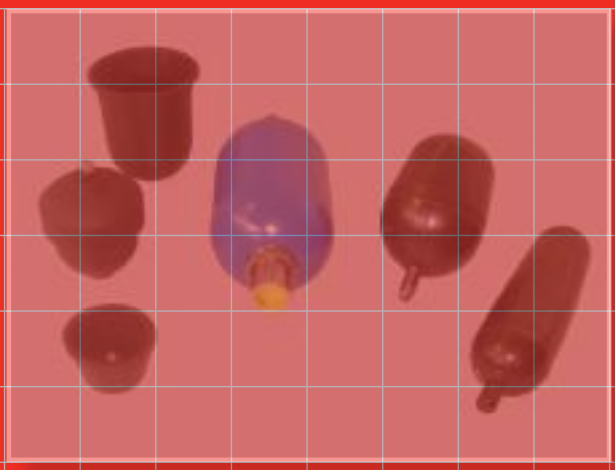
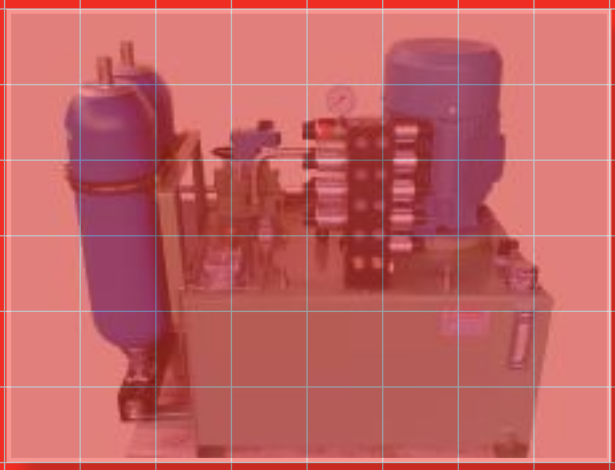




CATALOGO ACCUMULATORI

As

CATALOGO TECNICO

TECHNICAL CATALOGUE

INDICE

Versione 06/2015

N.B.: SI ESEGUONO

- **SOSTITUZIONI DI SACCHE E MEMBRANE PER ACCUMULATORI ISPEZIONABILI**
- **SI ESEGUONO CONTROLLI DI PRESSIONE CON RELATIVO RILASCIO DI CERTIFICATO**

Serie EHV
Pressione 330 bar

TIPO DI COSTRUZIONE: accumulatore con valvola antiestrusione lato fluido – corpo in acciaio forgiato senza saldature – valvola di carico azoto di robusta costituzione – smontabile

PRECARICA AZOTO "P_0": tra 0,9 pressione minima e 0,2 pressione massima

GAMMA DI TEMPERATURE: versione standard: da -20°C a +80°C. Altre gamme a richiesta

FLUIDI IN PRESSIONE: olio idraulico.
Elastomeri speciali come Viton, EPDM, Butile, ecc…compatibili con fluidi particolari sono disponibili su richiesta

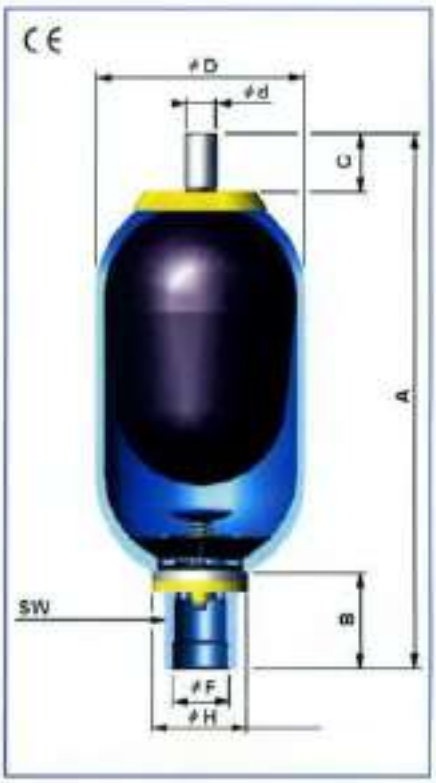
PORTATA "Q": i valori massimi indicati in tabella si riferiscono unicamente al montaggio in verticale. In caso di montaggio differente e/o di un maggior flusso contattare l'ufficio tecnico

MONTAGGIO: da verticale ad orizzontale. Per il montaggio del verificatore/gonfiatore di precarica tenere libero uno spazio di circa 200 mm sopra la valvola di carico azoto

FISSAGGIO: collari e mensole con inserti in gomma – kit di fissaggio

Descrizione	EHV10.330/90	EHV12.330/90	EHV20.330/90	EHV24,5.330/90	EHV32.330/90	EHV50.330/90
P max (bar)	330	330	330	330	330	330
V (L)	9,2	11	17,8	22,5	32	48,5
Q max (L/1')	900	900	900	900	900	900
Peso (Kg)	30	35	50	53	80	100
"D" (mm)	222	222	222	222	222	222
"A" max (mm)	583	683	893	1028	1418	1939
Attacco fluido "F"	2" gcf	2" gcf	2"gcf	2" gcf	2" gcf	2" gcf
O'Ring (mm)	54x3	54x3	54x3	54x3	54x3	54x3
Rid. lato fluido	1" gcf	1" gcf	1" gcf	1" gcf	1" gcf	1" gcf
B	103	103	103	103	103	103
C	65	65	65	65	65	70
"d"	22,5	22,5	22,5	22,5	22,5	51
"H"	101	101	101	101	101	101
SW	70	70	70	70	70	70
G (spurgo)	M12x1	M12x1	M12x1	M12x1	M12x1	M12x1
Collare	D226L	D226L	D226L	D226L	D226L	D226L
Mensola	CE 159	CE 160	CE 161	CE 162	CE 163	CE 164
Blocco di sicurezza	DI24.....	DI24.....	DI24.....	DI24.....	DI24.....	DI24.....

Serie EHV



Descrizione	EHV0,2.350/00*	EHV0,5.330/00*	EHV1.350/90	EHV1,6.350/90	EHV2,5.350/90	EHV4.350/90	EHV5.350/90	EHV6.350/90	EHV10.350/90
P max (bar)	350	350	350	350	350	350	350	350	350
V (L)	0,17	0,6	1	1,6	2,4	3,7	5	6	10
Q max (L/1')	120	240	240	240	450	450	450	450	450
Peso (Kg)	2,1	2,5	5	7	10	14	17	19	29
"D" (mm)	58	90	115	115	115	170	115	170	170
"A" max (mm)	266	258	326	435	546	431	895	557	822
Attacco fluido "F"	1/2"gcf	3/4"gcf	3/4"gcf	3/4"gcf	1"1/4gcf	1"1/4gcf	1"1/4gcf	1"1/4gcf	1"1/4gcf
O'Ring (mm)	18x2	21,3x2,4	21,3x2,4	21,3x2,4	36,3x3	36,3x3	36,3x3	36,3x3	36,3x3
Rid. lato fluido	1/4"gcf	3/8"gcf	3/8"gcf	3/4"gcf	3/4"gcf	3/4"gcf	3/4"gcf	3/4"gcf	3/4"gcf
B	38	54	54	54	66	65	66	65	65
C	28	27	65	65	65	65	65	65	65
Diametro "d"	16	16	22.5	16	22.5	22.5	22.5	22.5	22.5
Diametro "H"	38	50	50	50	68	68	68	68	68
SW	24	32	32	32	50	50	50	50	50
Collare	D56	D90	D114L	D114L	D114L	D168	D114L	D168	D168
Mensola			CE89	CE89	CE89	CE108	CE89	CE108	CE108
Blocco di sicurezza			DI10....	DI10....	DI16....	DI16....	DI16....	DI16....	DI16....

Serie EHVF SAE 3000
pressione 210 bar

TIPO DI COSTRUZIONE: accumulatore con valvola antiestrusione lato fluido – corpo in acciaio forgiato senza saldature – valvola di carico azoto di robusta costruzione – smontabile

PRECARICA AZOTO "P_0": tra 0,9 pressione minima e 0,2 pressione massima

GAMMA DI TEMPERATURE: versione standard: da -20°C a +80°C. Altre gamme a richiesta

FLUIDI IN PRESSIONE: olio idraulico.
Elastomeri speciali come Viton, EPDM, Butile, ecc. compatibili con fluidi particolari sono disponibili su richiesta.

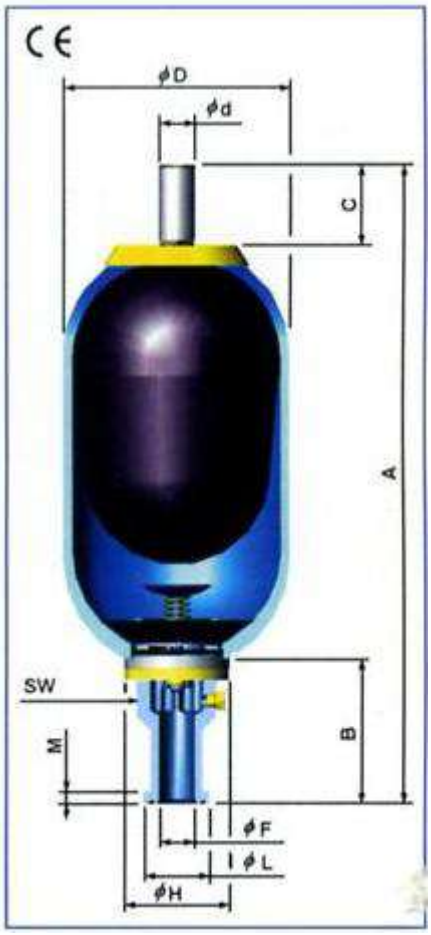
PORTATA "Q": i valori massimi indicati in tabella si riferiscono unicamente al montaggio in verticale. In caso di montaggio differente e/o di maggior flusso contattare l'ufficio tecnico.

MONTAGGIO: da verticale a orizzontale. Per il montaggio del verificatore/gonfiatore di precarica tenere uno spazio di circa 200 mm sopra la valvola di carico azoto

FISSAGGIO: collari e mensole con inserti di gomma – kit di fissaggio

Descrizione	EHVF10.210/90	EHVF12.210/90	EHVF20.210/90	EHVF24,5.210/90	EHVF32.210/90	EHVF50.210/90
P max (bar)	330	330	330	330	330	330
V (L)	9,2	11	17,8	22,5	32	48,5
Q max (L/1')	900	900	900	900	900	900
Peso (Kg)	30,5	35,5	50,5	53,5	81	101
"D" (mm)	222	222	222	222	222	222
"A" max (mm)	623	723	933	1068	1458	1979
Attacco fluido "F"	34	34	34	34	34	34
O'Ring (mm)	56,74x3,53	56,74x3,53	56,74x3,53	56,74x3,53	56,74x3,53	56,74x3,53
"L"	2" SAE 3000	2" SAE 3000	2" SAE 3000	2" SAE 3000	2" SAE 3000	2" SAE 3000
"M"	9,5	9,5	9,5	9,5	9,5	9,5
B	143	143	143	143	143	143
C	65	65	65	65	65	70
"d"	22,5	22,5	22,5	22,5	22,5	51
"H"	101	101	101	101	101	101
SW	70	70	70	70	70	70
G (spurgo)	M12x1	M12x1	M12x1	M12x1	M12x1	M12x1
Collare	D226L	D226L	D226L	D226L	D226L	D226L
Mensola	CE 159	CE 160	CE 161	CE 162	CE 163	CE 164

Serie EHVF SAE 3000



Descrizione	EHVF1.210/90	EHVF1,6.210/90	EHVF2.5.210/90	EHVF4.210/90	EHVF5.210/90	EHVF6.210/90	EHVF10.210/90
P max (bar)	350	350	350	350	350	350	350
V (L)	1	1,6	2,4	3,7	5	6	10
Q max (L/1')	570	570	570	450	570	450	450
Peso (Kg)	6	7	12	14,5	19	21	29
"D" (mm)	115	115	115	170	115	170	170
"A" max (mm)	392	501	591	476	940	602	864
Attacco fluido "F"	22	22	22	22	22	22	22
O'Ring (mm)	37,69x3,53	37,69x3,53	37,69x3,53	37,69x3,53	37,69x3,53	37,69x3,53	37,69x3,53
"L"	1"1/4 SAE 3000	1"1/4 SAE 3000	1"1/4 SAE 3000	1"1/4 SAE 3000	1"1/4 SAE 3000	1"1/4 SAE 3000	1"1/4 SAE 3000
"M"	8	8	8	8	8	8	8
B	111	111	111	110	111	110	110
C	65	65	65	65	65	65	65
"d"	22,5	16	22,5	22,5	22,5	22,5	22,5
"H"	68	68	68	68	68	68	68
SW	50	50	50	50	50	50	50
Collare	D114L	D114L	D114L	D168	D114L	D168	D168
Mensola	CE89	CE89	CE89	CE108	CE89	CE108	CE108

Serie EHVF SAE 6000
pressione 330-350 bar

TIPO DI COSTRUZIONE: accumulatore con valvola antiestrusione lato fluido – corpo in acciaio forgiato senza saldature – valvola di carico azoto di robusta costruzione – smontabile

PRECARICA AZOTO "P_0": tra 0,9 pressione minima e 0,2 pressione massima

GAMMA DI TEMPERATURE: versione standard: da -20°C a +80°C. Altre gamme a richiesta

FLUIDI IN PRESSIONE: olio idraulico.
Elastomeri speciali come Viton, EPDM, Butile, ecc. compatibili con fluidi particolari sono disponibili su richiesta.

PORTATA "Q": i valori massimi indicati in tabella si riferiscono unicamente al montaggio in verticale. In caso di montaggio differente e/o di maggior flusso contattare l'ufficio tecnico.

MONTAGGIO: da verticale a orizzontale. Per il montaggio del verificatore/gonfiatore di precarica tenere uno spazio di circa 200 mm sopra la valvola di carico azoto

FISSAGGIO: collari e mensole con inserti di gomma – kit di fissaggio

Descrizione	EHVF10.330/90	EHVF12.330/90	EHVF20.330/90	EHVF24,5.330/90	EHVF32.330/90	EHVF50.330/90
P max (bar)	330	330	330	330	330	330
V (L)	9,2	11	17,8	22,5	32	48,5
Q max (L/1')	900	900	900	900	900	900
Peso (Kg)	30,5	35,5	50,5	53,5	81	101
"D" (mm)	222	222	222	222	222	222
"A" max (mm)	623	723	933	1068	1458	1979
Attacco fluido "F"	34	34	34	34	34	34
O'Ring (mm)	47,22x3,53	47,22x3,53	47,22x3,53	47,22x3,53	47,22x3,53	47,22x3,53
"L"	1"1/2 SAE 6000	1"1/2 SAE 6000	1"1/2 SAE 6000	1"1/2 SAE 6000	1"1/2 SAE 6000	1"1/2 SAE 6000
"M"	12,5	12,5	12,5	12,5	12,5	12,5
B	143	143	143	143	143	143
C	65	65	65	65	65	70
"d"	22,5	22,5	22,5	22,5	22,5	51
"H"	101	101	101	101	101	101
SW	70	70	70	70	70	70
G (spurgo)	M12X1	M12x1	M12x1	M12x1	M12x1	M12x1
Collare	D226L	D226L	D226L	D226L	D226L	D226L
Mensola	CE 159	CE 160	CE 161	CE 162	CE 163	CE 164

Serie EHVF -SAE 6000

Descrizione	EHVF1.350/90	EHVF1,6.350/90	EHVF2,5.350/90	EHVF4.350/90	EHVF5.350/90	EHVF6.350/90	EHVF10.350/90
P max (bar)	350	350	350	350	350	350	350
V (L)	1	1,6	2,4	3,7	5	6	10
Q max (L/1')	570	570	570	450	570	450	450
Peso (Kg)	6	7	12	14,5	19	21	29
"D" (mm)	115	115	115	170	115	170	170
"A" max (mm)	392	501	591	476	940	602	864
Attacco fluido "F"	22	22	22	22	22	22	22
O'Ring (mm)	32,93x3,53	32,93x3,53	32,93x3,53	32,93x3,53	32,93x3,53	32,93x3,53	32,93x3,53
"L"	1" SAE 6000	1" SAE 6000	1" SAE 6000	1" SAE 6000	1" SAE 6000	1" SAE 6000	1" SAE 6000
"M"	9,5	9,5	9,5	9,5	9,5	9,5	9,5
B	111	111	111	110	111	110	110
C	65	65	65	65	65	65	65
Diametro "d"	22,5	16	22,5	22,5	22,5	22,5	22,5
Diametro "H"	68	68	68	68	68	68	68
SW	50	50	50	50	50	50	50
Collare	D114L	D114L	D114L	D168	D114L	D168	D168
Mensola	CE89	CE89	CE89	CE108	CE89	CE108	CE108

Serie EHP
Accumulatori a pistone

TIPI DI GUARNIZIONI DIVERSI
Sono disponibili diversi tipi di guarnizioni in funzione dell'alta velocità di scorrimento del pistone e della temperature di funzionamento.

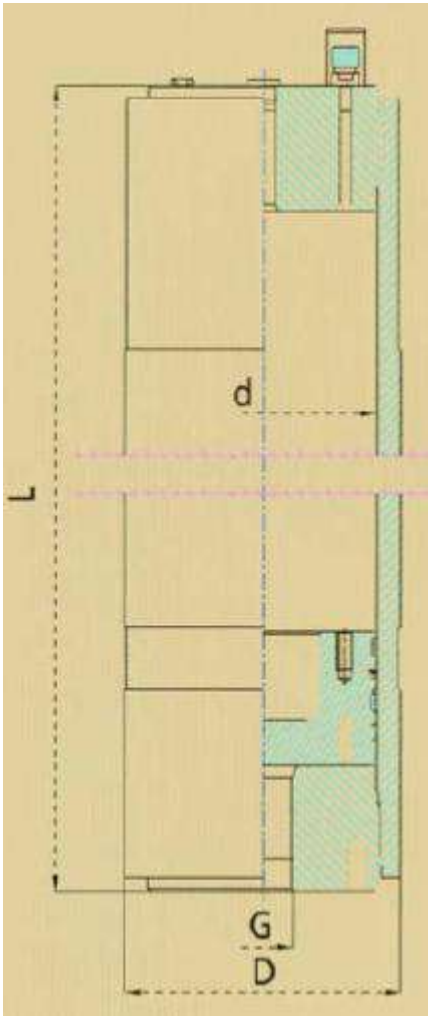
FACILE COLLEGAMENTO ALLE BOMBOLE ADDIZIONALI
Gli accumulatori a pistone possono essere facilmente collegati a bombole addizionali per aumentare il volume di utilizzo. Questa soluzione è più economica rispetto all'installazione del 100% del volume degli accumulatori.

FUNZIONALE INDICATORE DI POSIZIONE DEL PISTONE
Assicura un funzionamento ottimale. E' composto da un tubo, montato in parallelo all'accumulatore. Nel caso di accumulatore in acciaio ossidabile il magnete è situato all'interno del pistone. L'indicatore di posizione può essere equipaggiato con indicatore visivo, sensori di posizione di estremità o di un trasduttore lineare.

CARATTERISTICHE TECNICHE

	EHP 180	***EHP 250***	***EHP 350***
Pressione di progetto	250 bar	250 bar	220 bar
Pressione di prova	357.5 bar	357.5 bar	314.6 bar
Temperature di funzionamento	-40°C +100°C	-40°C +100°C	-40°C +100°C
Guarnizioni	Gomma nitrilica	Gomma nitrilica	Gomma nitrilica
Attacco lato olio	1"1/2 G	2" G	2" G
Attacco speciale lato olio	Su richiesta	Su richiesta	Su richiesta
Velocità di scorrimento	2 m/s	2 m/s	
Opzioni	Asta uscente lato olio/azoto indicatore di posizione visivo con fine corsa o trasduttore lineare	Asta uscente lato olio/azoto indicatore di posizione visivo con fine corsa o trasduttore lineare	Asta uscente lato olio/azoto indicatore di posizione visivo con fine corsa o trasduttore lineare
Bombola addizionale	G ½" e ¾"	G ½" e ¾"	G ½" e ¾"
Disco di rottura	G ¼"	G ¼"	G ¼"

Serie EHP



ACCUMULATORI A PISTONE EHP 180 IN ACCIAIO AL CARBONIO
PISTON ACCUMULATORS EHP 180 CARBONSTEEL

Pressione massima di utilizzo: 250 bar - volumi: 8 a 50 litri - øD: 219.1 mm. - ød: 180 mm.
Max working pressure: 250 bar - volumes: 8 to 50 lts. - øD: 219.1 mm. - ød: 180 mm.

Tipo *Type*	Volume litri *Volume lts.*	L. *L.*	Peso Kg. *Weight Kg.*	Q max (l/min) *Max flow (l/min)*
EHP 180/008/250/90	8	622	110	480
EHP 180/009/250/90	9	660	115	480
EHP 180/010/250/90	10	700	120	480
EHP 180/012/250/90	12	778	125	480
EHP 180/015/250/90	15	896	135	480
EHP 180/018/250/90	18	1015	145	480
EHP 180/020/250/90	20	1095	160	480
EHP 180/025/250/90	25	1290	175	480
EHP 180/030/250/90	30	1485	190	480
EHP 180/032/250/90	32	1565	200	480
EHP 180/035/250/90	35	1682	215	480
EHP 180/040/250/90	40	1880	230	480
EHP 180/045/250/90	45	2075	250	480
EHP 180/050/250/90	50	2275	270	480

ACCUMULATORI A PISTONE EHP 250 IN ACCIAIO AL CARBONIO
PISTON ACCUMULATORS EHP 250 CARBONSTEEL

Pressione massima di utilizzo: 250 bar - volumi: 25 a 100 litri - øD: 298.5 mm. - ød: 250 mm.
Max working pressure: 250 bar - volumes: 25 to 100 lts. - øD: 298.5 mm. - ød: 250 mm.

Tipo *Type*	Volume litri *Volume lts.*	L. *L.*	Peso Kg. *Weight Kg.*	Q max (l/min) *Max flow (l/min)*
EHP 250/025/250/90	25	891	260	750
EHP 250/030/250/90	30	992	275	750
EHP 250/035/250/90	35	1096	295	750
EHP 250/040/250/90	40	1196	310	750
EHP 250/045/250/90	45	1298	325	750
EHP 250/050/250/90	50	1401	345	750
EHP 250/055/250/90	55	1501	365	750
EHP 250/060/250/90	60	1606	375	750
EHP 250/065/250/90	65	1706	395	750
EHP 250/070/250/90	70	1811	410	750
EHP 250/075/250/90	75	1908	430	750
EHP 250/080/250/90	80	2011	445	750
EHP 250/085/250/90	85	2112	460	750
EHP 250/090/250/90	90	2216	475	750
EHP 250/095/250/90	95	2316	495	750
EHP 250/100/250/90	100	2421	510	750

ACCUMULATORI A PISTONE EHP 350 IN ACCIAIO AL CARBONIO
PISTON ACCUMULATORS EHP 350 CARBONSTEEL

Pressione massima di utilizzo: 220 bar - volumi: 30 a 350 litri - øD: 406.4 mm. - ød: 350 mm.
Max working pressure: 220 bar - volumes: 30 a 350 lts. - øD: 406.4 mm. - ød: 350 mm.

Tipo *Type*	Volume litri *Volume lts.*	L. *L.*	Peso Kg. *Weight Kg.*	Q max (l/min) *Max flow (l/min)*
EHP 350/030/250/90	30	818	540	750
EHP 350/040/250/90	40	922	570	750
EHP 350/050/250/90	50	1026	600	750
EHP 350/060/250/90	60	1130	625	750
EHP 350/070/250/90	70	1235	655	750
EHP 350/080/250/90	80	1338	680	750
EHP 350/090/250/90	90	1442	710	750
EHP 350/100/250/90	100	1546	735	750
EHP 350/150/250/90	150	2065	870	750
EHP 350/200/250/90	200	2585	1010	750
EHP 350/250/250/90	250	3105	1145	750
EHP 350/300/250/90	300	3625	1285	750
EHP 350/350/250/90	350	4144	1420	750

Serie HST
ACCUMULATORI IDROPNEUMATICI A MEMBRANA

CARATTERISTICHE TECNICHE

Pressione massima di lavoro: 300 bar
Pressione di prova: 450 bar
Corpo: in acciaio al carbonio verniciato
Valvola azoto standard: 5/8" UNF
Metodologia costruttiva: due componenti distinte unite da una speciale filettatura che sottoposta a pressioni dinamiche tende ad autobloccarsi
Temperatura d'impiego esecuzione standard: da -20°C a +90°C
Membrana standard: adatta a olii minerali e a fluidi non aggressivi
Montaggio: in ogni posizione
Rapporto di compressione: consigliato P2/P0=2.5 – massimo P2/P0=6
Vita meccanica: il numero di cicli è inversamente proporzionale all'aumento del rapporto di compressione

Conforme: 97/23/CE PED – 94/9/CE ATEX

Tipo	Pressione max	Volume Azoto	Precarica max	H	D	B	C	Connessione idraulica	Portata max	Peso	Dis.N°
	Bar	Litri	Bar	mm	mm	mm	mm		Litri/min	Kg	
HST 0.04	300	0.04	210	100	60	35	11	¾" BSP	35	0.7	2
HST 0.1	300	0.12	210	141	80	94	22	M 18X1.5	45	2.1	1
HST 0.35	300	0.35	210	152	101	100	22	M 18X1.5	50	3.2	1
HST 0.5	300	0.5	210	175	124	120	22	M 18X1.5	60	5	1
HST 0.7	300	0.7	210	218	100	80	22	M 18X1.5	55	5.5	1
HST 0.8	300	0.8	210	185	138	85	22	M 18X1.5	60	5.8	2
HST 1.3	300	1.3	210	232	120	180	22	M 18X1.5	55	7.9	1
HST 1.5	300	1.5	210	270	138	160	22	M 18X1.5	55	8.7	2
HST 2.3	300	2.3	210	340	138	165	22	M 18X1.5	55	10.5	2

Serie HTR
ACCUMULATORI IDROPNEUMATICI A SACCA

CARATTERISTICHE TECNICHE

Pressione massima di lavoro 210bar
Pressione di prova : 315 bar
Corpo: in acciaio carbonio verniciato
Temperatura di impiego: da -20°C a +80°C
Sacca standard: adatta a oliI minerali e a fluidi non aggressivi
Montaggio: da posizione verticale (valvola azoto verso l'alto) ad orizzontale
Rapporto compressione: consigliato P2/P0=2.5 – massimo P2/P0=4
Vita meccanica: il numero di cicli è inversamente proporzionale all'aumento del rapporto di compressione

Conforme a: 97/23/CE PED – 94/9/CE ATEX II 2 G

Disegno N°1

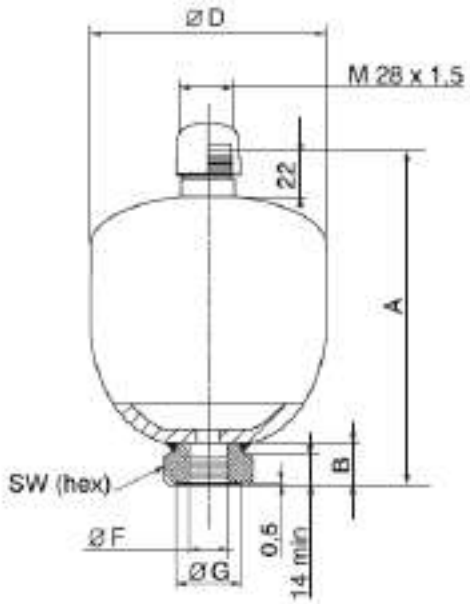
Disegno N°2

Tipo	Pressione max	Volume Azoto	Precarica max	H	D	C	B	Connessione idraulica	Portata max	Peso	Dis.N°
	Bar	Litri	Bar	mm	mm	mm	mm		Lt./min	Kg	
HTR0.3	250	0.3	150	185	72	15	20	M 18X1.5 *	40	2	1
HTR0.35	250	0.35	150	155	93	15	20	M 18X1.5 *	45	2.5	1
HTR0.7	250	0.75	150	220	92	15	20	M 18X1.5 *	40	3.7	1
HTR1.5	250	1.5	150	280	115	15	25	M 18X1.5 *	40	5.3	1
HTR2.5	250	2.5	150	483	115	15	50	1"¼ BSP	110	11.5	2
HTR4.5	210	4.5	150	395	170	15	80	1"¼ BSP	400	15	2
HTR6.5	210	6.5	150	520	170	20	60	1"¼ BSP	350	24	2
HTR10	210	10	150	760	170	15	80	1"¼ BSP	300	31	2
HTR20	150	19.5	100	845	220	15	110	2" BSP	600	59	2
HTR35	150	35	100	1380	220	15	110	2" BSP	540	90	2
HTR50	150	50	100	1870	220	15	110	2" BSP	500	121	2

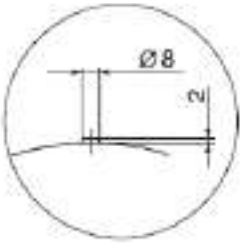
Serie ELM
Technical characteristics

Form A

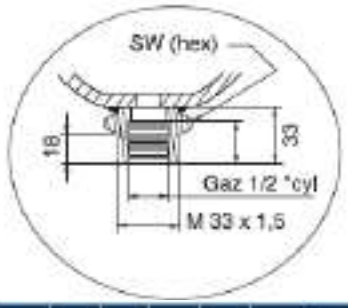
Standart F execution
nitrogen rechargeable



G execution at request
nitrogen pre-charged in factory



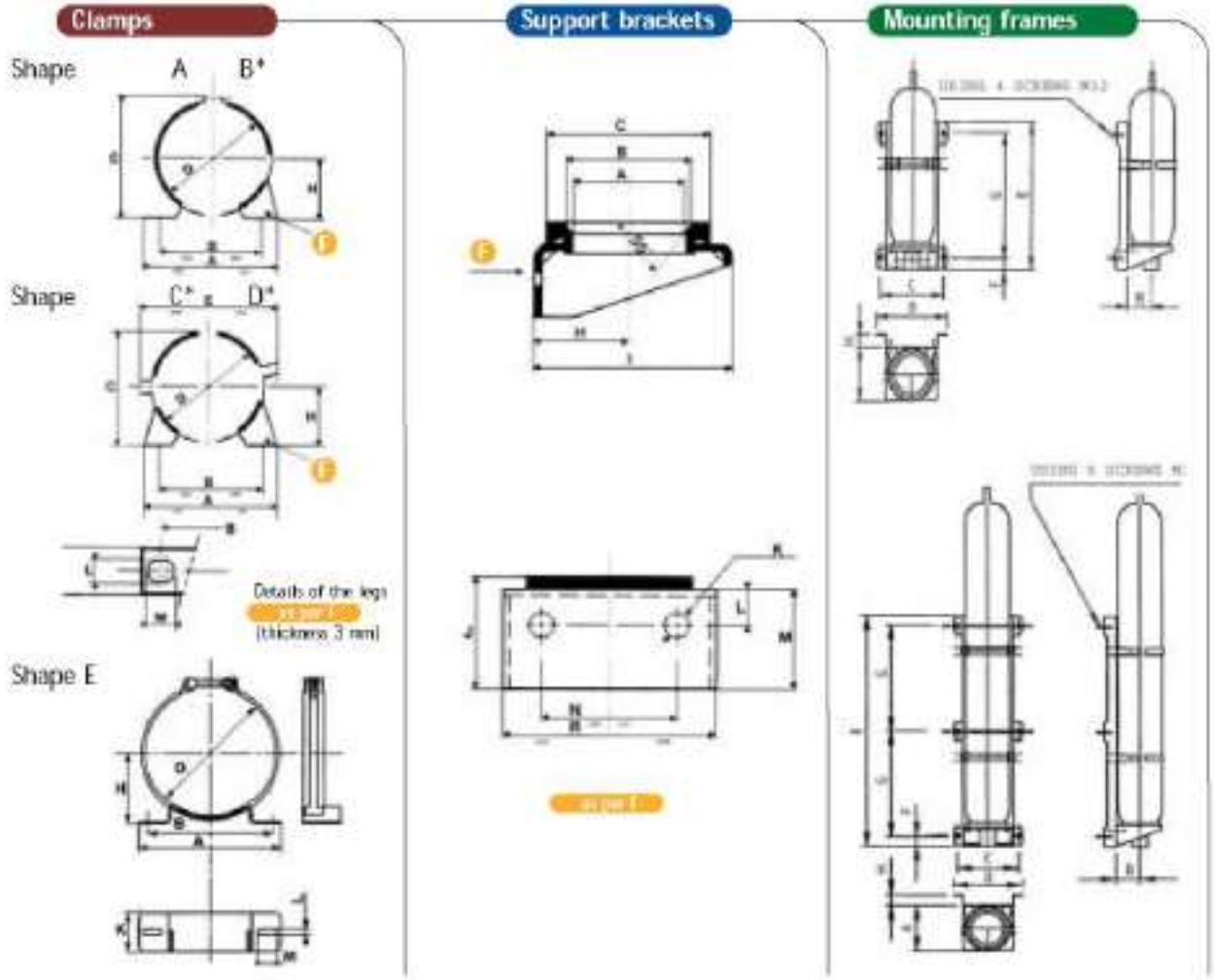
Form C



Other connection
at request

Designation	Execution form	Volume V0 in litres	Max pressure in bar	Max precharge pressure in bar	Compression ratio P max/P0	Pressure amplitude P max / P mini	Weight in kg	A	B	SW	D	G	Object F	Object H	Clamp designation	Lock nut designation
ELM 0.075-250/00/AF	AF	0,075	350	130	9	210	0,7	111	20	32	64	29	G 1/2	-	-	-
ELM 0.16-250/00/AF	AF	0,16	350	130	6	210	1	130	20	32	76	29	G 1/2	-	-	-
ELM 0.32-210/00/AF	AF	0,32	210	130	9	140	1,4	134	20	32	93	29	G 1/2	-	E85	-
ELM 0.50-210/00/AF	AF	0,50	210	130	9	175	2	152	22	41	106	34	G 1/2	-	E106	-
ELM 0.50-210/00/CF	CF	0,50	210	130	9	175	2	163	33	41	106	-	G 1/2	M33x1,5	E106	M33
ELM 0.75-160/00/CF*	CF	0,75	160	130	9	120	2,6	176	33	41	121	-	G 1/2	-	E124	-
ELM 0.75-210/00/AF	AF	0,75	210	130	9	175	2,6	166	22	41	122	34	G 1/2	-	E124	-
ELM 0.75-210/00/CF	CF	0,75	210	130	9	175	2,6	177	33	41	122	-	G 1/2	M33x1,5	E124	M33
ELM 0.75-350/00/AF	AF	0,75	350	130	9	150	4,4	168	18	41	133	34	G 1/2	-	E136	-
ELM 0.75-350/00/CF	CF	0,75	350	130	9	150	4,5	189	18	41	133	-	G 1/2	M33x1,5	E136	M33
ELM 1-210/00/AF	AF	1	210	130	9	170	3,5	190	22	41	136	34	G 1/2	-	E136	-
ELM 1-210/00/CF	CF	1	210	130	9	170	3,5	191	33	41	136	-	G 1/2	M33x1,5	E136	M33
ELM 1.4-210/90/AF	AF	1,4	210	130	6	120	4,2	191	22	41	148	34	G 1/2	-	E147	-
ELM 1.4-210/90/CF	CF	1,4	210	130	9	120	4,2	202	33	41	148	-	G 1/2	M33x1,5	E147	M33
ELM 1.4-350/90/AF	AF	1,4	350	130	9	150	7,4	199	20	41	169	34	G 1/2	-		-
ELM 1.4-350/90/CF	CF	1,4	350	130	9	150	7,5	220	20	41	169	-	G 1/2	M33x1,5		M33
ELM 2-160/90/AF	AF	2	160	100	9	90	3,5	240	22	41	144	34	G 1/2	-	E147	-
ELM 2-250/90/AF	AF	2	250	130	9	140	7,5	251	22	41	155	33	G 3/4	-	E155	-
ELM 2-350/90/AF	AF	2	350	130	6	200	11,3	219	22	55	188	34	G 3/4	-	E188	-
ELM 2-350/90/CF	CF	2	350	130	9	200	11,5	240	22	55	188	-	G 3/4	M45x1,5	E188	M45
ELM 2.8-250/90/AF	AF	2,8	350	130	6	140	10	288	21	41	174	34	G 3/4	-	E174	-
ELM 2.8-350/90/AF	AF	2,8	350	130	6	200	14,3	354	21	55	188	34	G 3/4	-	E188	-
ELM 2.8-350/90/CF	CF	2,8	350	130	6	200	14,5	385	21	55	188	-	G 3/4	M45x1,5	E188	M45
ELM 3.5-250/90/AF	AF	3,5	250	130	4	140	11	307	21	41	174	33	G 3/4	-	E174	-
ELM 3.5-350/90/AF	AF	3,5	350	130	4	200	16	304	21	55	188	34	G 3/4	-	E188	-
ELM 3.5-350/90/CF	CF	3,5	350	130	4	200	16,5	326	21	55	188	-	G 3/4	M45x1,5	E188	M45

