph 2: Piston Type 2 *(low friction model)*

Model Code

SK 350 - 20 / 2112 S - 210 F C F - V E - 18 -

Series
SK 350 = 3000 psi
SK 600 = 5000 psi

Size *(in Liters, see tables on dimension pages to follow)*
4 = 4 Liters
...see tables on following pages for complete list of sizes, and which versions they are available in
300 = 300 Liters

Material and Piston Type

Piston Type *(see page 13)*
2 = Low Friction Model
3 = General Duty

Piston Material
1 = Aluminum
2 = Carbon steel *(machined)*
3 = Stainless steel
4 = Carbon steel with surface protection *(machined)*
5 = Steel *(cold impact formed)*

Cylinder and End Cap Material
1 = Carbon steel *(machined)*
2 = Carbon steel with surface protection *(machined)*
3 = Stainless steel
6 = Low temperature carbon steel (< -20°F)

Seal Material *(including piston seals)*
2 = NBR
6 = FPM *(fluoro-elastomer)*
8 = PUR *(Polyurethane)*

Country of Installation
S = USA
(for other countries see page 2 for proper code designation)

Maximum Working Pressure in bar *(based upon first choice - SERIES)*
210 = 3000 psi (SK 350)
345 = 5000 psi (SK 600)

Fluid Port Connection

Type of Connection *(refer to tables on the following page)*
A = Threaded, Female
F = Flanged

Standard / Specification of Type of Connection *(refer to tables on the following page)*
A, B, C, D

Size of Connection *(refer to tables on the following page)*
A, B, C, D, E, ...

Gas Side Connection

Type of Connection *(refer to tables on the following page)*
A = Threaded, Female
F = Flanged
V = Gas Valve

Standard/Specification of Type of Connection *(OMIT if V was chosen directly above, refer to tables on the following page)*
(omit), A, B, C, D

Size of Connection *(refer to tables on the following page)*
A, B, C, D, E, ...

Piston Diameter

06	=	60mm	15	=	150mm
08	=	80mm	18	=	180mm
10	=	100mm	25	=	250mm
12	=	125mm	35	=	355mm

Supplementary Equipment

A	=	Electrical Limit Switch (35mm stroke)	M	=	Magnetic flapper indication
B	=	Electrical Limit Switch (200mm stroke)	S	=	Cable tension measurement system
C	=	Electrical Limit Switch (500mm stroke)	U	=	Ultrasonic measurement system
K	=	Protruding Piston Rod	E...	=	Special switch(1 (fixed and adjustable)

Safety Devices
1 = Burst Disc *(indicate nominal pressure)*
2 = Gas safety valve
3 = Thermal fuse cap *(see page 26)*

Model Codes containing RED selections are non-standard items – Contact HYDAC for information and availability
Not all combinations are available

1) Consult HYDAC for assistance with specifying switch details

Model Code Support Tables for Gas & Fluid Connections

Female Threaded Connections: A[1] Sample Code = A[1] A[2] A[3]

Code	Type of Connection	A	B	C	D	E	F	G	H	J	K	L	M
A	BSPP (ISO 228)	G1/8	G1/4	G3/8	G1/2	G3/4	G1	G1 1/4	G1 1/2	G2	G2 1/2	G3	N/A
B	DIN 13 or ISO 965/1 (Metric)	M10x1	M12x1.5	M14x1.5	M16x1.5	M18x1.5	M22x1.5	M27x2	M33x2	M42x2	M48x2	M60x2	N/A
C	ANSI B1.1 (UN..-2B) Seal SAE J 514	5/16-24UNF	3/8-24UNF	7/16-20UNF	1/2-20UNF	9/16-18UNF	3/4-16UNF	7/8-14UNF	1 1/16-12UN	1 3/16-12UN	1 5/16-12UN	1 5/8 12UN	1 7/8 12UN
D	ANSI B1.20.3	1/16-27	1/8-27	1/4-18	3/8-18	1/2-14	3/4-14	1-11 1/2	1 1/4-11 1/2	1 1/2-11 1/2	2-11 1/2	2 1/2-8	N/A

1) use “A” as the first character of the connection code for all Female Threaded Connections.
2) Enter the letter of the ROW (red) as the second character of the connection code.
3) Enter the letter of the COLUMN (gray) as the third character of the connection code.

