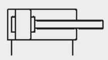
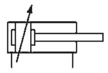
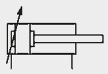
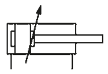
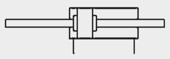
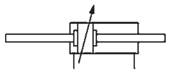
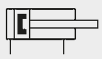
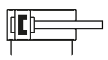
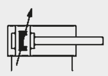
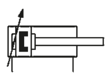
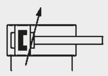
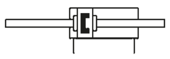
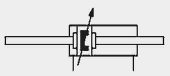
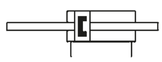
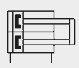
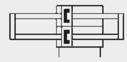
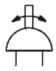
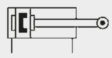
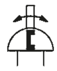
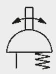
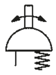
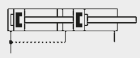
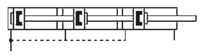
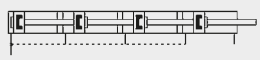
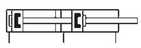
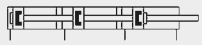
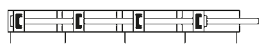
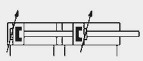
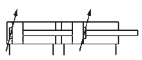
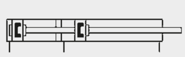
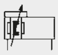
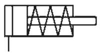
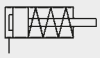
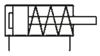
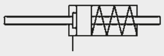
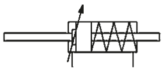
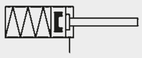
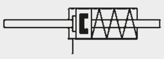
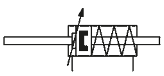
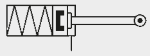
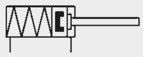
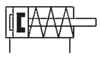
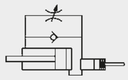
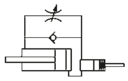
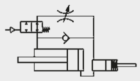
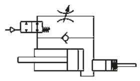
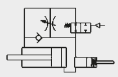
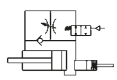
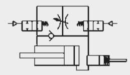
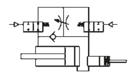
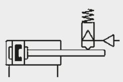
Pneumatic symbols

Symbol	Type
CD01 	Double-acting cylinder, cushioned
CD02 	Double-acting cylinder, with adjustable front and rear cushioning
CD03 	Double-acting cylinder, adjustable rear cushion
CD04 	Double-acting cylinder, adjustable front cushion
CD05 	Double-acting cylinder, through rod, cushioned
CD06 	Double-acting cylinder, through-rod, with adjustable front and rear cushioning
CD07 	Double-acting cylinder, magnetic
CD08 	Double-acting cylinder, magnetic, cushioned
CD09 	Double-acting cylinder, magnetic, with adjustable front and rear cushioning
CD10 	Double-acting cylinder, magnetic, adjustable rear cushion
CD11 	Double-acting cylinder, magnetic, adjustable front cushion
CD12 	Double-acting cylinder, through rod, magnetic, cushioned
CD13 	Double-acting cylinder, through rod, magnetic, with adjustable front and rear cushioning
CD14 	Double-acting cylinder, magnetic, through-rod
CD15 	Magnetic twin rod cylinders

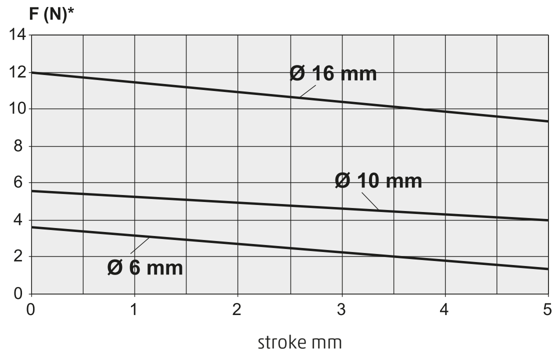
Symbol	Type
CD16 	Magnetic twin through-rod cylinders
CD17 	Double-acting rotary cylinder
CD18 	Double-acting rotary cylinder, magnetic
CD19 	Single-acting rotary cylinder
CD20 	Double-acting cylinder, magnetic, cushioned, roller rod
CD21 	Single-acting rotary cylinder
CD2T 	Magnetic tandem cylinder, two stages, cushioned, single rear supply, sole front supply
CD3T 	Magnetic tandem cylinder, three stages, cushioned, single rear supply, sole front supply
CD4T 	Magnetic tandem cylinder, four stages, cushioned, single rear supply, sole front supply
CD5T 	Magnetic tandem cylinder, two stages, cushioned, separated rear supplies, sole front supply
CD6T 	Magnetic tandem cylinder, three stages, cushioned, single rear supplies, sole front supply
CD7T 	Magnetic tandem cylinder, two stages, cushioned, single rear supplies, sole front supply
CD8T 	Magnetic tandem cylinder, two stages, with adjustable front cushioning, separated rear and front supplies
CD9T 	Non magnetic tandem cylinder, two stages, with adjustable front cushioning, separated rear and front supplies
CDPP 	Multi-position, magnetic cylinder, cushioned

Symbol	Type
CDSS 	Double-acting, rodless cylinder, magnetic
CS01 	Single-acting cylinder, front spring
CS02 	Single-acting cylinder, front spring, cushioned
CS03 	Double-acting cylinder, front spring, cushioned
CS04 	Single-acting cylinder, front spring, through rod, cushioned
CS05 	Double-acting cylinder, front spring, through rod, with adjustable rear cushioning
CS06 	Single-acting cylinder, front spring, magnetic, cushioned
CS07 	Double-acting cylinder, front spring, magnetic, with adjustable rear cushioning
CS08 	Single-acting cylinder, rear spring, magnetic, cushioned
CS09 	Single-acting cylinder, magnetic, front spring
CS10 	Single-acting cylinder, through rod, magnetic, cushioned
CS11 	Double-acting cylinder, front spring, magnetic, through rod, with adjustable rear cushioning
CS12 	Single-acting cylinder, front spring, magnetic, with adjustable rear cushioning
CS13 	Single-acting cylinder, front spring, magnetic, through rod, with adjustable rear cushioning
CS14 	Double-acting cylinder, rear spring, magnetic, with adjustable front cushioning

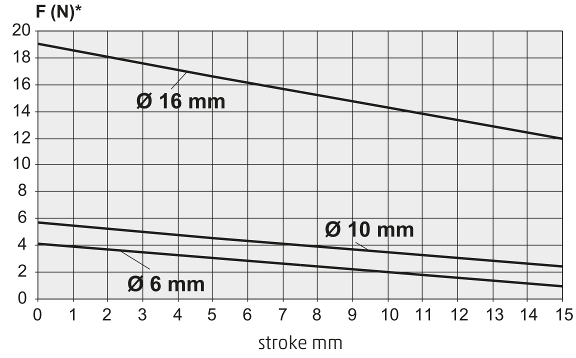
Symbol	Type
CS15 	Single-acting cylinder, rear spring, magnetic, roller rod, cushioned
CS16 	Double-acting cylinder, rear spring, magnetic, roller rod, cushioned
CS17 	Double-acting cylinder, magnetic, rear spring, cushioned
CS18 	Double-acting cylinder, magnetic, front spring, cushioned
HI01 	Hydrocheck, regulated rod thrust
HI02 	Hydrocheck, regulated rod return
HI03 	Hydrocheck, regulated rod thrust with stop valve
HI04 	Hydrocheck, regulated rod return with stop valve
HI05 	Hydrocheck, regulated rod thrust with skip valve
HI06 	Hydrocheck, regulated rod return with skip valve
HI07 	Hydrocheck, regulated rod thrust with skip and stop valve
HI08 	Hydrocheck, regulated rod return with skip and stop valve
RDLK 	Rod lock device