Collari e mensole



Dimensions clamps

P/N	Shape	D	H	A	B	C	E	K	L	M
A 56	A	56	36	134	97	92		30	9	14
B 90	B	90	53	134	97	127		30	9	14
B 114*	B	114	76	138	100	159		30	9	14
B 121*	B	121	73	138	100	164		30	9	14
C 168*	C	168	92	188	148	181	230	40	9	14
D 226*	D	226	123	270	216	241	290	40	15	21
E 114	E	114	73	160	100			65	9	35
E 168	E	168	92	210	148			65	9	35
E 226	E	226	123	246	216			65	9	35

Dimensions mounting frames

P/N	A	B	C	D	E	F	G	H
EF1	181	92	320	355	670	55	570	60
EF2	250	123	320	355	670	55	570	60
EF3	250	123	320	355	1240	55	565	60

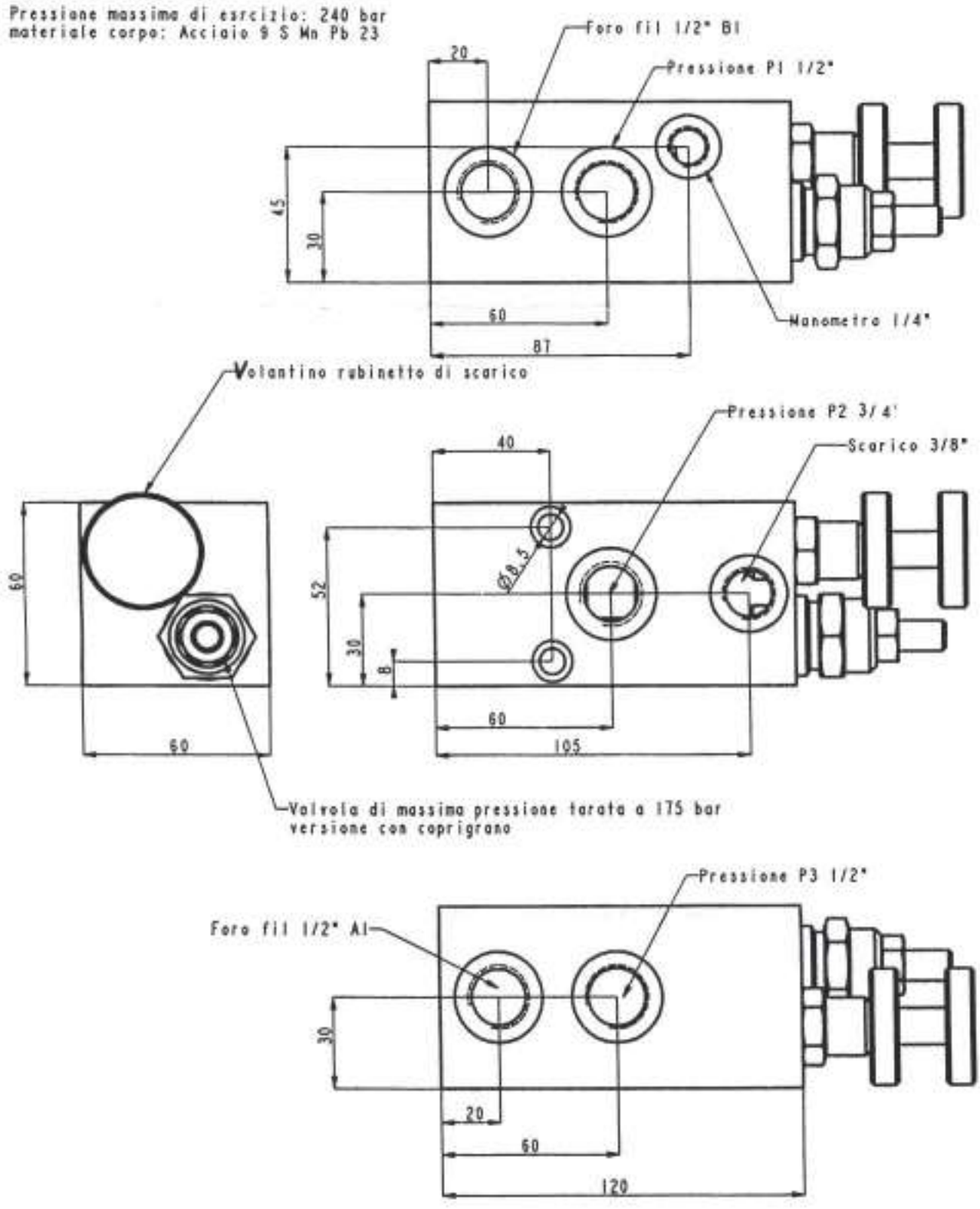
Dimensions Support brackets

P/N	A	B	C	H	I	J	K	L	M	N	R	Weight
CE 89	89	111	141	73	140	75	13	25	60	75	130	0,7
CE 108	108	120	150	92	175	95	17	25	80	160	210	1,5
CE 159	159	170	200	123	235	115	17	25	100	200	260	2,5

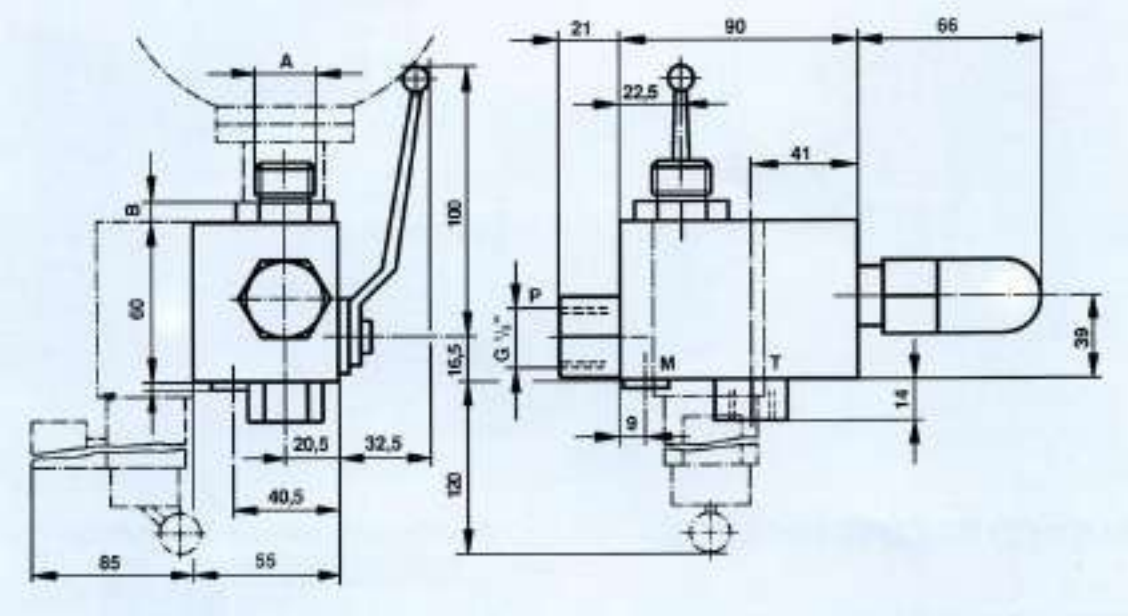
Above dimensions are in mm and are subject to manufacturing tolerances.

MAS.SI.ECB010

Massello di sicurezza per accumulatore con valvola di massima e rubinetto di scarico



Blocco di sicurezza e isolamento DI



PRESSIONE MASSIMA DI UTILIZZO
330 bar

GAMMA DI TEMPERATURE
Versione standard: da -20°C a +70°C

FLUIDO DI PRESSIONE
A seconda del flusso di pressione si utilizzano guarnizioni in Perburan o Viton

A	B	M	T	Peso kg
G ½"	8	G ¾"	G ⅞"	M = 2,3
G ¾"	8			
G 1 ¼"	24			E = 3,5
G 2"	24			

Apparecchio di controllo e ricarica VG3

DESCRIZIONE
L'apparecchio di controllo e ricarica VG3 serve per il riempimento degli accumulatori a sacca e a pistone con azoto e per il controllo o la variazione della pressione esistente. Per accumulatori a membrana con vite di carico gas, utilizzare il modello VG3 secondo OSP745. L'apparecchio si avvita sulla valvola di carico gas dell'accumulatore idraulico e si collega ad una normale bombola di azoto. Se si controlla soltanto la pressione non è necessario collegare il tubo.
Ogni unità contiene:

- Corpo VG3 per il controllo e il riempimento con manometro, valvola di non ritorno sull'attacco, valvola di scarico incorporata, valvola a spillo per l'apertura della valvola di riempimento dell'accumulatore
- Tubo per il caricamento, lunghezza 2 metri
- Bauletto di protezione in plastica

ISTRUZIONI

- Prima di ogni controllo e del riempimento completo o parziale con azoto occorre scaricare l'accumulatore idraulico lato fluido
- Svitare il tappo di protezione della valvola gas
- Avvitare il corpo VG3 con il raccordo (pos.11-12 o 13 secondo il tipo di accumulatore)sulla valvola di carico gas. Portare il manometro in posizione favorevole per poterlo leggere e bloccare l'adattatore a mano (pos.8)
- Controllare che sia chiusa la valvola di scarico. Chiudere la manopola del rubinetto di scarico in senso orario (pos.14)

CONTROLLO DELLA PRECARICA AZOTO
Girare la manopola a testa zigrinata in senso orario(pos.2). In tal modo si apre la valvola per il riempimento gas e la pressione può essere letta sul manometro

DIMINUZIONE DELLA PRECARICA AZOTO
Girare lentamente la manopola del rubinetto di scarico (pos.14)in senso antiorario. L'azoto si scarica

AUMENTARE / RIPRISTINARE LA PRECARICA AZOTO

- Collegare il tubo al corpo VG3(pos.16) e dall'altra ad una normale bombola di azoto in commercio
- Aprire con prudenza la valvola di chiusura della bombola di azoto. Far defluire lentamente l'azoto nell'accumulatore fino a raggiungere la pressione desiderata.
- Chiudere la bombola, dopo 5-10 minuti (stabilizzazione della temperatura) controllare la pressione di carico come descritto sopra e correggerla se necessario

SMONTAGGIO

- Svitare la manopola a testa zigrinata (pos.2)
- Girare la manopola del rubinetto (pos.14) in senso antiorario per liberare il sistema della pressione
- Svitare il corpo VG3
- Controllare la tenuta della valvola di riempimento gas con una sostanza schiumosa
- Riavvitare il tappo di protezione stringendolo a mano

ATTENZIONE:

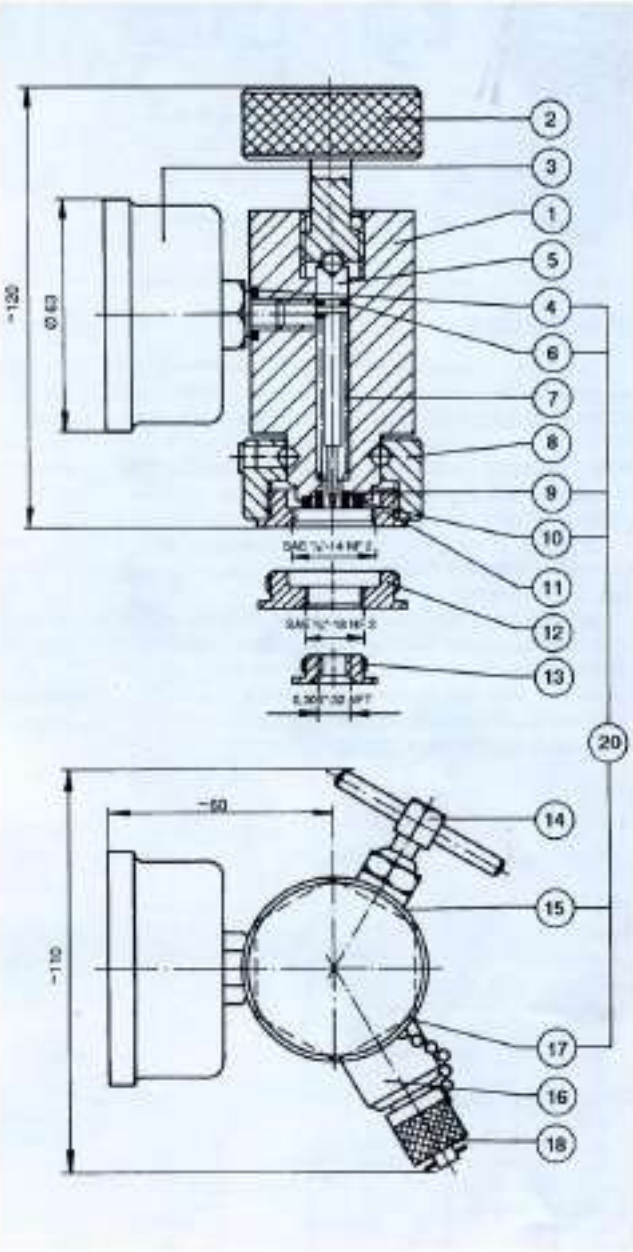
- **Non utilizzare mai ossigeno per riempimento! Pericolo di esplosione!**
- Qualora la pressione della bombola di azoto superi la pressione di lavoro ammessa dall'accumulatore bisogna utilizzare un riduttore di pressione sulla bombola di azoto

Apparecchio di controllo e ricarica VG3

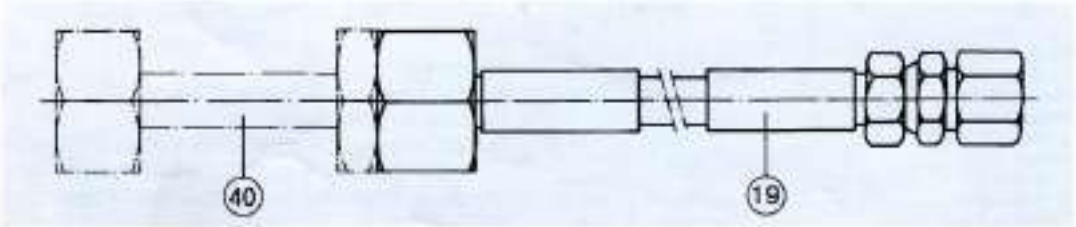
ELENCO PEZZI DI RICAMBIO

per l'apparecchio di controllo e ricarica VG 3

Pos.	N°	Descrizione	Ricambi consigliati
1	1	Corpo VG3	
2	1	Maniopola a testa zigrinata	
3	1	Attacco manometro G 1/4"	x
4	1	Guarnizione piatta	x
5	1	Valvola a spillo	
6	1	Guarnizione O'Ring	x
7	1	Molla di pressione	
8	1	Ghiera a testa zigrinata	
9	1	Guarnizione piatta	x
10	1	Guarnizione piatta	x
11	1	Raccordo (su richiesta) SAE 7/8" - 14NF2	
12	1	Raccordo SAE 5/8" - 18NF2	
13	1	Raccordo 0.305" - 32NFT	
14	1	Rubinetto di scarico	
15	1	Guarnizione O'Ring	
16	1	Valvola di non ritorno	
17	1	Guarnizione O'Ring	x
18	1	Tappo di protezione	
19	1	Tubo di riempimento	
20	1	Kit di guarnizioni (contiene tutte le guarnizioni)	x
40	1	Raccordo per bombole di azoto per:	
40b	GB/AUS	R 5/8" maschio	
40c	USA	24,51 x 1/14" maschio	
40d	Svizzera	21,7 c 1/14" femmina	
40e	Giappone	W23 x 1/14" femmina	
40f	Giappone	W23 x 1/14" maschio	
40g	Brasile	R 1/2" femmina	
40i	Cina	M22 x 1,5 femmina	
40k	Cina	5/8" femmina	
40l	Malaisia	G 7/8" maschio	
40m	Trinidad	7/8" - 14 UNF maschio	
40n	Bulgaria	3/4" femmina	
40o	Filippine	W23 x 1/14" sinistro	



ESEMPIO DI ORDINE
Kit di guarnizioni pos. 20 per VG 3



Apparecchio di controllo e ricarica VG3

Apparecchio di controllo e ricarica VGS

DESCRIZIONE
Il modello VGS serve per caricare gli accumulatori a sacca e a membrana con azoto e per il controllo o la variazione della pressione esistente. L'apparecchio si adatta a tutti gli accumulatori con valvola 5/8, valvola Schraeder e a vite. Si avvita sopra valvola di carico gas oppure sul filetto dell'accumulatore idraulico e viene collegato con un tubo ad una normale bombola di azoto. Se si controlla soltanto la pressione prima del riempimento non è necessario il collegamento del tubo.
Ogni unità è composta di:
- corpo VGS per il controllo e il riempimento con manometro, valvola di non ritorno sull'attacco, valvola di scarico incorporata, valvola a spillo per l'apertura della valvola di riempimento o della vite.
- tubo di carico, lunghezza 2 m
- bauletto di protezione plastica

ISTRUZIONI DI IMPIEGO
-prima di ogni controllo o del riempimento completo o parziale con azoto scaricare l'accumulatore idraulico lato fluido.

Accumulatore con valvola gas:
- svitare il tappo di protezione della valvola gas
- avvitare il corpo VGS con il raccordo POS.7 (+raccordo pos.26 in caso di valvola Schraeder) sulla valvola di carico gas. Portare il manometro in posizione favorevole alla lettura e bloccare l'adattatore a mano (pos.7)
- controllare che sia chiusa la valvola di scarico (chiudere la manopola del rubinetto di scarico pos.10 in senso orario)

Accumulatore con vite di chiusura:
- togliere il tappo di plastica della vite
- svitarla con chiave a brugola
- avvitare l'apparecchio senza adattatore sulla vite di chiusura. Portare il manometro in una posizione favorevole per la lettura e bloccare la ghiera (pos.5) a mano. Controllare che la valvola di scarico sia chiusa (manopola pos.10 dev'essere avvitata verso l'interno).

CONTROLLO DELLA PRECARICA AZOTO
Girare la chiavetta (pos.12)in senso antiorario. Così si apre la valvola di riempimento o la vite e la pressione può essere letta sul manometro

DIMINUZIONE DELLA PRECARICA AZOTO
Girare lentamente la manopola del rubinetto della valvola di scarico (pos.10) in senso antiorario. L'azoto si scarica

AUMENTARE/RIPRISTINARE LA PRECARICA AZOTO
- collegare il tubo da una parte al corpo VGS (pos.9) e dall'altro ad una normale bombola di azoto in commercio.
- Aprire con prudenza la valvola di chiusura della bombola di azoto, far defluire lentamente l'azoto nell'accumulatore fino a raggiungere la pressione desiderata.
- Chiudere la bombola. Dopo 5-10 minuti (stabilizzazione della temperatura)controllare la pressione e correggerla se necessario

Apparecchio di controllo e ricarica VGS

SMONTAGGIO

- Svitare la manopola a testa zigrinata (pos.12)
- Girare la manopola del rubinetto (pos.10)in senso orario
- Svitare il corpo VGS
- Chiudere bene la vite con chiave a brugola
- Controllare la tenuta della valvola di riempimento gas con una sostanza schiumosa
- Riavvitare il tappo di protezione stringendolo a mano

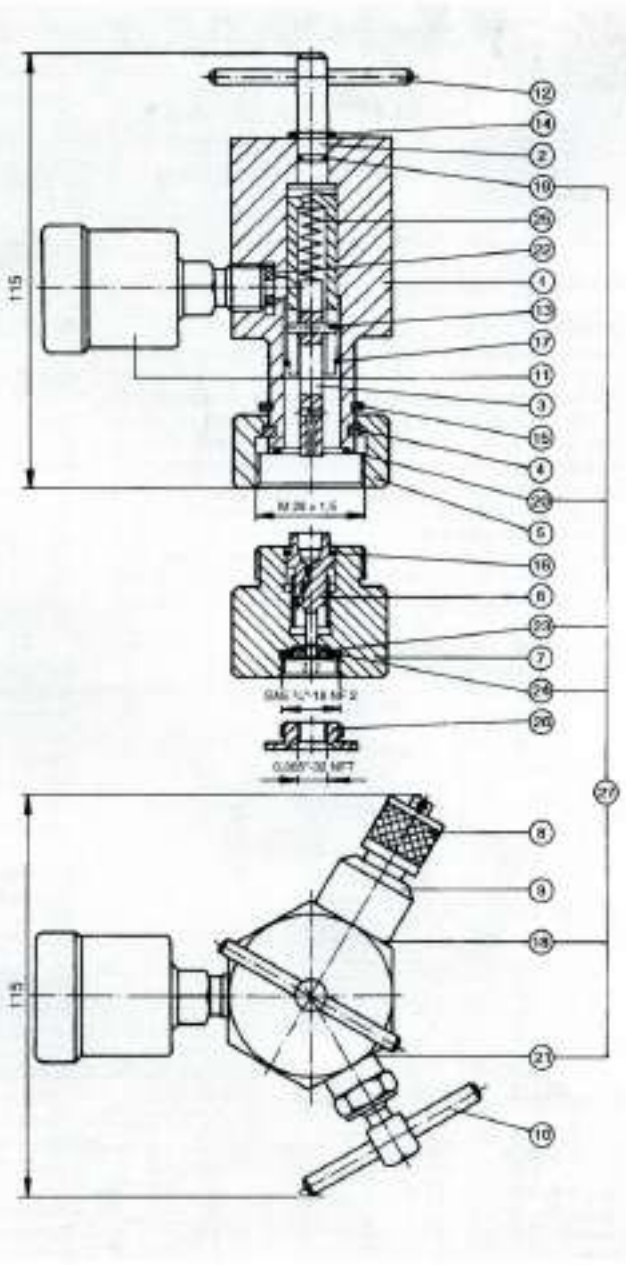
Attenzione:
- **non utilizzare mai ossigeno per il riempimento! Pericolo di esplosione**!
- qualora la pressione della bombola di azoto superi la pressione di lavoro ammessa dall'accumulatore bisogna utilizzare un riduttore di pressione sulla bombola di azoto

Apparecchio di controllo e ricarica VGS

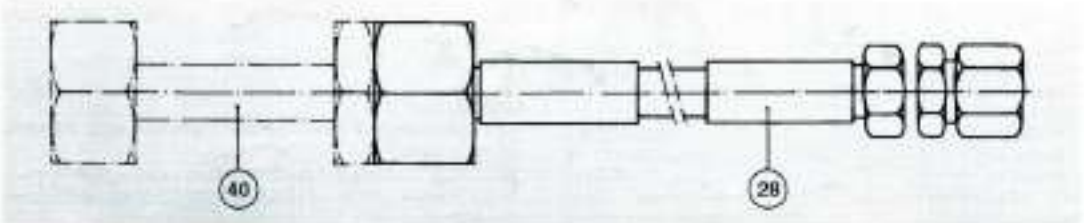
ELENCO PEZZI DI RICAMBIO

per l'apparecchio di controllo e ricarica VG S

Pos.	N°	Descrizione	Ricambi consigliati
1	1	Corpo VG S	
2	1	Fuso - Perno di manovra	
3	1	Perno esagonale	x
4	1	Anello diviso	x
5	1	Ghiera	
6	1	Perno	x
7	1	Raccordo intermedio	
8	1	Tappo di protezione	
9	1	Tappo di protezione	x
10	1	Rubinetto di scarico	x
11	1	Attacco manometro G 1/4"	
12	1	Spina	
13	1	Spina	
14	1	Anello di arresto	
15	1	Anello di arresto	
16	1	Anello elastico Seeger	
17	1	Anello elastico	x
18	1	Anello O'Ring	x
19	1	Anello O'Ring	x
20	1	Anello O'Ring	x
21	1	Anello O'Ring	x
22	1	Guarnizione di rame	x
23	1	Guarnizione piatta	x
24	1	Guarnizione piatta	x
25	1	Molla tarata	
26	1	Raccordo 0,305" - 32 NFT	
27	1	Kit guarnizioni (contiene tutte le guarnizioni)	x
28	1	Tubo di riempimento	
40	1	Raccordo per bombole di azoto varie	
40b	GB/AUS	R 5/8" maschio	
40c	USA	24,51 x 1/14" maschio	
40d	Svizzera	21,7 c 1/14" femmina	
40e	Giappone	W23 x 1/14" femmina	
40f	Giappone	W23 x 1/14" maschio	
40g	Brasile	R 1/2" femmina	
40i	Cina	M22 x 1,5 femmina	
40k	Cina	5/8" femmina	
40l	Malaisia	G 7/8" maschio	
40m	Trinidad	7/8" - 14 UNF maschio	
40n	Bulgaria	3/4" femmina	
40o	Filippine	W23 x 1/14" sinistro	



ESEMPIO DI ORDINE
Kit di guarnizioni pos. 20 per VG S



Bladder Accumulators
Standard

1. DESCRIPTION

1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy.

The compressibility of a gas is utilised in hydraulic accumulators for storing fluids. HYDAC bladder accumulators are based on this principle, using nitrogen as the compressible medium.

A bladder accumulator consists of a fluid section and a gas section with the bladder acting as the gas-proof screen. The fluid around the bladder is connected to the hydraulic circuit so that the bladder accumulator draws in fluid when the pressure increases and the gas is compressed. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

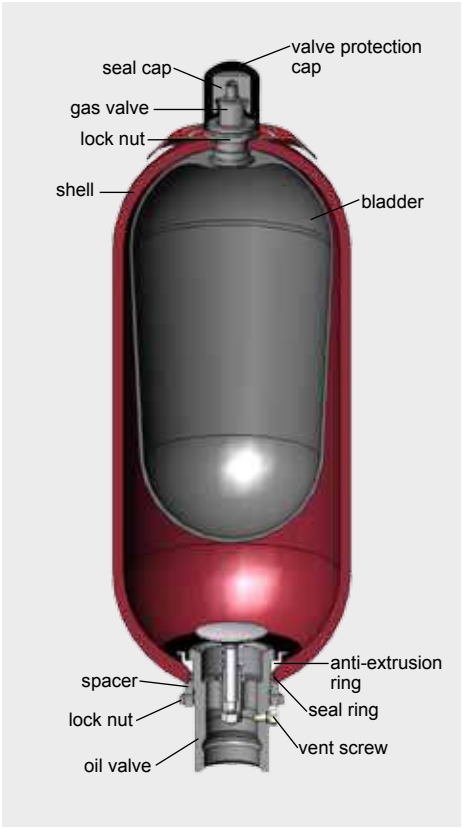
HYDAC bladder accumulators can be used in a wide variety of applications, some of which are listed below:

- energy storage
- emergency operation
- force equilibrium
- leakage compensation
- volume compensation
- shock absorption
- vehicle suspension
- pulsation damping

See catalogue section:

- Hydraulic Dampers No. 3.701

1.2. DESIGN



Design

- **Standard Bladder Accumulator SB330/400/500/550**
  HYDAC standard bladder accumulators consist of the pressure vessel, the flexible bladder with gas valve and the hydraulic connection with check valve. The pressure vessel is seamless and manufactured from high tensile steel.
- **Bladder accumulator SB 330N**
  The flow optimised design of the standard oil valve enables the maximum possible operating fluid flow rate to increase to 25 l/s on this accumulator type.
- **High Flow bladder accumulator SB330H**
  HYDAC high flow bladder accumulators, type SB330H, are high performance accumulators with a flow rate of up to 30 l/s. The fluid connection is enlarged to allow higher flow rates.

1.3. BLADDER MATERIAL

The following elastomers are available as standard:

- NBR (acrylonitrile butadiene rubber, perbunan),
- IIR (butyl rubber),
- FKM (fluoro rubber, Viton®),
- ECO (ethylene oxide epichlorohydrin rubber).

The material must be selected according to the particular operating fluid and temperature.

When choosing the elastomer, allowances must be made for the fact that the gas can cool down to below the permitted elastomer temperature if there are adverse discharge conditions (high pressure ratio p_2/p_0, high discharging velocity). This can cause cold cracking in the elastomer. The gas temperature can be calculated using the HYDAC Accumulator Simulation Program ASP.

1.4. CORROSION PROTECTION

For operation with chemically aggressive media, the accumulator shell can be supplied with corrosion protection, such as plastic coating on the inside or chemical nickel-plating. If this is insufficient, then stainless steel accumulators must be used.

1.5. MOUNTING POSITION

HYDAC bladder accumulators can be installed vertically, horizontally and at a slant. When installing vertically or at a slant, the oil valve must be at the bottom. On certain applications listed below, particular positions are preferable:

- Energy storage:
  vertical,
- Pulsation damping:
  any position from horizontal to vertical,
- Maintaining constant pressure:
  any position from horizontal to vertical,
- Volume compensation:
  vertical.

If the mounting position is horizontal or at a slant, the effective volume and the maximum permitted flow rate of the operating fluid are reduced.

1.6. TYPE OF MOUNTING

By using an appropriate adapter, HYDAC accumulators, up to size 1 l, can be mounted directly inline.

For strong vibrations and volumes above 1 litre, we recommend the use of HYDAC accumulator supports or the HYDAC accumulator mounting set.

See catalogue sections:

- Supports for Hydraulic Accumulators
  No. 3.502
- ACCUSET SB
  No. 3.503

2. TECHNICAL SPECIFICATIONS

2.1. EXPLANATORY NOTES

2.1.1 Operating pressure

See tables (may differ from nominal pressure for foreign test certificates).

2.1.2 Nominal volume

See tables

2.1.3 Effective gas volume

See tables
Based on nominal dimensions, this differs slightly from the nominal volume and must be used when calculating the effective volume.

2.1.4 Effective volume

Volume of fluid which is available between the operating pressures p_2 and p_1.

2.1.5 Max. flow rate of operating fluid

In order to achieve the max. flow rate given in the tables, the accumulator must be mounted vertically. It must be noted that a residual fluid volume of approx. 10 % of the effective gas volume remains in the accumulator.

2.1.6 Fluids

The following sealing and bladder materials are suitable for the fluids listed below.

Material	Fluids
NBR20	Mineral oils (HL, HLP, HFA, HFB, HFC), water
ECO	Mineral oil
IIR	Phosphate ester
FKM	Chlorinated hydro-carbons, petrol

2.1.7 Permitted operating temperature

The permitted operating temperatures are dependent on the application limits of the metal materials and the bladder.

The standard valve bodies, gas valves and accumulator shells are suitable for temperatures from -10 °C ... +80 °C.

Outside these temperatures, special material combinations must be used.
The following table shows the correlation between bladder material and application temperature.

Material	Temperature ranges
NBR20	-15 °C ... + 80 °C
NBR21	-50 °C ... + 80 °C
NBR22	-30 °C ... + 80 °C
ECO	-30 °C ... +120 °C
IIR	-40 °C ... +100 °C
FKM	-10 °C ... +150 °C

2.1.8 Gas charging

Hydraulic accumulators must only be charged with nitrogen.
Never use other gases.
RISK OF EXPLOSION!

In principle, the accumulator may only be charged with nitrogen class 4.5, filtered to < 3 µm.
If other gases are to be used, please contact HYDAC for advice.

2.1.9 Limits for gas pre-charge pressure

$p_0 \leq 0.9 \bullet p_1$

with a permitted pressure ratio of:

$p_2 : p_0 \leq 4 : 1$

p_2 = max. operating pressure
p_0 = gas pre-charge pressure

2.1.10 Certificate codes

Australia	F1 [1]
Brazil	U3 [3]
Canada	S1 [2]
China	A9
CIS	A6
EU member states	U
India	U3 [3]
Japan	P
New Zealand	T
Switzerland	U
Ukraine	A10
USA	S

[1] Approval required in the individual territories

[2] Approval required in the individual provinces

[3] Alternative certificates possible

On no account must any welding, soldering or mechanical work be carried out on the accumulator shell. After the hydraulic line has been connected it must be completely vented.

Work on systems with hydraulic accumulators (repairs, connecting pressure gauges etc) must only be carried out once the pressure and the fluid have been released.

**Please read the Operating Manual!
No. 3.201.CE**

Note:
Application examples, accumulator sizing and extracts from approvals regulations on hydraulic accumulators can be found in the following catalogue section:

- Accumulators
  No. 3.000

2.1.11 Gas side connection Standard

Series	Volume [l]	Gas valve type
SB330 / SB400	< 1	5/8-18UNF
	< 50	7/8-14UNF
	≥ 50	M50x1.5 / 7/8-14UNF

other pressure ranges on request.