Flange Connections: F[4] Sample Code = F[4] C[5] B[6]

Code	Type of Connection	A	B	C	D	E	F	G	H	J	K	L	M
C	SAE Code 61 (3000 psi)	1/2”	3/4”	1”	1 1/4”	1 1/2”	2”	2 1/2”	3”	3 1/2”	4”	5”	N/A
D	SAE Code 62 (6000 psi)	1/2”	3/4”	1”	1 1/4”	1 1/2”	2”	N/A	N/A	N/A	N/A	N/A	N/A

4) use “F” as the first character of the connection code for all Flange Connections.
5) Enter the letter of the ROW (red) as the second character of the connection code.
6) Enter the letter of the COLUMN (gray) as the third character of the connection code.

Gas Valve Connections: V[7] Sample Code = V[7] (omit)[8] A[9]

Code	Type of Connection
A	G 3/4 male with M28x1.5/M8 (standard HYDAC gas valve version 1)
E	G 3/4 male with 7/8-14 UNF-VG8 (standard HYDAC gas valve version 4)

7) use “V” as the first character of the connection code for all Gas Valve Connections.
8) OMIT the second character of the connection code.
9) Enter the letter of the ROW as the third character of the connection code.

Other Connections & Custom Solutions are Available:

HYDAC has the capabilities to produce accumulators with many other types of connections. The options listed above are simply the most common, and most readily available. Other connection options include:

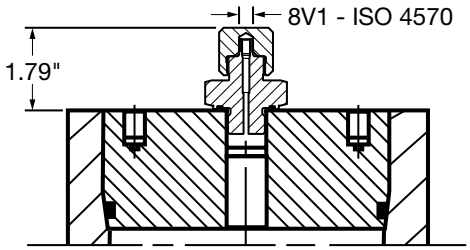
- Male threads
- Protruding flanges
- ANSI flanges
- DIN flanges
- Autoclave
- High Pressure Block FLANGE (Rexroth, AVIT, HAVIT) PN320

Custom solutions that incorporate valve/manifold assemblies are also available, for more information on special connections and custom solutions, consult factory.

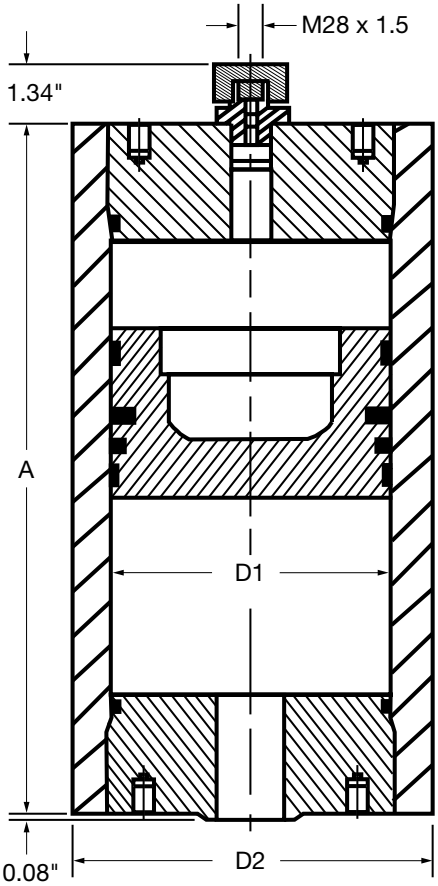
SK 350 Series

Type 2 Dimensions

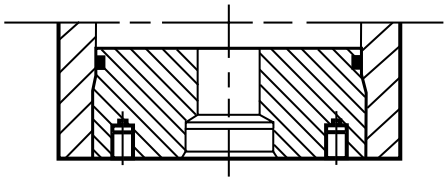
Gas Valve Version 4 (code designation VE)
Uses Charging Unit FPS



Gas Valve Version 1 (code designation VA)
Uses Charging Unit FPK



Flange Connection (code designation F_ _)
(specified by model code)



Threaded Connection (code designation A_ _)
(specified by model code)