Spring loads cylinders

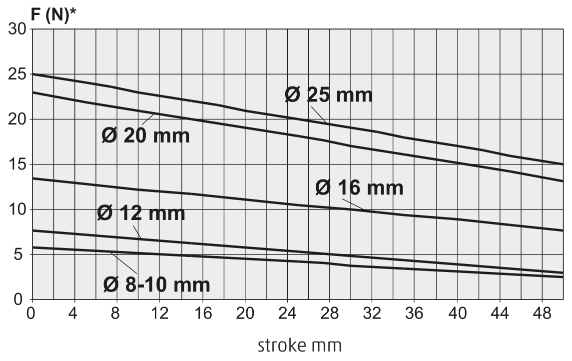
Series 14 - stroke 5 mm



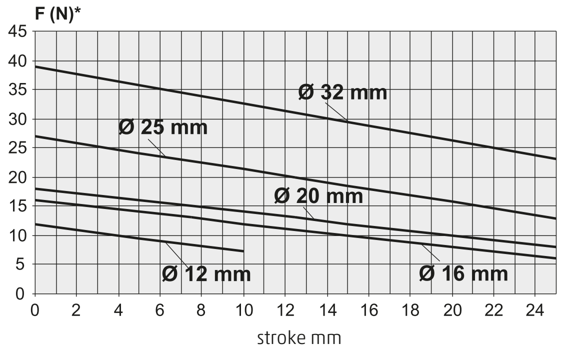
Series 14 - stroke 10 and 15 mm



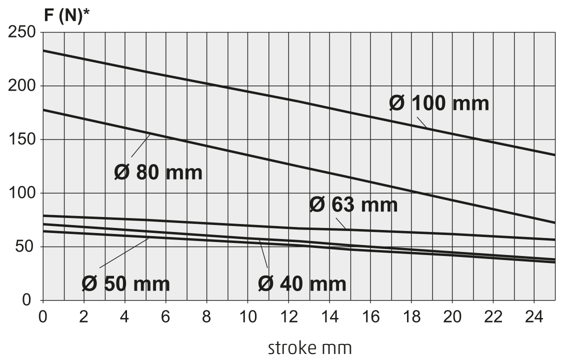
Series 16-24



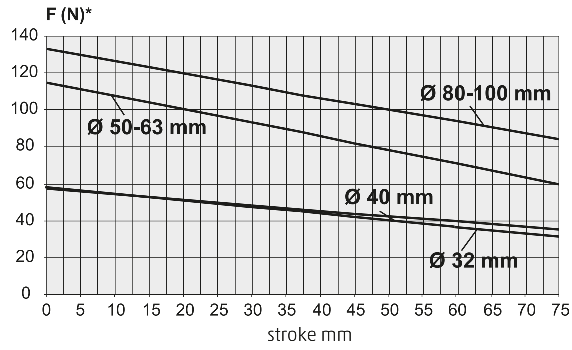
Series 31-32



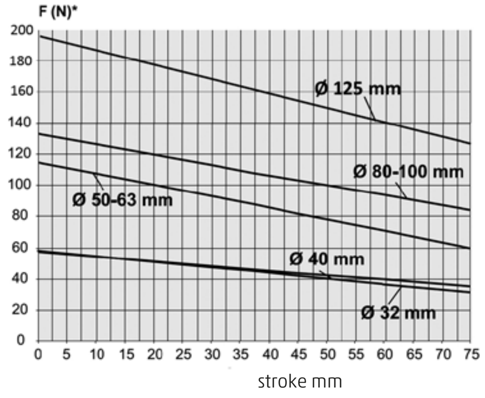
Series 31-32



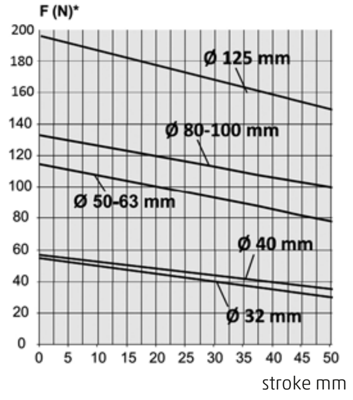
Series 60-61-42-90



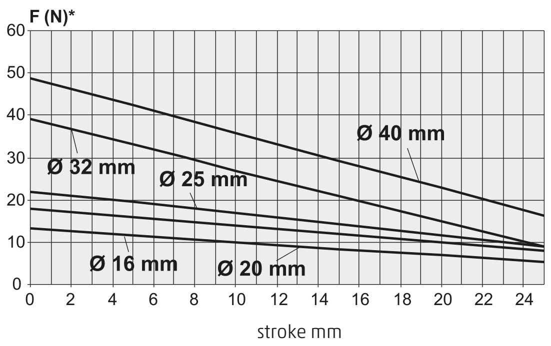
Series 63 - front spring



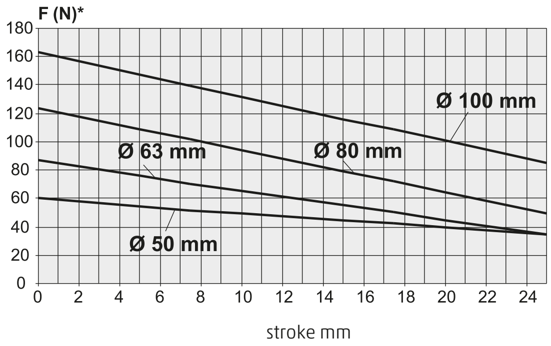
Series 63 - rear spring



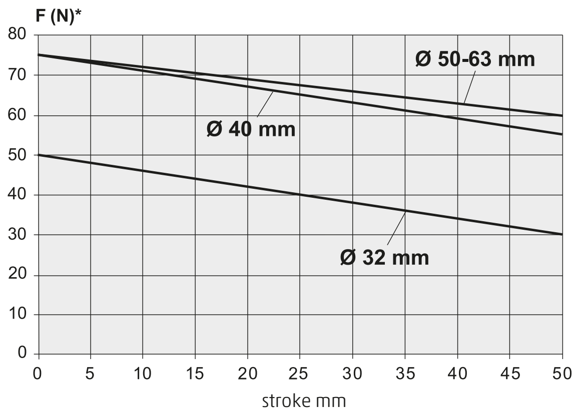
Series QP



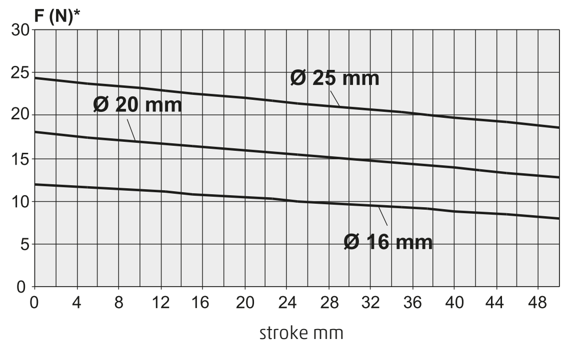
Series QP



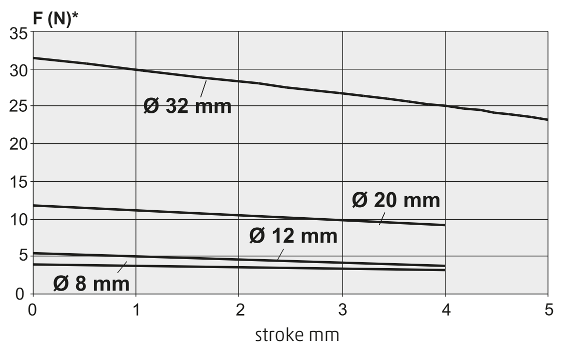
Series 90-97



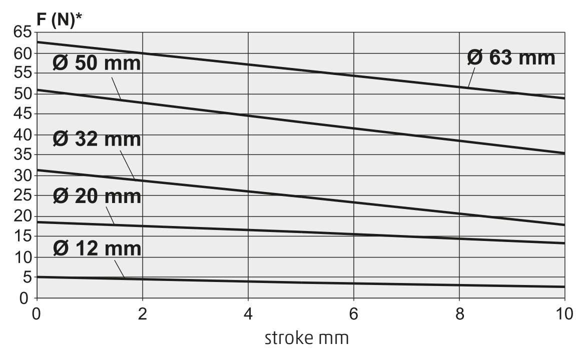
Series 94



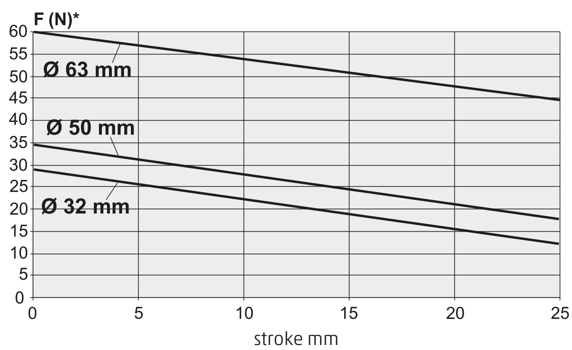
Series QN - stroke 4 and 5 mm



Series QN - stroke 10 mm



Series QN - stroke 25 mm



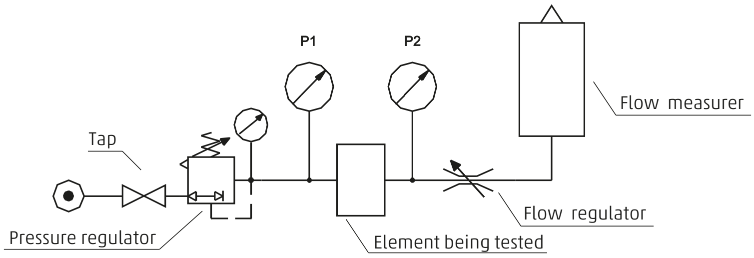
*** F = spring force**

Flow and speed cylinders

Valves and solenoid valves

Flow survey instruments.

The flow rate indicated in the catalogue is obtained with P1 = 6 bar and P2 = 5 bar.



Maximum speeds obtainable combining a certain flow regulator (mm/sec) with a cylinder

	Cylinders diameter (mm)						
Mod.	32	40	50	63	80	100	125
GSCU-1/8"; GSVU-1/8"; GMCU-1/8"; GSCU-1/8"	1000	986	629	395	246	158	100
GSCU-1/4"; GSVU-1/4"; GMCU-1/4"; GSCU-1/4"	-	1000	911	573	357	229	145
RFU 452 M5	204	-	-	-	-	-	-
RFU 482-1/8"	227	145	93	58	36	-	-
RFU 483-1/8"	520	333	212	133	83	53	-
RFU 444-1/4"	-	739	471	296	185	118	75
RFU 446-1/4"	-	-	847	532	332	213	135
SCU M5 - SVU M5	154	-	-	-	-	-	-
SCU-1/4"; SVU-1/4"; MCU-1/4"; MVU-1/4"	-	1000	660	415	259	166	105
SCU-1/8"; SVU-1/8"; MCU-1/8"; MVU-1/8"	604	387	247	155	97	62	-
SCU-3/8"; MCU-3/8"	-	-	-	622	388	249	158
SCU-1/2"; MCU-1/2"	-	-	-	-	1000	869	-

To obtain the above indicated speeds, the connected tubing should have a certain diameter and not exceed, if indicated, the max length (m)

	Tube diameter (mm) and max length (m)				
Mod.	4/2	6/4	8/6	10/8	12/10
GSCU-1/8"; GSVU-1/8"; GMCU-1/8"; GSCU-1/8"	-	0,4	8	25	-
GSCU-1/4"; GSVU-1/4"; GMCU-1/4"; GSCU-1/4"	-	-	4,5	18	24
RFU 452 M5	3,5	25	-	-	-
RFU 482-1/8"	3	25	-	-	-
RFU 483-1/8"	0,25	10	-	-	-
RFU 444-1/4"	-	2	17	-	-
RFU 446-1/4"	-	-	5	20	-
SCU M5 - SVU M5	5	-	-	-	-
SCU-1/4"; SVU-1/4"; MCU-1/4"; MVU-1/4"	-	0,4	8	25	-
SCU-1/8"; SVU-1/8"; MCU-1/8"; MVU-1/8"	-	7	-	-	-
SCU-3/8"; MCU-3/8"	-	-	3,5	-	-
SCU-1/2"; MCU-1/2"	-	-	-	0,25	3,5

Air flow required by the valve (6 bar) to obtain the above indicated speeds (Nl/min)

	Cylinders diameter (mm)						
Mod.	32	40	50	63	80	100	125
GSCU-1/8"; GSVU-1/8"; GMCU-1/8"; GSCU-1/8"	336	517	517	517	517	517	517
GSCU-1/4"; GSVU-1/4"; GMCU-1/4"; GSCU-1/4"	-	525	750	750	750	750	750
RFU 452 M5	69	-	-	-	-	-	-
RFU 482-1/8"	76	76	76	76	76	-	-
RFU 483-1/8"	175	175	175	175	175	175	-
RFU 444-1/4"	-	388	388	388	388	388	388
RFU 446-1/4"	-	-	697	697	697	697	697
SCU M5 - SVU M5	52	-	-	-	-	-	-
SCU-1/4"; SVU-1/4"; MCU-1/4"; MVU-1/4"	-	525	543	543	543	543	543
SCU-1/8"; SVU-1/8"; MCU-1/8"; MVU-1/8"	203	203	203	203	203	203	-
SCU-3/8"; MCU-3/8"	-	-	-	815	815	815	815
SCU-1/2"; MCU-1/2"	-	-	-	-	2100	2846	-

Output forces double-acting cylinders

Thrust side

Values in Newton

SERIES > 16 24 25 27 31 32 QP QN QCT QCB QCBF QCTF 40 41 42 50 52 60 61 62 63 90 92 94 95 97

Ø	Thrust side	Pressure									
		MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
8	0,50	4,44	8,9	13,3	17,7	22,2	26,6	31,0	35,5	39,9	44,4
10	0,79	6,93	13,9	20,8	27,7	34,7	41,6	48,5	55,4	62,4	69,3
12	1,13	9,98	20,0	29,9	39,9	49,9	59,9	69,9	79,8	89,8	99,8
16	2,01	17,74	35,5	53,2	71,0	88,7	106,5	124,2	141,9	159,7	177,4
20	3,14	27,72	55,4	83,2	110,9	138,6	166,3	194,1	221,8	249,5	277,2
25	4,91	43,32	86,6	130,0	173,3	216,6	259,9	303,2	346,5	389,9	433,2
32	8,04	70,97	141,9	212,9	283,9	354,9	425,8	496,8	567,8	638,7	709,7
40	12,56	110,89	221,8	332,7	443,6	554,5	665,4	776,2	887,1	998,0	1108,9
50	19,63	173,27	346,5	519,8	693,1	866,3	1039,6	1212,9	1386,2	1559,4	1732,7
63	31,16	275,08	550,2	825,2	1100,3	1375,4	1650,5	1925,6	2200,7	2475,7	2750,8
80	50,24	443,57	887,1	1330,7	1774,3	2217,8	2661,4	3105,0	3548,6	3992,1	4435,7
100	78,50	693,08	1386,2	2079,2	2772,3	3465,4	4158,5	4851,5	5544,6	6237,7	6930,8
125	122,66	1082,93	2165,9	3248,8	4331,7	5414,7	6497,6	7580,5	8663,5	9746,4	10829,3
160	200,96	1774,28	3548,6	5322,8	7097,1	8871,4	10645,7	12419,9	14194,2	15968,5	17742,8
200	314,00	2772,31	5544,6	8316,9	11089,2	13861,5	16633,8	19406,1	22178,4	24950,8	27723,1
250	490,62	4331,73	8663,5	12995,2	17326,9	21658,6	25990,4	30322,1	34653,8	38985,6	43317,3
320	803,84	7097,10	14194,2	21291,3	28388,4	35485,5	42582,6	49679,7	56776,8	63873,9	70971,0

SERIES > QX

Ø	Thrust side	Pressure									
		MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
10	1,58	14,22	28,44	42,66	56,88	71,1	85,32	99,54	113,76	127,98	142,2
16	4,02	35,48	71	106,4	142	177,4	213	248,4	283,8	319,4	354,8
20	6,28	55,44	110,8	166,4	221,8	277,2	332,6	388,2	443,6	499	554,4
25	9,82	86,64	173,2	260	346,6	433,2	519,8	606,4	693	779,8	866,4
32	16,08	141,94	283,8	425,8	567,8	709,8	851,6	993,6	1135,6	1277,4	1419,4