2.2. MODEL CODE
(also order example)

SB330 H – 32 A 1 / 112 U – 330 A 050

Series

Type code
H = high flow
N = increased flow, standard oil valve dimensions
A = shock absorber
P = pulsation damper
S = suction flow stabiliser
B = bladder top-repairable
Combinations possible, e.g. HB - High flow with top-repairable bladder or
PH - pulsation damper with high flow rate.
no details = standard

Nominal volume [l]

Fluid connection
A = standard connection, thread with internal seal face
F = flange connection
C = valve mounting with screws on underside
E = sealing surfaces on front interface (e.g. on thread M50x1.5 - valve)
G = male thread
S = special connection, to customer specification

Gas side
1 = standard model (see point 2.1.11)
2 = back-up model
3 = gas valve 7/8-14UNF with M8 female thread
4 = gas valve 7/8-14UNF with gas valve connection 5/8-18UNF
5 = gas valve M50x1.5 in accumulators smaller than 50 l
6 = 7/8-14UNF gas valve
7 = M28x1.5 gas valve
8 = M16x1.5 gas valve
9 = special gas valve, to customer specification

Material code [1)]
Standard model = 112 for mineral oils
depending on operating medium
others on request

Fluid connection
1 = carbon steel
2 = high tensile steel
3 = stainless steel [3)]
6 = low temperature steel

Accumulator shell
0 = plastic coated (internally)
1 = carbon steel
2 = chemically nickel-plated (internal coating)
4 = stainless steel [3)]
6 = low temperature steel

Accumulator bladder [2)]
2 = NBR20
3 = ECO
4 = IIR (butyl)
5 = NBR21 (low temperature)
6 = FKM
7 = Others
9 = NBR22

Certificate code
U = PED 97/23/EC

Permitted operating pressure [bar]

Connection
Thread, codes for fluid connections: A, C, E, G
A = thread to ISO 228 (BSP)
B = thread to DIN 13 or ISO 965/1 (metric)
C = thread to ANSI B1.1 (UN..-2B seal SAE J 514)
D = thread to ANSI B1.20.1 (NPT)
S = special thread, to customer specification

Flange, codes for fluid connection: F
A = DIN flange
B = flange ANSI B16.5
C = SAE flange 3000 psi
D = SAE flange 6000 psi
S = special flange, to customer specification

Pre-charge pressure p_0 [bar] at 20 °C, must be stated clearly, if required!

[1)] Not all combinations are possible
[2)] When ordering spare bladder, please state diameter of the smaller shell port
[3)] Depending on type and pressure rating

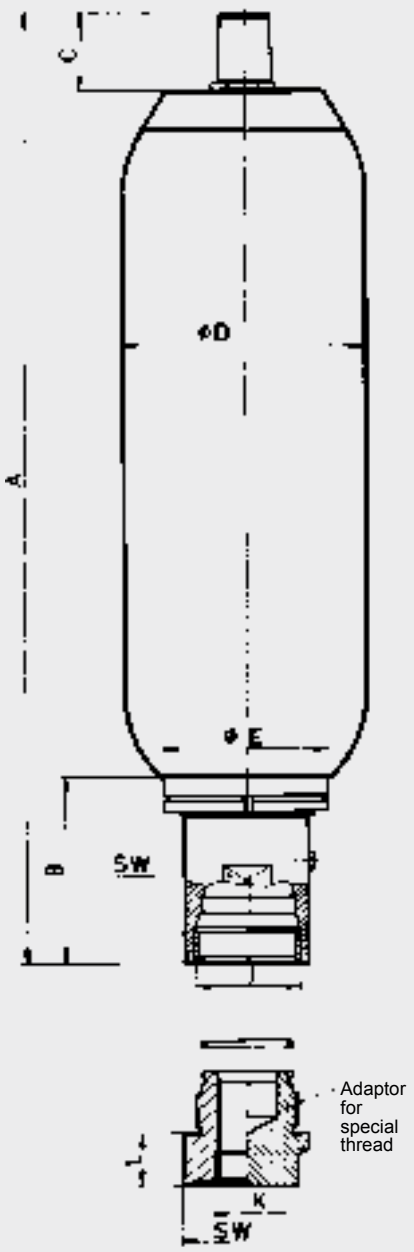
3. DIMENSIONS AND SPARE PARTS

3.1. DIMENSIONS

Nominal volume [l]	Valve	Max. operating pressure (PED 97/23/EC) [bar]	Effective gas volume [l]	Weight [kg]	A max. [mm]	B [mm]	C [mm]	Ø D max. [mm]	J thread ISO 228	Ø E [mm]	SW [mm]	Q [1] [l/s]
0.5	Standard	400	0.5	2.8	270	57	33.5	95.5	G 3/4	50	32	4
1		330	1	4.5	302		58	118				
		550		8.5	334	68		121	G 1	67	45	6
2.5		330	2.4	10	531	63		118	G 1 1/4		50	10
		550	2.5	13.5	539	68		121	G 1		45	6
4		330	3.7		419	63		173	G 1 1/4		50	10
		400										
5		550	4.9	23	867	68		121	G 1		45	6
6		330	5.7	15	531	63		173	G 1 1/4		50	10
10 [2]		330	9.3	25	728				G 1 1/4			
10	Standard	330	9.3	31.5	568	103	58	229	G 2	100	70	15
	N											25
	H		9	34.5	603	138			G 2 1/2	125	90	30
	Standard	400	9.3	37.5	572	103		233	G 2	100	70	15
		500	8.8	45	585	77	68	241				
13	Standard	330	12	43	686	103	58	229	G 2	100	70	15
	N											25
	H			46	695	138			G 2 1/2	125	90	30
	Standard	400		49	666	103		233	G 2	100	70	15
20	Standard	330	18.4	50.5	896	103	58	229	G 2	100	70	15
	N											25
	H		17.5	53.5	931	138			G 2 1/2	125	90	30
	Standard	400	18.4	63.5	896	103		233	G 2	100	70	15
		500	17	75.5	901	77	68	241		110	75	
24	Standard	330	23.6	69	1062	103	58	229	G 2	100	70	15
	N											25
	H		24	72	1097	138			G 2 1/2	125	90	30
32	Standard	330	33.9	87	1411	103	58	229	G 2	100	70	15
	N											25
	H		32.5	90	1446	138			G 2 1/2	125	90	30
	Standard	400	33.9	104.5	1411	103		233	G 2	100	70	15
		500	33.5	127	1446	77	68	241		110	75	
50		330	47.5	117.5	1931	103	68	229	G 2	100	70	15
	N											25
	H			120.5	1966	138			G 2 1/2	125	90	30
	Standard	400		142	1931	103		233	G 2	100	70	15
		500	48.3	169	1951	77		241			75	
60	Standard	330	60	182	1156	138	68	356	G 2 1/2	125	90	30
80			85	221	1406							
100			105	255	1656							
130			133	305	1976							
160			170	396	2006			406				
200			201	485	2306							

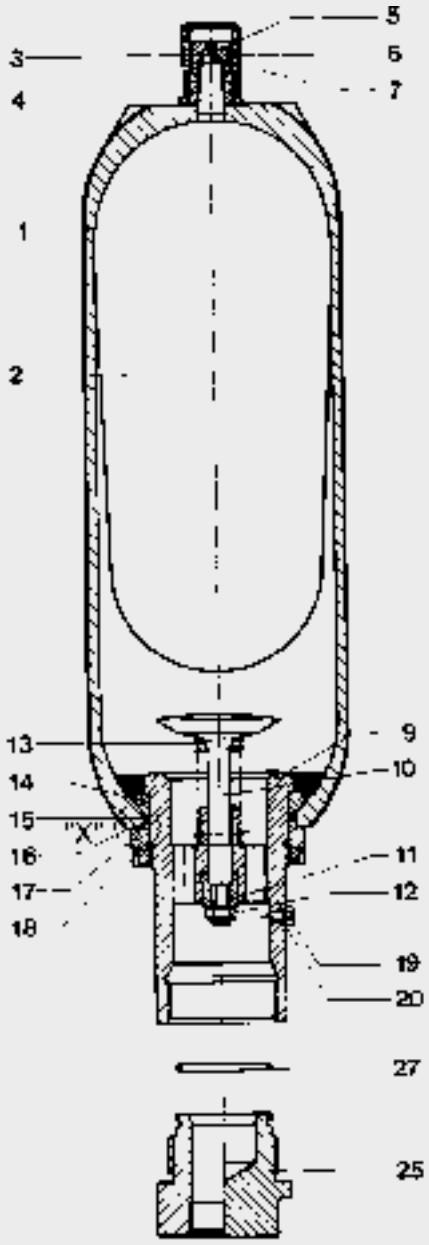
[1] Q = max. flow rate of operating fluid
[2] slimline version, for confined spaces

Dimensions

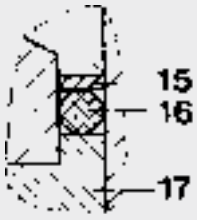


3.2. SPARE PARTS

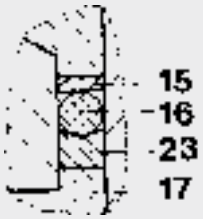
SB330/400/440/500/550
SB330H / SB330N



Detail "X"
SB330/400 – 0.5 ... 6 l



SB330/400/500 – 10 ... 200 l and
SB330H – 10 ... 200 l
SB550 – 1 ... 5 l



Designation	Item
Bladder assembly consisting of:	
Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
Seal kit consisting of:	
O-ring	7
Washer	15
O-ring	16
Vent screw	19
Support ring	23
O-ring	27
Repair kit [1] consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	
Anti-extrusion ring	14
Oil valve assembly consisting of:	
Valve assembly (items 9-13)	9
Anti-extrusion ring	14
Washer	15
O-ring	16
Spacer	17
Lock nut	18
Vent screw	19
Support ring	23

* available separately

[1] When ordering, please state diameter of the smaller shell port.

Item 1 not available as a spare part.

Item 19 for NBR/Carbon steel: seal ring (item 20) is included

Item 25 must be ordered as an accessory (see Point 4).

3.3. REPAIR KITS

NBR, carbon steel
Nominal volume: 0.5 ... 200 litres
Standard gas valve

Nom. volume [l]	Part no.
0.5	02128169
1	02106261
2.5	02106200
4	02106204
5	02106208
6	02112100
10*	03117512
10	02106212
13	02106216
20	02106220
24	02106224
32	02106228
50	02106252
60	03117513
80	03117514
100	03117515
130	03117516
160	03117517
200	03117558

* slimline version for confined spaces
others on request

4. ACCESSORIES FOR BLADDER ACCUMULATORS

4.1. ADAPTERS (GAS SIDE)

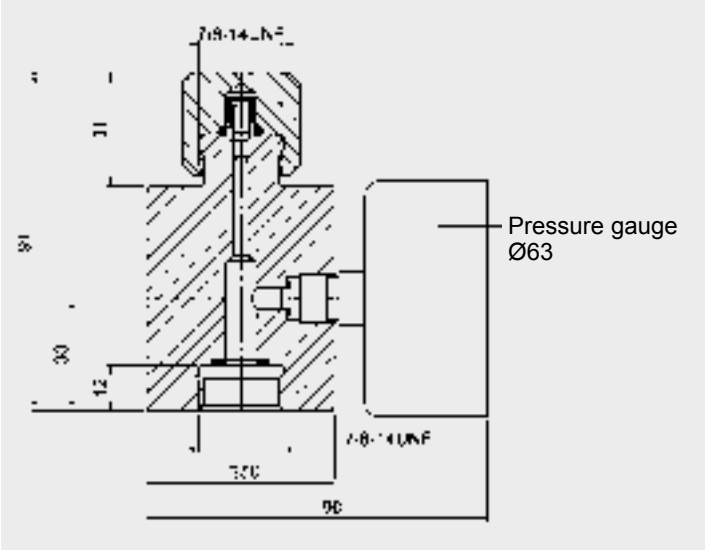
To monitor the accumulator pre-charge pressure, HYDAC offers a selection of gas side adapters.

For standard connection sizes (7/8-14UNF) the adapters shown below are available and must be stated separately at time of ordering.

For other gas-side accumulator connections (e.g. 5/8-18UNF) please contact your HYDAC agent.

4.1.1 **Pressure gauge model:**

Gas side connection on the bladder accumulator for permanent monitoring of the pre-charge pressure

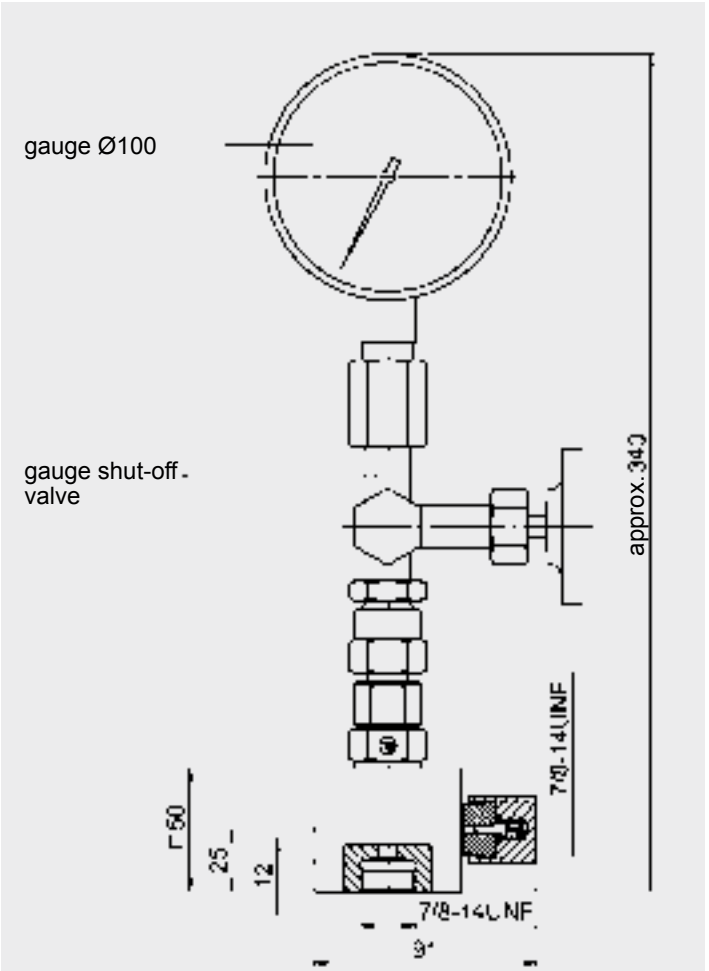


Gauge indication range	Pressure gauge Part no.	Adapter body* Part no.	Adapter assembly Part no.
–	–	00239275	00366621
0 - 10 bar	00614420		02108416
0 - 60 bar	00606886		03093386
0 - 100 bar	00606887		02104778
0 - 160 bar	00606888		03032348
0 - 250 bar	00606889		02100217
0 - 400 bar	00606890		02102117

* p_{max} = 400 bar

4.1.2 **Pressure gauge model with shut-off valve**

Gas side connection on the bladder accumulator for permanent monitoring of the pre-charge pressure with shut-off option.

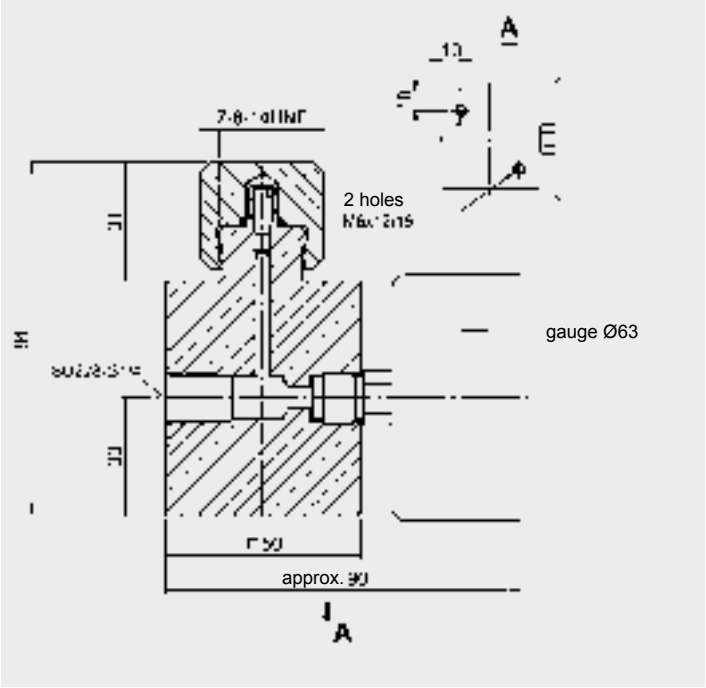


Gauge indication range	Pressure gauge Part no.	Adapter body* Part no.	Adapter assembly Part no.
–	–	00363713	02103381
0 - 25 bar	00631380		02105216
0 - 60 bar	00606771		02110059
0 - 100 bar	00606772		03139314
0 - 160 bar	00606773		03202970
0 - 250 bar	00606774		03194154
0 - 400 bar	00606775		02103226

* p_{max} = 400 bar

4.1.3 **Remote monitoring of the pre-charge pressure**
To monitor the pre-charge pressure in hydraulic accumulators remotely, gas side adapters with pressure gauge and mounting holes are available.

In order to connect these adapters directly with the hydraulic accumulator using appropriate lines, accumulator adapters are also available for connection at the top (see diagram 1) or for side-connection (see diagram 2).



Gauge indication range	Pressure gauge Part no.	Adapter body* Part no.	Adapter assembly Part no.
–	–	02116746	03037666
0 - 10 bar	00614420		03095818
0 - 60 bar	00606886		03095819
0 - 100 bar	00606887		03095820
0 - 160 bar	00606888		03095821
0 - 250 bar	00606889		03095822
0 - 400 bar	00606890		03095823

* p_{max} = 400 bar

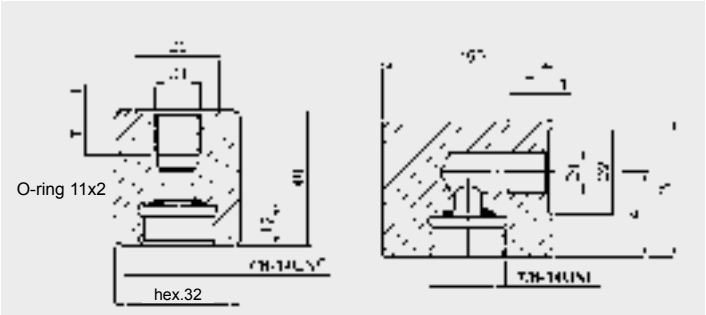


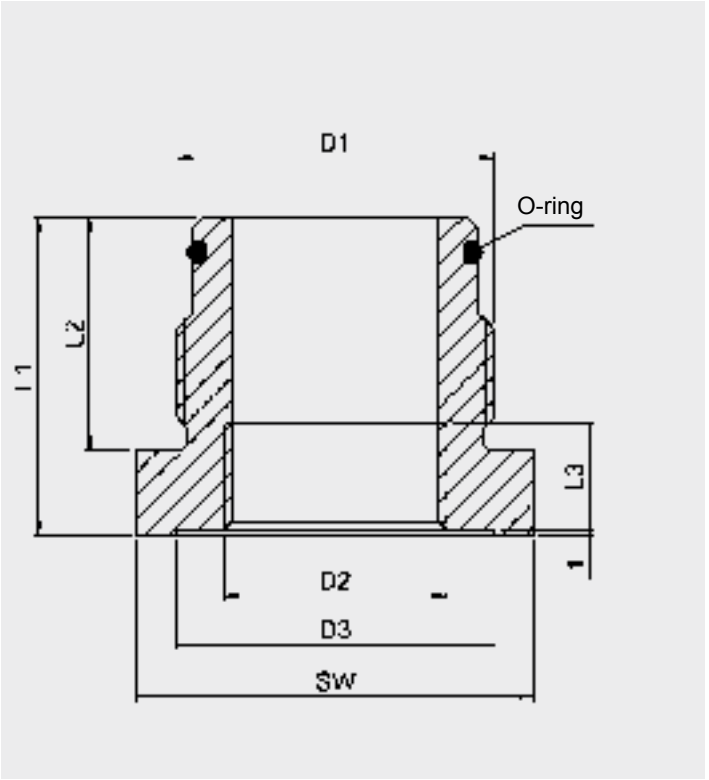
Diagram 1 **Diagram 2**

D1 Threaded connection	D2 [mm]	T	Adapter body* Part no.	Adapter assembly Part no.	Diag.
ISO228- G 1/4	25	14	00238709	02109481	1
			00241740	02102042	2
ISO228- G 3/8	28		00355021	02109483	1
			03280414	00366607	2
ISO228- G 1/2	34	16	02110594	02110636	1
			00237884	00366608	2

* p_{max} = 400 bar

4.2. ADAPTERS FOR STANDARD BLADDER ACCUMULATORS (FLUID SIDE)

To connect the bladder accumulator to pipe fittings. These are available separately.



D1 Accum. conn.* (ISO228-BSP)	D2 [mm]	D3 [mm]	L1 [mm]	L2 [mm]	L3 [mm]	SW [mm]	O-ring [mm]	Part no. NBR/ Carbon steel
G 3/4	G 3/8	28	55	28	12	32	17x3	02104346
	G 1/2		60		14	36		02104348
G 1 1/4	G 3/8	28	50	37	12	46	30x3	02116345
	G 1/2	34			14			02105232
	G 3/4	44			16			02104384
	G 1	50	67		18	65		02110124
G 2	G 1/2	34	60	44	14	65	48x3	02104853
	G 3/4	44			16			02104849
	G 1 1/4	60			20			02107113
	G 1 1/2	68	80		22	70		02105905

* others on request

5. NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications and operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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E 3.201.26/03.12

Bladder Accumulators
Low Pressure

1. DESCRIPTION

1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy.

The compressibility of a gas is utilised in hydraulic accumulators for storing fluids. HYDAC bladder accumulators are based on this principle, using nitrogen as the compressible medium.

A bladder accumulator consists of a fluid section and a gas section with the bladder acting as the gas-proof screen. The fluid around the bladder is connected to the hydraulic circuit so that the bladder accumulator draws in fluid when the pressure increases and the gas is compressed. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

HYDAC bladder accumulators can be used in a wide variety of applications, some of which are listed below:

- energy storage
- emergency operation
- force equilibrium
- leakage compensation
- volume compensation
- shock absorption
- vehicle suspension
- pulsation damping

See catalogue section:

- Hydraulic Dampers No. 3.701

1.2. DESIGN

HYDAC low pressure bladder accumulators consist of a welded pressure vessel, a flexible bladder with gas valve and a hydraulic connection with check valve or a perforated disc.

The table shows the different models which are described in greater detail in the pages that follow:

Designation	Perm. pressure [bar] 2)	Volume [l]	Q 1) [l/s]
SB40- 2.5 ... 50	40	2.5 - 50	7
SB40- 70 ... 220		70 - 220	30
SB35HB- 20 ... 50	35	20 - 50	20
SB16A- 100 ... 450	16	100 - 450	15
SB35A- 100 ... 450	35		
SB16AH- 100 ... 450	16		20
SB35AH- 100 ... 450	35		

1) Q = max. flow rate of pressure fluid
2) Higher pressures on request

1.3. BLADDER MATERIAL

The following elastomers are available as standard:

- NBR (acrylonitrile butadiene rubber, perbunan),
- IIR (butyl rubber),
- FKM (fluoro rubber, Viton®),
- ECO (ethylene oxide epichlorohydrin rubber).

The material must be selected according to the particular operating fluid and temperature.
When choosing the elastomer, allowances must be made for the fact that the gas can cool down to below the permitted elastomer temperature if there are adverse discharge conditions (high pressure ratio p_2/p_0, high discharging velocity). This can cause cold cracking in the elastomer.
The gas temperature can be calculated using the HYDAC Accumulator Simulation Program ASP.

1.4. CORROSION PROTECTION

For operation with chemically aggressive media, the accumulator shell can be supplied with corrosion protection, such as plastic coating on the inside or chemical nickel-plating. If this is insufficient, then stainless steel accumulators must be used.

1.5. MOUNTING POSITION

HYDAC bladder accumulators can be installed vertically, horizontally and at a slant. When installing vertically or at a slant, the oil valve must be at the bottom. On certain applications listed below, particular positions are preferable:

- Energy storage: vertical,
- Pulsation damping: any position from horizontal to vertical,
- Maintaining constant pressure: any position from horizontal to vertical,
- Pressure surge damping: vertical,
- Volume compensation: vertical.

If the mounting position is horizontal or at a slant, the effective volume and the maximum permitted flow rate of the operating fluid are reduced.

Bladder accumulators SB16A / SB35A and SB16AH / SB35AH must only be installed vertically with the gas side at the top.

1.6. TYPE OF MOUNTING

For strong vibrations and volumes above 1 litre, we recommend the use of HYDAC accumulator supports or the HYDAC accumulator mounting set.

See catalogue sections:

- Supports for Hydraulic Accumulators No. 3.502
- ACCUSET SB No. 3.503

2. TECHNICAL SPECIFICATIONS

2.1. EXPLANATORY NOTES

2.1.1 Operating pressure

See tables (may differ from nominal pressure for foreign test certificates).

2.1.2 Nominal volume

See tables

2.1.3 Effective gas volume

See tables

Based on nominal dimensions, this differs slightly from the nominal volume and must be used when calculating the effective volume.

2.1.4 Effective volume

Volume of fluid which is available between the operating pressures p_2 and p_1.

2.1.5 Max. flow rate of the operating fluid

In order to achieve the max. flow rate given in the tables, the accumulator must be mounted vertically. It must be noted that a residual fluid volume of approx. 10 % of the effective gas volume remains in the accumulator.

2.1.6 Fluids

The following sealing and bladder materials are suitable for the fluids listed below.

Material	Fluids
NBR	Mineral oils (HL, HLP, HFA, HFB, HFC), water
ECO	Mineral oil
IIR	Phosphate ester, water
FKM	Chlorinated hydrocarbons, petrol

2.1.7 Permitted operating temperature

The permitted operating temperatures are dependent on the application limits of the metal materials and the bladders.

The standard valve bodies, gas valves and accumulator shells are suitable for temperatures from -10 °C ... +80 °C.

Outside these temperatures, special material combinations must be used. The following table shows the correlation between bladder material and application temperature.

Material	Temperature ranges
NBR20	-15 °C ... +80 °C
NBR21	-50 °C ... +80 °C
NBR22	-30 °C ... +80 °C
ECO	-30 °C ... +120 °C
IIR	-40 °C ... +100 °C
FKM	-10 °C ... +150 °C

2.1.8 Gas charging

Hydraulic accumulators must only be charged with nitrogen.
Never use other gases.
RISK OF EXPLOSION!

In principle, the accumulator may only be charged with nitrogen class 4.5, filtered to < 3 µm.
If other gases are to be used, please contact HYDAC for advice.

2.1.9 Limits for gas pre-charge pressure

$p_0 \leq 0.9 \bullet p_1$

with a permitted pressure ratio of:
$p_2 : p_0 \leq 4 : 1$

p_2 = max. operating pressure
p_0 = gas pre-charge pressure

For HYDAC low pressure accumulators, the following must also be taken into account:

Type SB40: $p_{0\,max}$ = 20 bar
Type SB35HB: $p_{0\,max}$ = 10 bar

2.1.10 Certificate codes

Australia	F1 [1]
Brazil	U3 [3]
Canada	S1 [2]
China	A9
CIS	A6
EU member states	U
India	U3 [3]
Japan	P
New Zealand	T
Switzerland	U
Ukraine	A10
USA	S
others on request	

[1] Approval required in the individual territories

[2] Approval required in the individual provinces

[3] Alternative certificates possible

On no account must any welding, soldering or mechanical work be carried out on the accumulator shell. After the hydraulic line has been connected it must be completely vented.

Work on systems incorporating hydraulic accumulators (repairs, connecting pressure gauges etc) must only be carried out once the pressure and the fluid have been released.

Please read the Operating Manual! No. 3.201.CE

Note:
Application examples, accumulator sizing and extracts from approvals regulations on hydraulic accumulators can be found in the following catalogue section:

- Accumulators
  No. 3.000

2.2. MODEL CODE
(also order example)

SB40 A – 100 F 7 / 112 U – 40 A

Series

Type code
H = high flow
N = increased flow, standard oil valve dimensions
A = shock absorber
B = bladder top-repairable
Combinations possible, e.g. HB - High flow with top-repairable bladder
no details = standard

Nominal volume [l]

Fluid connection
A = standard connection, thread with internal seal face
F = flange connection
C = valve mounting with screws on underside
E = sealing surfaces on front interface (e.g. on thread M50x1.5 - valve)
G = male thread
S = special connection, to customer specification

Gas side
1 = standard model
2 = back-up model
3 = gas valve 7/8-14UNF with M8 female thread
4 = gas valve 7/8-14UNF with gas valve connection 5/8-18UNF
5 = gas valve M50x1.5 in accumulators smaller than 50 l
6 = 7/8-14UNF gas valve
7 = M28x1.5 gas valve
8 = M16x1.5 gas valve
9 = special gas valve, to customer specification

Material code [1)]
Standard model = 112 for mineral oils
depending on operating medium
Others on request

Fluid connection
1 = carbon steel
2 = high tensile steel
3 = stainless steel [3)]
6 = low temperature steel

Accumulator shell
0 = plastic coated (internally)
1 = carbon steel
2 = chemically nickel-plated (internal coating)
4 = stainless steel [3)]
6 = low temperature steel

Accumulator bladder [2) 4)]
2 = NBR20
3 = ECO
4 = IIR (butyl)
5 = NBR21 (low temperature)
6 = FKM
7 = Others
9 = NBR22

Certificate code
U = PED 97/23/EC

Permitted operating pressure [bar]

Connection
Thread, codes for fluid connections: A, C, E, G
A = thread to ISO 228 (BSP)
B = thread to DIN 13 or ISO 965/1 (metric)
C = thread to ANSI B1.1 (UN..-2B seal SAE J 514)
D = thread to ANSI B1.20.1 (NPT)
S = special thread, to customer specification

Flange, codes for fluid connection: F
A = EN 1092-1 welding neck flange
B = flange ASME B16.5
C = SAE flange 3000 psi
D = SAE flange 6000 psi
S = special flange, to customer specification

Required gas pre-charge pressure must be stated separately!

1) Not all combinations are possible
2) When ordering spare bladder, please state diameter of the smaller shell port
3) Depending on type and pressure rating
4) Standard materials, all other materials on request

3. LOW PRESSURE ACCUMULATORS

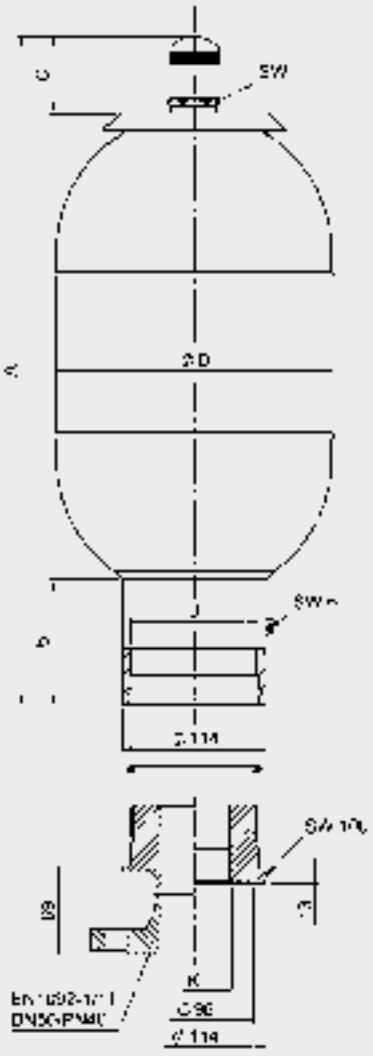
3.1. STANDARD BLADDER ACCUMULATORS SB40-2.5 ... 50

3.1.1 Design

HYDAC standard low pressure accumulators consist of:

- A welded pressure vessel which can be treated with various types of corrosion protection for chemically aggressive fluids, or can be supplied in stainless steel.
- A bladder with gas valve. The bladders are available in the elastomers listed under point 2.1.
- A hydraulic connector with a perforated disc which is held in place with retaining ring.

3.1.2 Dimensions SB40-2.5 ... 50



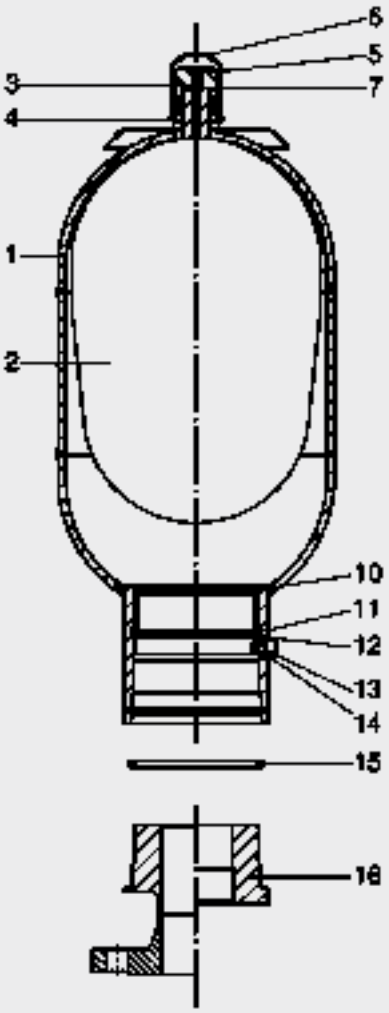
SB40-2.5 ... 50

Permitted operating pressure 40 bar (PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A [mm]	B [mm]	C [mm]	Ø D [mm]	J thread ISO DIN 13	K* thread ISO 228	SW [mm]	Q [1] [l/s]
2.5	2.5	9	541	122	68	108	M100x2	G 2	36	7
5	5.0	13	891							
10	8.7	14	533	106		219				
20	18.0	23	843							
32	33.5	38	1363							
50	48.6	52	1875						68 [2]	

* Item 16 must be ordered separately
[1] Q = max. flow rate of operating fluid (at approx. 0.5 bar pressure drop via adapter)
[2] Lock nut

3.1.3 Spare parts SB40-2.5 ... 50



Description	Item
Bladder assembly [1] consisting of:	
Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
Seal kit consisting of:	
O-ring	7
Vent screw	13
Seal ring	14
O-ring	15
Repair kit [1] consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	
Hydraulic connector assembly consisting of:	
Perforated disc	10
Anti-extrusion ring	11
Retaining ring	12
Vent screw	13
Seal ring	14
O-ring	15

* available separately
[1] When ordering, please state diameter of the smaller shell port.
Item 1 not available as a spare part.