3000 psi maximum working pressure

Size liters	Effective Gas Volume gal	Weight lbs / (kg)	A in / (mm)	ø D1 in / (mm)	ø D2 in / (mm)
10	2.5	233 / (107)	28 / (711)	7.09 (180)	8.62 (219)
16	4	283 / (128)	37.2 / (945)		
20	5	316 / (143)	43.4 / (1102)		
30	7.5	400 / (181)	58.9 / (1496)		
40	10	482 / (219)	74.4 / (1890)		
50	12.5	566 / (257)	89.9 / (2283)		
40	10	788 / (357)	49 / (1245)	9.84 (250)	12.21 (310)
50	12.5	882 / (400)	57.1 / (1450)		
60	15	974 / (442)	65 / (1651)		
75	20	1114 / (505)	77.1 / (1958)		
100	25	1347 / (611)	97.1 / (2466)		
115	30	1488 / (675)	109.2 / (2774)		
135	35	1676 / (760)	125.3 / (3183)		
150	40	1816 / (824)	137.4 / (3490)		
170	45	2004 / (909)	152.4 / (3871)		
190	50	2194 / (994)	168.4 / (4277)		
100	25	1859 / (843)	61.9 / (1572)	13.98 (355)	17.09 (434)
115	30	1986 / (901)	67.9 / (1725)		
150	40	2287 / (1037)	81.8 / (2078)		
190	50	2630 / (1193)	97.7 / (2482)		
250	65	3144 / (1426)	121.6 / (3089)		
300	80	3572 / (1620)	141.5 / (3594)		

5000 psi maximum working pressure

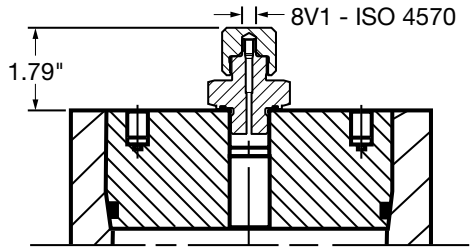
Size liters	Effective Gas Volume gal	Weight lbs / (kg)	A in / (mm)	ø D1 in / (mm)	ø D2 in / (mm)
0.2	0.05	15 / (7)	8.6 / (218)	2.36 (60)	3.15 (80)
0.5	0.125	20 / (9)	12.8 / (325)		
1	0.25	26 / (12)	19.8 / (502)		
0.5	0.125	24 / (11)	9.8 / (250)	3.15 (80)	3.94 (100)
1	0.25	29 / (13)	13.8 / (350)		
2	0.5	40 / (18)	21.7 / (550)		
2.5	0.625	62 / (28)	20.9 / (532)	3.94 (100)	4.96 (126)
5	1.25	88 / (40)	33.5 / (850)		
7.5	1.875	115 / (52)	46.1 / (1170)		
2	0.5	82 / (37)	13.6 / (345)	4.92 (125)	6.30 (160)
5	1.25	115 / (52)	23.2 / (590)		
15	3.75	225 / (102)	55.3 / (1405)		
6	1.5	128 / (58)	21.5 / (545)	5.91 (150)	7.09 (180)
20	5	231 / (105)	52.6 / (1335)		
40	10	386 / (175)	97.2 / (2470)		

Note: Other sizes available on request. Intermediate sizes are possible, depending on the length/diameter required. Please consult factory for details on special sizes.
Dimensions are for general information only,
all critical dimensions should be verified.
Dimensions are in inches/(mm) and lbs/(kg)