Traction side

Values in Newton

SERIES > 16 24 25 40 41 42 60 61 62 63 90 92 94 95 97

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
8	0,50	4	0,38	3,33	6,7	10,0	13,3	16,6	20,0	23,3	26,6	29,9	33,3
10	0,79	4	0,66	5,82	11,6	17,5	23,3	29,1	34,9	40,8	46,6	52,4	58,2
12	1,13	6	0,85	7,49	15,0	22,5	29,9	37,4	44,9	52,4	59,9	67,4	74,9
16	2,01	6	1,73	15,25	30,5	45,7	61,0	76,2	91,5	106,7	122,0	137,2	152,5
20	3,14	8	2,64	23,29	46,6	69,9	93,1	116,4	139,7	163,0	186,3	209,6	232,9
25	4,91	10	4,12	36,39	72,8	109,2	145,5	181,9	218,3	254,7	291,1	327,5	363,9
32	8,04	12	6,91	60,99	122,0	183,0	244,0	305,0	365,9	426,9	487,9	548,9	609,9
40	12,56	16	10,55	93,15	186,3	279,4	372,6	465,7	558,9	652,0	745,2	838,3	931,5
50	19,63	20	16,49	145,55	291,1	436,6	582,2	727,7	873,3	1018,8	1164,4	1309,9	1455,5
63	31,16	20	28,02	247,36	494,7	742,1	989,4	1236,8	1484,2	1731,5	1978,9	2226,2	2473,6
80	50,24	25	45,33	400,25	800,5	1200,8	1601,0	2001,3	2401,5	2801,8	3202,0	3602,3	4002,5
100	78,50	25	73,59	649,76	1299,5	1949,3	2599,0	3248,8	3898,6	4548,3	5198,1	5847,8	6497,6
125	122,66	32	114,62	1011,96	2023,9	3035,9	4047,8	5059,8	6071,8	7083,7	8095,7	9107,6	10119,6
160	200,96	40	188,40	1663,38	3326,8	4990,2	6653,5	8316,9	9980,3	11643,7	13307,1	14970,5	16633,8
200	314,00	40	301,44	2661,41	5322,8	7984,2	10645,7	13307,1	15968,5	18629,9	21291,3	23952,7	26614,1
250	490,62	50	471,00	4158,46	8316,9	12475,4	16633,8	20792,3	24950,8	29109,2	33267,7	37426,1	41584,6
320	803,84	63	772,68	6822,02	13644,0	20466,1	27288,1	34110,1	40932,1	47754,1	54576,2	61398,2	68220,2

SERIES > QX

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
10	1,58	6	1,0148	9,1332	18,2664	27,3996	36,5328	45,666	54,7992	63,9324	73,0656	82,1988	91,332
16	4,02	16	3,02	26,62	53,2	79,8	106,4	133	159,6	186,2	213	239,6	266,2
20	6,28	20	4,72	41,58	83,2	124,8	166,4	208	249,6	291	332,6	374,2	415,8
25	9,82	24	7,56	66,68	133,4	200	266,6	333,4	400	466,8	533,4	600	666,8
32	16,08	32	12,06	106,46	213	319,4	425,8	532,2	638,8	745,2	851,6	958,2	1064,6

Traction side

Values in Newton

SERIES > 31 32

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm^2**	**mm**	**cm^2**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
12	1,13	6	0,85	7,49	15,0	22,5	29,9	37,4	44,9	52,4	59,9	67,4	74,9
16	2,01	8	1,51	13,31	26,6	39,9	53,2	66,5	79,8	93,1	106,5	119,8	133,1
20	3,14	10	2,36	20,79	41,6	62,4	83,2	104,0	124,8	145,5	166,3	187,1	207,9
25	4,91	10	4,12	36,39	72,8	109,2	145,5	181,9	218,3	254,7	291,1	327,5	363,9
32	8,04	12	6,91	60,99	122,0	183,0	244,0	305,0	365,9	426,9	487,9	548,9	609,9
40	12,56	12	11,43	100,91	201,8	302,7	403,6	504,6	605,5	706,4	807,3	908,2	1009,1
50	19,63	16	17,62	155,53	311,1	466,6	622,1	777,6	933,2	1088,7	1244,2	1399,7	1555,3
63	31,16	16	29,15	257,34	514,7	772,0	1029,4	1286,7	1544,0	1801,4	2058,7	2316,1	2573,4
80	50,24	20	47,10	415,85	831,7	1247,5	1663,4	2079,2	2495,1	2910,9	3326,8	3742,6	4158,5
100	78,50	25	73,59	649,76	1299,5	1949,3	2599,0	3248,8	3898,6	4548,3	5198,1	5847,8	6497,6

SERIES > QP

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm^2**	**mm**	**cm^2**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
12	1,13	6	0,85	7,49	15,0	22,5	29,9	37,4	44,9	52,4	59,9	67,4	74,9
16	2,01	8	1,51	13,31	26,6	39,9	53,2	66,5	79,8	93,1	106,5	119,8	133,1
20	3,14	10	2,36	20,79	41,6	62,4	83,2	104,0	124,8	145,5	166,3	187,1	207,9
25	4,91	10	4,12	36,39	72,8	109,2	145,5	181,9	218,3	254,7	291,1	327,5	363,9
32	8,04	12	6,91	60,99	122,0	183,0	244,0	305,0	365,9	426,9	487,9	548,9	609,9
40	12,56	16	10,55	93,15	186,3	279,4	372,6	465,7	558,9	652,0	745,2	838,3	931,5
50	19,63	16	17,62	155,53	311,1	466,6	622,1	777,6	933,2	1088,7	1244,2	1399,7	1555,3
63	31,16	20	28,02	247,36	494,7	742,1	989,4	1236,8	1484,2	1731,5	1978,9	2226,2	2473,6
80	50,24	25	45,33	400,25	800,5	1200,8	1601,0	2001,3	2401,5	2801,8	3202,0	3602,3	4002,5
100	78,50	25	73,59	649,76	1299,5	1949,3	2599,0	3248,8	3898,6	4548,3	5198,1	5847,8	6497,6

SERIES > 27

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm^2**	**mm**	**cm^2**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
20	3,14	8	2,64	23,29	46,6	69,9	93,1	116,4	139,7	163,0	186,3	209,6	232,9
25	4,91	10	4,12	36,39	72,8	109,2	145,5	181,9	218,3	254,7	291,1	327,5	363,9
32	8,04	12	6,91	60,99	122,0	183,0	244,0	305,0	365,9	426,9	487,9	548,9	609,9
40	12,56	16	10,55	93,15	186,3	279,4	372,6	465,7	558,9	652,0	745,2	838,3	931,5
50	19,63	16	17,62	155,53	311,1	466,6	622,1	777,6	933,2	1088,7	1244,2	1399,7	1555,3
63	31,16	20	28,02	247,36	494,7	742,1	989,4	1236,8	1484,2	1731,5	1978,9	2226,2	2473,6

SERIES > QCT QCB QCTF QCBF

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm^2**	**mm**	**cm^2**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
20	3,14	10	2,36	20,79	41,6	62,4	83,2	104,0	124,8	145,5	166,3	187,1	207,9
25	4,91	12	3,78	33,34	66,7	100,0	133,3	166,7	200,0	233,4	266,7	300,0	333,4
32	8,04	16	6,03	53,23	106,5	159,7	212,9	266,1	319,4	372,6	425,8	479,1	532,3
40	12,56	16	10,55	93,15	186,3	279,4	372,6	465,7	558,9	652,0	745,2	838,3	931,5
50	19,63	20	16,49	145,55	291,1	436,6	582,2	727,7	873,3	1018,8	1164,4	1309,9	1455,5
63	31,16	20	28,02	247,36	494,7	742,1	989,4	1236,8	1484,2	1731,5	1978,9	2226,2	2473,6

Table showing air consumption of double-acting cylinders

Thrust side

Values in Nl for each 10 mm of stroke

SERIES > 16 24 25 27 31 32 QP QCT QCB QCBF QCTF 40 41 42 50 52 60 61 62 63 90 92 94 95 97

Ø	Thrust side	Pressure									
		MPa (bar)	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**
mm	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
8	0,50	0,001	0,002	0,002	0,003	0,003	0,004	0,004	0,005	0,005	0,006
10	0,79	0,002	0,002	0,003	0,004	0,005	0,005	0,006	0,007	0,008	0,009
12	1,13	0,002	0,003	0,005	0,006	0,007	0,008	0,009	0,010	0,011	0,012
16	2,01	0,004	0,006	0,008	0,010	0,012	0,014	0,016	0,018	0,020	0,022
20	3,14	0,006	0,009	0,013	0,016	0,019	0,022	0,025	0,028	0,031	0,035
25	4,91	0,010	0,015	0,020	0,025	0,029	0,034	0,039	0,044	0,049	0,054
32	8,04	0,016	0,024	0,032	0,040	0,048	0,056	0,064	0,072	0,080	0,088
40	12,56	0,025	0,038	0,050	0,063	0,075	0,088	0,100	0,113	0,126	0,138
50	19,63	0,039	0,059	0,079	0,098	0,118	0,137	0,157	0,177	0,196	0,216
63	31,16	0,062	0,093	0,125	0,156	0,187	0,218	0,249	0,280	0,312	0,343
80	50,24	0,100	0,151	0,201	0,251	0,301	0,352	0,402	0,452	0,502	0,553
100	78,50	0,157	0,236	0,314	0,393	0,471	0,550	0,628	0,707	0,785	0,864
125	122,66	0,245	0,368	0,491	0,613	0,736	0,859	0,981	1,104	1,227	1,349
160	200,96	0,402	0,603	0,804	1,005	1,206	1,407	1,608	1,809	2,010	2,211
200	314,00	0,628	0,942	1,256	1,570	1,884	2,198	2,512	2,826	3,140	3,454
250	490,63	0,981	1,472	1,963	2,453	2,944	3,434	3,925	4,416	4,906	5,397
320	803,84	1,608	2,412	3,215	4,019	4,823	5,627	6,431	7,235	8,038	8,842

SERIES > QX

Ø	Thrust side	Pressure									
		MPa (bar)	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**
mm	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
10	1,58	0,003	0,005	0,006	0,008	0,009	0,011	0,013	0,014	0,016	0,017
16	4,02	0,008	0,012	0,016	0,02	0,024	0,028	0,032	0,036	0,04	0,044
20	6,28	0,012	0,018	0,026	0,032	0,038	0,044	0,05	0,056	0,062	0,07
25	9,82	0,02	0,03	0,04	0,05	0,058	0,068	0,078	0,088	0,098	0,108
32	16,08	0,032	0,048	0,064	0,08	0,096	0,112	0,128	0,144	0,16	0,176

Traction side

Values in Nl for each 10 mm of stroke

SERIES > 16 24 25 40 41 42 60 61 62 63 90 92 94 95 97

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
8	0,50	4	0,38	0,001	0,001	0,002	0,002	0,002	0,003	0,003	0,003	0,004	0,004
10	0,79	4	0,66	0,001	0,002	0,003	0,003	0,004	0,005	0,005	0,006	0,007	0,007
12	1,13	6	0,85	0,002	0,003	0,003	0,004	0,005	0,006	0,007	0,008	0,008	0,009
16	2,01	6	1,73	0,003	0,005	0,007	0,009	0,010	0,012	0,014	0,016	0,017	0,019
20	3,14	8	2,64	0,005	0,008	0,011	0,013	0,016	0,018	0,021	0,024	0,026	0,029
25	4,91	10	4,12	0,008	0,012	0,016	0,021	0,025	0,029	0,033	0,037	0,041	0,045
32	8,04	12	6,91	0,014	0,021	0,028	0,035	0,041	0,048	0,055	0,062	0,069	0,076
40	12,56	16	10,55	0,021	0,032	0,042	0,053	0,063	0,074	0,084	0,095	0,106	0,116
50	19,63	20	16,49	0,033	0,049	0,066	0,082	0,099	0,115	0,132	0,148	0,165	0,181
63	31,16	20	28,02	0,056	0,084	0,112	0,140	0,168	0,196	0,224	0,252	0,280	0,308
80	50,24	25	45,33	0,091	0,136	0,181	0,227	0,272	0,317	0,363	0,408	0,453	0,499
100	78,50	25	73,59	0,147	0,221	0,294	0,368	0,442	0,515	0,589	0,662	0,736	0,810
125	122,66	32	114,62	0,229	0,344	0,458	0,573	0,688	0,802	0,917	1,032	1,146	1,261
160	200,96	40	188,40	0,377	0,565	0,754	0,942	1,130	1,319	1,507	1,696	1,884	2,072
200	314,00	40	301,44	0,603	0,904	1,206	1,507	1,809	2,110	2,412	2,713	3,014	3,316
250	490,63	50	471,00	0,942	1,413	1,884	2,355	2,826	3,297	3,768	4,239	4,710	5,181
320	803,84	63	772,68	1,545	2,318	3,091	3,863	4,636	5,409	6,181	6,954	7,727	8,500