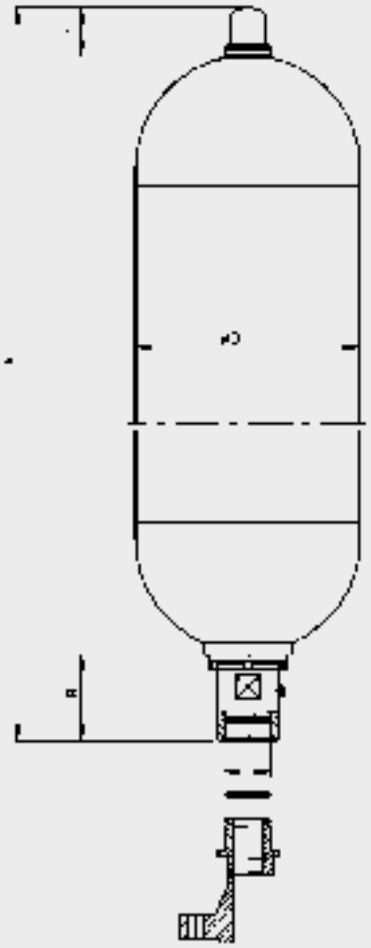
3.2. BLADDER ACCUMULATORS SB40-70 ... 220

3.2.1 Design

HYDAC low pressure accumulators, type SB40-70 ... 220 consist of:

- A welded pressure vessel which is compact and yet suitable for high flow rates and large volumes.
  The pressure vessel is manufactured in carbon steel or in stainless steel.
- A bladder with gas valve.
- A hydraulic connector with check valve.

3.2.2 Dimensions SB40-70 ... 220



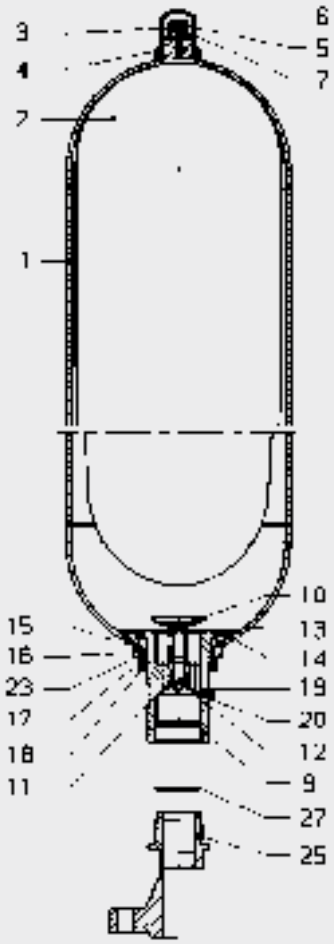
SB40-70 ... 220

Permitted operating pressure 40 bar
(PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A max. [mm]	B [mm]	C [mm]	Ø D [mm]	J thread ISO 228	Q [1] [l/s]
70	64	94	1199	137	78	356	G 2 1/2	30
100	111	113	1629					
130	133	133	1879					
190	192	169	2086			407		
220	220	193	2330					

[1] Q = max. flow rate of operating fluid

3.2.3 Spare parts SB40-70 ... 220



Description	Item
Bladder assembly [1] consisting of:	
Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
Seal kit consisting of:	
O-ring	7
Washer	15
O-ring	16
Vent screw	19
Support ring	23
O-ring	27
Repair kit [1] consisting of:	
Seal kit (see above)	
Bladder assembly (see above)	
Anti-extrusion ring	14
Oil valve assembly consisting of:	
Valve assembly (items 9-13)	9
Anti-extrusion ring	14
Washer	15
O-ring	16
Spacer	17
Lock nut	18
Vent screw	19
Support ring	23

* available separately

[1] When ordering, please state diameter of the smaller shell port.

Item 1 not available as a spare part.

Item 19 for NBR/Carbon steel:
seal ring (item 20) included

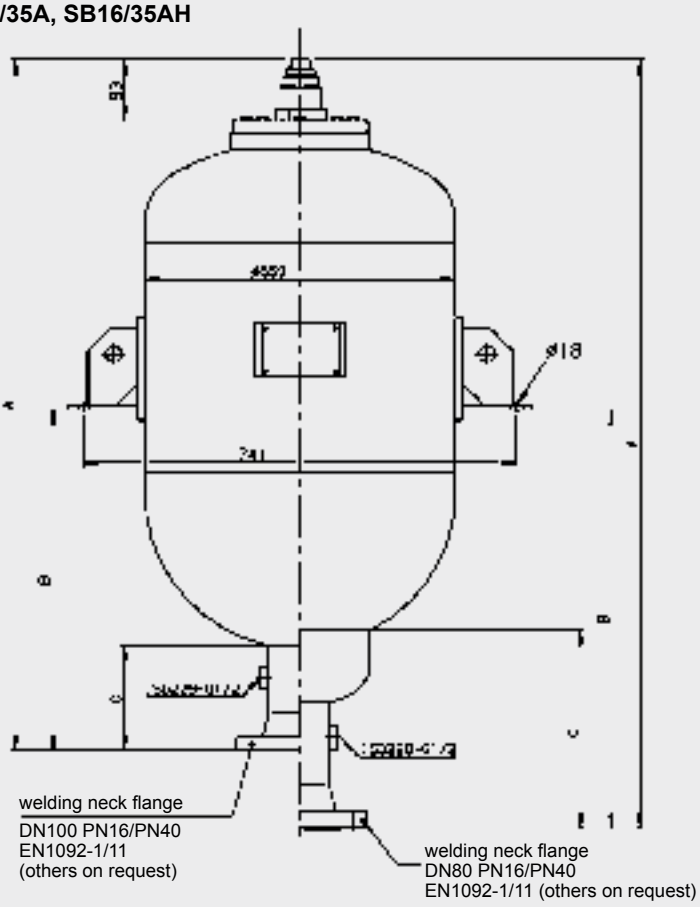
3.3. LOW PRESSURE ACCUMULATORS SB16/35A AND SB16/35AH

3.3.1 Design

HYDAC low pressure bladder accumulators for large volumes, type SB35A and SB16A are in a weld construction in carbon steel or stainless steel.

The hydraulic outlet is covered by a perforated disc which prevents the flexible bladder extruding from the shell. The bladder is top-repairable.

3.3.2 Dimensions SB16/35A, SB16/35AH



SB16/35A

Permitted operating pressure 16/35 bar
(PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg] SB16A	Weight [kg] SB35A	A (approx.) [mm] SB16A	A (approx.) [mm] SB35A	B (approx.) [mm] SB16A	B (approx.) [mm] SB35A	C (approx.) [mm] SB16A	C (approx.) [mm] SB35A	DN*
100	99	84	144	880	880	390	403			
150	143	101	161	1070	1080	490	503			
200	187	122	223	1310	1320	685	698	185	198	100
300	278	155	288	1710	1720	975	988			
375	392	191	326	2230	2240	1250	1263			
450	480	237	386	2325	2635	1465	1478			

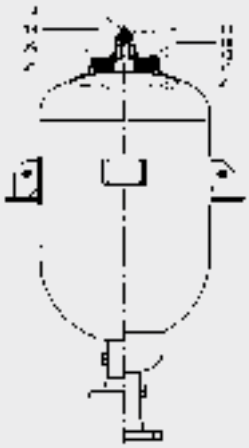
SB16/35AH

Permitted operating pressure 16/35 bar
(PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg] SB16AH	Weight [kg] SB35AH	A (approx.) [mm] SB16AH	A (approx.) [mm] SB35AH	B (approx.) [mm] SB16AH	B (approx.) [mm] SB35AH	C (approx.) [mm] SB16AH	C (approx.) [mm] SB35AH	DN*
100	99	93	153	957	965	457	465			
150	143	110	170	1157	1165	557	565			
200	187	131	230	1417	1425	842	850	245	254	80
300	278	164	297	1865	1873	1092	1100			
375	392	200	335	2307	2315	1342	1350			
450	480	246	395	2702	2710	1542	1550			

* to EN1092-1/11 / PN16 or PN40
others on request

3.3.3 Spare parts SB16/35A, SB16/35AH



Description	Item
Bladder	2
Lock nut	3
O-ring	11
Seal ring	13
Vent screw	18
O-ring	19
Retaining ring	21
O-ring	25

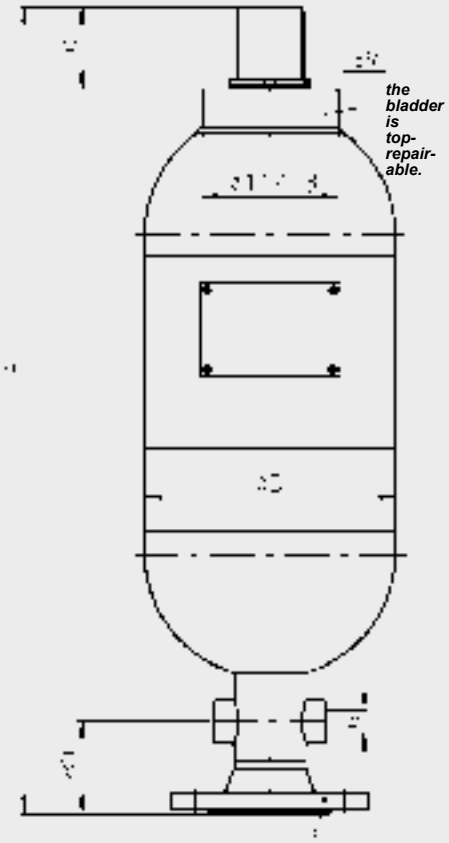
3.4. HIGH FLOW BLADDER ACCUMULATOR SB35HB

3.4.1 Design

HYDAC high flow bladder accumulators type SB35HB are high performance accumulators for flow rates of up to 20 l/s at 2 bar Δp.

They consist of a pressure vessel in a weld construction and a flexible bladder with gas valve.
The pressure vessel contains a fixed perforated disc, permitting a high flow rate through its large free cross-section. For use with chemically aggressive fluids, the shell can be manufactured in stainless steel. See point 2.1. for bladder materials.

3.4.2 Dimensions SB35HB



welding neck flange DN50 / PN40 EN1092-1/11 (others on request)

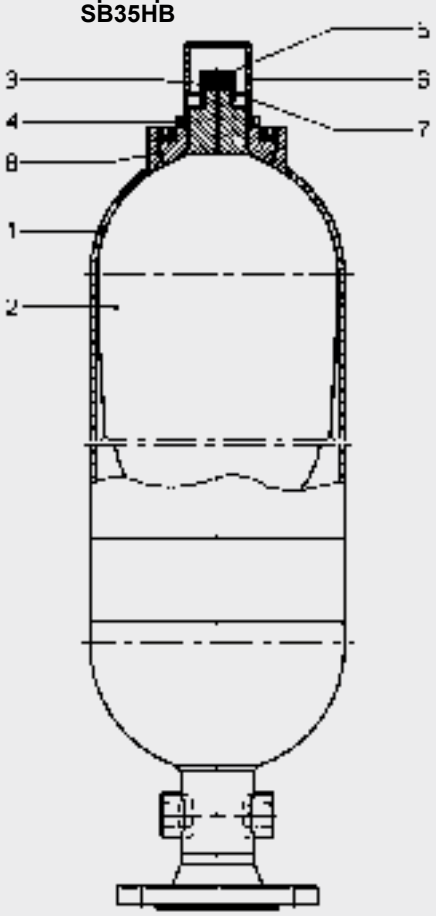
SB35HB

Permitted operating pressure 35 bar
(PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A max. [mm]	C [mm]	Ø D [mm]	J thread ISO 228	SW [mm]	Q [1] [l/s]
20	19.8	43	1081	63	219	G 1/2	36	20
32	35.0	56	1591					
50	50.0	69	2091	78			Ø68 [2]	

[1] Q = max. flow rate of pressure fluid
[2] Lock nut

3.4.3 Spare parts SB35HB



Description	Item
Bladder assembly [1] consisting of:	
Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
Seal kit consisting of:	
Gas valve insert*	3
O-ring	7
O-ring	8
Repair kit [1] consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	

* available separately

[1] When ordering, please state diameter of the smaller shell port.

Item 1 not available as a spare part.

4. NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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Bladder Accumulators
High pressure

1. DESCRIPTION

1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy.

The compressibility of a gas (nitrogen) is utilised in hydraulic accumulators for storing fluids. HYDAC bladder accumulators are based on this principle.

A bladder accumulator consists of a fluid section and a gas section with the bladder acting as the gas-proof screen.

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

HYDAC bladder accumulators can be used in a wide variety of applications and are also available in different pressure ranges, see catalogue sections:

- Bladder Accumulators Standard No. 3.201
- Bladder Accumulators Low Pressure No. 3.202
- Accumulators No. 3.000

1.2. CONSTRUCTION

The high pressure bladder accumulator consists of the pressure vessel, the flexible bladder with gas valve and the hydraulic connection with check valve.

1.2.1 **Shell material**

The forged pressure vessel is seamless and manufactured from high tensile chrome molybdenum steel.

1.2.2 **Bladder material**

The following elastomers are available as standard:

- NBR (acrylonitrile butadiene rubber, perbunan),
- IIR (butyl rubber),
- FKM (fluoro rubber, Viton®),
- ECO (ethylene oxide epichlorohydrin rubber).

The material used depends on the particular operating medium and temperature.

When choosing the elastomer, allowances must be made for the fact that the gas can cool down to below the permitted elastomer temperature if there are adverse discharge conditions (high pressure ratio p_2/p_0, high discharging velocity). This can cause cold cracking in the elastomer. The gas temperature can be calculated using the HYDAC Accumulator Simulation Program ASP.

1.2.3 **Corrosion protection**

For operation with chemically aggressive media, the accumulator shell can be chemically nickel-plated internally or supplied with a special plastic coating, such as Duroplast.

For external corrosion protection the accumulator can be supplied with an epoxy resin finish specially for offshore applications.

1.3. MOUNTING POSITION AND TYPE OF MOUNTING

Information on secure mounting positions and mounting elements can be found in the following catalogue sections:

- Bladder Accumulators Standard No. 3.201
- Supports for Hydraulic Accumulators No. 3.502
- ACCUSET SB No. 3.503

2. TECHNICAL SPECIFICATIONS

2.1. MODEL CODE

(also order example)

SB690 - 32 A 1 / 312 U - 690 D

Series

Nominal volume [l]

Fluid connection
A = standard connection

Gas side connection
1 = standard model [2)]
9 = special model (example: 1/4" - BSP)

Material code [1)]

Fluid connection
2 = high tensile steel
3 = stainless steel
6 = low temperature steel

Accumulator shell
0 = plastic coated (internally)
1 = carbon steel
2 = chemically nickel-plated (internal coating)
6 = low temperature steel
8 = plastic coated (e.g. Duroplast) internally and externally

Accumulator bladder
2 = NBR20
3 = ECO
4 = IIR (butyl)
5 = NBR21 (low temperature)
6 = FKM
7 = Others
9 = NBR22

Certificate code
U = PED 97/23/EC

Permitted operating pressure [bar]

Connection
A = Thread to ISO228 (1/2" BSP)
D = Thread to ANSI B1.20.3 (1/2" NPTF)

Required gas pre-charge pressure must be stated separately!

[1)] Not all combinations are possible
[2)] Gas valve in SB < 10 l = 7/8 - 14 UNF,
in SB ≥ 10 l = M50x1.5

2.2. EXPLANATORY NOTES

2.2.1 **Operating pressure**

690 bar (10000 psi)
Higher pressures on request

2.2.2 **Permitted working temperature and elastomer resistance**

NBR20	-15 °C ... +80 °C	water water-glycol mineral oil
NBR21	-50 °C ... +80 °C	
NBR22	-30 °C ... +80 °C	
ECO	-30 °C ... +120 °C	mineral oil
IIR	-40 °C ... +100 °C	phosphate ester, water
FKM	-10 °C ... +150 °C	chlorinated hydrocarbons, petrol

2.2.3 **Gas charging**

Hydraulic accumulators must only be charged with nitrogen.
Never use other gases.
RISK OF EXPLOSION!

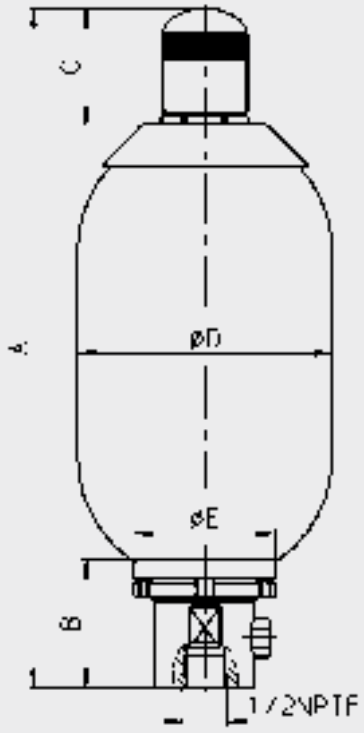
In principle, the accumulator may only be charged with nitrogen class 4.5, filtered to < 3 µm.

If other gases are to be used, please contact HYDAC for advice.

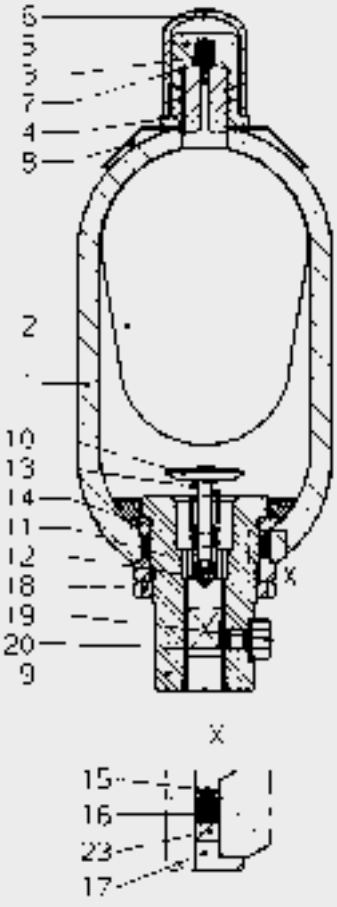
3. DIMENSIONS AND SPARE PARTS

3.1. DRAWINGS

3.1.1 Dimensions



3.1.2 Spare parts



3.2. DIMENSIONS

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A max. [mm]	B [mm]	C [mm]	Ø D max. [mm]	Ø E [mm]	SW [mm]
1	1.0	8.5	324	61	58	122	67	45
2.5	2.5	13.5	531					
5	4.9	23	860					
13	12.0	92	700	77	68	250	110	75
20	17.0	114	865					
32	33.5	186	1385					
54	49.7	260	1900					

3.3. SPARE PARTS

3.3.1 Part numbers

NBR

Nominal volume [l]	Seal kit P/N	Bladder assembly P/N	Repair kit P/N	Anti-extrusion ring P/N
1	03182615	03010110	03182617	00293262
2.5		03211568	03201771	
5		03211569	03201772	
13	03182616	03211570	03211573	03028455
20		03211592	03211574	
32		03211571	03211585	
54		03116598	03211586	

Description	Item
Bladder assembly	
consisting of:	
Bladder	2
Gas valve insert	3
Lock nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
Seal kit	
consisting of:	
O-ring	7
Washer	15
O-ring	16
Vent screw	19
Support ring	23
Repair kit	
consisting of:	
Seal kit (see above)	
Bladder assembly (see above)	
Anti-extrusion ring	14

Item 1 not available as a spare part.

4. NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications and operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Diaphragm Accumulators

1. DESCRIPTION

1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy.

The compressibility of a gas is utilised in hydraulic accumulators for storing fluids. HYDAC diaphragm accumulators are based on this principle, using nitrogen as the compressible medium.

A diaphragm accumulator consists of a fluid section and a gas section with the diaphragm acting as the gas-proof screen.

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

At the base of the diaphragm is a valve poppet. This shuts off the hydraulic outlet when the accumulator is completely empty and thus prevents damage to the diaphragm.

NOTE:

HYDAC diaphragm accumulators when fitted with a HYDAC Safety and Shut-off Block comply with the regulations of the Pressure Equipment Directive PED 97/23/EC and the German regulations on health & safety at work (Betr.Sich.V.).

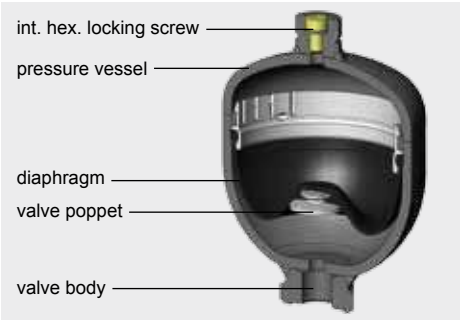
See catalogue section:

- Safety and shut-off block SAF/DSV No. 3.551

1.2. DESIGN

HYDAC diaphragm accumulators are available in two versions.

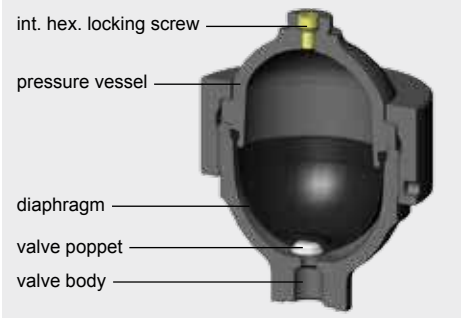
1.2.1 **Weld type**



This consists of:

- Welded pressure vessel, rechargeable on the gas side or, alternatively, completely sealed. Fluid connection available in various types.
- Flexible diaphragm to separate the fluid and gas sections.
- Valve poppet set into the base of the diaphragm.

1.2.2 **Screw type**



This consists of:

- Forged upper section with gas charging connection.
- Forged lower section with fluid connection.
- Exchangeable flexible diaphragm to separate the gas and fluid.
- Vulcanized valve poppet set into the base of the diaphragm.
- Lock nut to hold the upper and lower sections of the accumulator together.

1.2.3 **Diaphragm materials**

The diaphragms are available in the following elastomers:

- NBR (acrylonitrile butadiene rubber, perbunan),
- IIR (butyl rubber),
- FKM (fluoro rubber, Viton®),
- ECO (ethylene oxide epichlorohydrin rubber).

The material must be selected according to the particular operating fluid and temperature.

When choosing the elastomer, allowances must be made for the fact that the gas can cool down to below the permitted elastomer temperature if there are adverse discharge conditions (high pressure ratio p_2/p_0, high discharging velocity). This can cause cold cracking in the elastomer. The gas temperature can be calculated using the HYDAC Accumulator Simulation Program ASP.

1.2.4 **Corrosion protection**

For use with chemically aggressive fluids the accumulator can be supplied with corrosion protection, such as plastic coating or a galvanic or chemical surface protection. If this is insufficient, then almost all types can be supplied in stainless steel.

1.3. MOUNTING POSITION

Optional. However, if there is a risk of contamination collecting, a vertical position is preferable (fluid connection at the bottom).

1.4. TYPE OF MOUNTING

Accumulators up to 2 l can be screwed directly inline.

Where strong vibrations are expected, the accumulator must be secured to prevent it working loose. For weld type accumulators we recommend HYDAC support clamps. For screw type accumulators with lock nut, a suitable support console can be ordered.

Additional male threads on the hydraulic connection are available for screwing into mounting holes - see table 3.1.

See catalogue section:

- Supports for Hydraulic Accumulators No. 3.502

1.5. GENERAL

1.5.1 **Permitted operating pressure**
See tables 3.1. and 3.2.

The permitted operating pressure can differ from the nominal pressure for foreign test certificates.

1.5.2 **Nominal volume**
See tables 3.1. and 3.2.

1.5.3 **Effective gas volume**
Corresponds to the nominal volume of the diaphragm accumulator.

1.5.4 **Effective volume**
Volume of fluid which is available between the operating pressures p_2 and p_1.

1.5.5 **Fluids**
Mineral oils, hydraulic oils. Other fluids on request.

1.5.6 **Gas charging**
All accumulators are supplied with a protective pre-charge.
Higher gas pre-charge pressures are available on request (gas charging screw or sealed gas connection).

Hydraulic accumulators must only be charged with nitrogen.
Never use other gases.
RISK OF EXPLOSION!

1.5.7 **Permitted operating temperature**
-10 °C ... +80 °C
263 K ... 353 K
for material code 112.
Others on request

1.5.8 **Permitted pressure ratio**
Ratio of maximum operating pressure p_2 to gas pre-charge pressure p_0.

1.5.9 **Max. flow rate of operating fluid**
In order to achieve the max. flow rate given in the tables, a residual fluid volume of approx. 10 % of the effective gas volume must remain in the accumulator.

1.5.10 **Certificate codes**
Hydraulic accumulators which are installed in countries outside Germany are supplied with the test certificates required in that country. The country of installation must be stated at the time of ordering.
HYDAC pressure vessels can be supplied with virtually any test certificate.
Please note that the operating pressure can differ from the nominal pressure.
The following table contains a few examples of the codes used in the model code for different countries of installation:

Australia	F [1)]
Brazil	U [3)]
Canada	S1 [2)]
China	A9
CIS	A6
EU member states	U
India	U [3)]
Japan	P
New Zealand	T
South Africa	U [3)]
Switzerland	U [3)]
Ukraine	A10
USA	S
others on request	

[1)] approval required in the individual territories
[2)] approval required in the individual provinces
[3)] alternative certificates possible

On no account must any welding, soldering or mechanical work be carried out on the accumulator shell. After the hydraulic line has been connected it must be completely vented. Work on systems incorporating hydraulic accumulators (repairs, connecting pressure gauges etc.) must only be carried out once the pressure and the fluid have been released.
Please read the Operating Manual!
No. 3.100 CE

Note:
Application examples, accumulator sizing and extracts from approvals regulations on hydraulic accumulators can be found in the catalogue section:

- Accumulators No. 3.000

2. TECHNICAL SPECIFICATIONS

2.1. MODEL CODE

(also order example)

SBO210 – 2 E1 / 112 U – 210 AK 050

Series

Nominal volume [l]

Type [2]

Weld type:
E1 = rechargeable M28x1.5
E2 = sealed gas connection,
with gas pre-charge as requested [4]
E3 = rechargeable,
gas valve M16x1.5 / M14x1.5

Screw type
A6 = rechargeable M28x1.5,
exchangeable diaphragm
A3 = gas valve M16x1.5 / M14x1.5,
exchangeable diaphragm

Material code [2]
depends on operating medium
Standard model = 112 for mineral oils

Fluid connection
1 = carbon steel
3 = stainless steel 1.4571
4 = carbon steel with protective coating [1]
6 = low temperature steel

Accumulator shell
0 = plastic coated
1 = carbon steel
2 = carbon steel with protective coating [1] [3]
4 = stainless steel 1.4571
6 = low temperature steel

Diaphragm
2 = NBR20 (acrylonitrile butadiene)
3 = ECO (ethylene oxide epichlorohydrin)
4 = IIR (butyl)
5 = NBR21 (low temperature NBR)
6 = FKM (fluoro rubber)
7 = other (e.g. PTFE, EPDM ... on request)

Certificate code [2]
U = PED 97/23/EC
For other countries see table

Permitted operating pressure [bar]

Fluid connection [2] **form**
Standard connection = AK or AB

e.g. Form AK = G 3/4
for SBO210-2 see Point 3

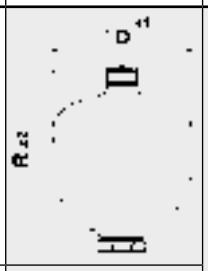
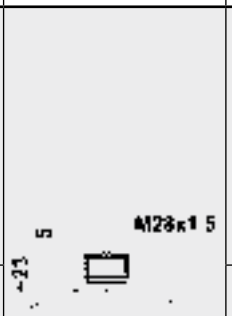
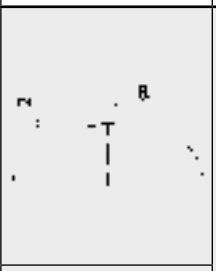
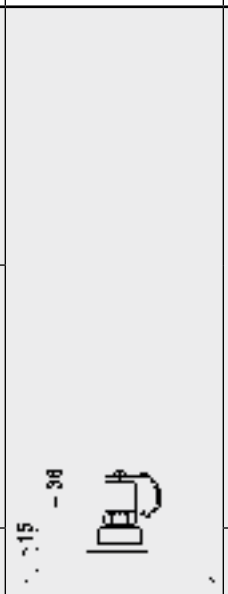
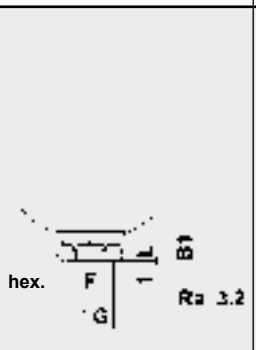
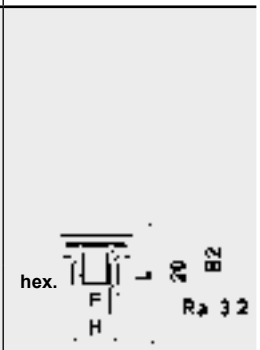
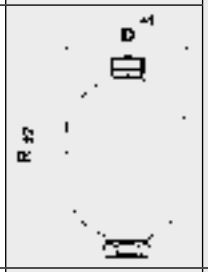
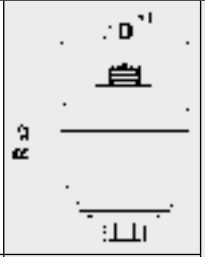
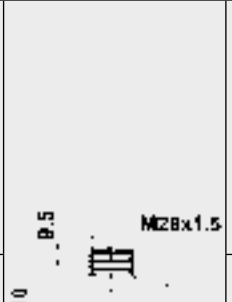
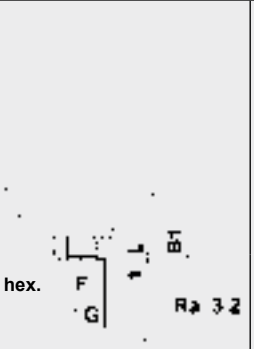
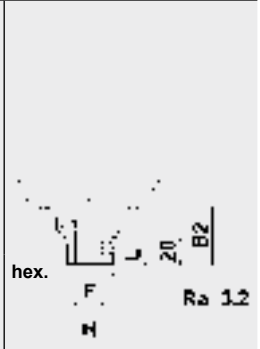
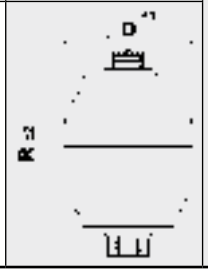
Pre-charge pressure p_0 [bar] at 20 °C, must be stated clearly, if required! [4]

[1] only for screw type
[2] not all combinations are possible
[3] only parts in contact with the medium
[4] only for type E1 or E2, for scheduled orders

3. TECHNICAL SPECIFICATIONS

3.1. WELD TYPE ACCUMULATORS
– non-exchangeable diaphragms –

3.1.1 Drawings

Diag.	Type	Gas side connection			Fluid side connection*	
		E1	E2	E3	AK	AB
1						
2			–			
3			on request			
4			–			

* = alternative fluid connections on request

3.1.2 **Dimensions**

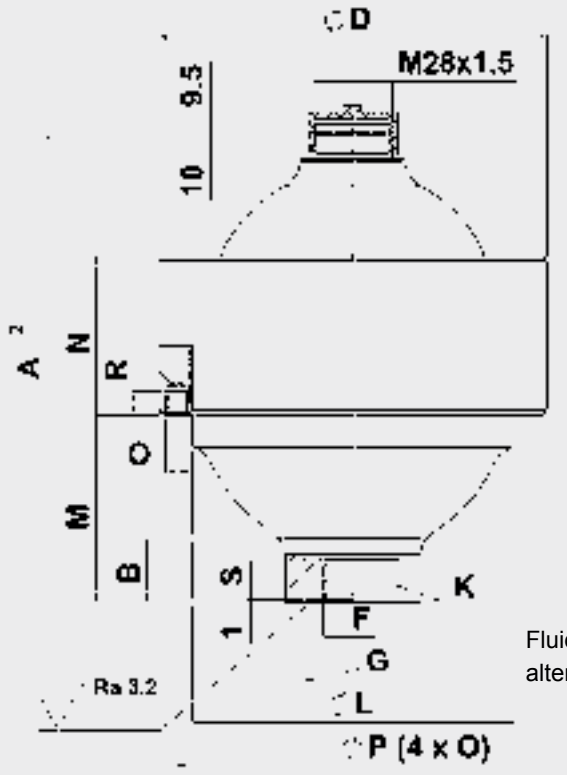
Nom. vol.[1]	Perm. press. ratio	Series	Certificate code U		R	ØD	Weight	Q [2]	**Standard fluid connection**										Diag.
			Permitt. oper. pressure [bar]						**Form AK**					**Form AB**					
[l]	$p_2 : p_0$		Carbon steel	Stainless steel	[mm]	[mm]	[kg]	[l/min]	F ISO 228	ØG [mm]	L [mm]	B 1 [mm]	hex. SW	F ISO 228	H DIN 13	L [mm]	B 2 [mm]	hex. SW	
0.075	8 : 1	250	250	–	91	64	0.7	38	G 1/2	–	14	21	30	not available					1
0.16	8 : 1	210	210	180	103	74	0.8	38	G 1/2	–	14	21	30	not available					1
		300	300	–	108	78	1.1												
0.32	8 : 1	210	210	160	116	93	1.3	95	G 1/2	–	14	21	30	not available					1
		300	300	–	120	96	1.8												
0.5	8 : 1	160	160	–	130	102	1.3	95	G 1/2	–	14	21	30	G 1/2	M33x1.5	14	37	41	1
		210	210	–	133	105	1.7												
0.6	8 : 1	330	330	–	151	115	3.3	95	G 1/2	34	14	21	41	G 1/2	M33x1.5	14	37	41	1
		350	350	–	130	121	3.5						50					50	3
0.7	8 : 1	100	100	–	151	106	1.8	95	G 1/2	34	14	21	41	G 1/2	M33x1.5	14	37	41	1
0.75	8 : 1	140	140	–	142	116	1.8	95	G 1/2	34	14	21	41	G 1/2	M33x1.5	14	37	41	1
		210	210	140	147	121	2.8												
		250	250	–	152	126	3.6									15	42		
		330	330	–	140	126	4.0					26							3
1	8 : 1	200	200	–	159	136	3.6	95	G 1/2	34	14	21	41	G 1/2	M33x1.5	14	37	41	1
	4 : 1	250	250	–	192	126	4.4												2
		330	330	–	169		4.8					26				15	42		4
1.4	8 : 1	140	140	–	173	145	3.9	95	G 1/2	34	14	21	41	G 1/2	M33x1.5	14	37	41	4
		210	210	–	178	150	5.4												1
		250	250	–	185	153	5.9									15			
		330	330	–	172	155	7.6					33					42		3
2	8 : 1	100	100	100	190	160	4.0	150	G 3/4	44	16	28	46	G 3/4	M45x1.5	16	33	46	1
		210	210	–	198	167	6.6												
	4 : 1	250	250	–	232	153	7.4												2
	8 : 1	330	330	–	181	172	9.2					43					42		3
2.8	4 : 1	210	210	–	250	167	8.2	150	G 3/4	44	16	28	46	G 3/4	M45x1.5	16	33	46	2
		250	250	–	250	170	7.8												
		330	330	–	237	172	11.0					43					42		4
	6 : 1				231							44							3
3.5	4 : 1	250	210	–	306	170	11.2	150	G 3/4	44	16	28	46	G 3/4	M45x1.5	16	33	46	2
		330	330	–	274	172	13.8					44					42		4
4	4 : 1	50	–	50	294	158	5.0	150	G 3/4	44	16	44	46	G 3/4	M45x1.5	16	33	46	2
		250	–	180	306	170	11.2												

[1] Others on request
[2] Max. flow rate of operating fluid

3.2. SCREW TYPE
– exchangeable diaphragm –

3.2.1 **Drawings**

Type A6



Type A3

Fluid connection AK
alternative fluid connections on request

Fig. 5

3.2.2 **Dimensions**

Nom. vol. [1] [l]	Perm. press. ratio $p_2 : p_0$	Series	Certificate code U / Permitt. oper. pressure [bar] Carbon steel	Certificate code U / Permitt. oper. pressure [bar] Stainless steel	Weight [kg]	A [mm]	B [mm]	ØD [mm]	ØL [mm]	M [mm]	N [mm]	O	ØP [mm]	R [mm]	Q [2] [l/min]	**Standard fluid connection Form AK** F ISO 228	S [mm]	ØG [mm]	K SW	Diag.
0.1	10 : 1	500	500	–	1.9	110	30	95	–	53	35	–	–	–	95	G 1/2	14	–	36	5
0.25	10 : 1	500	500	–	3.9	129	20	115	92	56	56	–	–	–	95	G 1/2	14	–	36	
			–	350	4.9			125			60									
		750	–	750	9.0	136	11	153	114	57.5	63							27		
0.6	10 : 1	450	450	250	5.7	170	19	140	115	68	57	–	–	–	95	G 1/2	14	34	41	
1.3	10 : 1	400	400	–	11.2	212	28	199	160	97	65	M8	180	10	150	G 3/4	16	44	50	
2	10 : 1	250	250	180	11.4	227	17	201	168	101	64	M8	188	10	150	G 3/4	16	44	50	
2.8	10 : 1	400	400	–	22.0	257	30	252	207	106	80	M8	230	10	150	G 3/4	16	44	50	
4	10 : 1	400	400	–	34.0	284	30	287	236	127.5	90	M8	265	10	150	G 3/4	16	44	50	

[1] Others on request
[2] Max. flow rate of operating fluid

4. NOTE

The information in this brochure relates to the operating conditions and applications described. For applications and operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Hydraulic Dampers

1. HYDRAULIC DAMPERS

1.1. DESCRIPTION

1.1.1 Mode of operation

The pressure fluctuations occurring in hydraulic systems can be cyclical or one-off problems due to:

- flow rate fluctuations from displacement pumps
- actuation of shut-off and control valves with short opening and closing times
- switching pumps on and off
- sudden linking of spaces with different pressure levels.