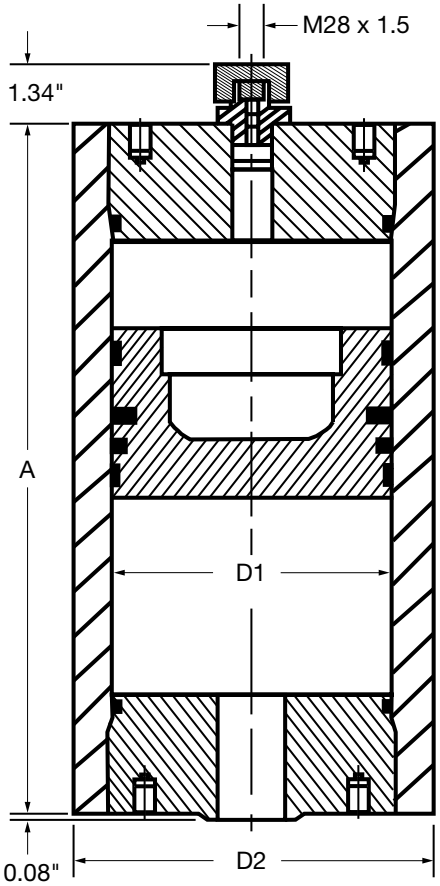
SK 600

Type 2 Dimensions

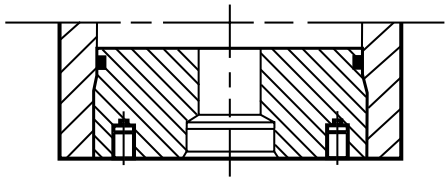
Gas Valve Version 4 (code designation VE)
Uses Charging Unit FPS



Gas Valve Version 1 (code designation VA)
Uses Charging Unit FPK



Flange Connection (code designation F_ _)
(specified by model code)



Threaded Connection (code designation A_ _)
(specified by model code)

3000 psi maximum working pressure

Size liters	Effective Gas Vol gal	Weight	A	ø D1	ø D2
10	2.5	302 / (137)	28 / (711)	7.09 (180)	9.61 (244)
16	4	402 / (182)	37.2 / (945)		
20	5	447 / (203)	43.4 / (1102)		
30	7.5	606 / (275)	58.9 / (1496)		
40	10	736 / (334)	74.4 / (1890)		
50	12.5	884 / (401)	89.9 / (2283)		
40	10	1110 / (503)	49 / (1245)	9.84 (250)	13.31 (338)
50	12.5	1254 / (569)	57.1 / (1450)		
60	15	1396 / (633)	65 / (1651)		
75	20	1611 / (731)	77.1 / (1958)		
100	25	1969 / (893)	97.1 / (2466)		
115	30	2184 / (990)	109.2 / (2774)		
135	35	2472 / (1121)	125.3 / (3183)		
150	40	2689 / (1220)	137.4 / (3490)		
170	45	2977 / (1350)	153.5 / (3899)		
190	50	3265 / (1481)	169.5 / (4305)		

Dimensions are for general information only,
all critical dimensions should be verified.
Dimensions are in inches/(mm) and lbs/(kg)

SK 280 Series
Piston Accumulators

Advantages

The new piston accumulator series: SK280 is non repairable. The special production process of these HYDAC accumulators saves costs. Therefore it is possible to offer better sales prices.

- cost-effective – because of an optimized production process
- weight reduced series
- reduced installation space
- Standard-gas valve with integrated M28x1.5 male thread (non refillable execution possible)
- Quick delivery for models with standard connection
- Fully tested (function test and fatigue test)
- SAE fluid ports are available

Application

- Mobile Hydraulic
- Industrial Hydraulic

Model Code

SK280 - 1 / 3 2 1 8 U – 280 AAD VB - 05

Type
SK280 = Piston Accumulator

Nominal Volume [l]

Material and Piston Code

Piston Type
3 = Piston type 3

Piston Material
2 = Carbon steel

Cylinder and Covers Material
1 = Carbon steel

Seal Material (incl. Piston Sealing)
5 = Low Temperature NBR
8 = PUR (Polyurethan)

Certificate Code
U = PED 97/23/EC

Max. Working Pressure (bar)

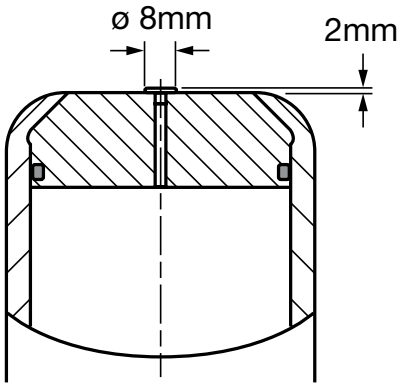
Fluid Connection
AAD = Thread to ISO 228 size G1/2 (ISO 288)
ACE = 9/16-18-2B (SAE J 514) (SAE-06)
ACF = 3/4-16-2B (SAE J 514) (SAE-08)
ACH = 1 1/16-12-2B (SAE J 514) (SAE-12)
ACK = 1 5/16-12-2B (SAE J 514) (SAE-16)