SERIES > QX

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**	**MPa (bar)**
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
10	1,58	6	1,0148	0,002	0,003	0,004	0,005	0,006	0,007	0,008	0,009	0,010	0,011
16	4,02	16	3,02	0,006	0,01	0,012	0,016	0,018	0,022	0,024	0,028	0,03	0,034
20	6,28	20	4,72	0,01	0,014	0,018	0,024	0,028	0,032	0,038	0,042	0,048	0,052
25	9,82	24	7,56	0,016	0,022	0,03	0,038	0,046	0,052	0,06	0,068	0,076	0,084
32	16,08	32	12,06	0,024	0,036	0,048	0,06	0,072	0,084	0,096	0,108	0,12	0,132

Traction side

Values in Nl for each 10 mm of stroke

SERIES > 31 32

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
12	1,13	6	0,85	0,002	0,003	0,003	0,004	0,005	0,006	0,007	0,008	0,008	0,009
16	2,01	8	1,51	0,003	0,005	0,006	0,008	0,009	0,011	0,012	0,014	0,015	0,017
20	3,14	10	2,36	0,005	0,007	0,009	0,012	0,014	0,016	0,019	0,021	0,024	0,026
25	4,91	10	4,12	0,008	0,012	0,016	0,021	0,025	0,029	0,033	0,037	0,041	0,045
32	8,04	12	6,91	0,014	0,021	0,028	0,035	0,041	0,048	0,055	0,062	0,069	0,076
40	12,56	12	11,43	0,023	0,034	0,046	0,057	0,069	0,080	0,091	0,103	0,114	0,126
50	19,63	16	17,62	0,035	0,053	0,070	0,088	0,106	0,123	0,141	0,159	0,176	0,194
63	31,16	16	29,15	0,058	0,087	0,117	0,146	0,175	0,204	0,233	0,262	0,291	0,321
80	50,24	20	47,10	0,094	0,141	0,188	0,236	0,283	0,330	0,377	0,424	0,471	0,518
100	78,50	25	73,59	0,147	0,221	0,294	0,368	0,442	0,515	0,589	0,662	0,736	0,810

SERIES > QP

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
12	1,13	6	0,85	0,002	0,003	0,003	0,004	0,005	0,006	0,007	0,008	0,008	0,009
16	2,01	8	1,51	0,003	0,005	0,006	0,008	0,009	0,011	0,012	0,014	0,015	0,017
20	3,14	10	2,36	0,005	0,007	0,009	0,012	0,014	0,016	0,019	0,021	0,024	0,026
25	4,91	10	4,12	0,008	0,012	0,016	0,021	0,025	0,029	0,033	0,037	0,041	0,045
32	8,04	12	6,91	0,014	0,021	0,028	0,035	0,041	0,048	0,055	0,062	0,069	0,076
40	12,56	16	10,55	0,021	0,032	0,042	0,053	0,063	0,074	0,084	0,095	0,106	0,116
50	19,63	16	17,62	0,035	0,053	0,070	0,088	0,106	0,123	0,141	0,159	0,176	0,194
63	31,16	20	28,02	0,056	0,084	0,112	0,140	0,168	0,196	0,224	0,252	0,280	0,308
80	50,24	25	45,33	0,091	0,136	0,181	0,227	0,272	0,317	0,363	0,408	0,453	0,499
100	78,50	25	73,59	0,147	0,221	0,294	0,368	0,442	0,515	0,589	0,662	0,736	0,810

SERIES > 27

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
20	3,14	8	2,64	0,005	0,008	0,011	0,013	0,016	0,018	0,021	0,024	0,026	0,029
25	4,91	10	4,12	0,008	0,012	0,016	0,021	0,025	0,029	0,033	0,037	0,041	0,045
32	8,04	12	6,91	0,014	0,021	0,028	0,035	0,041	0,048	0,055	0,062	0,069	0,076
40	12,56	16	10,55	0,021	0,032	0,042	0,053	0,063	0,074	0,084	0,095	0,106	0,116
50	19,63	16	17,62	0,035	0,053	0,070	0,088	0,106	0,123	0,141	0,159	0,176	0,194
63	31,16	20	28,02	0,056	0,084	0,112	0,140	0,168	0,196	0,224	0,252	0,280	0,308

SERIES > QCT QCB QCTF QCBF

Ø	Thrust side	Ø rod	Traction side	Pressure									
				MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
mm	**cm²**	**mm**	**cm²**	**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
20	3,14	10	2,36	0,005	0,007	0,009	0,012	0,014	0,016	0,019	0,021	0,024	0,026
25	4,91	12	3,78	0,008	0,011	0,015	0,019	0,023	0,026	0,030	0,034	0,038	0,042
32	8,04	16	6,03	0,012	0,018	0,024	0,030	0,036	0,042	0,048	0,054	0,060	0,066
40	12,56	16	10,55	0,021	0,032	0,042	0,053	0,063	0,074	0,084	0,095	0,106	0,116
50	19,63	20	16,49	0,033	0,049	0,066	0,082	0,099	0,115	0,132	0,148	0,165	0,181
63	31,16	20	28,02	0,056	0,084	0,112	0,140	0,168	0,196	0,224	0,252	0,280	0,308

SERIES > ARP

			Pressure (opening/closing)									
	Volume (l)		MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
Mod.	**open./clos.**		**0,10 (1)**	**0,20 (2)**	**0,30 (3)**	**0,40 (4)**	**0,50 (5)**	**0,60 (6)**	**0,70 (7)**	**0,80 (8)**	**0,90 (9)**	**1 (10)**
ARP 001	0,03	0,03	0,05/0,05	0,08/0,08	0,11/0,11	0,13/0,13	0,16/0,16	0,19/0,19	0,21/0,21	0,24/0,24	0,27/0,27	0,29/0,29
ARP 003	0,10	0,10	0,20/0,20	0,30/0,30	0,40/0,40	0,50/0,50	0,60/0,60	0,70/0,70	0,80/0,80	0,90/0,90	1,00/1,00	1,10/1,10
ARP 005	0,20	0,30	0,40/0,60	0,60/0,90	0,80/1,20	1,00/1,50	1,20/1,80	1,40/2,10	1,60/2,40	1,80/2,70	2,00/3,00	2,20/3,30
ARP 010	0,40	0,50	0,80/1,00	1,20/1,50	1,60/2,00	2,00/2,50	2,40/3,00	2,80/3,50	3,20/4,00	3,60/4,50	4,00/5,00	4,40/5,50
ARP 012	0,49	0,64	0,98/1,28	1,47/1,92	1,96/2,56	2,45/3,20	2,94/3,84	3,43/4,48	3,92/5,12	4,41/5,76	4,90/6,40	5,39/7,04
ARP 020	0,90	1,00	1,80/2,00	2,70/3,00	3,60/4,00	4,50/5,00	5,40/6,00	6,30/7,00	7,20/8,00	8,10/9,00	9,00/10,00	9,90/11,00
ARP 035	1,69	1,90	3,38/3,80	5,07/5,70	6,76/7,60	8,45/9,50	10,14/11,40	11,83/13,30	13,52/15,20	15,21/17,10	16,90/19,00	18,59/20,90
ARP 055	2,80	3,40	5,60/6,80	8,40/10,20	11,20/13,60	14,00/17,00	16,80/20,40	19,60/23,80	22,40/27,20	25,20/30,60	28,00/34,00	30,80/37,40
ARP 055	2,80	3,40	5,60/6,80	8,40/10,20	11,20/13,60	14,00/17,00	16,80/20,40	19,60/23,80	22,40/27,20	25,20/30,60	28,00/34,00	30,80/37,40
ARP 070	3,05	3,70	6,10/7,40	9,15/11,10	12,20/14,80	15,25/18,50	18,30/22,20	21,35/25,90	24,40/29,60	27,45/33,30	30,50/37,00	33,55/40,70
ARP 100	5,52	5,90	11,04/11,80	16,56/17,70	22,08/23,60	27,60/29,50	33,12/35,40	38,64/41,30	44,16/47,20	49,68/53,10	55,20/59,00	60,72/64,90
ARP 150	7,60	9,60	15,20/19,20	22,80/28,80	30,40/38,40	38,00/48,00	45,60/57,60	53,20/67,20	60,80/76,80	68,40/86,40	76,00/96,00	83,60/105,60
ARP 250	8,50	9,80	17,00/19,60	25,50/29,40	34,00/39,20	42,50/49,00	51,00/58,80	59,50/68,60	68,00/78,40	76,50/88,20	85,00/98,00	93,50/107,80
ARP 400	13,60	17,50	27,20/35,00	40,80/52,50	54,40/70,00	68,00/87,50	81,60/105,00	95,20/122,50	108,80/140,00	122,40/157,50	136,00/175,00	149,60/192,50

Dimensioning guide for Shock Absorbers Series SA

In order to select the correct dimensions of Shock absorbers the following parameters are needed:

- Weight of the impact object	m	(kg)
- Impact speed	v	(m/s)
- Propelling or thrust force	F	(N)
- No. of impact cycles per hour	C	(/hr)

Some formulas	
1. Kinetic energy	$E_K = mv^2/2$
2. Drive energy	$E_D = F \cdot S$
3. Total energy	$E_T = E_K + E_D$
4. Free fall speed	$v = \sqrt{(2g*h)}$

Some formulas	
5. Cylinder's traction force	$F = \frac{D^2 \cdot \pi}{4} \cdot P \cdot g/100$
6. Cylinder's thrust force	$F = \frac{(D^2 - d^2) \cdot \pi}{4} \cdot P \cdot g/100$
7. Maximum shock force (approx.)	$Fm = 1.2\ E_T / S$
8. Total energy consumption per hour	$E_{TC} = E_T \cdot C$
9. Mass	$Me = 2E_T/v^2$

Dimensioning guide: formulas and examples

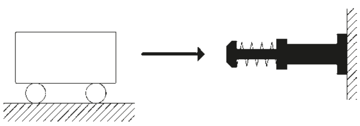
Symbols description

Symbol	Unit	Description
m		friction coefficient
a	(rad)	angle of incline
q	(rad)	side load angle
w	(rad/s)	angular velocity
A	(m)	width
B	(m)	thickness
C	(/hr)	impact cycles per hour
D	(mm)	cylinder diameter
d	(mm)	piston rod diameter
Ed	(Nm)	drive energy per cycle
Ek	(Nm)	kinetic energy per cycle
Et	(Nm)	total energy per cycle
Etc	(Nm)	total energy per hour
F	(N)	propelling force

Symbol	Unit	Description
Fm	(N)	maximum shock force
g	(m/s^2)	gravity acceleration $(9.81\ m/s^2)$
h	(m)	hight
m	(kg)	mass to be decelerated
Me	(kg)	effective mass
P	(bar)	operating pressure
R	(m)	radius
Rs	(m)	shock absorber mounting distance from rotation center
S	(m)	stroke (shock absorber)
T	(Nm)	driving torque
t	(s)	deceleration time
v	(m/s)	velocity of impact mass
vs	(m/s)	impact velocity at shock absorber

Example 1: Horizontal impact

Application data:
v = 1.0 m/s
m = 50 kg
S = 0.01 m
C = 1500 cycles/h



Calculation:

$$E_K = \frac{mv^2}{2} = \frac{50 \cdot 1^2}{2} = 25\ Nm$$

$E_T = Ek = 25\ Nm$

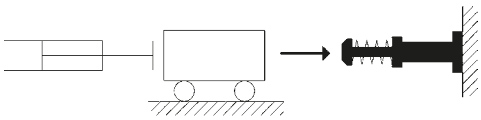
$E_{TC} = E_T \cdot C = 25 \cdot 1500 = 37500\ Nm/h$

$$Me = \frac{2E_T}{v^2} = \frac{2 \cdot 25}{1^2} = 50\ kg$$

The adequate Shock Absorber to use in this case is Mod. SA 2015 according to the technical data where we find that E_T (max) = 59 Nm, E_{TC} (max) = 38000 Nm/h and Me (max) = 120 kg.