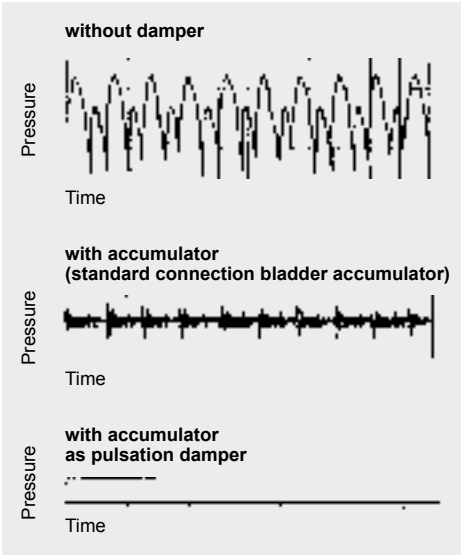
HYDAC hydraulic dampers are particularly suitable for damping such pressure fluctuations.

Selecting the most suitable hydraulic damper for each system ensures that

- vibrations caused by pipes, valves, couplings etc are minimised and subsequent pipe and valve damage is prevented
- measuring instruments are protected and their performance is no longer impaired
- the noise level in hydraulic systems is reduced
- the performance of machine tools is improved
- interconnection of several pumps in one line is possible
- an increase in pump rpm and feed pressure is possible
- the maintenance and servicing costs can be reduced
- the service life of the system is increased.

1.2. APPLICATION

1.2.1 Pulsation damping TYPE SB...P / SBO...P



General

The HYDAC pulsation damper

- prevents pipe breaks caused by material fatigue, pipe oscillations and irregular flow rates,
- protects valves, control devices and other instruments,
- improves noise level damping.

Applications

The pulsation damper is particularly suitable for:
hydraulic systems, displacement pumps of all types, sensitive measurement and control instruments and manifolds in process circuits in the chemical industry.

Mode of operation

The pulsation damper has two fluid connections and can therefore be fitted directly inline.

The flow is directed straight at the bladder or diaphragm by diverting it in the fluid valve. This causes direct contact of the flow with the bladder or diaphragm which, in an almost inertialess operation, balances the flow rate fluctuations via the gas volume.

It particularly compensates for higher frequency pressure oscillations. The pre-charge pressure is adjusted to individual operating conditions

Construction

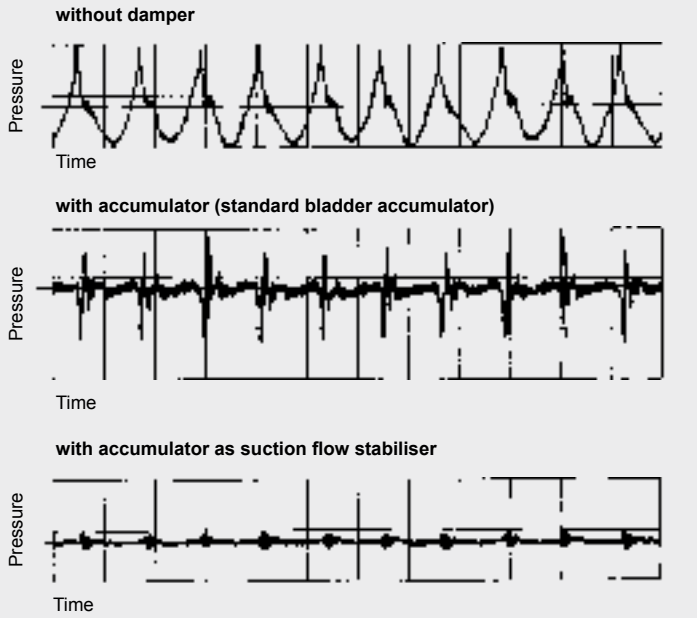
The HYDAC pulsation damper consists of:

- the welded or forged pressure vessel in carbon steel; available with internal coating or in stainless steel for chemically aggressive fluids;
- the special fluid valve with inline connection, which guides the flow into the vessel (threaded or flange connection);
- the bladder or diaphragm in various elastomers as shown under 1.4.1.

Installation

As close as possible to the pulsation source. Mounting position preferably vertical (gas valve pointing upwards).

1.2.2 Suction flow stabiliser Type SB...S



General
The HYDAC suction flow stabiliser

- improves the NPSH value of the system;
- prevents cavitation of the pump;
- prevents pipe oscillations.

Applications
Main application areas are piston and diaphragm pumps in public utility plants, reactor construction and the chemical industry.

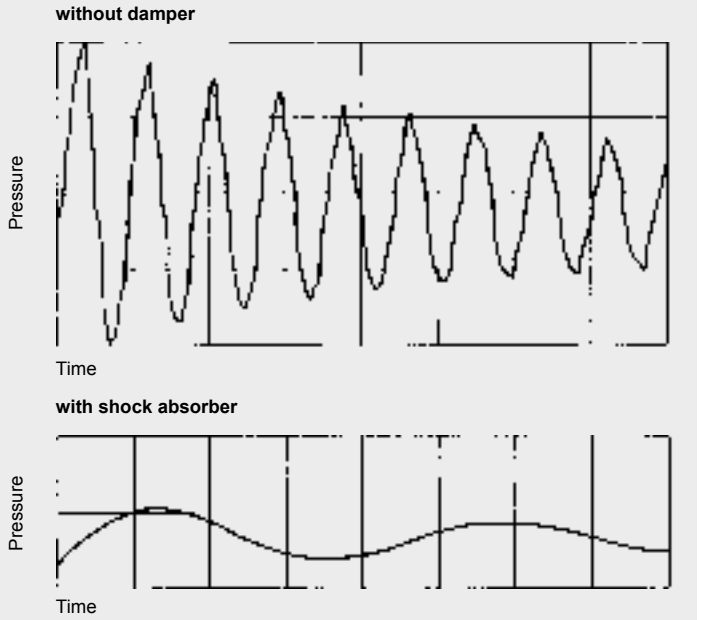
Mode of operation
Trouble-free pump operation is only possible if no cavitation occurs in the pump suction and pipe oscillations are prevented.

A relatively high fluid volume in the suction flow stabiliser in relation to the displacement volume of the pump reduces the acceleration effects of the fluid column in the suction line. Also an air separation is achieved due to the extremely low flow rate in the suction flow stabiliser and the deflection on a baffle. By adjusting the charging pressure of the bladder to the operating conditions, the best possible pulsation damping is achieved.

Construction
The HYDAC suction flow stabiliser consists of a welded vessel in steel or stainless steel.
Inlet and outlet are on opposite sides and are separated by a baffle. The upper part houses the encapsulated bladder. In addition, there is a vent screw in the cover plate and a drainage facility on the bottom.

Installation
As close as possible to the suction inlet of the pump. Mounting position vertical (gas valve pointing upwards).

1.2.3 Shock absorber Type SB...A



General
The HYDAC shock absorber

- reduces pressure shocks;
- protects pipelines and valves from being destroyed.

Applications
The accumulators are particularly suitable for use in pipelines with quick-acting valves or flaps and whilst pumps are being switched on and off.

They are also suitable for energy storage in low pressure applications.

Mode of operation
Sudden changes in pipeline flow, such as those caused by pump failure or the closing or opening of valves, can cause pressures which are many times higher than the normal values.

The shock absorber prevents this by converting potential into kinetic energy and vice versa. This prevents pressure shocks and protects pipelines, valves, control instruments and other devices from destruction.

Construction
The HYDAC shock absorber consists of:

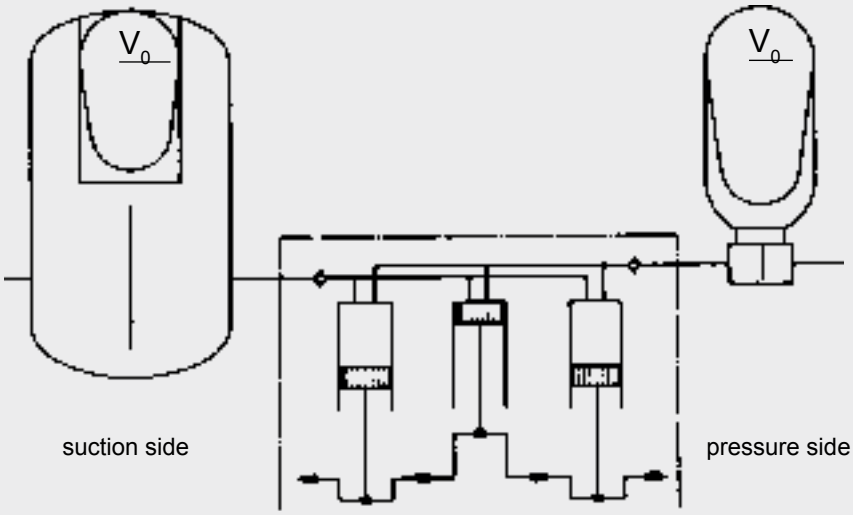
- the welded pressure vessel in carbon steel with or without corrosion protection or in stainless steel;
- the connection including perforated disc which prevents the flexible bladder from extruding from the vessel, and the flange;
- the bladder in various elastomer qualities as shown under point 1.4.1 with built-in gas valve, which is used for charging pressure p_0 and for possible monitoring activities.

Special model
Shock absorbers can also be in the form of diaphragm or piston accumulators. Available on request.

Installation
As close as possible to the source of the erratic condition. Mounting position vertical (gas valve pointing upwards).

1.3. SIZING

1.3.1 Pulsation damper and suction flow stabiliser



On the suction and pressure side of piston pumps almost identical conditions occur regarding irregularity of the flow rate. Therefore the same formulae for determining the effective gas volume are used for calculating the damper size. That in the end two totally different damper types are used is due to the different acceleration and pressure ratios on the two sides.

Not only is the gas volume V_0 a decisive factor but also the connection size of the pump has to be taken into account when selecting the pulsation damper.
In order to avoid additional variations in cross-section which represent reflection points for vibrations, and also to keep pressure drops to a reasonable level, the connection cross-section of the damper must be the same as the pipeline.

The gas volume V_0 of the damper is determined with the aid of the formula for adiabatic changes of state.

By giving the residual pulsation or the gas volume, the damper size can be calculated with the aid of the HYDAC software **ASP** (**A**ccumulator **S**imulation **P**rogram). The results can then be printed out or the data files can be stored in ASP format.

The ASP-program is available free of charge via our website www.hydac.com or via E-Mail to speichertechnik@hydac.com.

Designations:

ΔV = fluctuating fluid volume [l]

$$\Delta V = m \bullet q$$

q = stroke volume [l]

$$q = \frac{\pi \bullet d_\kappa^2}{4} \bullet h_\kappa$$

d_κ = piston diameter [dm]

h_κ = piston stroke [dm]

m = amplitude factor

$$m = \frac{\Delta V}{q}$$

z = no. of compressions / effective cylinders per revolution

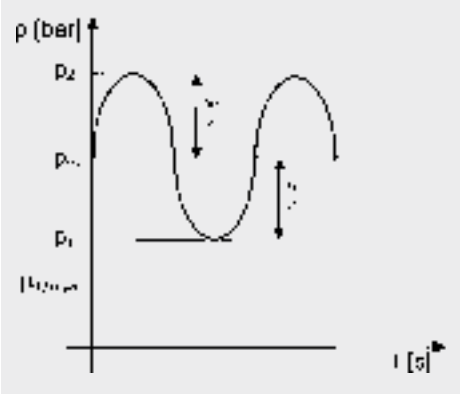
x = residual pulsation [± %]

κ = isentropic exponent

Φ = pressure ratio of pre-charge pressure to operating pressure [0.6 ... 0.9]

$$\Phi = \frac{p_0}{p_m}$$

Δp = height of pressure fluctuations
$\Delta p = p_2 - p_1$ [bar]



Formulae:

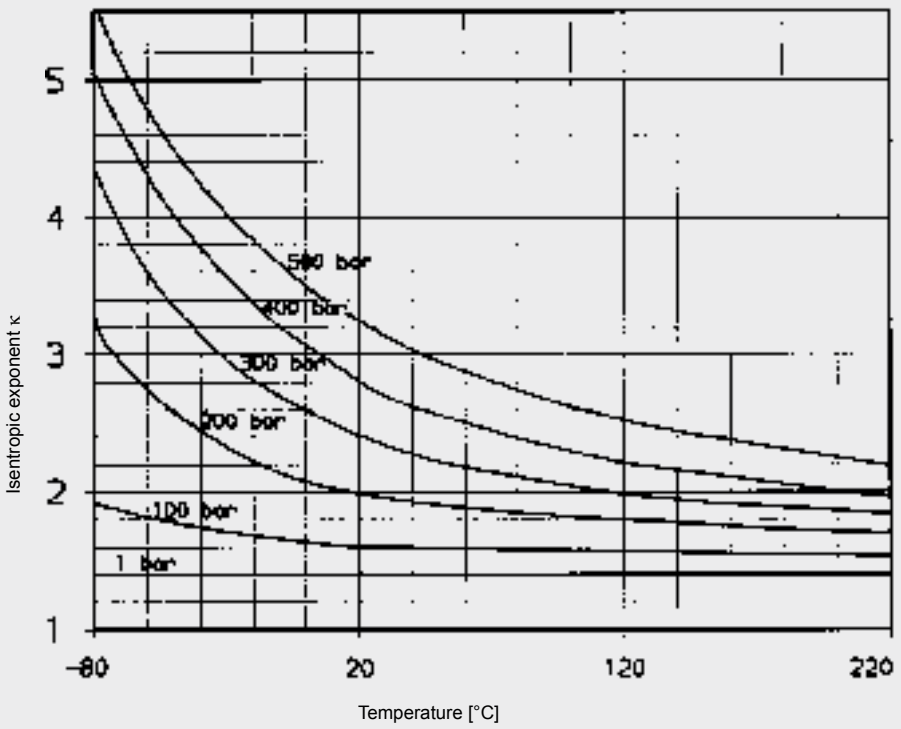
$$V_0 = \frac{\Delta V}{\left[\frac{\Phi}{1-\frac{x}{100}}\right]^{\frac{1}{\kappa}} - \left[\frac{\Phi}{1+\frac{x}{100}}\right]^{\frac{1}{\kappa}}}$$

$$\Delta V = m \bullet q$$

$$x\,[\pm\%] = \left|\frac{p_1 - p_m}{p_m} \bullet 100\right|$$

$$= \left|\frac{p_2 - p_m}{p_m} \bullet 100\right|$$

Isentropic exponent κ dependent on pressure and temperature:



m-values for piston pump
(others on request):

	m-value	
z	single acting	double acting
1	0.550	0.250
2	0.210	0.120
3	0.035	0.018
4	0.042	0.010
5	0.010	0.006
6	0.018	0.001
7	0.005	
8	0.010	
9	0.001	

Calculation example

Given parameters:

Single-acting 3-piston pump

Piston diameter:	70 mm
Piston stroke:	100 mm
Motor speed:	370 min^{-1}
Output:	427 l/min
Operating temperature:	20 °C
Operating pressure	
- Outlet:	200 bar
- Inlet:	4 bar

Required:

a) Suction flow stabiliser for a residual pulsation of ± 2.5%

b) Pulsation damper for a residual pulsation of ± 0.5%

Solution:

a) Determining the required suction flow stabiliser

$$V_0 = \frac{\Delta V}{\left[\frac{\Phi}{1-\frac{x}{100}}\right]^{\frac{1}{\kappa}} - \left[\frac{\Phi}{1+\frac{x}{100}}\right]^{\frac{1}{\kappa}}}$$

$$V_0 = \frac{0.035 \bullet \frac{\pi \bullet 0.7^2}{4} \bullet 10}{\left[\frac{0.6}{1-\frac{2.5}{100}}\right]^{\frac{1}{1.4}} - \left[\frac{0.6}{1+\frac{2.5}{100}}\right]^{\frac{1}{1.4}}}$$

V_0 = 0.54 l

Selected: SB16S-25 with 1 l gas volume

b) Determining the required pulsation damper

$$V_0 = \frac{\Delta V}{\left[\frac{\Phi}{1-\frac{x}{100}}\right]^{\frac{1}{\kappa}} - \left[\frac{\Phi}{1+\frac{x}{100}}\right]^{\frac{1}{\kappa}}}$$

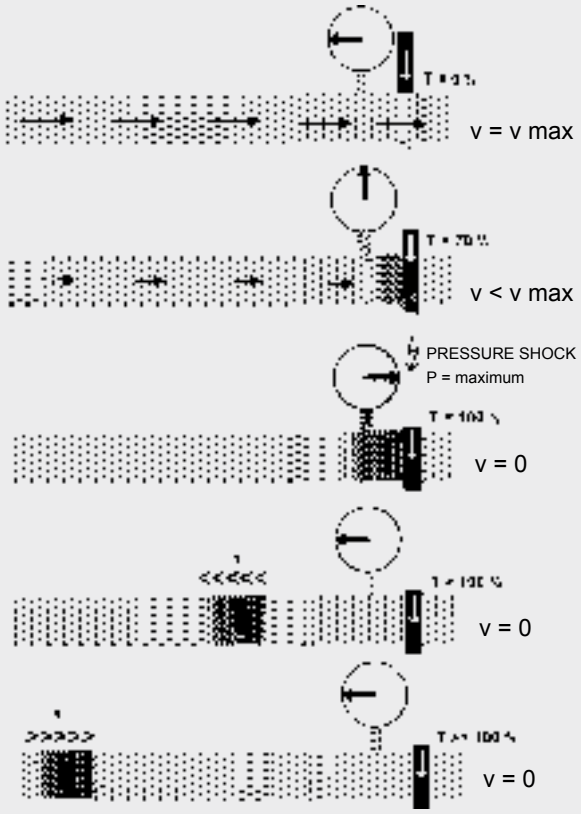
$$V_0 = \frac{0.035 \bullet \frac{\pi \bullet 0.7^2}{4} \bullet 10}{\left[\frac{0.7}{1-\frac{0.5}{100}}\right]^{\frac{1}{2.0}} - \left[\frac{0.7}{1+\frac{0.5}{100}}\right]^{\frac{1}{2.0}}}$$

V_0 = 3.2 l

Selected: SB330P-4

1.3.2 **Shock absorber**

Pressure shock produced when a valve is closed without a hydraulic accumulator



Simplified pressure shock calculation for the closing of a valve.

Estimate of Joukowsky's max. occurring pressure shock

$\Delta p (N/m^2)$ = $\rho \cdot a \cdot \Delta v$
ρ (kg/m³) = fluid density
Δv = $v - v_1$
Δv = change of fluid velocity
v (m/s) = fluid velocity before the change in its condition
v_1 (m/s) = fluid velocity after the change in its condition
a (m/s) = propagation velocity of pressure wave

$$a\ (m/s) = \frac{1}{\sqrt{\rho \cdot \left[\frac{1}{K} + \frac{D}{E \cdot e}\right]}}$$

K (N/m²) = compression modulus of the fluid
E (N/m²) = modulus of elasticity of pipeline
D (mm) = internal diameter of pipeline
e (mm) = wall thickness of the pipeline

The pressure wave runs to the other end of the pipeline and will reach the valve again after time t (reflection time), whereby:

$$t\ (s) = \frac{2 \cdot L}{a}$$

L (m) = length of the pipeline
T (s) = effective operating time (closing) of the valve
If T < t then:
$p_{max} = p_1 + \Delta p$
If T > t then:

$$p_{max} = p_1 + \rho \cdot a \cdot \Delta v \cdot \frac{t}{T}$$

Determining the required damper size

The accumulator must absorb the kinetic energy of the fluid by converting it into potential energy within the pre-determined pressure range. The change of state of the gas is adiabatic in this case

$$V_0 = \frac{m \cdot v^2 \cdot 0.4}{2 \cdot p_1 \cdot \left[\left[\frac{p_2}{p_1}\right]^{1-\frac{1}{\kappa}} - 1\right] \cdot 10^2} \cdot \left[\frac{p_1}{p_0}\right]^{\frac{1}{\kappa}}$$

m (kg) = weight of fluid in the pipeline
v (m/s) = velocity of the fluid
p_1 (bar) = zero head of the pump
p_2 (bar) = permitted operating pressure
p_0 (bar) = pre-charge pressure

A special calculation program to analyse the pressure curve is available for sizing during pump failure or start-up and for manifolds.

Calculation example
Rapid closing of a shut-off valve in a re-fuelling line.

Given parameters:

Length of the pipeline L:
2000 m

NW of pipeline D:
250 mm

Wall thickness of pipeline e:
6.3 mm

Material of pipeline:
Steel

Flow rate Q:
432 m³/h = 0.12 m³/s

Density of medium ρ:
980 kg/m³

Zero head of pump p_1:
6 bar

Min. operating pressure p_{min}:
4 bar

Effective closing time of the valve T:
1.5 s (approx. 20% of total closing time)

Operating temperature:
20 °C

Compression modulus of the fluid K:
1.62×10^9 N/m²

Elasticity modulus (steel) E:
2.04×10^{11} N/m²

Required:

Size of the required shock absorber, when the max. pressure (p_2) must not exceed 10 bar.

Solution:

Determination of reflection time:

$$a = \frac{1}{\sqrt{\rho \cdot \left[\frac{1}{K} + \frac{D}{E \cdot e}\right]}}$$

$$a = \frac{1}{\sqrt{980 \cdot \left[\frac{1}{162 \cdot 10^9} + \frac{250}{2.04 \cdot 10^{11} \cdot 6.3}\right]}}$$

$$a = 1120 \text{ m/s}$$

$$t = \frac{2 \cdot L}{a} = \frac{2 \cdot 2000}{1120} = 3.575 \text{ s} *$$

* since T < t the max. pressure surge occurs and the formula as shown in Point 1.3.2. must be used.

$$v = \frac{Q}{A}$$

$$v = \frac{0.12}{0.25^2 \cdot \pi/4} = 2.45 \text{ m/s}$$

$$\Delta_p = \rho \cdot a \cdot \Delta v$$

$$\Delta_p = 980 \cdot 1120 \cdot (2.45\text{-}0) \cdot 10^{-5}$$

$$= 26.89 \text{ bar}$$

$$p_{max} = p_1 + \Delta_p$$

$$p_{max} = 6 + 26.89 = 32.89 \text{ bar}$$

Determining the required gas volume:

$$p_0 \leq 0.9 \cdot p_{min}$$

$$p_0 \leq 0.9 \cdot 5 = 4.5 \text{ bar}$$

$$V_0 = \frac{m \cdot v^2 \cdot 0.4}{2 \cdot p_1 \cdot \left[\left[\frac{p_2}{p_1}\right]^{1-\frac{1}{\kappa}} - 1\right] \cdot 10^2} \cdot \left[\frac{p_1}{p_0}\right]^{\frac{1}{\kappa}}$$

with $m = V \cdot \rho = \frac{\pi}{4} \cdot D^2 \cdot L \cdot \rho$

$$V_0 = \frac{\frac{\pi}{4} \cdot 0.25^2 \cdot 2000 \cdot 980 \cdot 2.45^2 \cdot 0.4}{2 \cdot 7 \cdot \left[\left[\frac{11}{7}\right]^{1-\frac{1}{14}} - 1\right] \cdot 10^2} \cdot \left[\frac{7}{4.5}\right]^{\frac{1}{14}}$$

$$V_0 = 1641 \text{ l}$$

Selected:

4 off shock absorbers
SB 35AH-450.

1.4. TECHNICAL DATA

1.4.1 **MODEL CODE** (also order example)
Pulsation damper, suction flow stabiliser, shock absorber

SB330 P – 10 A 1 / 112 U – 330 AI

Series
SB... = with bladder
SBO... = with diaphragm

Type
A = shock absorber
AH = high flow shock absorber
P = pulsation damper
PH = high flow pulsation damper
S = suction flow stabiliser

Nominal volume [l]

Fluid connection
A = threaded connection
E = threaded connection for welded construction (diaphragm accumulators only)
F = flange [4)]

Type code
1 = standard model (not for threaded construction)
2 = back-up model [1)]
6 = standard model for thread-type diaphragm accumulators of the type SBO...P-...A6

Material code [2)]
depends on operating medium
Standard model = 112 for mineral oils

Fluid connection
1 = carbon steel
2 = high tensile steel
3 = stainless steel (Niro)
4 = chemically nickel-plated (internal coating) [1)]
6 = low temperature steel

Accumulator shell
0 = plastic (internal coating) [1)]
1 = carbon steel
2 = chemically nickel-plated (internal coating) [1)]
4 = stainless steel (Niro) [1)]
6 = low temperature steel

Accumulator bladder/diaphragm [3)]
2 = NBR20 (acrylonitrile butadiene)
3 = ECO (ethylene oxide epichlorohydrin)
4 = IIR (butyl)
5 = NBR21 (low temperature NBR)
6 = FKM (fluoro rubber)
7 = other (e.g. PTFE, EPDM)

Certification code [2)]
U = PED 97/23/EC

Permitted operating pressure [bar]

Connction
AI = ISO 228 (BSP), standard connection
BI = DIN 13 to ISO 965/1 (metric) [4)]
CI = ANSI B1.1 (UNF thread,sealing to SAE standard) [4)]
DI = ANSI B1.20 (NPT thread) [4)]

SBO250P-0.075E1 and for SBO210P-0.16E1:
AK = ISO 228 (BSP), standard connection

[1)] Not available for all models
[2)] Not all combinations are possible
[3)] When ordering spare bladder, please state diameter of the smaller shell port
[4)] Please give full details when ordering

1.4.2 General

Operating pressure
See tables (may differ from nominal pressure for foreign test certificates).

Nominal volumes
See tables

Effective gas volume
See tables, based on nominal dimensions. This differs slightly from the nominal volume and must be used when calculating the usable volume.

On the diaphragm accumulator, the effective gas volume corresponds to the nominal volume.

Usable volume
Volume of fluid which is available between the operating pressures p_2 and p_1.

Fluids
Mineral oils, hydraulic oils, non-flam fluids, water, emulsions, fuels.
Others on request.

Gas charge
Hydraulic accumulators must only be charged with nitrogen.
Never use other gases.
RISK OF EXPLOSION!

When supplied, the accumulator is only pre-charged for storage purposes. Higher pre-charge pressures are possible by arrangement.

Permitted operating temperature
-10 °C ... +80 °C
263 K ... 353 K
with material code 112.

Other media on request.

Permitted pressure ratio
Ratio of maximum operating pressure p_2 to gas pre-charge pressure p_0.

See catalogue section:

- Accumulators
  No. 3.000

General safety instructions
On no account must any welding, soldering or mechanical work be carried out on the accumulator shell.

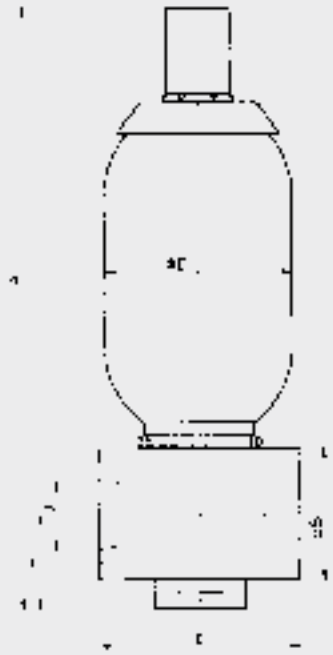
After the hydraulic line has been connected it must be completely vented. Work on systems with hydraulic dampers (repairs, connecting pressure gauges etc) must only be carried out once the pressure and the fluid have been released.

Please read the Operating Manual!

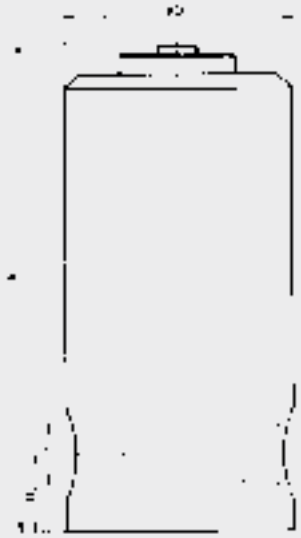
- Bladder Accumulators
  No. 3.201.CE
- Diaphragm Accumulators
  No. 3.100.CE
- Piston accumulators
  No. 3.301.CE

1.4.3 Pulsation damper

SB330/550P(PH)-...



SB800P-...



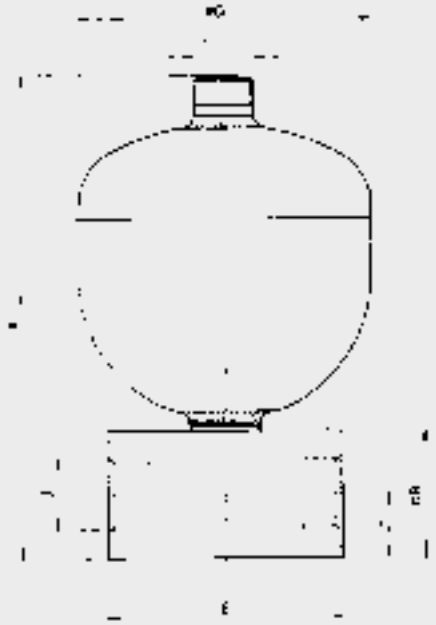
SB1000P-...

Dimensions SB

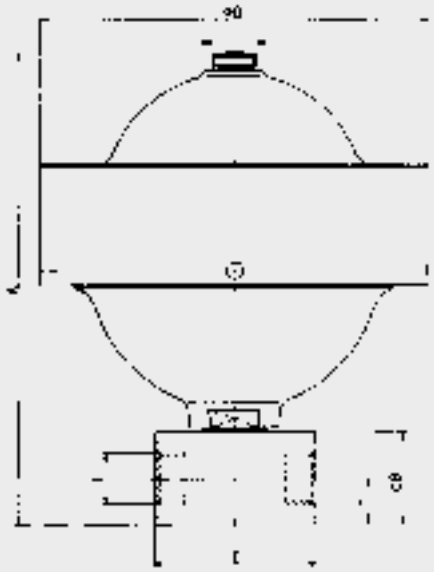
Nominal volume [l]	Max. operating pressure* [bar]	Effective gas volume [l]	Weight [kg]	A [mm]	□ B [mm]	Ø D [mm]	E [mm]	H [mm]	J [2] thread ISO 228	Series
1	330	1.0	11	365	80	118	120	57	G 1 1/4	SB330P
	550		13	384	70	121		53		SB550P
1.5	800 [3]	1.3	36	346	–	160	–	55		SB800P
	1000 [3]		94	414	–	215	–	49	[1]	SB1000P
2.5	330	2.4	16	570	80	118	120	57	G 1 1/4	SB330P
	550	2.5	20	589	70	121		53		SB550P
4	330	3.7	18	455	80	171		57		SB330P
			26	491	100		150	85	G 1 1/2	SB330PH
5	550	4.9	26	917	70	121	120	53	G 1 1/4	SB550P
6	330	5.7	20	559	80	171		57		SB330P
			28	593	100		150	85	G 1 1/2	SB330PH
10		9.3	40	620		229				SB330P
			50	652	130x140			100	SAE2"-6000 PSI	SB330PH
13	330	12.0	48	712	100			85	G 1 1/2	SB330P
20		18.4	70	920						SB330P
			80	952	130x140			100	SAE2"-6000 PSI	SB330PH
24	330	23.6	82	986	100			85	G 1 1/2	SB330P
32		33.9	100	1445						SB330P
			110	1475	130x140			100	SAE2"-6000 PSI	SB330PH

* Certification to PED 97/23/EC
[1] M56x4, high pressure connection DN 16, others on request
[2] Standard connection code = AI, others on request
[3] Special model, on request

SBO...P...E



SBO...P...A6



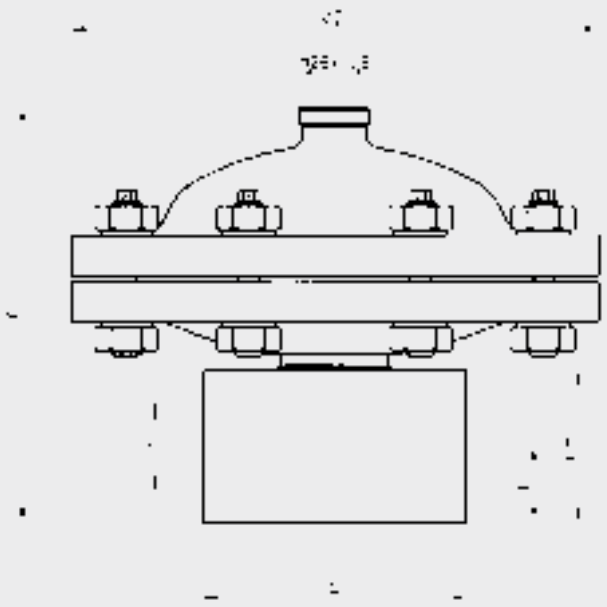
Dimensions SBO

Nominal volume	Max. operating pressure*		Weight	A	□ B	Ø D	E	H	J [1] thread	Series	
	Carbon steel	Stainless steel (NIRO)									
[l]	[bar]	[bar]	[kg]	[mm]	[mm]	[mm]	[mm]	[mm]	ISO 228		
0.075	250	–	0.9	131	–	64	41 hex.	13	G 1/4	SBO250P-...E1	weld-type
0.16	210	180	1.0	143	–	74				SBO210P-...E1	
0.32		160	2.6	175	50	93	80	25	G 1/2		
0.5		–	3.0	192		105					
0.6	330	–	5.6	222	60	115	105	30	G 1	SBO330P-...E1	
0.75	210	140	5.1	217		121				SBO210P-...E1	
1.0	200	–	6.0	231		136				SBO200P-...E1	
1.4	140	–	6.2	244		145				SBO140P-...E1	
	210	–	7.7	250		150				SBO210P-...E1	
	250	–	8.2	255		153				SBO250P-...E1	
2.0	100	100	6.3	261		160				SBO100P-...E1	
	210	–	8.9	267		167				SBO210P-...E1	
3.5	250	–	13.5	377		170				SBO250P-...E1	
4.0	–	50	7.9	368		158				SBO50P-...E1	
		250	13.5	377		170				SBO250P-...E1	
0.25	500	350	5.2 (6.3)	162	50	115 (125)	80	25	G 1/2	SBO500P-...A6	thread-type
0.6	330	250	8.9 (9.1)	202	60	140 (142)	95		G 1	SBO450P-...A6	
1.3	400	–	13.8	267		199	105	30		SBO400P-...A6	
2.0	250	180	15.6	285		201				SBO250P-...A6	
2.8	400	–	24.6	308		252				SBO400P-...A6	
4.0		–	36.6	325		287					

* Certification to PED 97/23/EC
[1] Standard connection code = AI, others on request
( ) Brackets indicate different dimensions for stainless steel version (NIRO)

Pulsation dampers for aggressive media

SBO...P-...A6/347...(PTFE)



Pulsation damper in stainless steel with PTFE coated diaphragm and PTFE or FFKM seals. Also available without connection block.

