MORIS
Macchine Oleodinamiche
Riduttori Impianti Speciali

Chapter 5

TELESCOPIC PISTONS

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Enclosed with this handbook and related production.

DRAWING	DESCRIPTION
9600/51	Table to determine the rates of pressure – speed – pump – motor relative to ram type and load (Telescopic pistons with two extractors)
9600/52	Table to determine the rates of pressure – speed – pump – motor relative to ram type and load (Telescopic pistons with three extractors)
9601	Choice of the piston type and of the power unit
9602	Diagram of the peak loads guideless telescopic pistons with two extractors (Overpressure factor 1.4)
9602/10	Diagram of the peak loads guideless telescopic pistons with two extractors – Type: 46/2 – 60/2 – 78/2 – 85/2 (Overpressure factor 1.4)
9602/20	Diagram of the peak loads guideless telescopic pistons with two extractors – Type: 103/2 – 120/2 – 14/2 – 170/2 – 205/2) (Overpressure factor 1.4)
9603	Diagram of the peak loads guideless telescopic pistons with three extractors (Overpressure factor1.4)
9603/10	Diagram of the peak loads guideless telescopic pistons with three extractors – Type: 58/3 – 75/3 – 98/3 – 107/3) (Overpressure factor 1.4)
9603/20	Diagram of the peak loads guideless telescopic pistons with three extractors – Type: 127/3 – 150/3 – 176/3 (Overpressure factor 1.4)

SERIES 9000

9604	Synchronous telescopic pistons (Two/Three extracting elements lateral/central type
9604/5	Dimensions and calculation data telescopic piston 77/2
9605	Calculation data for telescopic pistons with two extracting elements (Overpressure factor 1.4)
9607	Calculation data for telescopic pistons with three extracting elements (Overpressure factor 1.4)
9607/5	Dimensions and calculation data telescopic piston 77/2
9608	Guided synchronous telescopic pistons - Brackets for guide arms fastening to the piston heads
9609	Synckronous telescopic pistons – Subdivion of the overstroke
9620/1	Changing sealing elements in telescopic pistons
9620/2	Changing sealing elements in telescopic pistons
9620/3	Changing sealing elements in telescopic pistons
9620/4	Changing sealing elements in telescopic pistons
9620/5	Changing sealing elements in telescopic pistons
9620/6	Changing sealing elements in telescopic pistons (Telescopic pistons with two extractors)
9620/7	Changing sealing elements in telescopic pistons (Telescopic pistons with three extractors)
9620/8	Changing sealing elements in telescopic pistons

SERIES “H”

DRAWING	DESCRIPTION
HL/9017	Table to determine the rates of pressure – speed – pump – motor relative to ram type and load (Telescopic piston with two extractors)
HL 09.01 (1/10)	Telescopic jacks selection
HL 09.02 (1/3)	Procedure bleeding, re-synchronization and test
HL 09.03 (1/4)	Seals substitution

9600/51-IN

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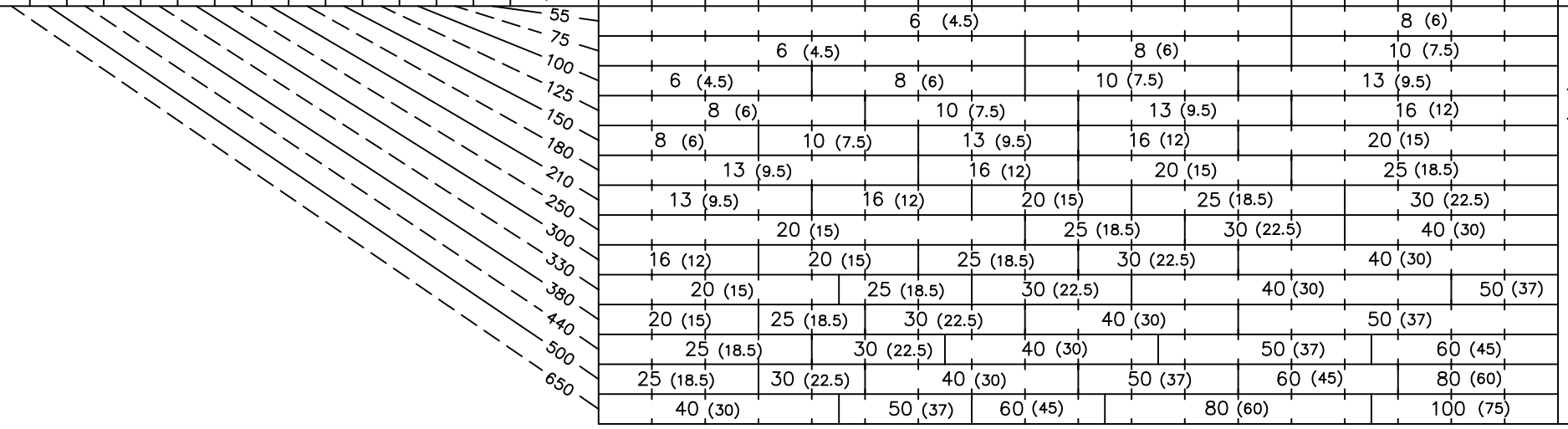
TABLE TO DETERMINE THE RATES OF: PRESSURE – SPEED – PUMP – MOTOR RELATIVE TO RAM TYPE AND LOAD (TELESCOPIC PISTONS WITH TWO EXTRACTORS)