Example 2: Horizontal impact with propelling force

Application data:
m = 40 kg
P = 6 bar
S = 0.01 m first hypothesis SA 1210
v = 1.2 m/s
D = 50 mm
C = 780 cycles/h
To facilitate the calculation, the pressure in the empty cylinder chamber is not considered (safety condition)



Calculation:

$$E_K = \frac{mv^2}{2} = \frac{40 \cdot 1,2^2}{2} = 28,8\ Nm$$

Consider the shock absorber with the lowest E_T but superior to 28.8 Nm: mod. SA 2015 S=0.015 m

$$E_D = F \cdot S = \frac{D^2 \cdot \pi}{4} \cdot P \cdot g/100 \cdot S = \frac{50^2 \cdot \pi}{4} \cdot 6 \cdot 9,81/100 \cdot 0,015 = 17,3\ Nm$$

$E_T = E_K + E_D = 28,8 + 17,3 = 46,1\ Nm$

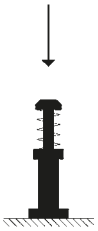
$E_{TC} = E_T \cdot C = 46,1 \cdot 780 = 35958\ Nm/h$

$$Me = \frac{2E_T}{v^2} = \frac{2 \cdot 46,1}{1,2^2} = 64,0\ Kg$$

The adequate Shock Absorber to use in this case is Mod.SA 2015 according to the technical data where we find that E_T (max) = 59 Nm, E_{TC} (max)=38000 Nm/h and Me (max) = 120 kg.

Example 3: Free fall impact

Application data:
h = 0,35 m
m = 5 kg
S = 0.01 m
first hypothesis SA 1210
C = 1500 cycles/h



Calculation:

v = $\sqrt{(2g \cdot h)}$ $\sqrt{(2 \cdot 9{,}81 \cdot 0{,}35)} = 2{,}6$ m/s

E_K = $m \cdot g \cdot h = 5 \cdot 9{,}81 \cdot 0{,}35 = 17{,}2$ Nm
Consider the shock absorber with the lowest l'E_T but superior to 17.2 Nm:
mod. SA 1412 S = 0.012 m

E_D = $F \cdot S = m \cdot g \cdot s = 5 \cdot 9{,}81 \cdot 0{,}012 = 0{,}6$ Nm

E_T = $E_K + E_D = 17{,}2 + 0{,}6 = 17{,}8$ Nm

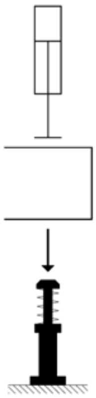
E_{TC} = $E_T \cdot C = 17{,}8 \cdot 1500 = 26700$ Nm/h

Me = $\frac{2E_T}{v^2} = \frac{2 \cdot 17{,}5}{2{,}6^2} = 5$ Kg

The adequate shock absorber to use in this case is Mod. SA 1412 according to the technical data, where we find that E_T (max) = 20 Nm, E_{TC} (max) = 33000 Nm/h and Me (max) = 40 kg.

Example 4: Vertical impact downwards with propelling force

Application data:
m = 50 kg
S = 0.025 m
P = 6 bar
D = 63 mm
C = 600 cycles/h
v = 1,0 m/s



Calculation:

E_K = $\frac{mv^2}{2} = \frac{50 \cdot 1^2}{2} = 25$ Nm

E_D = $F \cdot S = (m \cdot g + \frac{D^2 \cdot \pi}{4} \cdot P \cdot g/100) \cdot S = (50 \cdot 9{,}81 + \frac{63 \cdot \pi}{4} \cdot 6 \cdot 9{,}81/100) \cdot 0{,}025 = 58{,}1$ Nm

E_T = $E_K + E_D = 25 + 58{,}1 = 83{,}1$ Nm

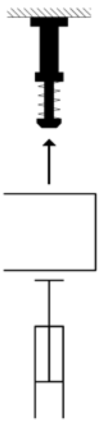
E_{TC} = $E_T \cdot C = 83{,}1 \cdot 600 = 49860$ Nm/h

Me = $\frac{2E_T}{v^2} = \frac{2 \cdot 84}{1^2} = 168$ Kg

The adequate shock absorber to use in this case is Mod. SA 2725 according to the technical data, where we find that E_T (max) = 147 Nm, E_{TC} (max) = 72000 Nm/h and Me (max) = 270 kg.

Example 5: Vertical impact upwards with propelling force

Application data:
m = 50 kg
h = 0.3 m
S = 0.025 m
first hypothesis
Mod. SA 2525
P = 6 bar = 0,6 MPa
D = 63 mm
C = 600 cycles/h
v = 1,0 m/s



Calculation:

E_K = $\frac{mv^2}{2} = \frac{50 \cdot 1^2}{2} = 25$ Nm

Consider the shock absorber with the lowest l'E_T but superior to 25 Nm:
mod. SA 2015 S=0.015 m

E_D = $F \cdot S = (\frac{D^2 \cdot \pi}{4} \cdot P \cdot g/100 - m \cdot g) \cdot S = (\frac{63^2 \cdot \pi}{4} 6 \cdot 9{,}81/100 - 50 \cdot 9{,}81) \cdot 0{,}015 = 20{,}1$ Nm

E_T = $E_K + E_D = 25 + 20{,}1 = 45{,}7$ Nm

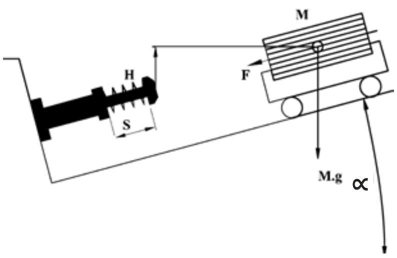
E_{TC} = $E_T \cdot C = 45{,}1 \cdot 600 = 27060$ Nm/h

Me = $\frac{2E_T}{v^2} = \frac{2 \cdot 45{,}7}{1^2} = 91{,}4$ Kg

The adequate shock absorber to use in this case is Mod. SA 2015 according to the technical data, where we find that E_T (max) = 59 Nm, E_{TC} (max) = 38000 Nm/h and Me (max)= 120 kg.

Example 6: Inclined impact

Application data:
m = 10 kg
h = 0,3 m
S = 0.015 m
∝ = 30°
C = 600 cycles/h



Calculation:

v = $\sqrt{(2g \cdot h)}$ $\sqrt{(2 \cdot 9{,}81 \cdot 0{,}3)} = 2{,}43$ m/s

E_K = $m \cdot g \cdot h$ $10 \cdot 9{,}81 \cdot 0{,}3 = 29{,}4$ Nm

E_D = $F \cdot S = m \cdot g \cdot \sin\alpha \cdot s = 10 \cdot 9{,}81 \cdot \sin 30° \cdot 0{,}015 = 10 \cdot 9{,}81 \cdot 0{,}5 \cdot 0{,}015 = 0{,}7$ Nm

E_T = $E_K + E_D = 29{,}4 + 0{,}7 = 30{,}1$ Nm

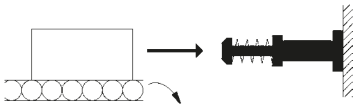
E_{TC} = $E_T \cdot C = 30{,}1 \cdot 600 = 18060$ Nm/h

Me = $\frac{2E_T}{v^2} = \frac{2 \cdot 30{,}1}{2{,}43^{2a}} = 10{,}2$ Kg

The adequate shock absorber to use in this case is Mod. SA 2015 according to the technical data, where we find that E_T (max) = 59 Nm, E_{TC} (max) = 38000 Nm/h and Me (max) = 120 kg.

Example 7: Horizontal mass on conveyer

Application data:
m = 5 kg
v = 0,5 m/s
µ = 0,25
S = 0.006 m
C = 3000 cycles/h



Calculation:

$$E_K = \frac{mv^2}{2} = \frac{5 \cdot 0{,}5^2}{2} = 0{,}63 \text{ Nm}$$

E_D = F . S = m · g · µ · s = 5 · 9,81 · 0,25 · 0,006 = 0,07 Nm

E_T = E_K + E_D = 0,63 + 0,07 = 0,7 Nm

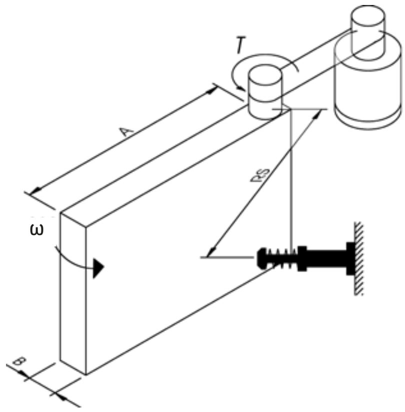
E_{TC} = E_T · C = 0,7 · 3000 = 2100 Nm/h

$$Me = \frac{2E_T}{v^2} = \frac{2 \cdot 07}{0{,}5^2} = 5{,}6 \text{ Kg}$$

The adequate shock absorber to use in this case is Mod. SA 0806 according to the technical data, where we find that E_T (max) = 3 Nm, E_{TC} (max) = 7000 Nm/h and Me (max) = 6 kg.

Example 8: Horizontal rotating door

Application data:
m = 20 kg
ω = 2,0 rad/s
T = 20 Nm
Rs = 0,8 m
A = 1,0 m
S = 0,015 m
C = 600 cycles/h



Calculation:

$$I = \frac{m\,(4A^2 + B^2)}{12} = \frac{20(4 \cdot 1{,}0^2 + 0{,}05^2)}{12} = 6{,}67 \text{ Kg} \cdot m^2$$

$$E_K = \frac{I\omega^2}{2} = \frac{6{,}67 \cdot 2{,}0^2}{2} = 13{,}34 \text{ Nm}$$

$$\theta = \frac{S}{Rs} = \frac{0{,}015}{0{,}8} = 0{,}019 \text{ rad}$$

E_D = T · θ = 20 · 0,018 = 0,36 Nm

E_T = E_K + E_D = 13,34 + 0,36 = 13,7 Nm

E_{TC} = E_T · C = 13,7 · 600 = 8220 Nm/h

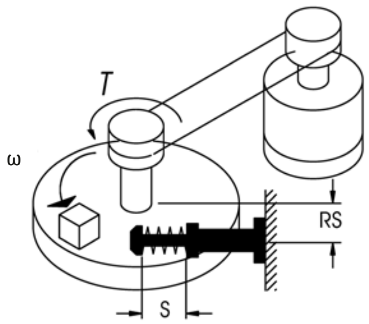
v = ω · Rs = 2,0 · 0,8 = 1,6 m/s

$$Me = \frac{2\,E_T}{v^2} = \frac{2 \cdot 13{,}7}{1{,}6^2} = 10{,}7 \text{ Kg}$$

The adequate shock absorber to use in this case is Mod. SA 1412 according to the technical data, where we find that E_T (max) = 20 Nm, E_{TC} (max) = 33000 Nm/h and Me (max) = 40 kg.

Example 9: Horizontal rotating door

Application data:
m = 200 kg
ω = 1,0 rad/s
T = 100 Nm
R = 0,5 m
Rs = 0,4 m
S = 0,015 m
C = 100 cycles/h



Calculation:

$$I = \frac{mR^2}{2} = \frac{200 \cdot 0{,}5^2}{2} = 25 \text{ Kg} \cdot m^2$$

$$E_K = \frac{I\omega^2}{2} = \frac{25 \cdot 1{,}0^2}{2} = 12{,}5 \text{ Nm}$$

$$\theta = \frac{S}{Rs} = \frac{0{,}015}{0{,}4} = 0{,}0375 \text{ rad}$$

E_D = T · θ = 100 · 0,0375 = 3,75 Nm

E_T = E_K + E_D = 12,5 + 3,75 = 16,25 Nm

E_{TC} = E_T · C = 16,25 · 100 = 1625 Nm/h

v = ω · Rs = 1,0 · 0,4 = 0,4 m/s

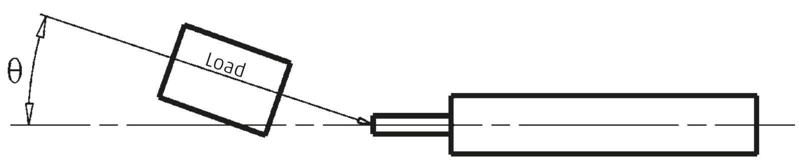
$$Me = \frac{2\,E_T}{v^2} = \frac{2 \cdot 16{,}25}{0{,}4^2} = 203 \text{ Kg}$$

The adequate shock absorber to use in this case is Mod. SA 2015 according to the technical data, where we find that E_T (max) = 59 Nm, E_{TC} (max) = 38000 Nm/h and Me (max) = 720 kg.