Gas Side Connection
VB = gas valve execution M28 x 1.5 / M8 integrated in gas side end-cover
000 = not refillable execution *(see drawing)*

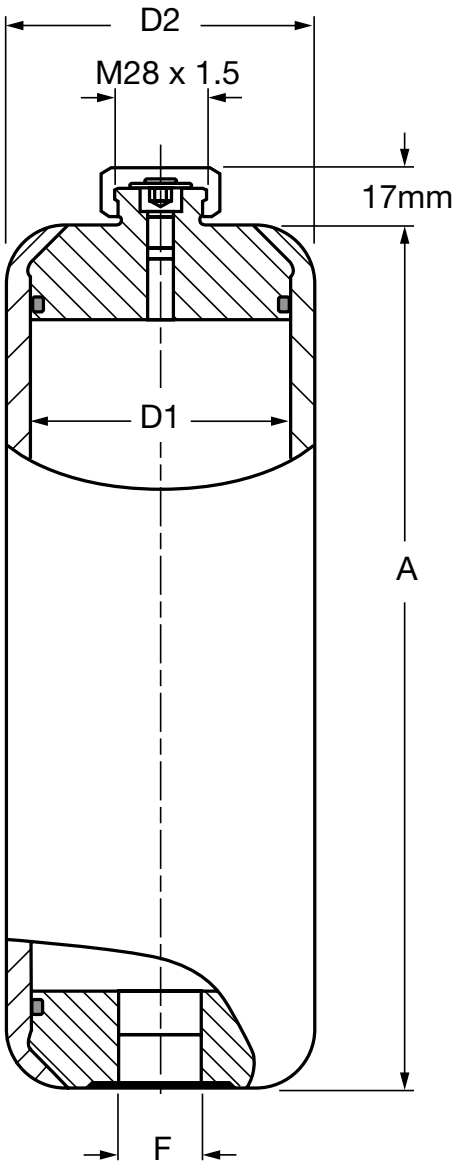
Piston Diameter
05 = 50 mm

Model Codes containing RED selections are non-standard items – Contact HYDAC for information and availability
Not all combinations are available – See page 16

Dimensions
000 Connection



VB Connection - Refillable



Nominal Volume (Liter)	A +/- 3	F ISO 228	F SAE Ports	Weight	D1	D2
0.16	160	G 1/2	9/16-18-2B	2	50	60
0.32	240	G 1/2	9/16-18-2B	2.5		
0.5	335	G 1/2	3/4-16-2B	3.1		
0.75	460	G 1/2	3/4-16-2B	4		
1	590	G 1/2	3/4-16-2B	4.8		
0.32	205	G 1/2	3/4-16-2B	3	60	70
0.5	265	G 1/2	3/4-16-2B	3.5		
0.75	355	G 1/2	3/4-16-2B	4.2		
1	445	G 1/2	3/4-16-2B	5.1		
1.5	620	G 1/2	3/4-16-2B	6.4		
2	800	G 1/2	3/4-16-2B	7.8		
2.5	975	G 1/2	3/4-16-2B	9.2		
0.5	210	G 3/4	1 1/16-12-2B	6.5	80	95
0.75	260	G 3/4	1 1/16-12-2B	7.2		
1	310	G 3/4	1 1/16-12-2B	8		
1.5	410	G 3/4	1 1/16-12-2B	9.5		
2	510	G 3/4	1 1/16-12-2B	11.5		
2.5	605	G 3/4	1 1/16-12-2B	13		
3	705	G 3/4	1 1/16-12-2B	14.5		
3.5	805	G 3/4	1 1/16-12-2B	16		
4	905	G 3/4	1 1/16-12-2B	17.5		
0.75	235	G 1	1 5/16-12-2B	14	100	125
1	265	G 1	1 5/16-12-2B	15		
1.5	330	G 1	1 5/16-12-2B	17		
2	395	G 1	1 5/16-12-2B	19		
3	520	G 1	1 5/16-12-2B	23.5		
4	650	G 1	1 5/16-12-2B	28		
5	775	G 1	1 5/16-12-2B	32.5		
6	900	G 1	1 5/16-12-2B	37		

Dimensions are for general information only,
all critical dimensions should be verified.
Dimensions are in mm and kg