Certification to
PED 97/23/EC

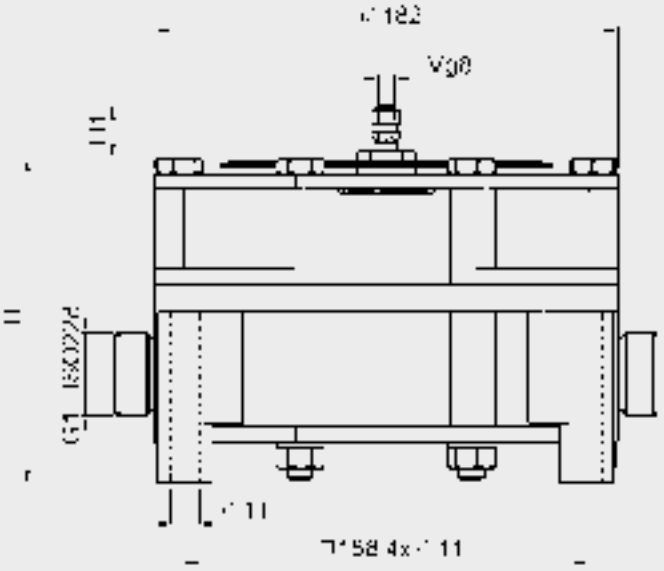
Permitted operating temperature:
-15 °C ... +80 °C

Permitted pressure ratio $p_2 : p_0 = 2 : 1$

Nominal volume [l]	Max. operating pressure [bar]	Weight [kg]	A [mm]	□ B [mm]	Ø D [mm]	E [mm]	H [mm]	J [1] thread ISO 228
0.2	40	11	140	60	210	105	30	G 1
	250	27	197		230			
0.5	40	12	165		210			
	250	26	200		230			

[1] Standard connection code = AI, others on request

SBO...P-...A4/777... (PVDF/PTFE)



Pulsation damper in PVDF with PTFE-coated diaphragm.

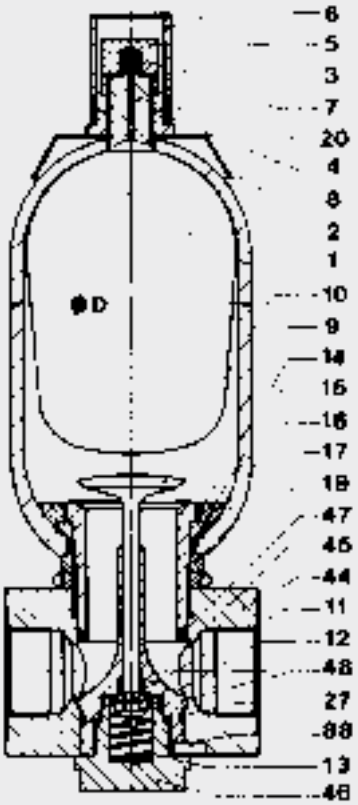
Permitted operating temperature:
-10 °C ... +65 °C

Permitted pressure ratio $p_2 : p_0 = 2 : 1$

Nominal volume [l]	Max. operating pressure [bar]	Weight [kg]	H [mm]	H1 [mm]
0.2	10	5.7	128	20
	16	6.5	130	18
	25			
0.5	10	6.0	168	20
	16	6.8	170	19
	25			

Spare parts

SB...P



Description	Item
Bladder assembly* consisting of:	
Bladder	2
Gas valve insert	3
Retaining nut	4
Cap nut	5
Valve protection cap	6
O-ring	7
Seal kit* consisting of:	
O-ring	7
Washer	15
O-ring	16
Support ring	23
O-ring	27
O-ring	47
O-ring	48
Anti-extrusion ring*	14
Gas valve insert*	3

* recommended spares

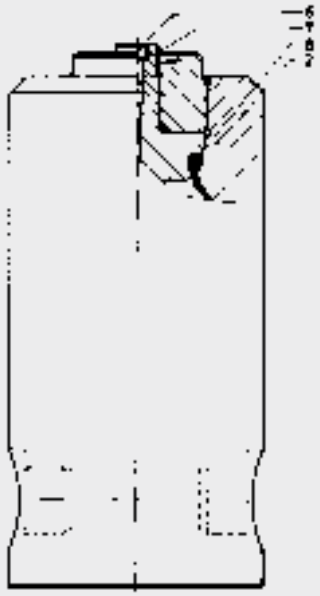
Description	Item
Connection assembly consiting of:	
Oil valve body	9
Valve poppet	10
Damping sleeve	11
Lock nut	12
Spring	13
Anti-extrusion ring	14
Washer	15
O-ring	16
Spacer	17
Lock nut	19
Support ring (only for 330 bar)	23
O-ring	27
Connector	44
Guide piece	45
Cap	46
O-ring	47
O-ring	48
Locking key	88

O-ring dimensions [mm]

Series	Nominal vol.	Item 7	Item 16	Item 27	Item 47	Item 48
SB330P	1- 6 l	7.5x2	55x3.5 [1)]	42.2x3 [1)]	46x3 [1)]	24.2x3 [1)]
SB550P	1- 5 l	7.5x2	50.17x5.33 [1)]	37.82x1.78 [1)]	40.94x2.62 [1)]	23.52x1.78 [1)]
SB330P/PH	10-32 l/4+6 l	7.5x2	80x5 [1)]	57.2x3 [1)]	67.2x3 [1)]	37.2x3 [1)]
SB330PH	10-32 l	7.5x2	100x5 [1)]	64.5x3 [1)]	84.5x3 [1)]	44.2x3 [1)]

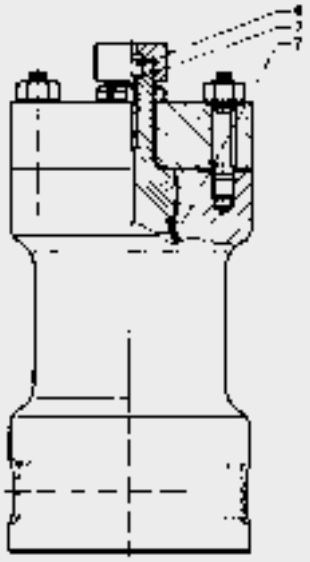
[1)] For code 663 and 665 different dimensions

SB800P



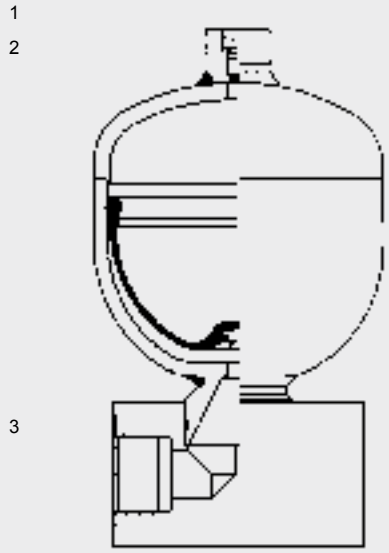
Description	Item
Bladder	2
Charging screw	6
Seal ring U 9.3x13.3x1	7
Support ring	8

SB1000P



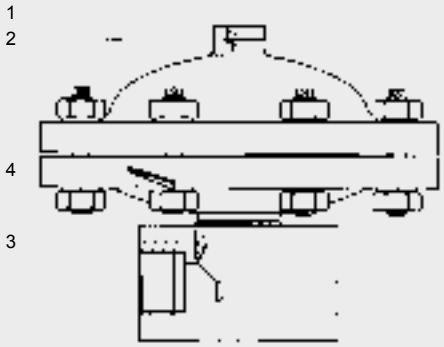
Description	Item
Bladder	2
Charging screw	6
Seal ring	7

SBO...P...E



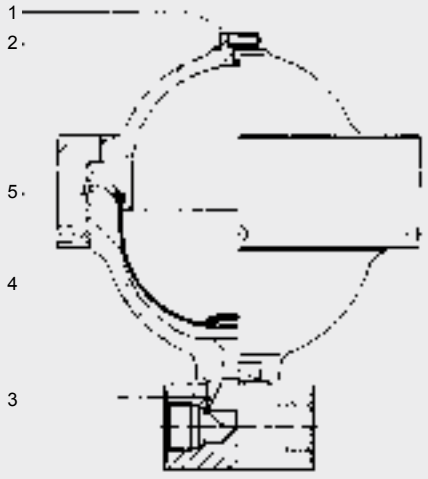
Description	Item
Charging screw	1
Seal ring	2
Seal ring	3

SBO...P-...A6/347...(PTFE)



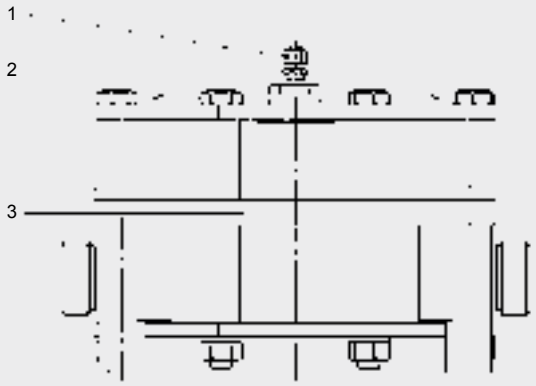
Description	Item
Charging screw	1
Seal ring	2
Seal ring	3
Diaphragm	4

SBO...P...A6



Description	Item
Charging screw	1
Seal ring	2
Seal ring	3
Diaphragm	4
Support ring	5

SBO...P-...A4/777... (PVDF/PTFE)

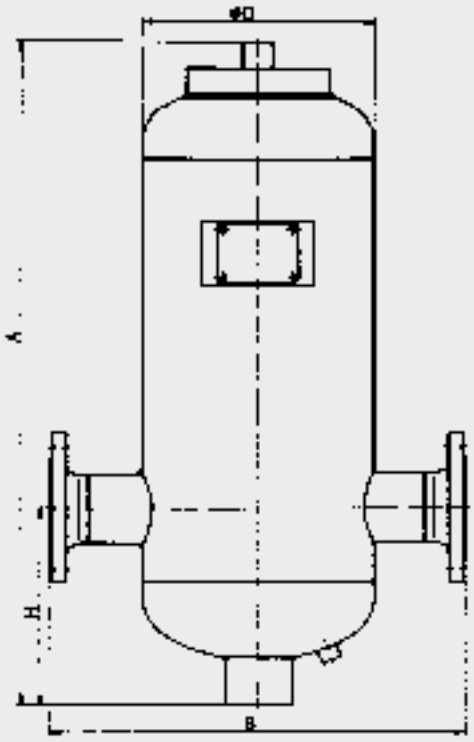


Description	Item
Gas valve complete	1
Gas valve insert brass / stainless steel	2
Diaphragm	3

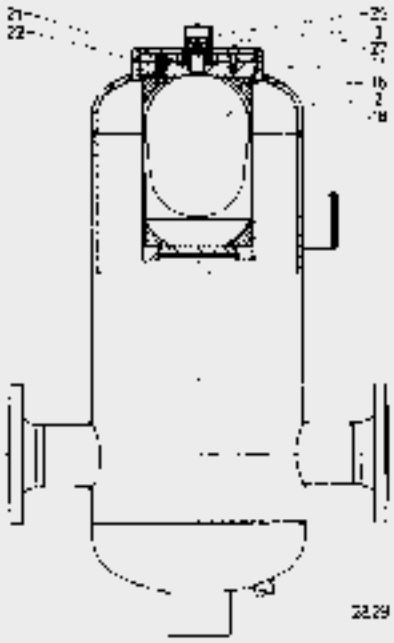
Please read the Operating Manual!
Available on request!

1.4.4 Suction flow stabiliser

SB16S



Spare Parts



Dimensions

SB16S - permitted working pressure 16 bar; certified to PED 97/23/EC

Nominal volume [l]	Fluid volume [l]	Effective gas volume [l]	Weight [kg]	A [mm]	B [mm]	Ø D [mm]	H [mm]	DN*
12	12	1	40	580	425	219	220	65
25	25	2.5	60	1025				
40	40	4	85	890	540	300	250	80
100	100	10	140	1150	650	406	350	100
400	400	35	380	2050	870	559	400	125

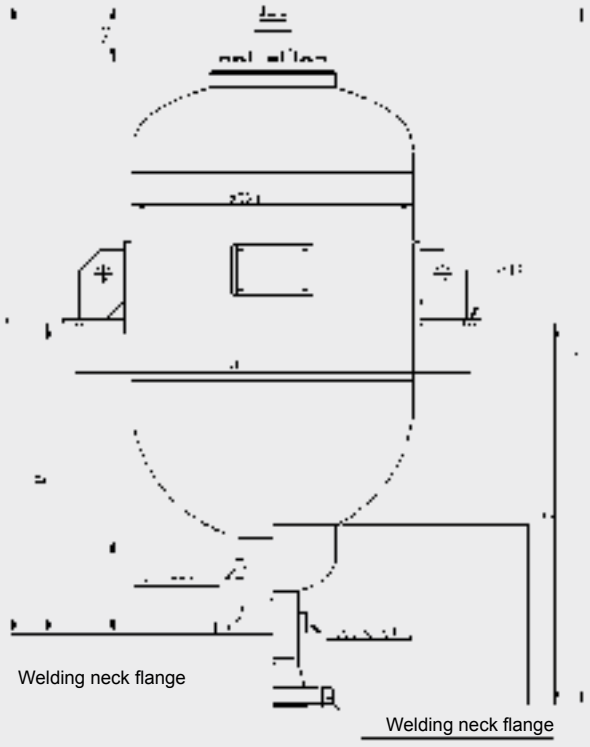
Further pressure ranges 25 bar, 40 bar; others on request.
Other fluid volumes on request

* to EN1092-1/11 /B1/PN16 or PN40

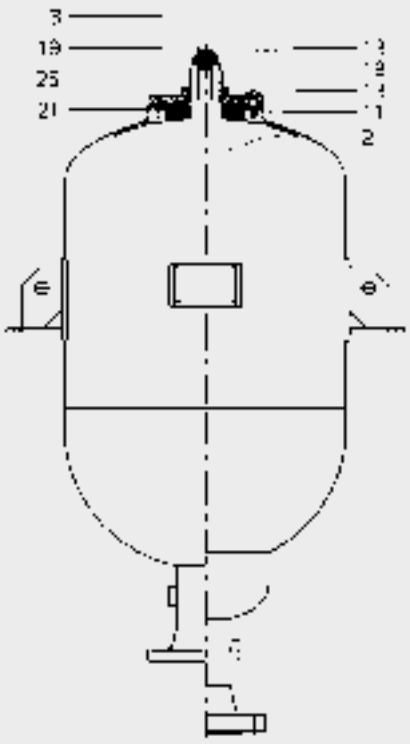
Description	Item
Bladder	2
Gas valve insert	3
O-ring	11
Insertion ring, 2x	18
Lock nut	21
Retaining ring	22
Cap nut	25
O-ring	27
Seal ring	28
Lock nut	29

1.4.5 Shock absorber

SB16/35A(H)



Spare Parts



Dimensions

SB16/35A - permitted operating pressure 16/35 bar (PED 97/23/EC)

Nominal volume	Effective gas volume	Weight [kg]		A (approx.) [mm]		B (approx.) [mm]		C (approx.) [mm]		DN*
[l]	[l]	SB16A	SB35A	SB16A	SB35A	SB16A	SB35A	SB16A	SB35A	
100	99	84	144	870	880	390	403	185	198	100
150	143	101	161	1070	1080	490	503			
200	187	122	223	1310	1320	685	698			
300	278	155	288	1710	1720	975	988			
375	392	191	326	2230	2240	1250	1263			
450	480	237	386	2625	2635	1465	1478			

SB16/35AH - Permitted operating pressure 16/35 bar (PED 97/23/EC)

Nominal volume	Effective gas volume	Weight [kg]		A (approx.) [mm]		B (approx.) [mm]		C (approx.) [mm]		DN*
[l]	[l]	SB16AH	SB35AH	SB16AH	SB35AH	SB16AH	SB35AH	SB16AH	SB35AH	
100	99	93	153	957	965	457	465	245	254	80
150	143	110	170	1157	1165	557	565			
200	187	131	230	1417	1425	842	850			
300	278	164	297	1865	1873	1092	1100			
375	392	200	335	2307	2315	1342	1350			
450	480	246	395	2702	2710	1542	1550			

* to EN1092-1/11 /B1/PN16 or PN40
others on request

Description	Item
Bladder	2
Lock nut	3
O-ring	11
Seal ring	13
Vent screw	18
O-ring	19
Retaining ring	21
O-ring	25

HYDAC INTERNATIONAL

Safety and Shut-off Block
SAF/DSV

1. DESCRIPTION

1.1. GENERAL

The HYDAC safety and shut-off block is used to shut off and discharge hydraulic accumulators or user units. It complies with the relevant safety standards in accordance with DIN EN 982 and the German industrial safety regulations, BetrSichV.

E 3.551.17/08.03

HYDAC SAFETY AND SHUT-OFF BLOCK

INDEX Page

1.1.1 Key to circuit diagram

① Safety valve to prevent excess pressure to PED 97/23/EC

The Hydac pressure relief valve DB12 is used on the SAF series. This is a direct-operated pressure relief valve in seat valve construction with excellent opening and closing properties. This version of DB 12 valve conforms to the requirements of the Pressure Equipment Directive 97/23/EC with CE marking.

② Pressure gauge

③ Shut-off valve

④ Pressure release valve

⑤ Connection for test gauge

These devices are combined in a compact, space-saving HYDAC safety and shut-off block. The following devices are also available:

⑥ Solenoid-operated pressure release valve.

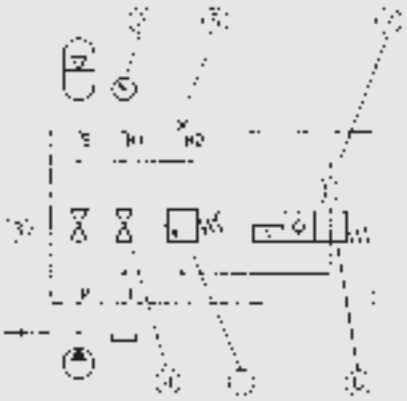
⑦ Throttle

1.1.2 Product benefits

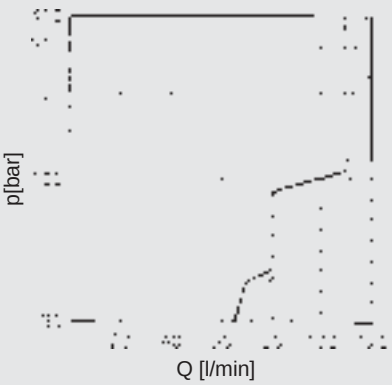
The compact combination of elements considerably simplifies the connection of an accumulator or user unit to the hydraulic system and provides the following advantages:

- Minimum of space, maintenance and installation required. As all the individual units are combined in one block, considerably fewer pipe fittings are necessary for installation.
- Considerable reduction in installation time
- All types of connections for all accumulator systems and makes are available - imperial and metric connections as well as manifold mounted and weld nipple connections.
- Additional valves such as pilot-operated check valves, flow control valves and combined flow control and check valves can be fitted to the system connection P.

Circuit diagram



DB 12 CE p-Q graph, see ① above



This valve cannot be set to values in the shaded area.

1.2. CONSTRUCTION

The SAF safety and shut-off block consists of a valve block, a built-in HYDAC pressure relief valve, a main shut-off valve and a manually operated pressure release valve, and the necessary gauge connections are provided in addition to the tank connection. In addition an optional solenoid-operated 2-way directional valve allows automatic pressure relief of the accumulator or user unit and therefore of the hydraulic system in an emergency or during shut-down.

1.3. CONNECTIONS

The safety and shut-off block has the following connections:

S – Accumulator connection

P – Pipe connection (pump)

T – Tank connection

M1 – Test gauge connection
G ½ - ISO 228
(G ¼ for SAF 10)

M2 – Gauge connection
G ¼ - ISO 228

1.4. TECHNICAL SPECIFICATIONS

1.4.1 **Operating fluids**

Mineral oil to DIN 51524

Part 1 and 2
(other fluids on request)

VISCOSITY RANGE

min. 10 mm²/s
max. 380 mm²/s

FILTRATION

Max. permissible contamination level of the operating fluid to NAS 1638 class 10.
We therefore recommend a filter with a minimum retention rate of $ß_{20} \geq 100$.
The fitting of filters and regular replacement of filter elements guarantees correct operation, reduces wear and tear and extends the service life.

1.4.2 **Permissible working temperature**

-10 °C to +80 °C
(ambient temperature on "E" version limited to
-10 °C to +40 °C)

1.4.3 **Max. operating pressure**

400 bar

1.4.4 **Model with solenoid-operated pressure relief**

TYPE OF OPERATION
Solenoid-operated by means of pressure-tight, oil-immersed, single stroke solenoids in accordance with VDE 0580. Actuating solenoid with plug to DIN 43650, standard for general industrial applications, available for 24 V DC and 230 V AC.

TYPE OF VOLTAGE
DC solenoid
When connected to AC voltage, the necessary DC voltage is produced by means of a bridge rectifier connector.

VOLTAGE TOLERANCE
-5 % to +10 %

NOMINAL CURRENT
Depending on the nominal voltage
24 V DC 1.04 A
230 V AC 0.13 A

POWER CONSUMPTION
p_{20} = 26 W

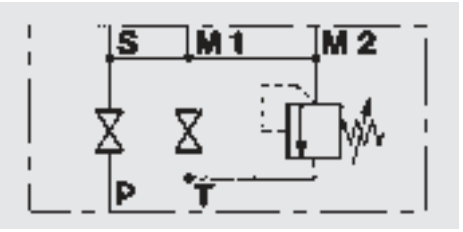
SWITCH-ON TIME
100 % = continuous operation

SWITCHING TIME
Depending on symbol, pressure across the individual ports and flow rate,
switch-on time = approx. 25 ms,
switch-off time = approx. 35 ms

1.5 STANDARD MODELS

1.5.1 **Model with manually operated pressure release valve**

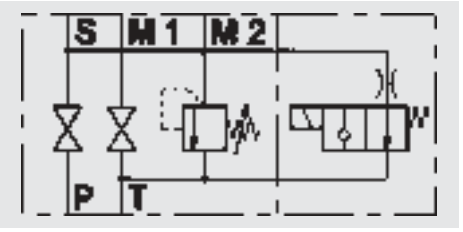
The basic model Safety and Shut-off Block has a manually operated pressure release valve, code "M", and a direct-operated pressure relief valve.



Sizes: SAF 10 M
SAF 20 M
SAF 32 M

1.5.2 **Model with solenoid-operated pressure relief**

The "E" model Safety and Shut-off Block contains a solenoid-operated 2-way directional valve (open when de-energised) (standard) for automatic pressure relief of the accumulator and the hydraulic system.



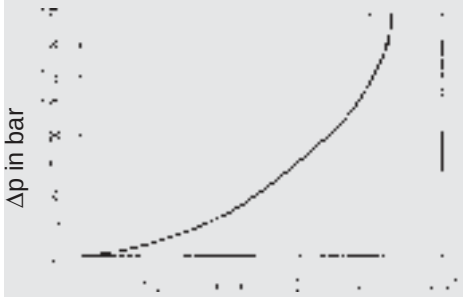
Sizes: SAF 10 E
SAF 20 E
SAF 32 E

1.6. Δp-Q GRAPHS FOR SAF

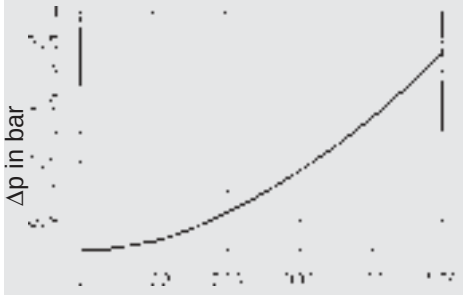
with DB 12 pressure relief valve

1.6.1 Flow from the pump to the accumulator

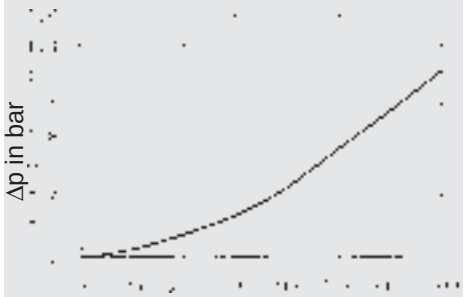
SAF 10 M/E



SAF 20 M/E

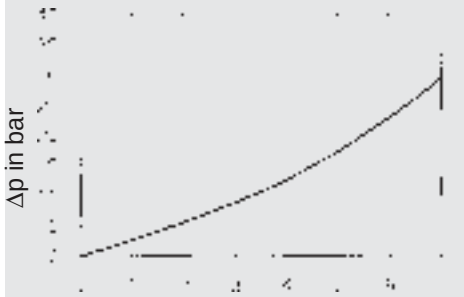


SAF 32 M/E

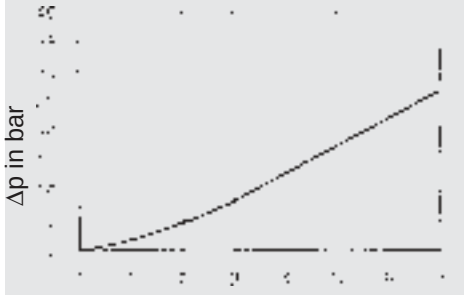


1.6.2 Flow from the accumulator via the solenoid-operated pressure release valve to the tank

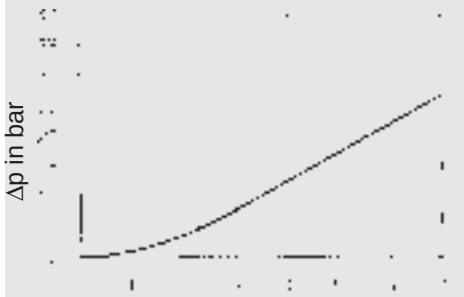
SAF 10 E



SAF 20 E

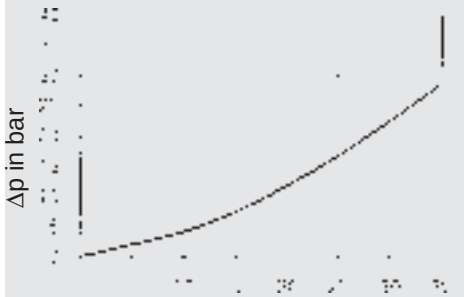


SAF 32 E

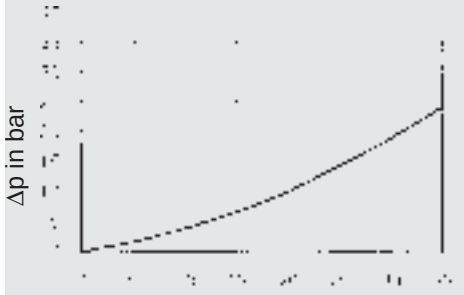


1.6.3 Flow from the accumulator via the pressure release valve to the tank

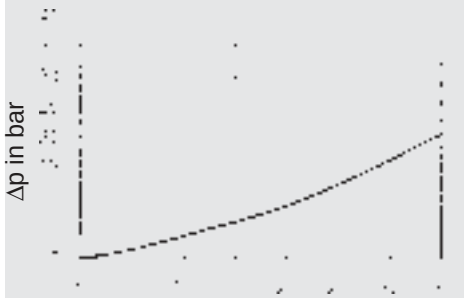
SAF 10 M/E



SAF 20 M/E



SAF 32 M/E



measured at:

ν = 32 mm²/s

t_{Oil} = 40 °C

operating pressure = 400 bar

2. MODEL CODE FOR SAF

(also order example)

SAF 20 E 1 2 Y 1 T 210 A –S 13 –LPI

Safety and shut-off block
Series SAF

Size of main shut-off valve
10 = DN 10
20 = DN 20
32 = DN 32

Discharge
M = Manual discharge
E = Solenoid-operated and manual discharge

Block material
1 = Carbon steel
2 = 1.4021 (stainless steel 304)
3 = 1.4571 (stainless steel 316)
7 = Other

Seal material (elastomer)
2 = NBR (Perbunan)
5 = EPDM
6 = FPM (Viton)
7 = Other

For solenoid-operated discharge with manual override
Y = Open when de-energised (2-way directional valve 2SV5E2Y)
Z = Closed when de-energised (2-way directional valve 2SV5E2Z)

Type of voltage – seat valve
1 = 24 V DC
2 = 110 - 115 V AC
3 = 220 - 230 V AC
6 = 120 V AC
7 = Other

Pressure relief valve
T... = Pressure-set and lead-sealed by TÜV
N... = Adjustable using Allen key 1)

Pressure setting
e.g. 210 bar

Threaded connections to
A = ISO 228 (BSP)
B = DIN 13, to ISO 965/1 (metric)[1)]
C = ANSI B1.1 (UNF, O-ring seal to SAE)[1)]
without M2-gauge connection

Adaptor
to accumulator (see point 6.1.)
e.g. S13 = ISO 228 - G 2A

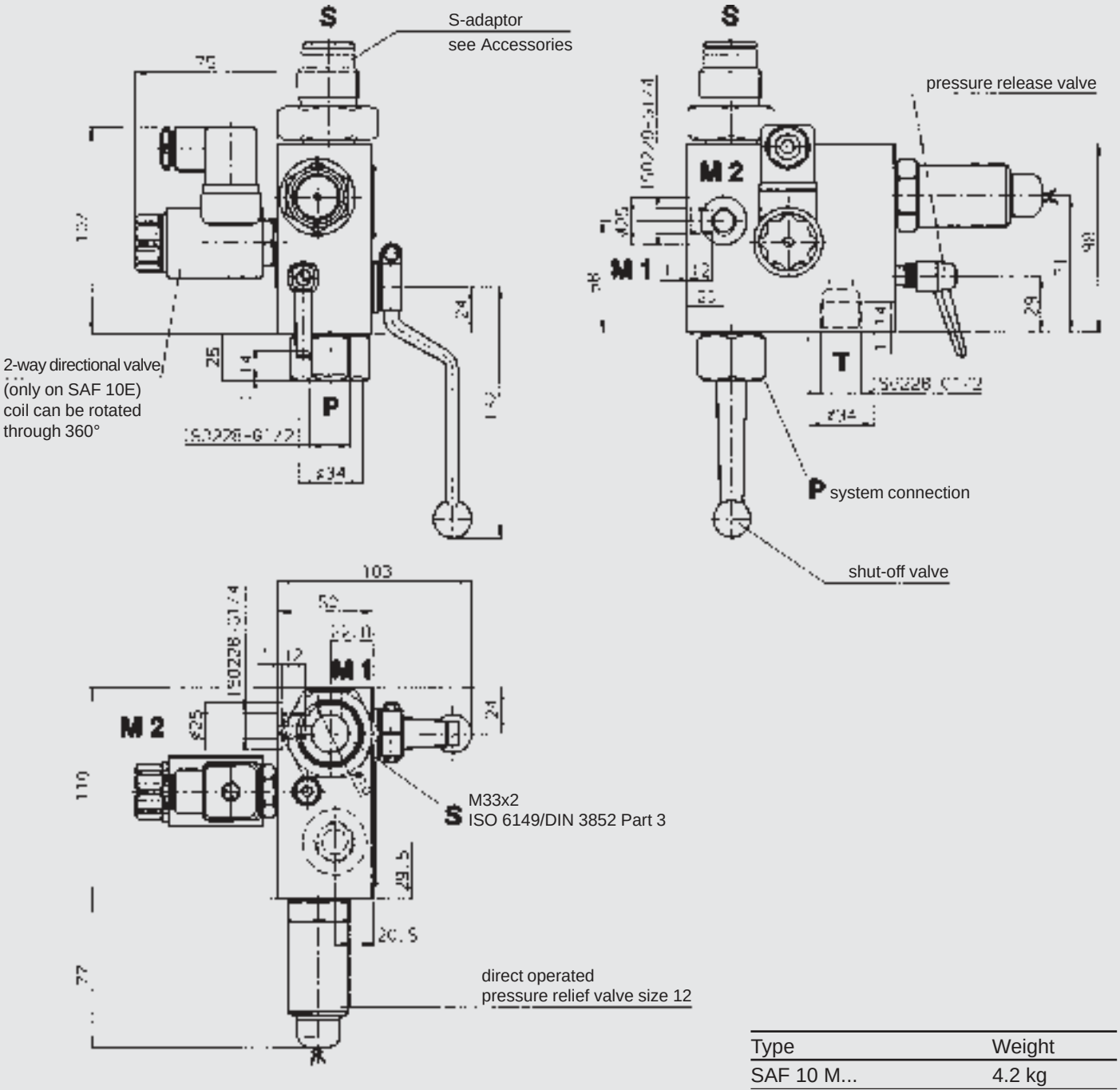
Additional equipment (see Point 7.3)
L = lockable main shut-off valve (for use with padlock)
LPI = model L with additional position monitoring (inductive proximity switch)
LPM = model L with additional position monitoring (mechanical limit switch)

Accessories
(When ordering please give full details) e.g. Shut-off valve for pressure gauges
(see point 6.2.)