Perpendicularity of the load

To ensure the lifetime of the shock absorber, the movement of the impact body must be perpendicular to the shock absorbers axial centre.

Note: The maximum allowable eccentricity θ ≤ 2,5° (0,044 rad).



Quality: our priority commitment

Research, technological innovation, training, respect for personnel, employee and environmental safety and total customer care are all factors that Camozzi considers strategic in the achievement of quality.

To Camozzi quality is a system that ensures excellence, not only of the final product but throughout the entire business process.

Our certifications

Camozzi's main goals include quality and safety, the protection of the environment and compatibility of our activities with the territories in which they are performed.

Since 1993 Camozzi has been certified in accordance with the ISO 9001 standard for quality management. In 2003 the company obtained ISO 14001 certification for environmental management.

In the same year, DNV, the global quality assurance and risk management company, certified Camozzi's Integrated Management System, which includes both ISO 9001 and ISO 14001 standards. Furthermore, in 2013 Camozzi obtained ISO/TS 16949 certification for the Series C-Truck and Series 9000 fuel fittings, then transitioned to the new edition of the IATF 16949 standard in 2018.

From 1 July 2003, all products sold in the European Union and destined to be used in potentially explosive areas, had to be approved according directive 94/9/CE, also known as ATEX.

This directive covered both electrical and non-electrical parts, including for instance pneumatic power and control equipment.

Mandatory directives

- Directive 99/34/EC concerning liability for defective products modified by Legislative Decree 02/02/01 n° 25.
- Directive 2014/35/EU "Equipment designed for use within certain voltages".
- Directive 2014/30/EU "Electromagnetic Compatibility EMC" and relative additions.
- Directive 2014/34/EU "Atex".
- Directive 2006/42/EC "Machinery".
- Directive 2014/68/EU "Pressure Equipment Directive".
- Directive 2001/95/EC "General product safety".
- Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Technical standards

- ISO 4414 - Pneumatic fluid power - General rules and safety requirements for systems and their components

Environmental notes

- Packaging: we respect the environment, so use materials which can be recycled, including recyclable PE and paper.
- Green Design Project: in the study of new products, the environmental impact is always taken into consideration (real project, elaboration, etc.).

Information for the use of Camozzi products

In order to ensure proper functioning of Camozzi products these general guidelines should be noted.

Air quality

While resources such as electricity, water and gas are normally supplied by external companies to guaranteed standards, compressed air is produced from the ambient atmosphere. It is therefore the user that has to guarantee compressed air quality.

High quality air is essential for proper functioning of pneumatic systems. One cubic metre of air at atmospheric pressure typically contains the following:
- more than 150 million solid particles with dimensions from 0,01 µm to 100 µm,
- fumes due to combustion,
- water vapour, with volume depending on temperature; at 30° there are about 30 g/m³ of water
- oil, up to about 0,03 mg
- micro organisms
- plus a variety of chemical contaminants, odours etc ...

The further the air is compressed, the higher the air quantity in the same volume and therefore the higher the amount of contaminants.

In order to reduce unwanted contents, compressors are fitted with filters, driers and oil separators at the inlet and outlet.

In spite of these precautions, the air, during its passage along pipes and tubes or while in storage tanks, can collect contaminants such as flakes of rust. Further, water vapour contained in the air can cool down and liquefy, then absorb and retain oil fumes.

For this reason it is advisable to fit compressed air systems and pneumatic machinery with air treatment equipment.

Air treatment: classification according to ISO 8573-1-2010 standard

ISO 8573-1-2010 Class	Solid particles: Max. Number of Particles per m³ 0,1 - 0,5 µm	0,5 - 1 µm	1 - 5 µm	Max Concentration mg/m³	Water: Water pressure dew point °C	Liquid g/m³	Oil: Total content (liquid, aerosol and vapour) mg/m³
0	More strict than class 1, defined by the device user						
1	≤ 20,000	≤ 400	≤ 10	-	≤ - 70°	-	≤ 0,01
2	≤ 400,000	≤ 6,000	≤ 100	-	≤ - 40°	-	≤ 0,1
3	-	≤ 90,000	≤ 1,000	-	≤ - 20°	-	≤ 1
4	-	-	≤ 10,000	-	≤ + 3°	-	≤ 5
5	-	-	≤ 100,000	-	≤ + 7°	-	-
6	-	-	-	≤ 5	≤ + 10°	-	-
7	-	-	-	5 - 10	-	≤ 0,5	-
8	-	-	-	-	-	0,5 - 5	-
9	-	-	-	-	-	5 - 10	-
X	-	-	-	> 10	-	> 10	-

Different types of air treatment equipment have different functions: isolation valves, pressure regulators, soft-start valves and of course filters. In some applications lubricators are still used, but this is increasingly unusual. Regarding filtering, there are international standards, such as ISO 8573-1-2010, that classify air according to its quality.

ISO 8573-1-2010 classifies compressed air according to the presence of three contaminating categories: solid particles, water or water vapour, and concentration of micro mist or oil vapours. In general, if not specified otherwise in the characteristics of the single component, Camozzi products require an ISO 8573-1-2010 class 7-4-4 air quality.

- class 7 = air has a maximum concentration of SOLID PARTICLES of 5 mg/m³. The filtering elements are designed to separate solid particles with a dimension of more than 25 µm.
The air exiting from our filters and therefore the air at the inlet of all other components can contain solid particles with a maximum concentration of 5 mg/m3 and with a maximum dimension of 25 µm.

- class 4 = the compressed AIR temperature has to be ≤ 3°C in order for entrained water vapour to condense and become liquid.
Conventional filters have characteristics that separate the humidity in the air only if it is in a liquid or near-liquid state.
It is the cooling of the air that enables condensation and removal of water vapour.
The air flow entering the bowl of the filter sustains a minimum expansion phase, (according to the Gas Law when gas suddenly expands, its temperature drops) followed by a vortex, this enables the heavier particles and the water vapour (condensing due to the expansion) to adhere to the sides of the bowl and slide down towards the drain.
Except for specific versions, users of Camozzi filters have to install driers in their compressed air production systems that, by cooling the air, dehumidify it.

- class 4 = the concentration of OIL PARTICLES must be of maximum 5 mg/m³. It should be noted that compressors use oil for lubrication and that this can be carried into the compressed air system in the form of aerosol, vapour or liquid.
This oil, as with all other contaminants, can be transported by the air into the pneumatic circuit. It can then contact the seals of the components and subsequently pass into the environment through the outlets of the solenoid valves. In this case coalescing filters are used to aggregate those micro-molecules of oil suspended in the air and remove them.
The use of Camozzi coalescing filters enable to reach classes 2 and 1.
It is important to keep in mind that best performance is reached only by means of a multi-phase filtering process with subsequent phases.
As illustrated, different filters have different characteristics - a very efficient filter for a certain contaminant may not be so effective for other contaminants.

The filtering elements determine the class of the filters, these elements should be replaced after a specified period or after a specified number of working hours. These parameters vary according to the characteristics of the incoming air.

Camozzi filters are subdivided into different groups:
- Filtering element of 25 µm, class 7-8-4
- Filtering element of 5 µm, class 6-8-4
- Filtering element of 1 µm, class 2-8-2 with pre-filter class 6-8-4
- Filtering element of 0,01 µm, class 1-8-1 with pre-filter class 6-8-4 residual oil content of 0,01 mg/m³
- Activated carbon, class 1-7-1 with pre-filter class 1-8-1 residual oil content of 0,003 mg/m³

The components are factory greased with special products and do not need an additional lubrication. In case it should be necessary, use ISO VG 32 oil. The quantity of oil introduced into the circuit depends on the applications. Camozzi suggests a maximum dosage of three drops per minute.

Pneumatic cylinders

The choice of the correct cylinder mounting and also that of the rod attachment to any moving parts, are as important as the control of parameters relating to speed, mass and radial loads.
The control of these parameters has to be guaranteed by the user.
The location of position sensors (reed switches), and their switching response times to magnetic fields, is dependent upon the type and bore size of the cylinder and the appropriate precautions need to be taken when fixing these items. (see notes on the pages about sensors).

We do not advise the use of a cylinder as a shock absorber or for pneumatic cushioning. If used at the maximum speed, we recommend gradual deceleration to avoid a violent impact between piston and the cylinder end cover.
As a general value, we calculate a maximum average speed of 1 m/sec.
In this case no lubrication is required as the lubrication introduced during assembly is sufficient to guarantee good operation.
If faster speeds are required, we suggest lubrication in the quantities described above.

Directive ATEX 2014/34/EU: Products classified for the use in potentially explosive atmospheres

ATEX 2014/34/EU

Since 19 April 2016 all products which are sold in the European Union and destined to be used in **potentially explosive atmospheres** have had to be approved according to new Directive 2014/34/EU, also known as ATEX. This Directive applies to both electrical and non-electric items, such as pneumatic drives.

Main changes introduced by Directive 2014/34/EU:

- Non-electric apparatus and devices, such as pneumatic cylinders, have to comply with the Directive.
- Equipment is classified into different categories, which identifies the potentially explosive zones in which they may be used.
- The products are identified with the CE mark Ex.
- The instructions for use and the declarations of conformity should be supplied with each product that is to be used in potentially explosive zones.
- The Directive applies to products intended to be used in zones that are potentially explosive due to the presence of dust as well as to zones where potentially explosive gases may be present.
  A potentially explosive atmosphere could be composed of gas, mist, steam or dust, which may be present constantly, intermittently or created by processes conducted within the zone. An explosion can occur when there are one or more inflammable substances plus an ignition source present.

An ignition source could be:

- Electrical (electric arcs, induced current, heat generated by the Joule effect, i.e. heat created when an electric current flows through a resistance.)
- Mechanical (heat between surfaces caused by friction, sparks generated by the collision of metallic bodies, electrostatic discharges, adiabatic compression, i.e. compression of an atmosphere causing a temperature rise)
- Chemical (exothermic reactions between materials)
- Naked flames. The products which are subject to approval are those which, during their normal use or because of a malfunction, present one or more ignition sources within a potentially explosive atmosphere.

The manufacturer has to guarantee that the product conforms to the declarations and carries the appropriate markings. Moreover, the product should always be accompanied by the appropriate instructions.

The maker and/or user of the equipment should identify the risk zone(s), as defined by Directive 99/92/CE, in which the products are to be used and ensure all instructions are followed.

In the case where a product is made up of two or more components with different markings, the component which is classified in the lowest category defines the class to which the complete product belongs.

Example:
solenoid suitable for Category 3 marked ...
Ex - II 3 Ex...

and valve suitable for Category 2 ...
Ex - II 2 Ex...

The valve unit with solenoid can be used only in Category 3 or Zone 2/22.

Zones, groups and categories

In the places and for the types of equipment subject to Directive 99/92/CE, the user should identify the classification of the zones in relation to the danger of the creation of explosive atmospheres because of the presence of gas or dust.