[1)] on request

3. DIMENSIONS

3.1. SAF 10 SAFETY AND SHUT-OFF BLOCK SIZE 10

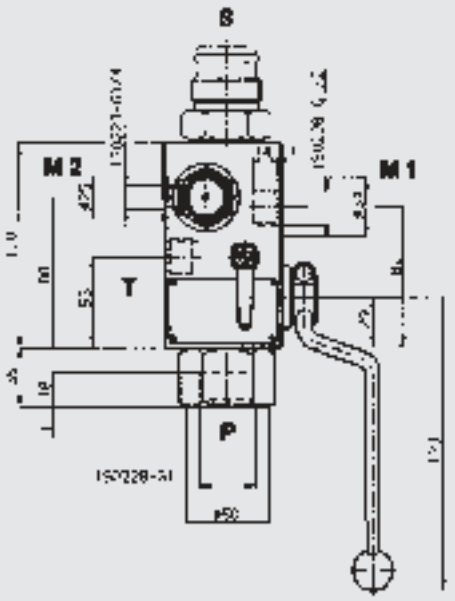


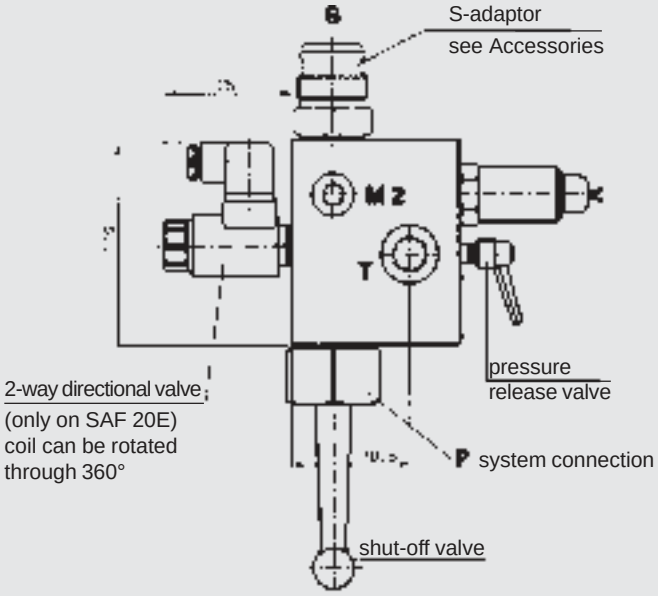
Type	Weight
SAF 10 M...	4.2 kg
SAF 10 E...	4.6 kg

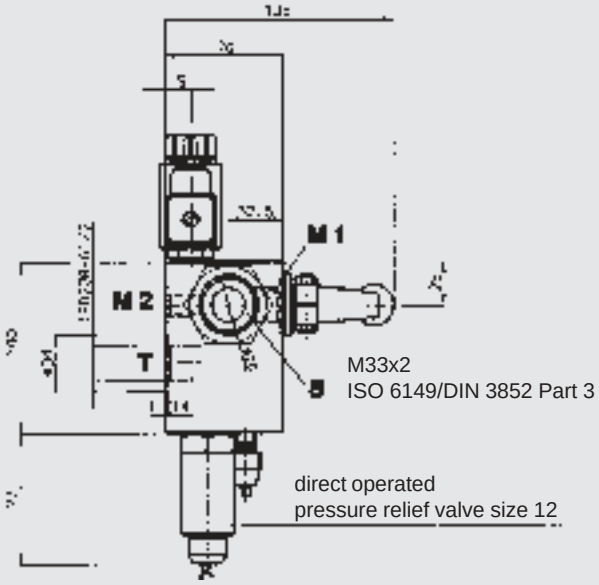
SAF10 standard models

Model	Stock no.	Model	Stock no.
SAF10M12T400A	2121582	SAF10E12Y1T400A	2125858
SAF10M12T350A	2122208	SAF10E12Y1T350A	2122210
SAF10M12T330A	2121236	SAF10E12Y1T330A	2122211
SAF10M12T315A	2121121	SAF10E12Y1T315A	2122212
SAF10M12T300A	2121354	SAF10E12Y1T300A	2122213
SAF10M12T250A	2121353	SAF10E12Y1T250A	2122214
SAF10M12T210A	2121346	SAF10E12Y1T210A	2121662
SAF10M12T200A	2121351	SAF10E12Y1T200A	2122215
SAF10M12T150A	2121345	SAF10E12Y1T150A	2122216
SAF10M12T100A	2121344	SAF10E12Y1T100A	2122041
SAF10M12T070A	2121350	SAF10E12Y1T070A	2122217
SAF10M12T050A	2122207	SAF10E12Y1T050A	2122218
SAF10M12T035A	2121349	SAF10E12Y1T035A	2122219

3.2. SAF 20 SAFETY AND SHUT-OFF BLOCK SIZE 20





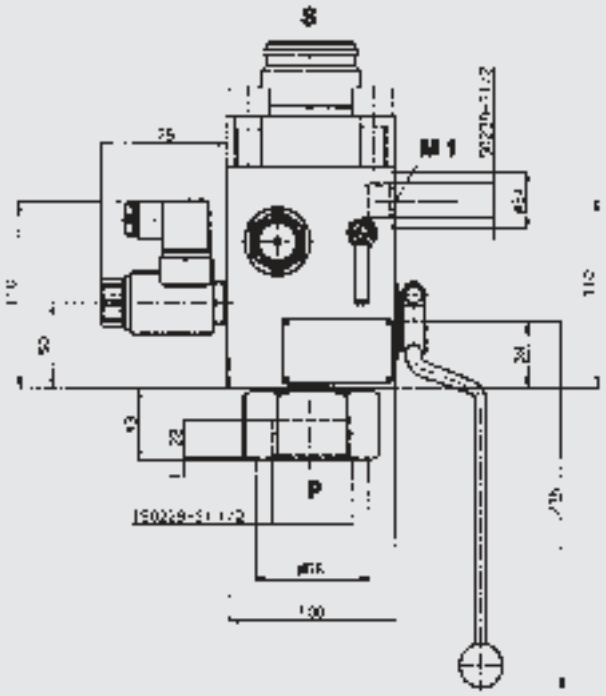


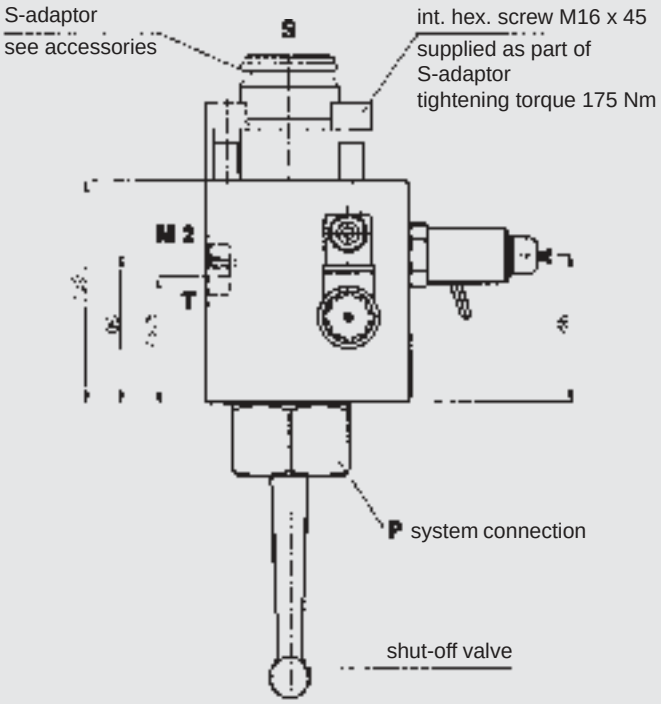
Type	Weight
SAF 20 M...	6.8 kg
SAF 20 E...	7.2 kg

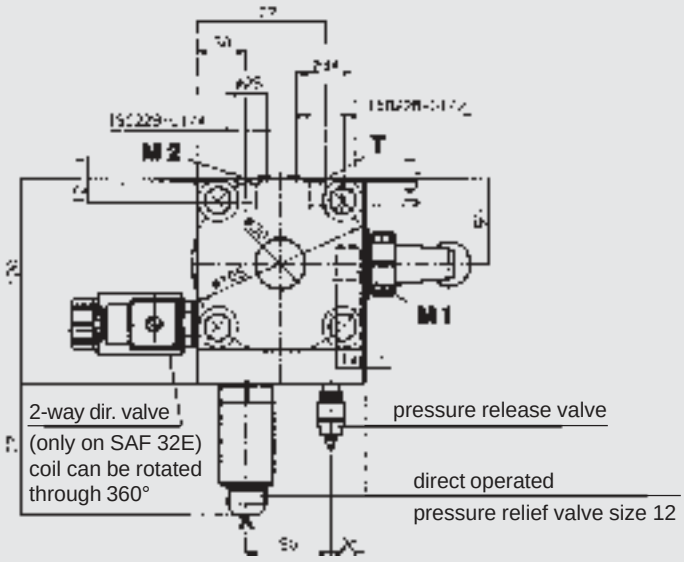
SAF20 standard models

Model	Stock no.	Model	Stock no.
SAF20M12T400A	2120317	SAF20E12Y1T400A	2121022
SAF20M12T350A	2120434	SAF20E12Y1T350A	2121979
SAF20M12T330A	2120323	SAF20E12Y1T330A	2120394
SAF20M12T315A	2120324	SAF20E12Y1T315A	2120833
SAF20M12T300A	2120332	SAF20E12Y1T300A	2120836
SAF20M12T250A	2120432	SAF20E12Y1T250A	2120851
SAF20M12T210A	2120319	SAF20E12Y1T210A	2120320
SAF20M12T200A	2120325	SAF20E12Y1T200A	2120835
SAF20M12T150A	2120330	SAF20E12Y1T150A	2120832
SAF20M12T100A	2120401	SAF20E12Y1T100A	2120369
SAF20M12T070A	2120326	SAF20E12Y1T070A	2120849
SAF20M12T050A	2122172	SAF20E12Y1T050A	2121000
SAF20M12T035A	2120281	SAF20E12Y1T035A	2122220

3.3. SAF 32 SAFETY AND SHUT-OFF BLOCK SIZE 32





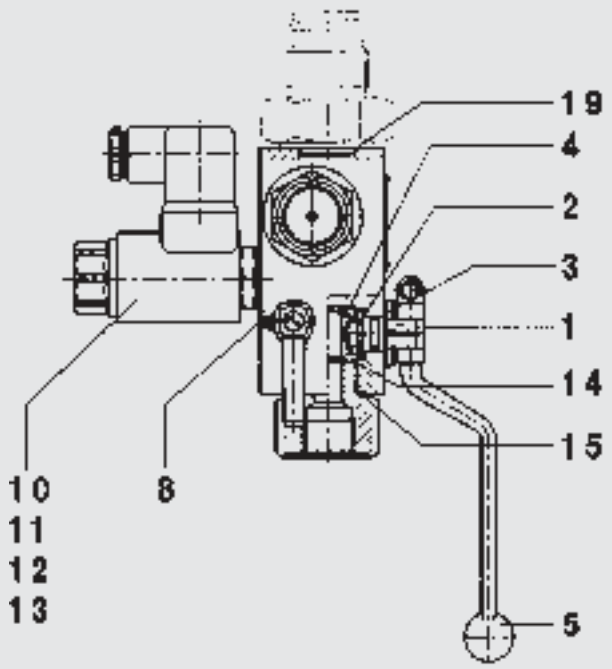


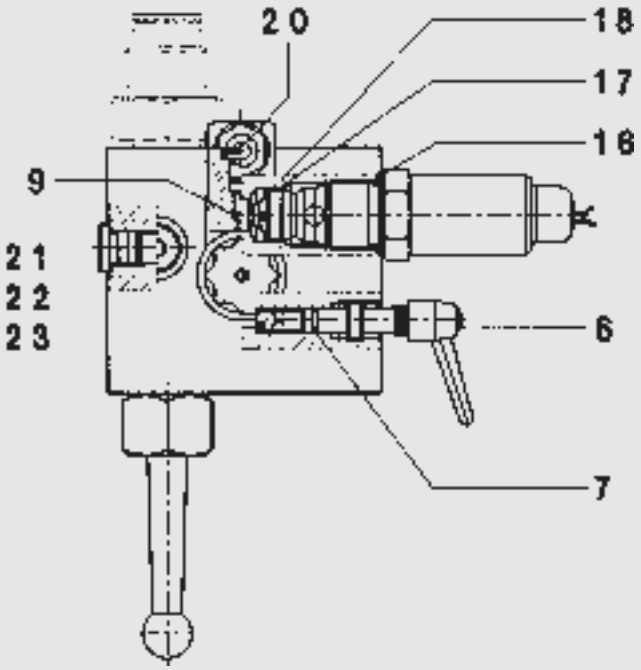
Type	Weight
SAF 32 M...	12.0 kg
SAF 32 E...	12.4 kg

SAF32 standard models

Model	Stock no.	Model	Stock no.
SAF32M12T400A	2125856	SAF32E12Y1T400A	2123123
SAF32M12T350A	2122230	SAF32E12Y1T350A	2122221
SAF32M12T330A	2122231	SAF32E12Y1T330A	2120371
SAF32M12T315A	2121136	SAF32E12Y1T315A	2122222
SAF32M12T300A	2120837	SAF32E12Y1T300A	2120834
SAF32M12T250A	2122233	SAF32E12Y1T250A	2122223
SAF32M12T210A	2120321	SAF32E12Y1T210A	2120318
SAF32M12T200A	2121135	SAF32E12Y1T200A	2122224
SAF32M12T150A	2121134	SAF32E12Y1T150A	2122225
SAF32M12T100A	2121129	SAF32E12Y1T100A	2122226
SAF32M12T070A	2122234	SAF32E12Y1T070A	2122227
SAF32M12T050A	2121137	SAF32E12Y1T050A	2122228
SAF32M12T035A	2121125	SAF32E12Y1T035A	2122229

4. SPARE PARTS FOR SAF





SAF block		SAF 10 M SAF 10 E	SAF 20 M SAF 20 E	SAF 32 M SAF 32 E
Description	Item	Dimensions		
Repair kit consists of:		Stock no. 2122238 (NBR) 2122240 (FPM)	Stock no. 2122242 (NBR) 2122244 (FPM)	Stock no. 2122246 (NBR) 2122248 (FPM)
Spindle	1			
Disc	2			
O-ring	3	10 x 2	15 x 2.5	20 x 3
Ball	4			
Switching handle	5			
Spindle	6			
O-ring	7	6 x 2		
Set screw	8	M 4x6	M 4x10	
Slip-in orifice	9			
O-ring	11	17 x 2		
Support ring	12	11.7 x 15 x 1		
O-ring	13	11 x 2		
Sealing cup	14			
O-ring	15	21 x 2	34 x 2.5	56.7 x 2.8
O-ring	16	23.47 x 2.62		
Support ring	17	18.3 x 21.5 x 1		
O-ring	18	18 x 2		
O-ring	19	29.7 x 2.8	29.7 x 2.8	37.2 x 3
Blanking plug	20 21 22 23	G 1/8 G 1/4 – –	G 1/8 G 1/4 G 3/8 G 1/2	G 1/8 G 1/4 G 3/8 G 1/2
2-way directional valve, complete (for "E" version only)	10	Stock no. 2115443 (2SV5E2Y-open when de-energised) 2117453 (2SV5E2Z-closed when de-energised)		
Blanking plug, complete (converts "E" version to "M" version)		277645		
Seal kit consists of: Items 3, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23		Stock no. 2121699 (NBR) 2121701 (FPM)	Stock no. 2121703 (NBR) 2121705 (FPM)	Stock no. 2121707 (NBR) 2121709 (FPM)
Spindle repair kit consists of items 6, 7, 8		Stock no. 2115648 (NBR) 2115649 (FPM)		

5. DESCRIPTION OF DSV 10

5.1. GENERAL

DSV 10 as a low cost alternative to the SAF 10

The 3-way safety block DSV 10 is used to shut off and discharge hydraulic accumulators or user units. It complies with relevant safety standards in accordance with DIN EN 982 and the German industrial safety regulations, BetrSichV.

The HYDAC pressure relief valve DB 12 is used with the DSV series. This is a direct-operated pressure relief valve in seat valve construction with excellent opening and closing characteristics.

This version of DB 12 complies with the requirements of the Pressure Equipment Directive 97/23/EC with CE marking.

There are four different models:

- DSV 10 M
  Manual discharge
  Standard L-ball
- DSV 10 M - T-ball
  Manual discharge
  T-ball, accumulator drain
- DSV 10 EY
  Manual / solenoid-operated discharge
  Open when de-energised
- DSV 10 EZ
  Manual / solenoid-operated discharge
  Closed when de-energised

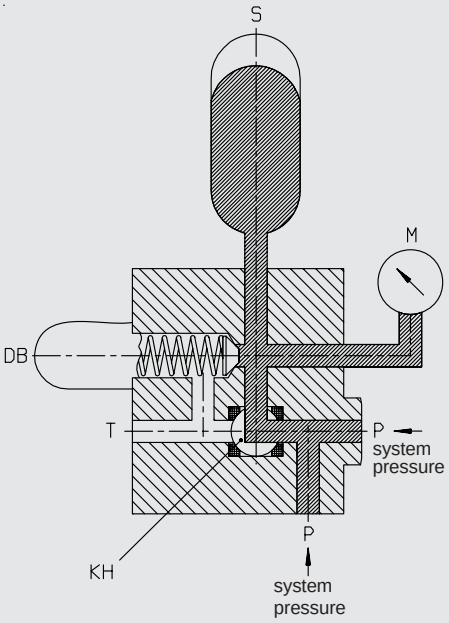
The essential difference compared to the SAF10 lies in the shut-off and discharge function of the DSV10. On request we can supply other models to cover nearly all applications, e.g. for aggressive media.

On request we can supply test certificates to EN 10204 and quality test certificates to DIN 55350, Part 18.

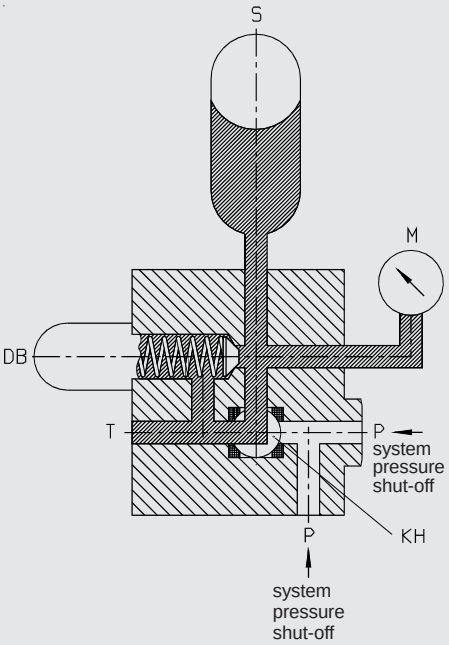
5.2. CONSTRUCTION

The DSV 3-way safety block consists of a valve block with a built-in Hydac pressure relief valve and a shut-off valve. It has ports for the pump, pressure gauge, tank and accumulator. In addition an optional solenoid-operated 2-way directional valve allows automatic discharge of the accumulator or user unit.

Accumulator operation



Shutting off the system pressure and simultaneously discharging the accumulator



P	Pump port
S	Accumulator
KH	Change-over ball valve
DB	Pressure relief valve
M	Pressure gauge connection
T	Tank port

The DSV 10 can be used as a cost-effective alternative to the SAF 10. Unlike the SAF 10, the DSV 10 shuts off when discharging simultaneously to the tank.

5.3. PORTS

The DSV has the following ports:

S - Accumulator port
(M33x2 DIN 3852 Part 3)

P - Inline port
(G 3/8 and G 1/2)

T - Tank port
(G 1/4)

M - Pressure gauge port
(G 1/4)

5.4. FUNCTION

When the accumulator is in operation the change-over ball valve connects the pump port with the accumulator. At the same time the accumulator is monitored for pressure via the built-in pressure relief valve.
By switching over the ball valve, the pump port is shut off leakage-free on the inlet side and the accumulator is discharged simultaneously to the tank.

During switching all three ports (P, S and T) are momentarily interconnected (negative switching overlap). If a solenoid-operated 2-way directional seat valve is fitted, automatic discharge is possible (e.g. in the event of a power failure or shut-down).

5.5. NOTES

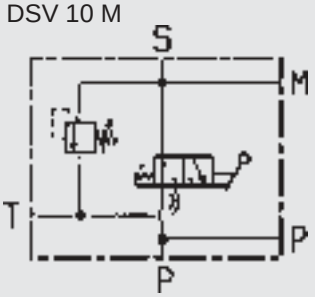
Ball valves are not designed to be used as flow control valves; therefore they should always be either fully open or fully closed, to avoid damaging the sealing cups.

To ensure correct functioning, pressure and temperature specifications must be observed.

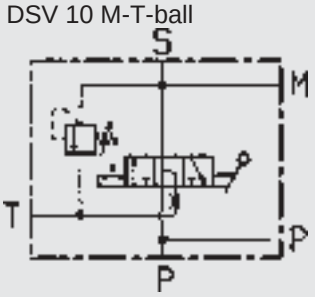
5.6. TECHNICAL SPECIFICATIONS

5.6.1 Symbols

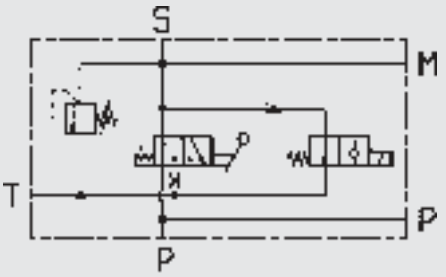
DSV 10 M



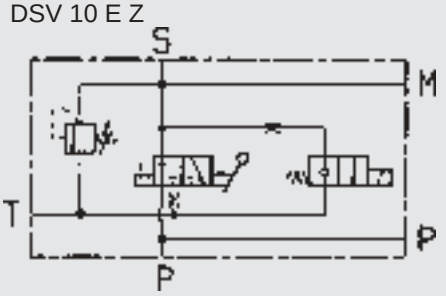
DSV 10 M-T-ball



DSV 10 E Y



DSV 10 E Z



5.6.2 Type of construction

Ball valve isolating device

Pressure relief valve is direct-operated as a cone seat valve

Seat valve is pilot-operated

5.6.3 Materials

Housing and blanking plug in steel, surface protection: phosphate-plated

Ball in steel, hard-chromed

Pressure relief valve and seat valve in high tensile steel, closing element in hardened and polished steel, wear-resistant, surface protection: phosphate-plated

Ball seal in high quality synthetic material (POM)

Soft seals in Perbunan (NBR)

Clamped handle SW 09, cranked, in red anodised aluminium

5.6.4 Mounting position

Optional

5.6.5 Operating fluids

Mineral oil to DIN 51524, Part 1 and Part 2
(Other media on request)

VISCOSITY RANGE:
Min. 10 mm²/s
Max. 380 mm²/s

FILTRATION:
Max. permissible contamination level of the operating fluid to NAS 1638, Class 10.

We therefore recommend a filter with a minimum retention rate of $\beta_{20} \geq 100$.

The fitting of filters and the regular replacement of filter elements guarantees correct operation, reduces wear and tear and increases the service life.

5.6.6 Permissible operating temperature

-10 °C to +80 °C

(Ambient temperature for "E" version is limited to -10 °C to +40 °C)

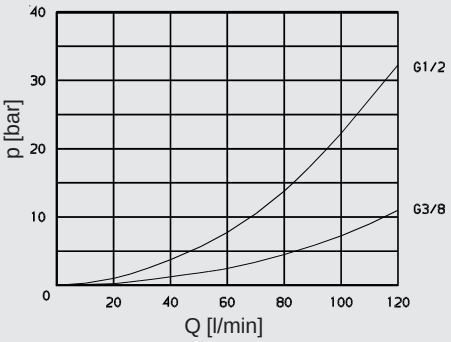
5.6.7 Maximum operating pressure

350 bar

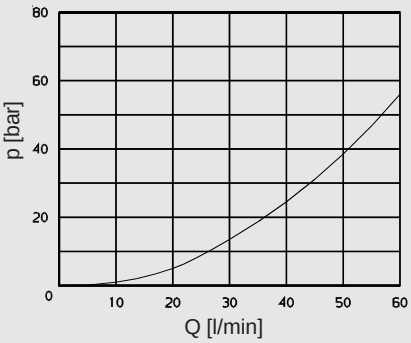
5.6.8 Δp - Q graph

measured at
t_{Oil} = 50 °C
ν = 30 mm²/s

Flow rate from P to S



Flow rate from S to T



5.6.9 Model with solenoid-operated pressure relief

TYPE OF OPERATION
Solenoid-operated by means of pressure-tight, oil-immersed, single-stroke solenoids in accordance with VDE 0580. Actuating solenoid with plug to DIN 43650, standard for general industrial applications, available for 24 V DC and 230 V AC.

TYPE OF VOLTAGE
DC solenoid
When connected to AC voltage the necessary DC voltage is produced by means of a bridge rectifier connector.

VOLTAGE TOLERANCE
-5 % to +10 %

NOMINAL CURRENT
Dependent on the nominal voltage

24 V DC	1.04 A
230 V AC	0.13 A

POWER CONSUMPTION
p_{20} = 26 W
SWITCH-ON TIME
100 % = continuous operation

SWITCHING TIME
Depending on symbol, pressure across the individual ports and flow rate,
switch-on time = approx. 25 ms
switch-off time = approx. 35 ms

5.7. SPARE PARTS

Please see brochure no. E 5.251, HYDAC DSV 3-way safety block.

5.8. MODEL CODE FOR DSV 10

(also order example)

DSV 10 M . – 4 . 1 / 1 / X / T ... – G 24 – Z4 ...

3-way safety block

Nominal bore
10

Discharge
M = manual
E = solenoid-operated and manual discharge

For solenoid-operated discharge with manual override
Y = open when de-energised (2-way directional valve 2SV5E2Y)
Z = closed when de-energised (2-way directional valve 2SV5E2Z)

Construction - pressure relief valve
4 = DB 12

With/without fitted pressure relief valve
1 = with pressure relief valve
0 = without pressure relief valve

Accumulator connection
1 = M 33x2

Series
(determined by manufacturer)

Setting of pressure relief valve
T = pressure-set and lead-sealed by TÜV
V = adjustable using tool
F = preset by manufacturer
x = no details (for model without relief valve cartridge)

Pressure setting
... = pressure setting
... = pressure range
xxx = no details (for model without relief valve cartridge)

Pressure setting range
DB12 – 150 bar
DB12 – 250 bar
DB12 – 350 bar

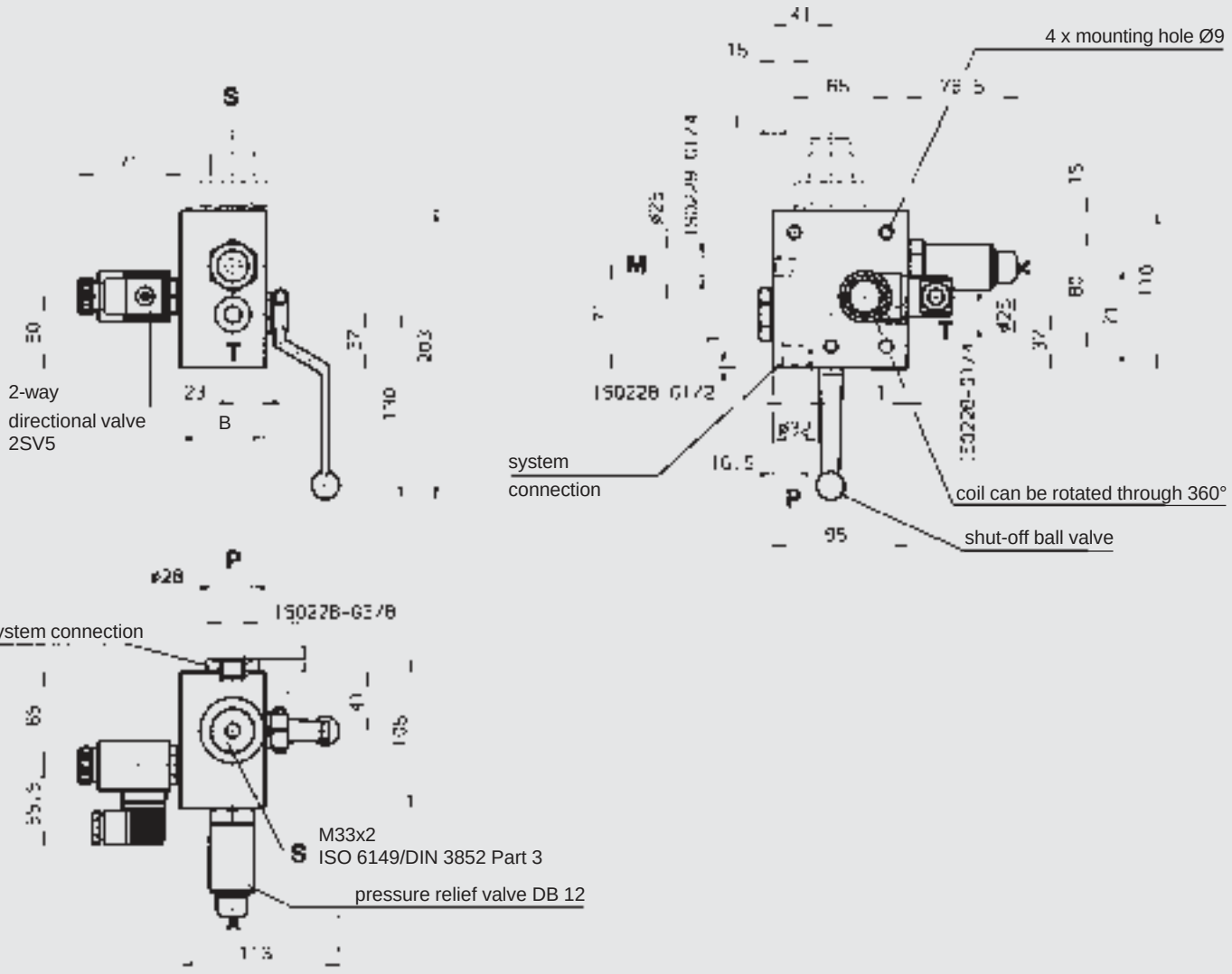
Type of voltage - seat valve
G 24 = 24 V DC
W115 = 110 - 115 V AC
W230 = 220 - 230 V 50/60 Hz AC

Type of connection for actuating solenoid
Z4 = connector to DIN 43650 - AF2 - PG11
ZW4 = DC - AC rectified connector

Supplementary details
T-ball = ball bore (180° switch)
Viton (FKM) = O-ring seal
Adaptor to accumulator - see point 6.1.