Apparatus and equipment for the use in potentially explosive zones are divided in groups:

Group I > apparatus used in mines

Group II > apparatus used in installations above ground

Group I: Apparatus used in mines

CATEGORY M1
Functioning in explosive atmospheres

CATEGORY M2
Non-supplied equipment in explosive atmospheres

Group II: Apparatus for installations above ground

Product category	Gas	Dust
1	Zone 0	Zone 20
2	Zone 1	Zone 21
3	Zone 2	Zone 22

Classification of zones according to Directive 99/92/CE

Category 1	Zone 0 -	Area in which (permanently, for long periods or often) an explosive atmosphere is present, consisting of a mixture of air and inflammables in the form of gas, vapour or mist.
	Zone 20 -	Area in which (permanently, for long periods or often) an explosive atmosphere is present in the form of a dust/powder cloud which is combustible in air.
Category 2	Zone 1 -	Area in which, during normal activities, the formation of an explosive atmosphere is probable, consisting of a mixture of air and inflammables in the form of gas, vapours or mist.
	Zone 21 -	Area in which occasionally during normal activities the formation of an explosive atmosphere is probable, in the form of a dust cloud which is combustible in air.
Category 3	Zone 2 -	Area in which, during normal activities, the formation of an explosive atmosphere, consisting of a mixture of air and inflammables in the form of gas, vapour or mist is not probable and, whenever this should occur, it is only of a short duration.
	Zone 22 -	Area in which, during normal activities, the formation of an explosive atmosphere in the form of a combustible dust cloud is not probable and, whenever this should occur, it is only of a short duration.

Example of Marking: Ex II 2 GD c T100°C (T5) -20°C≤Ta≤60°C

II	II Group: Devices which are to be used in spaces exposed to risks of an explosive atmosphere, different from underground spaces, mines, tunnels, etc., classified according to the criteria in Annex I of the Directive 2014/34/EU (ATEX).
2	Category: Devices designed to function in compliance with the operational parameters determined by the manufacturer and guarantee a high protection level.
GD	Qualification gas and dusts: Protected against gas (G) and explosive dusts (D).
c	Non-electrical devices: Non-electrical devices for potentially explosive atmospheres. Protection through constructive security.
T 100°C	Max. temperature for components for dusts: Max. superf. temp. of 100°C regarding potential hazards resulting from striking within the vicinity of hazardous dusts.
T5	Max. temperature for components for gas: Max. superf. temp. of 100°C regarding potential hazards which may result from striking within gas environments.
Ta	Environmental temperature: **-20°C≤Ta≤60°C.** Environmental temperature range (with dry air)

Group I: Temperature classes

Temperature = 150°C or = 450°C according to the level of dust on the apparatus.

Group II: Temperature classes

Temp. classes for gas (G)	Admissible surface temperatures
T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

ATEX certified Camozzi products

APPARATUS classified as ATEX Group II

Cylinders

Series	Category	Zone	Gas/Dust
16*	2 DE-3 SE	1/21 DE -2/22 SE	G/D
24*	2 DE-3 SE	1/21 DE-2/22SE	G/D
25*	2 DE-3 SE	1/21 DE-2/22SE	G/D
31-32	2 DE-3 SE	1/21DE-2/22SE	G/D
31-32 Tandem/multi-position	2 DE	1/21 DE	G/D
40*	2 DE	1/21 DE	G/D
41*	2 DE	1/21 DE	G/D
60*	2 DE-3 SE	1/21 DE-2/22 SE	G/D
61*	2 DE-3 SE	1/21 DE-2/22 SE	G/D
62*	2 DE	1/21 DE	G/D
63*	2 DE-3 SE	1/21 DE-2/22 SE	G/D
27	2 DE	1/21 DE	G/D
QP-QPR	2 DE-3 SE	1/21 DE-2/22 SE	G/D
QN	3 SE	2/22 SE	G/D
42	2 DE-3 SE	1/21 DE-2/22 SE	G/D
ARP	2	1/21	G/D
QCT-QCB-QXT-QXB	2	1/21	G/D

Proximity switches

Series	Category	Zone	Gas/Dust
CSH/CST/CSV	3	2/22	G/D
CSG	3	2/22	G/D

Valves

Series	Category	Zone	Gas/Dust
P	3	2/22	G/D
W	3	2/22	G/D
Y	3	2/22	G/D

Solenoids

Series	Category	Zone	Gas/Dust
U70	3	2/22	G/D
H80I**	2	1/21	G/D

Pressure switches

Series	Category	Zone	Gas/Dust
PM 11**	1	0/20	G/D

Freely installable **COMPONENTS** classified as ATEX Group II

Products	Category	Zone	Gas/Dust
Silencers	2	1/21	G/D
Quick release couplings	2	1/21	G/D
Manifolds	2	1/21	G/D
Sub-bases	2	1/21	G/D
Feet	2	1/21	G/D
Caps	2	1/21	G/D
Plates	2	1/21	G/D

Valves

Series	Category	Zone	Gas/Dust
9#*	2	1/21	G/D
A#	2	1/21	G/D
2	2	1/21	G/D
3#	2	1/21	G/D
4#	2	1/21	G/D
NA (NAMUR) #	2	1/21	G/D
E (pneumatic)	2	1/21	G/D

FRL

Series	Category	Zone	Gas/Dust
MC#	2	1/21	G/D
N	2	1/21	G/D
MX#	2	1/21	G/D
T	2	1/21	G/D
CLR	2	1/21	G/D
M	2	1/21	G/D
MD#	2	1/21	G/D

* According to ISO standard
** Products with ATEX and IECEX certification
# Without solenoid

» The order code number of the certified products is obtained by adding "EX" to the standard article number
Es. 358-015 standard solenoid valve
Es. 358-015EX ATEX certified solenoid valve

Accessories available in Category 2 Zone 1/21: couplings, junctions, brackets, piston rod nuts, nuts, counter brackets, bushings, pins, clevis pins, caps, gaskets, diaphragm, sub-bases, plates, feet, hand operated valves, flow valves, flanges, screw, tie rods, automatic and blocking valves, silencers and pressure gauge, connector kits, clamps, rapid and super rapid push-in fittings, hoses, sealing rings, locking nuts. Accessories available in Category 3, Zone 2/22: adaptors, slot covers, extensions, connectors. For more information on this kind of products see the website:
http://catalogue.camozzi.com within the section: Downloads > Certifications > ATEX Directive 2014/34/EU > List of products excluded from the directive 2014/34/EU ATEX.

Camozzi around the world

Camozzi Automation S.p.A.
Società Unipersonale
Via Eritrea, 20/I
25126 Brescia
Italia
Tel. +39 030/37921
Fax +39 030/2400464
info@camozzi.com
www.camozzi.com

Camozzi Neumatica S.A.
Polo Industrial Ezeiza,
Puente del Inca 2450,
B1812IDX, Carlos Spegazzini, Ezeiza
Provincia de Buenos Aires
Argentina
Tel. +54 11/52639399
info@camozzi.com.ar
www.camozzi.com.ar

Camozzi Automation GmbH
Löfflerweg 18
A-6060 Hall in Tirol
Austria
Tel. +43 5223/52888-0
Fax +43 5223/52888-500
info@camozzi.at
www.camozzi.at

Camozzi Pneumatic
66-1, Perehodnaya str.,
220070, Minsk
Belarus
Tel. +375 17/3961170 (71)
Fax +375 17/3961170 (71)
info@camozzi.by
www.camozzi.by

Camozzi do Brasil Ltda.
Rod. Adauto Campo Dall'Orto, 2.200
Condomínio Techville
CEP 13178-440 Sumaré S.P.
Brazil
Tel. +55 19/21374500
sac@camozzi.com.br
www.camozzi.com.br

Shanghai Camozzi Automation Control Co, Ltd.
717 Shuang Dan Road, Malu
Shanghai - 201801
China
Tel. +86 21/59100999
Fax +86 21/59100333
info@camozzi.com.cn
www.camozzi.com.cn

Camozzi S.r.o.
V Chotejně 700/7
Praha - 102 00
Czech Republic
Tel. +420 272/690 994
Fax +420 272/700 485
info@camozzi.cz
www.camozzi.cz

Camozzi Automation ApS
Metalvej 7 F
4000 Roskilde
Denmark
Tel. +45 46/750202
info@camozzi.dk
www.camozzi.dk

Camozzi Automation OÜ
Osmussaare 8
13811 Tallinn
Estonia
Tel. +372 6119055
Fax +372 6119055
info@camozzi.ee
www.camozzi.ee

Camozzi Automation Sarl
5, Rue Louis Gattefossé
Parc de la Bandonniére
69800 Saint-Priest
France
Tel. +33 (0)478/213408
Fax +33 (0)472/280136
info@camozzi.fr
www.camozzi.fr

Camozzi Automation GmbH
Porschestraße 1
D-73095 Albershausen
Germany
Tel. +49 7161/91010-0
Fax +49 7161/91010-99
info@camozzi.de
www.camozzi.de

Camozzi India Private Limited
D-44, Hosiery Complex,
Phase II Extension,
Noida - 201 305
Uttar Pradesh
India
Tel. +91 120/4055252
Fax +91 120/4055200
info@camozzi-india.com
www.camozzi.in

Camozzi Pneumatic Kazakhstan LLP
Shevchenko/Radostovets,
165b/72g, off. 615
050009 Almaty
Kazakhstan
Tel. +7 727/3335334 - 3236250
Fax +7 727/2377716 (17)
info@camozzi.kz
www.camozzi.kz

Camozzi Malaysia SDN. BHD.
30 & 32, Jalan Industri USJ 1/3
Taman Perindustrian USJ 1
47600 Subang Jaya
Selangor
Malaysia
Tel. +60 3/80238400
Fax +60 3/80235626
cammal@camozzi.com.my
www.camozzi.com.my

Camozzi Neumatica de Mexico S.A. de C.V.
Lago Tanganica 707
Col. Ocho Cedros 2ª sección
50170 Toluca
México
Tel. +52 722/2707880 - 2126283
Fax +52 722/2707860
camozzi@camozzi.com.mx
www.camozzi.com.mx

Camozzi Automation AS
Verkstedveien 8
1400 Ski
Norway
Tel. +47 40644920
info@camozzi.no
www.camozzi.no

Camozzi Pneumatic LLC
Chasnikovo,
Solnechnogorskiy District
Moscow 141592
Russian Federation
Tel. +7 495/786 65 85
Fax +7 495/786 65 85
info@camozzi.ru
www.camozzi.ru

Camozzi Iberica SL
Avda. Altos Hornos de Vizcaya, 33, L-2
48901 Barakaldo - Vizcaya
Spain
Tel. +34 946 558 958
info@camozzi.es
www.camozzi.com

Camozzi Automation AB
Bronsyxegatan 7
213 75 Malmö
Sweden
Tel. +46 40/6005800
info@camozzi.se
www.camozzi.se

Camozzi Automation B.V.
De Vijf Boeken 1 A
2911 BL Nieuwerkerk a/d IJssel
The Netherlands
Tel. +31 180/316677
info@camozzi.nl
www.camozzi.nl

LLC Camozzi
Kirillovskaya Str, 1-3, section "D"
Kiev - 04080
Ukraine
Tel. +38 044/5369520
Fax +38 044/5369520
info@camozzi.ua
www.camozzi.ua

Camozzi Automation Ltd.
The Fluid Power Centre
Watling Street
Nuneaton, Warwickshire
CV11 6BQ
United Kingdom
Tel. +44 (0)24/76374114
Fax +44 (0)24/76347520
info@camozzi.co.uk
www.camozzi.co.uk

Camozzi Automation, Inc.
Street address:
2160 Redbud Boulevard, Suite 101
McKinney, TX 75069-8252
Remittances:
P.O. Box 678518
Dallas, TX 75267-8518
USA
Tel. +1 972/5488885
Fax +1 972/5482110
info@camozzi-usa.com
www.camozzi-usa.com

Camozzi Venezuela S.A.
Calle 146 con Av. 62
N°146-180
P.O. Box 529
Zona Industrial Maracaibo
Edo. Zulia
Venezuela
Tel. +58 261/4116267
info@camozzi.com.ve
www.camozzi.com.ve

Camozzi R.O.
in Hochiminh City
6th Floor, Master Building,
155 Hai Ba Trung St.,
Ward 6, District 3
Hochiminh City
Vietnam
Tel. +84 8/54477588
Fax +84 8/54477877
bhthien@camozzi.com.vn
www.camozzi.com.vn

Camozzi distributors around the world

Europe

ZULEX d.o.o.
Safeta Zajke 115b
Sarajevo
Bosnia-Herzegovina
Tel. +387 33/776580
Fax +387 33/776583
zulex@bih.net.ba
www.zulex.com.ba

L.D. GmbH
Blvd Asen
Yordanov 5
1592 Sofia
Bulgaria
Tel. +359 2/9269011
Fax +359 2/9269025
camozzi@ld-gmbh.com
www.ld-gmbh.com

Bibus Zagreb d.o.o.
Anina 91
HR 10000 Zagreb
Croatia
Tel. +385 1/3818004
Fax +385 1/3818005
bibus@bibus.hr
www.bibus.hr

TS Hydropower Ltd.
Industrial Area N°64
Aglanzia 21-03
Nicosia
Cyprus
Tel. +357 22/332085
Fax +357 22/338608
tshydro@cytanet.com.cy

AVS-Yhtiöt Oy
Rusthollarinkatu 8
02270 Espoo
Finland
Tel. +358 10/6137100
Fax +358 10/6137701
info@avs-yhtiot.fi
www.avs-yhtiot.fi

TECHNOMATIC Group IKE
Esopou str, Kalochori Industrial Park
57009, Thessaloniki
Greece
Tel. +30 2310/752773
Fax +30 2310/778732
info@technomaticgroup.gr
www.technomaticgroup.gr

Tech-Con Hungária Kft
Véső u. 9-11 (entrance: Süllő u. 8.)
1133 Budapest
Hungary
Tel. +36 1/412 4161
Fax +36 1/412 4171
tech-con@tech-con.hu
www.tech-con.hu

Loft & Raftæki
Hjallabrekka 1
200 Kópavogur
Iceland
Tel. +354 564/3000
Fax +354 564/0030
loft@loft.is
www.loft.is

DBF TECHNIC SIA
Bauskas iela 20 - 302
1004 Riga
Latvia
Tel. +371 296 26916
Fax +371 6 7808650
info@pneimatika.lv
www.pneimatika.lv

Hidroteka Engineering UAB
Chemijos 29E
LT-51333 Kaunas
Lithuania
Tel. +370 37/452969
Fax +370 37/760500
hidroteka@hidroteka.lt
www.hidroteka.lt

Rayair Automation Ltd.
KW23G - Corradino Ind. Estate
Paola, PLA3000
Malta
Tel. +356 21/672497
Fax +356 21/805181
sales@rayair-automation.com
www.rayair-automation.com

Bibus Menos Sp. z o.o.
ul. Spadochroniarzy 18
80-298 Gdańsk
Poland
Tel. +48 58/6609570
Fax +48 58/6617132
info@bibusmenos.pl
www.bibusmenos.pl

Experts d.o.o.
Mitropolit Teodosij Gologanov, 149
MK-1000 Skopje
Rep. of Macedonia
Tel. +389 2/3081970
experts@t.mk
www.experts.com.mk

Tech-Con Industry S.r.l.
Calea Crângasi N°60
Sector 6, 060346 Bucharest
Romania
Tel. +40 21/2219640
Fax +40 21/2219766
automatizari@tech-congroup.com
www.tech-con.ro

Tech-Con d.o.o. Beograd
Cara Dušana 205a
11080 Zemun - Belgrade
Serbia
Tel. +381 11/4142790
Fax +381 11/3166760
office.belgrade@tech-congroup.com
www.tech-con.rs

STAF Automation, s.r.o.
Kostiviarska 4944/5
974 01 Banská Bystrica
Slovakia
Tel. +421 48/4722777
Fax +421 48/4722755
staf@staf.sk
www.staf.sk

KOVIMEX d.o.o.
Podskrajnik 60,
SI-1380 Cerknica
Slovenia
Tel. +386 1/7096430
Fax +386 1/7051930
kovimex@kovimex.si
www.kovimex.com

BIBUS AG
Allmendstrasse 26
CH-8320 Fehraltorf
Switzerland
Tel. +41 44/8775011
Fax +41 44/8775019
info.bag@bibus.ch
www.bibus.ch

Hidrel Hidrolik Elemanlar San. Ve Tic. A.Ş.
Percemli Sok. No:7 Tunel Mevkii
34420 Karakoy Istanbul
Turkey
Tel. +90 212 251 73 18 - 249 48 81
Fax +90 212 292 08 50
info@hidrel.com.tr
www.hidrel.com.tr

>>

Camozzi distributors around the world

America

LEVCORP S.A.
Av. Roma No. 7447
Zona Obrajes
La Paz
Bolivia
Tel. +591 2 2815658
Fax +591 2 2815695
info@levcorp.bo
www.levcorp.bo

NOMADA Ltda
Panamericana Norte 2998 unidad 3036
Renca - Santiago
Chile
Tel. +56 2 2904 0032
ventas@nomadachile.com
www.nomadachile.com

Eurotécnica de Costa Rica AYM, S.A.
150 m oeste del cruce de Llorente,
hacia Epa Tibás
Costa Rica
Tel. +506 2241/4242 - 4230
Fax +506 2241/4272
eurotecnica@eurotecnicacr.com
www.eurotecnicacr.com

Fluidica Cia. Ltda.
Abelardo Moncayo Oe4-08 y Av. América
Quito, Pichincha
Ecuador
Tel. +593 2/2440848 - 2/5102004 -
2/2254773
Fax +593 2/2440848
info@fluidica-ec.com
www.fluidica-ec.com

Aplitec S.A. de C.V.
75 Av. Nte,
Residencial Escalon Norte II
Pje KL #3-C
San Salvador
El Salvador
Tel. +503 2557/2666
Fax +503 2557/2652
info@aplitecsv.com
www.aplitecsv.com

Isotex de Panamá,S.A.
Plaza El Conquistador, Local #45
Vía Tocúmen, Panamá City
Panamá
Tel. +507 217-0050
Fax +507 217-0049
info@isotexpty.com

Eicepak S.A.C.
Av. Los Cipreses N° 484 Los Ficus
Santa Anita - Lima
Perù
Tel. +51 1/3628484 - 3627127
- 3628698
ventas1@eicepak.com
www.eicepak.com

LT Industrial, SRL
Ave. Charles Summer #53, suite 24B
Plaza Charles Summer
Santo Domingo, Los Prados
Repubblica Dominicana
Tel. +1809-623-5156
Fax +1829-956-7205
info@ltindustrialrd.com

Cocles S.A.
BVAR Artigas 4543 P.O. Box 11800
Montevideo
Uruguay
Telefax +598 22030307/22006428/
22090446
cocles@adinet.com.uy
www.cocles.com.uy

Middle East

Compressed Air Technology Co.Saa
Cairo-Alexandria Desert Road Kilo 28
Behind Gas Station Emirates
Abu Rawash
Egypt
Tel. +20 35391986/35391987/35391985
Fax +20 35391990
neveen@elhaggarmisr.com
info@elhaggarmisr.com
www.elhaggarmisr.com

Automation Yeruham & Co.
34, Hahofer st.
PO Box 1844 Length 5811702 Holon
Israel
Tel. +972 73/2606401
Fax +972 3/5596616
office@ayeruham.com
www.ayeruham.com

Raymond Feghali Co.
For Trade & Industry SARL
Roumieh industrial zone - Lebanon
P.O. BOX 90-723 Jdeideh
Lebanon
Tel. +961 1/893176 - 3/660287
Fax +961 1/879500
info@raymondfeghalico.com
www.raymondfeghalico.com

Techno-Line Trading & Services WLL
Ware House 05, Building 2189
Road 1529, Block 115
Hidd
Kingdom of Bahrain
Tel. +973 17783906
Fax +973 17786906
techline@batelco.com.bh
sales@technoline.me

AL-Maram National Co. For Buildings
General Contracting W.L.L.
Shuwaikh Industrial Area Pl. Shop No. 9
Shuwaikh
Kuwait
Tel./Fax +965 24828108
Cell. +965 65615386
almaramkuwait@gmail.com
www.almaramgtc.com

Al-Hawaiya for Industrial Solutions Co.
(ALHA)
Kilo - 3, Makkah Road
P.O. Box 11429
Jeddah 21453
Saudi Arabia
Tel. +966 12/6576874
Fax +966 12/6885061
info@alha.com.sa
www.alha.com.sa

I.M.O.
Industrial Machine Trd. Co. L.L.C.
P.O. Box 20376
Sharjah
United Arab Emirates
Tel. +971 6/5437991 - 6/5437992
Fax +971 6/5437994
imo@eim.ae

Asia

PT. Golden Archy Sakti
Kompleks Prima Centre Blok B2 No.2
Jl.Pool PPD - Pesing Poglar No.11,
Kedaung Kali Angke - Cengkareng,
Jakarta Barat 11710
Indonesia
Tel. +62 21/54377888
Fax +62 21/54377089
sales@archy.co.id
www.archy.co.id

Seika Corporation
Aqua Dojima East Bldg.
16F, 4-4, 1-Chome, Dojimahama,
Kita-Ku Osaka
Japan
Tel. +81 6/63453175
Fax +81 6/63443584
konof@jp.seika.com

Polytechnic Automation
Suite 604, 6th Floor, K. S.
Trade Tower,
New Challi,
Shahrah-e-Liaquat,
Karachi - 74000,
Pakistan
Tel. +9221 32426612
Fax +9221 32426188
polytech_ent@yahoo.com

Exceltec Automation Inc.
608-G, EL-AL Building,
Quezon Avenue, Tatalon
Quezon City, 1113
Philippines
Tel. +632/4161143 - 4161141
- 731 9015
Fax +632/7121672
sales.manila@exltec.com

Exceltec Enviro Pte Ltd
Block 3025 Ubi Road 3
03-141
408653
Singapore
Tel. +65/67436083
Fax +65/67439286
sales@exltec.com

Taewon-AP
Geomdanbuk-ro 40-gil, Buk-gu
Daegu 41511
South Korea
Tel. +82 53 384 1058
Fax +82 53 384 1057
info@taewon-ap.com
www.taewon-ap.com

Korea Flutech Co. Ltd
No15-4, 101-gil Palgong-ro, Dong-gu,
Daegu, 41005
South Korea
Tel. +82 53 213 9090
Fax +82 53 353 5997
info@kflutech.com
www.kflutech.com

Savikma Automation & Engineering Services (Pvt) Ltd.
22, Wattegedara Road
Maharagama
Sri Lanka
Tel. +94 115642164
Hot line +94 777800070
Fax +94 112844777
saes@sltnet.lk

Zenith Automation International Co., Ltd.
1F., No.9, Aly. 1, Ln. 5,
Sec. 3, Ren'ai Rd.,
Da'an Dist., Taipei City 10651
Taiwan (R.O.C.)
Tel. +886 2/2781 1267
Fax +886 2/3322 8973
zaisales@z-auto.com.tw
www.z-auto.com.tw

Pneumax Co. Ltd.
107/1 Chaloem Phrakiat R.9 Rd.,
Pravet - Bangkok 10250
Thailand
Tel. +66 2/7268000
Fax +66 2/7268260
import@pneumax.co.th
www.pneumax.co.th

Africa

Boudissa Technology Sarl
25, Cité 20 Août 1955
Oued Roumane El Achour
Algiers - 16403
Algeria
Tel./Fax +213 (0) 23316751
Tel./Fax +213 (0) 23316733
contact@boudissatech.com
www.boudissatech.com

DISMATEC
Distribution de Materiels Techniques
N° RCCM-CI-ABJ-2010B1882
16 BP 236 ABIDJAN 16
Ivory Coast
Tel. +225 21267091
Fax +225 21262367
dismatec2002@yahoo.fr

Hydramatics Control Equipment
15 Village Crescent,
Linbro Business Park,
Sandton Johannesburg 2065
South Africa
Tel. +2711/6081340 - 1 - 2
Fax +2786/5516311
sales@hydramatics.co.za
www.hydramatics.co.za

A.T.C. Automatisme
Avenue Habib Bourguiba
Centra Said - BP 25 2033
Megrine
Tunisia
Tel. +216 71/297328
Fax +216 71/429084
commercial@atc-automatisme.com
www.atc-automatisme.com

Oceania

Griffiths Components Pty Ltd
605 Burwood Hwy
Knoxfield Victoria
Melbourne 3180
Australia
Tel. +61 3/9800 6500
Fax +61 3/9801 8553
enquiry@camozzi.com.au