5.9. DIMENSIONS

DSV 10 3-way safety block



Type	B[mm]	Weight
DSV 10 M...	45	3.5 kg
DSV 10 E...	60	3.9 kg

DSV10 standard models

Model	Stock no.	Model	Stock no.
DSV-10-M-4.0/1/X/XXXX	555999	DSV-10-EY-4.0/1/X/XXXX-G24-Z4	557367
DSV-10-M-4.1/1/X/T035	555968	DSV-10-EY-4.1/1/X/T035-G24-Z4	555980
DSV-10-M-4.1/1/X/T050	555969	DSV-10-EY-4.1/1/X/T050-G24-Z4	555981
DSV-10-M-4.1/1/X/T070	555970	DSV-10-EY-4.1/1/X/T070-G24-Z4	555982
DSV-10-M-4.1/1/X/T100	555971	DSV-10-EY-4.1/1/X/T100-G24-Z4	555983
DSV-10-M-4.1/1/X/T150	555972	DSV-10-EY-4.1/1/X/T150-G24-Z4	555984
DSV-10-M-4.1/1/X/T200	555973	DSV-10-EY-4.1/1/X/T200-G24-Z4	555985
DSV-10-M-4.1/1/X/T210	555974	DSV-10-EY-4.1/1/X/T210-G24-Z4	555986
DSV-10-M-4.1/1/X/T250	555975	DSV-10-EY-4.1/1/X/T250-G24-Z4	555987
DSV-10-M-4.1/1/X/T300	555976	DSV-10-EY-4.1/1/X/T300-G24-Z4	555988
DSV-10-M-4.1/1/X/T315	555977	DSV-10-EY-4.1/1/X/T315-G24-Z4	555989
DSV-10-M-4.1/1/X/T330	555978	DSV-10-EY-4.1/1/X/T330-G24-Z4	555990
DSV-10-M-4.1/1/X/T350	555979	DSV-10-EY-4.1/1/X/T350-G24-Z4	555991

6. ACCESSORIES

6.1. ADAPTORS FOR SAF/DSV10
to connect the safety and shut-off block with the accumulator

6.1.1 **Adaptor for standard bladder accumulator**

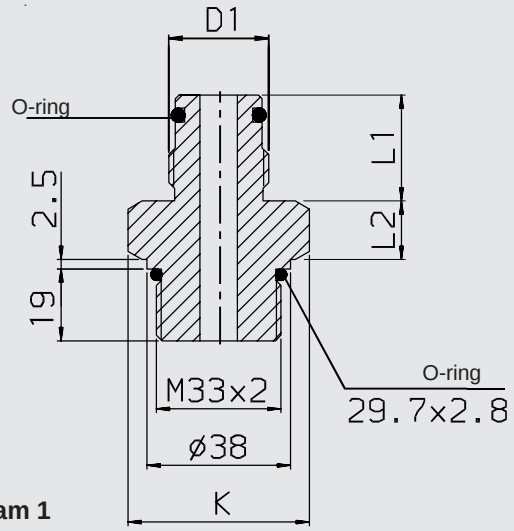


Diagram 1

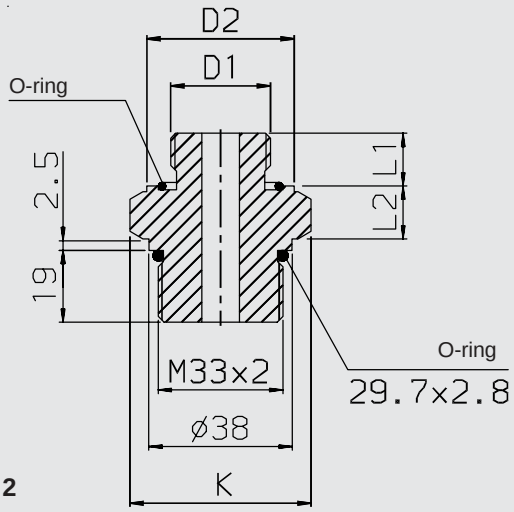


Diagram 2

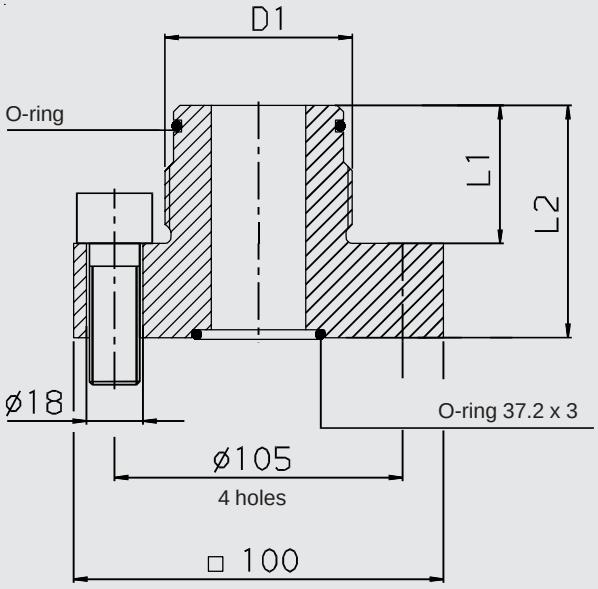


Diagram 3

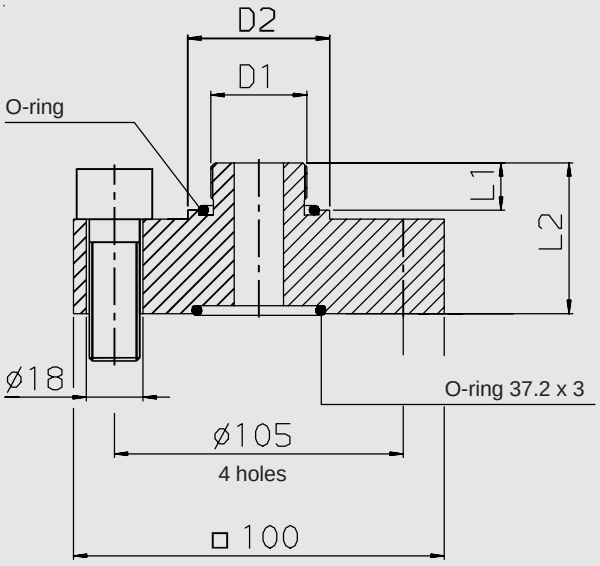
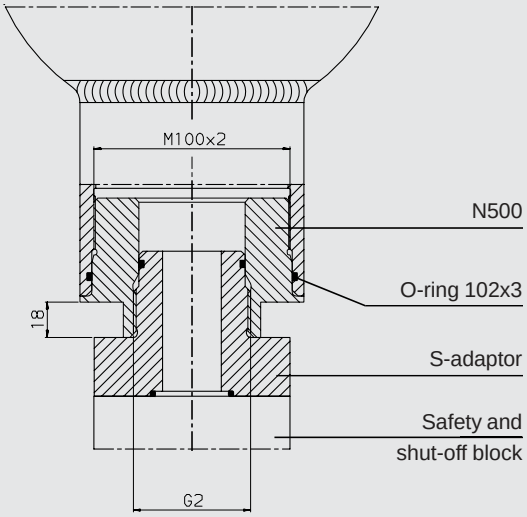


Diagram 4

Model	Accumulator type	D1 Thread	Adaptor	Stock no.[2] NBR/C-steel	Diag. no.	K SW	L1 (mm)	L2 (mm)	D2 (mm)	O-ring
SAF 10/20 DSV 10	SB 330/400 - 0.5 to 1 l	G 3/4 A	S 10	369479	1	41	28	15.5		17x3
	SB 550/600 - 1 to 5 l	G 1 A	S 11	372750		46	34	16.5		22x3
	SB 330/400 -2.5 to 5 l	G 1 1/4 A	S 12	369480			37			30x3
	SB 330/400 - 10 to 50 l	G 2 A	S 13	369481		65	44	20.5		48x3
	SB 440/500/600 - 10 to 50 l									
	Connection with metric fine thread	M 30x1.5	S 20	369482	2	41	15	17.5	40	32x2
		M 40x1.5	S 21	369483		55	20	20.5	54	43x3
		M 50x1.5	S 22	369484		65			64	53x3
SAF 32	SB 330/400 - 0.5 to 1 l	G 3/4 A	S 305 [1]	366723	3		28	58		17x3
	SB 550/600 - 1 to 5 l	G 1 A	S 306 [1]	2102855			34	64		22x3
	SB 330/400 - 2.5 to 5 l	G 1 1/4 A	S 307 [1]	366724			37	67		30x3
	SB 330/400/600 - 10 to 50 l	G 2 A	S 309 [1]	366715			44	74		48x3
	SB 440/500 - 10 to 50 l		S 308 [1]	376813				115		
	Connection with metric fine thread	M 30x1.5	S 330 [1]	366735	4		15	47	45	32x2
		M 40x1.5	S 340 [1]	366736			20	51	60	43x3
		M 50x1.5	S 350 [1]	366737					75	53x3

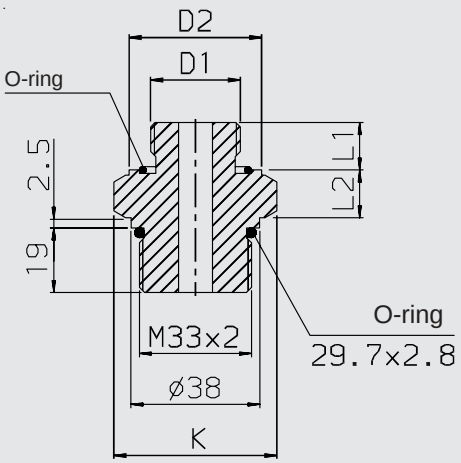
[1] Adaptor supplied with 4 off int. hex. screws M 16x45 (stock no. 615924). Tightening torque 175 Nm.
[2] Others on request

6.1.2 **Adaptor for low pressure bladder accumulator**



Model	Accumulator type	Adaptor	Stock no.[1] NBR/C-steel	Corresponding S - adaptor	Stock no.[1] NBR/C-steel
SAF 10/20 and DSV 10	SB40	N500	367229	S 13	369481
SAF 32	2.5 to 50 l	N500	367229	S 309	366715

6.1.3 **Adaptor for diaphragm accumulator**



Model	Accumulator type	D1 Thread	Stock no.[1] NBR/C-steel	Adaptor	K SW	L1 (mm)	L2 (mm)	D2 (mm)	O-ring
SAF10/20	SBO...E-0.075 to 1.4 l	G 1/2 A	369485	S 30	41	14	17.5	33	22x3
	SBO...A6-0.1 to 210-1.3 l								
DSV10	SBO...E-2.0 to 3.5 l	G 3/4 A	369486	S 31		16		40	28x3
	SBO...A6-400-1.3 to 4 l								

[1] Others on request

6.1.4 **Adaptor for piston accumulator**

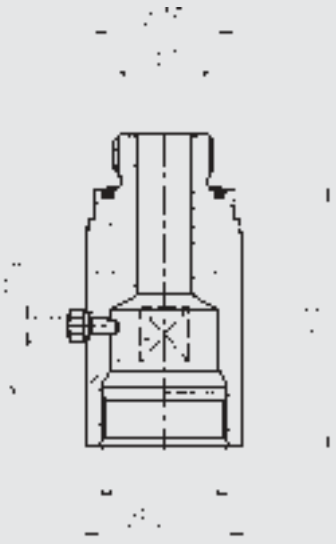


Diagram 5

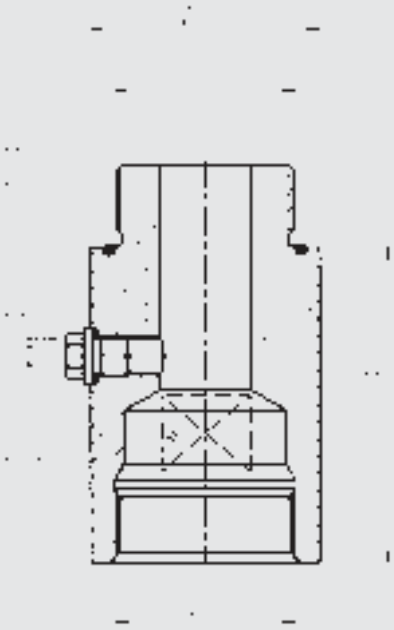
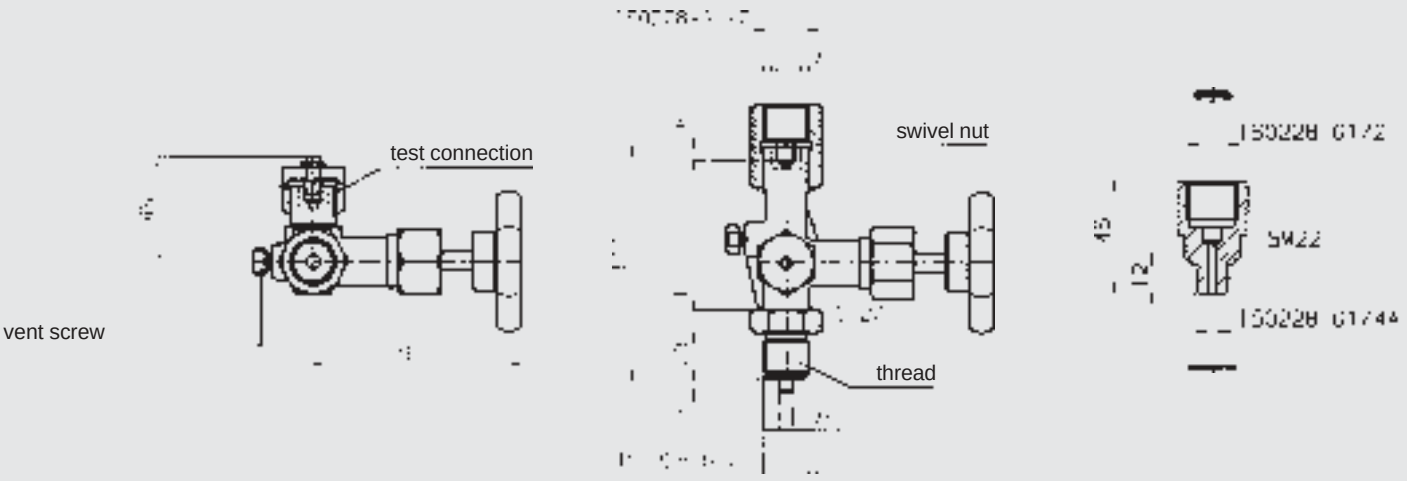


Diagram 6

Model	Accumulator type	Adaptor	Stock no.[1] NBR/C-steel	Diag. no.	D1 (mm)	D2 (mm)	O-ring	Corresponding S-adaptor	Stock no.[1] NBR/C-steel
SAF 10/20 DSV 10	SK210/350 - 2.5 to 7.5	K 406	374929	5	G 1 1/4	G 1	35x3	S 12	369480
	SK210/350 - 10 to 45	K 408	374931	6	G 2	G 1 1/2	53x3	S 13	369481
SAF 32	SK210/350 - 50 to 120	K 409	374933			G 2	62x3	S 309	366715

[1] Others on request

6.2 SHUT-OFF VALVE FOR PRESSURE GAUGES

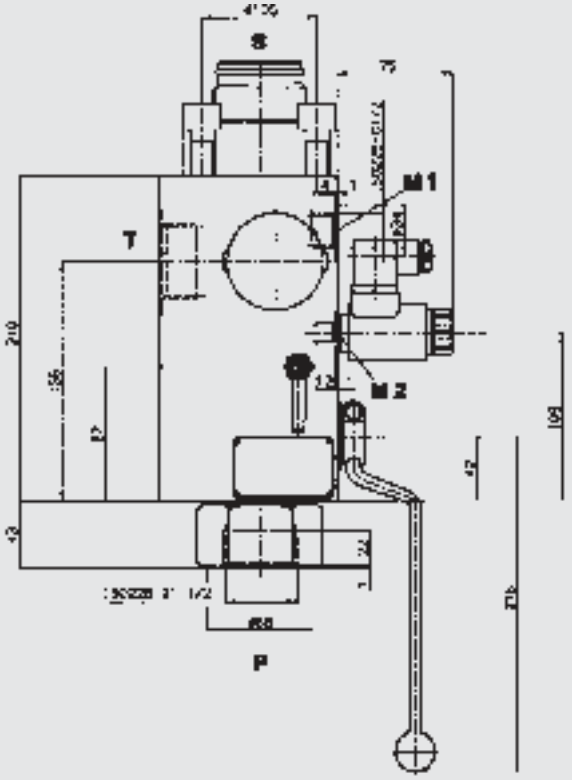


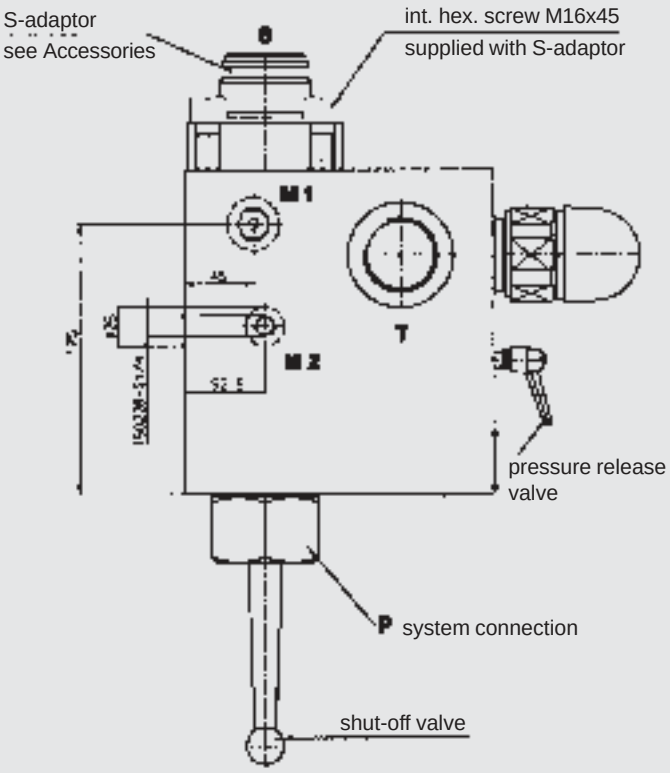
Consisting of shut-off valve AG (stock no. 611 903) with vent screw, swivel nut, thread and test connection to DIN 16271 as well as adaptor PA with seals (stock no. 370754).

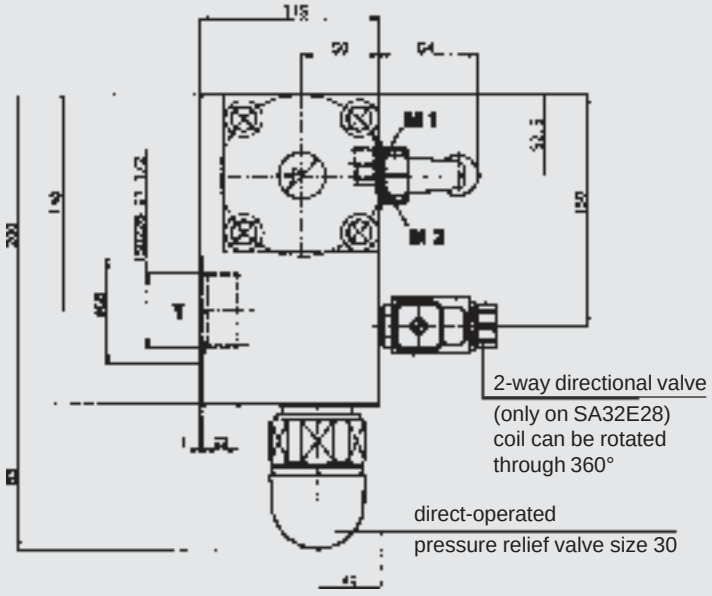
7. SPECIAL MODELS

7.1. TYPE SA 32 M (E) 28

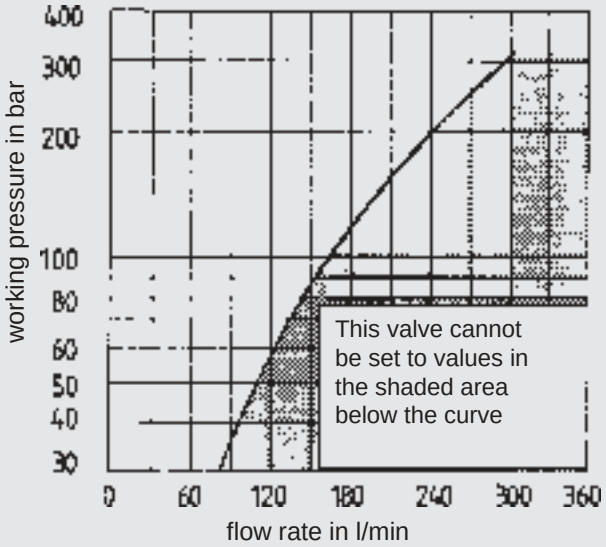
with direct operated pressure relief valve size 30
(max. working pressure 315 bar)







Direct-operated
pressure relief valve size 30



Two different models of the 2-way directional valve are available:

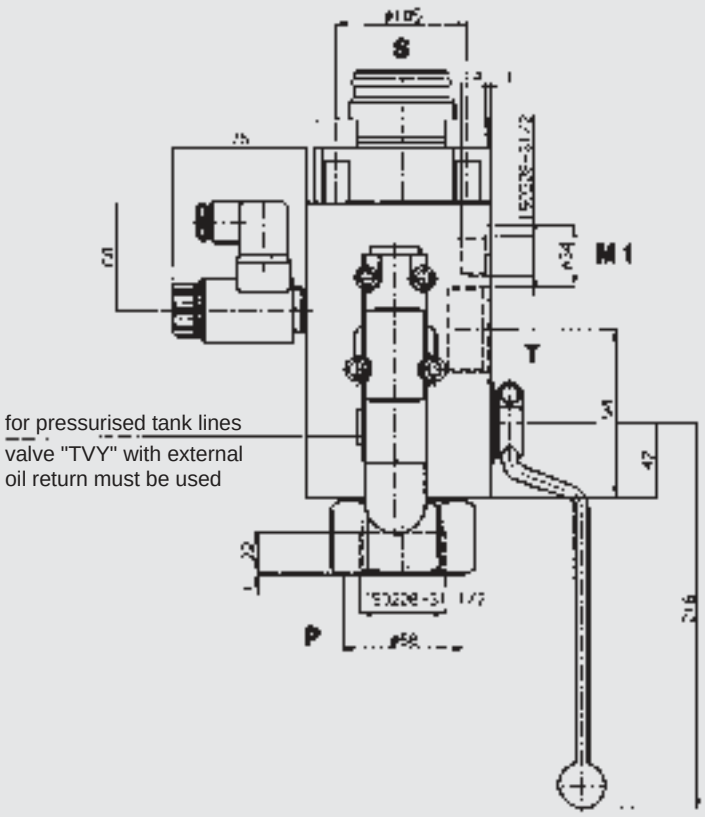
2SV5E2Y
(open when de-energised)

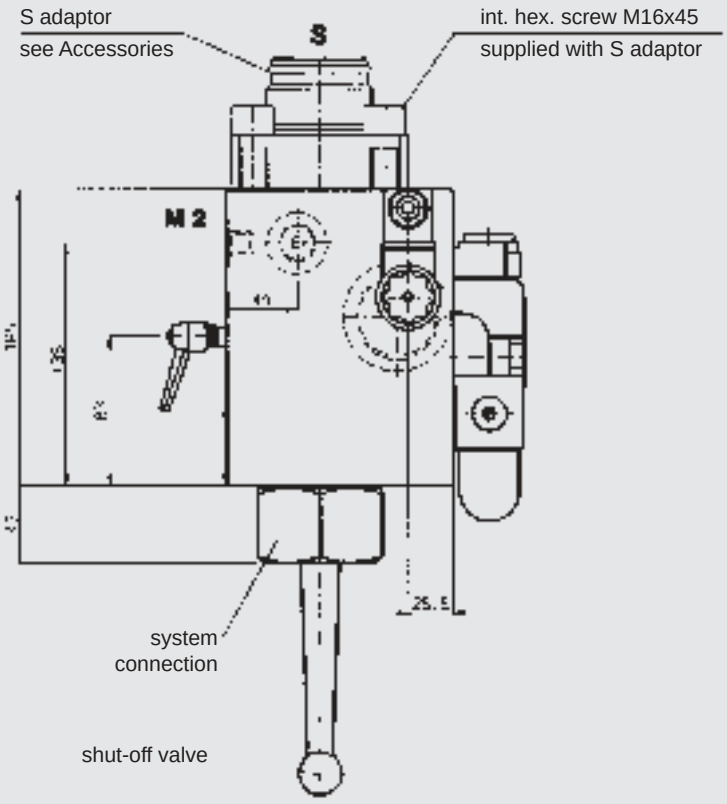
2SV5E2Z
(closed when de-energised)

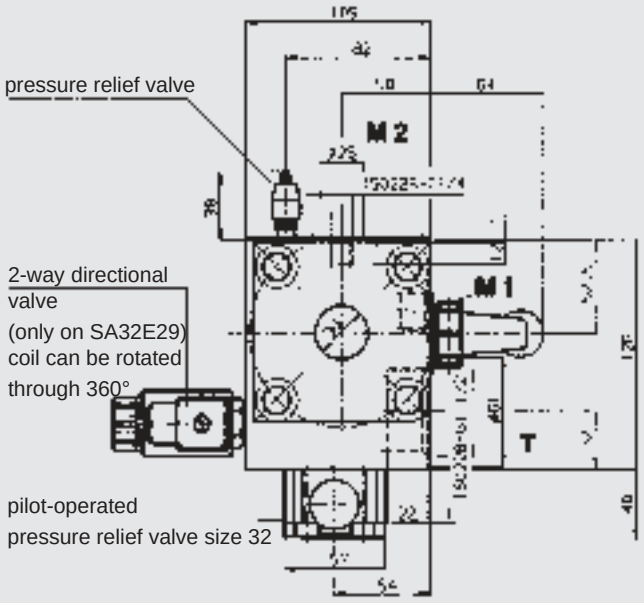
Type	Weight
SA 32 M 28...	38 kg
SA 32 E 28...	39 kg

7.2 TYPE SA 32 M (E) 29

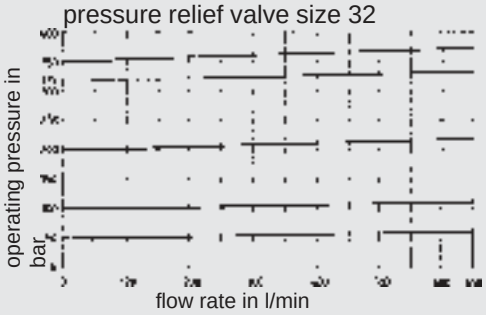
with pilot-operated pressure relief valve
(max. operating pressure 330 bar)



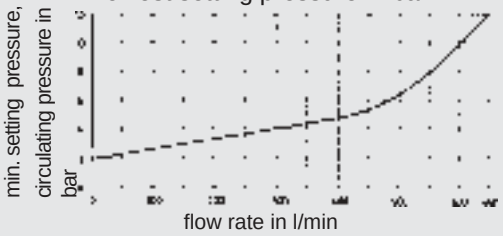




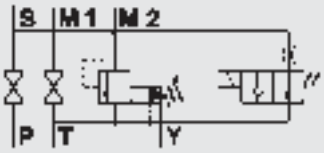
Pilot-operated
pressure relief valve size 32



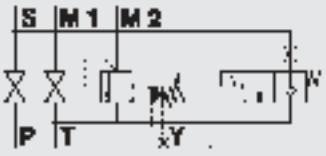
Lowest setting pressure in bar



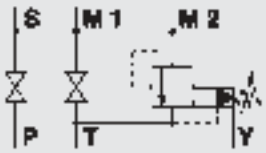
S A 3 2 E 2 9 T V Y



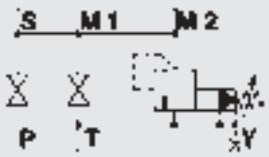
S A 3 2 E 2 9 T V



S A 3 2 M 2 9 T V Y



S A 3 2 M 2 9 T V



The safety and shut-off block SA32M(E)29 is equipped with a pilot-operated pressure relief valve (size 32) for high flow rates (up to 600 l/min).

The E version of the safety and shut-off block has a solenoid-operated 2-way directional valve for automatic pressure release of the accumulator and the hydraulic system in an emergency or during shut-down.

For unpressurised tank lines, valve type "TV" can be used (with internal oil return to tank).

For pressurised tank lines, valve type "TVY" is recommended
(with external oil return to tank).

Two different models of the 2-way directional valve are available:

- 2SV5E2Y (open when de-energised)
- 2SV5E2Z (closed when de-energised)

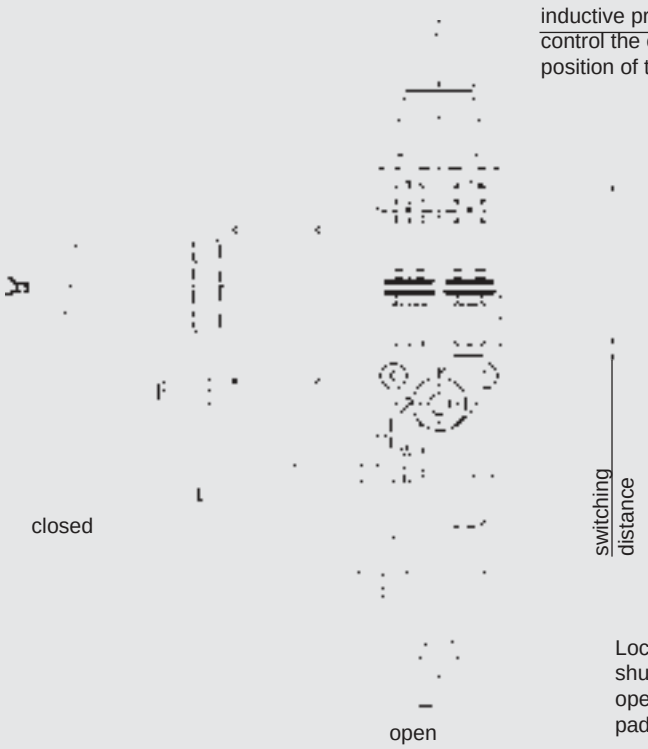
Type	Weight
SA 32 M 29...	22.5 kg
SA 32 E 29...	23.5 kg

7.3. SAFETY AND SHUT-OFF BLOCK WITH ADDITIONAL EQUIPMENT

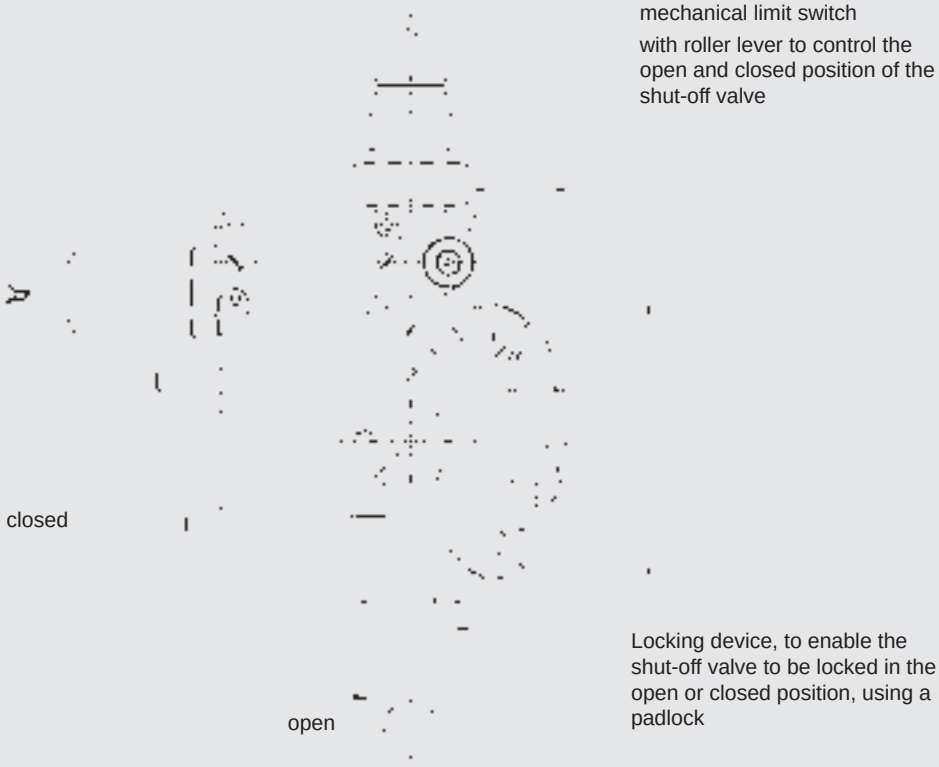
Safety and shut-off blocks are available with a device to enable the shut-off valve to be locked in either the open or closed position, by fitting a padlock.

It is also possible to fit inductive proximity switches or roller-actuated limit switches to control the open and closed position of the shut-off valve.

7.3.1 **Additional device LPI**



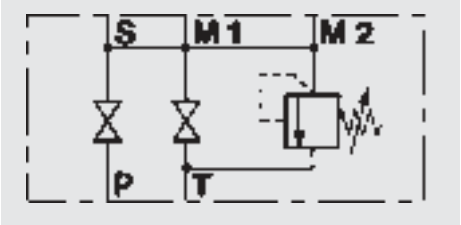
7.3.2 **Additional device LPM**



7.4. SAFETY AND SHUT-OFF BLOCK FOR HIGH FLOW RATE

The basic design of the shut-off block is the same as the standard model.

Technical specifications:
Type: SA50M60T...
Size: DN 50
Max. working pressure: 315 bar
Direct-operated
pressure relief valve size 30



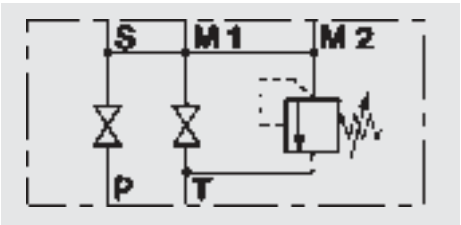
7.5. SAFETY AND SHUT-OFF BLOCK FOR FRONT PANEL MOUNTING

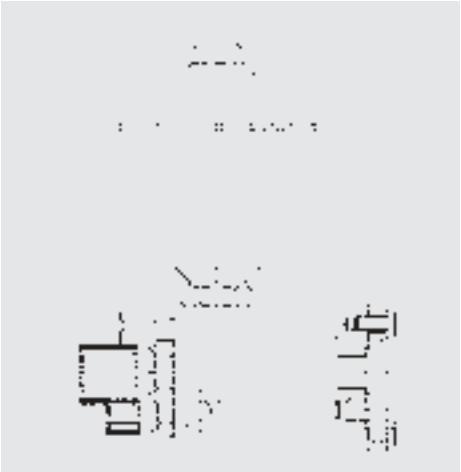
The safety and shut-off block consists of a valve block, a built-in pressure relief valve, a main shut-off valve and a manually operated pressure release valve.

This block is mounted on a front panel with 3 M8 screws.
Ports "P" and "T" are situated on the mounting side.

Advantages:
The compact design means that the block occupies a minimum of space and ensures minimum maintenance.

Technical specifications:
Type: SA 6M10T...
Size: DN 10
Max. working pressure: 350 bar
Direct-operated
pressure relief valve size 6





7.6. SAFETY AND SHUT-OFF BLOCK WITH 2-WAY CARTRIDGE VALVE (LOGIC ELEMENT OR LOGISTOR)

This safety and shut-off block consists of a valve block, a built-in pressure relief valve and a solenoid-operated 2-way cartridge valve which replaces the main shut-off valve.

Advantages:
In addition to its compact construction, this model is capable of rapid switching to control the oil flow.

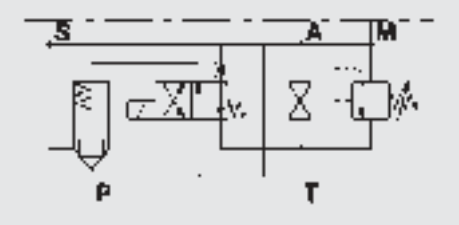
7.6.1 Function when using 4/2 directional valve

When the 4/2 directional valve is in the switching position shown (open when de-energised), the spring chamber of the logic element is pressurised via the accumulator pressure; the path from P to S is blocked and the hydraulic accumulator is automatically shut-off from the system. By connecting the accumulator via the slip-in orifice in the pilot valve to the tank, it will slowly discharge.

When the 4/2 directional valve is in the crossed-over switching position (energised), the spring chamber of the logic element is discharged, the path from P to S is opened and the accumulator is charged.

Technical specifications:

Type	Size	max. operating pressure	Pressure relief valve
SA20A50T...	DN 20	400 bar	size 20
SA32A50T...	DN 30	315 bar	size 30
SA40A50T...	DN 40	315 bar	size 30



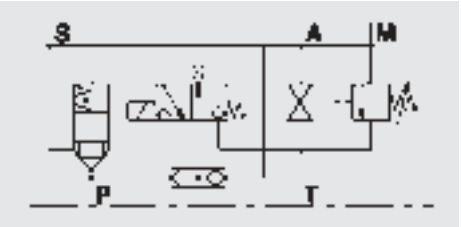
7.6.2 Function when using 3/2 directional seat valve

When the 3/2 directional seat valve is in the switching position shown (open when de-energised), the spring chamber of the logic element is pressurised via the system pressure; the path from P to S is blocked and the accumulator is shut-off from the system. When the 3/2 directional seat valve is in the discharge position (energised) the spring chamber of the logic element is discharged, the path from P to S is open and the accumulator is charged.

If the pump breaks down or if it is switched off, the 3/2 directional seat valve reverts to the "open when de-energised" position; the accumulator pressure shuts off the logic element via the shuttle change-over valve and shuts off the accumulator from the system.

Technical specifications:

Type	Size	max operating pressure	Pressure relief valve
SA20A51T...	DN 20	400 bar	size 20
SA32A51T...	DN 30	315 bar	size 30
SA40A51T...	DN 40	315 bar	size 30



8. NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

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