DATE 01/04

DWG.N. 9600/51

SPEED OF RAM IN UPWARD DIRECTION M/SEC (AVERAGE LOAD)

PUMP L/1'														RAM TYPE	STATIC PRESSURE IN BARS																			TOTAL LOAD (USEFUL LOAD + CAR + CAR FRAME + ACC. = kg)
650	500	440	380	330	300	250	210	180	150	125	100	75	55		12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	37 38	39 40	41 42	43 44	45 46	
										1.18	0.94	0.70	0.52	46/2	155	191	227	262	297	331	365	400	434	470	503	539	571	606	640	677	–	–	
														46/2–G1	131	170	207	244	280	316	351	387	422	457	491	527	560	597	631	–	–	–	
									1.02	0.85	0.71	0.57	0.42	0.30	60/2	253	317	379	441	502	563	623	682	740	801	861	918	976	1035	1092	1155	1210	–	
														60/2–G1	184	257	325	391	456	519	581	643	704	764	824	886	944	1005	1066	1125	1185	–	
				1.11	1.01	0.85	0.71	0.61	0.49	0.42	0.32	0.26	0.18	77/2	424	529	633	734	834	935	1035	1135	1231	1330	1430	1523	1626	1718	1819	1911	2012	–	
														77/2–G1	298	422	536	646	753	859	963	1064	1166	1268	1367	1469	1566	1668	1765	1862	1963	2061	
			1.06	0.92	0.84	0.72	0.60	0.51	0.41	0.35	0.29	0.20	0.14	85/2	445	579	707	834	958	1081	1203	1323	1444	1566	1684	1803	1921	2042	2159	2277	2395	–	
														85/2–G1	189	365	520	664	802	936	1067	1195	1321	1445	1570	1694	1814	1939	2059	2181	2300	–	
1.26	0.97	0.87	0.74	0.62	0.57	0.49	0.41	0.35	0.29	0.24	0.19	0.13		103/2	734	921	1104	1282	1460	1640	1815	1990	2164	2333	2507	2682	2850	3024	3193	3364	–	–	
														103/2–G1	492	715	921	1118	1309	1495	1679	1860	2039	2219	2395	2574	2749	2921	3099	3274	3446	–	
0.96	0.73	0.64	0.55	0.47	0.43	0.36	0.31	0.26	0.21	0.18	0.15			120/2	1026	1281	1532	1778	2023	2263	2506	2744	2984	3219	3454	3693	3935	4164	4400	4642	–	–	
														120/2–G1	727	1027	1305	1573	1833	2087	2338	2586	2832	3076	3320	3560	3802	4042	4284	4517	–	–	
0.69	0.53	0.46	0.39	0.33	0.30	0.26	0.22	0.18	0.15	0.12				141/2	1270	1636	1993	2343	2687	3030	3369	3705	4037	4372	4706	5031	5364	5690	6016	6353	6670	6992	
														141/2–G1	537	1044	1479	1881	2265	2634	2998	3354	3706	4052	4397	4739	5076	5413	5754	6086	6422	6757	
0.46	0.35	0.31	0.27	0.24	0.22	0.18	0.14	0.12	0.10					170/2	2174	2673	3163	3648	4134	4608	5089	5566	6035	6509	6977	7447	7912	8382	8853	–	–	–	
														170/2–G1	1680	2244	2782	3299	3806	4306	4798	5287	5774	6258	6739	7216	7689	8167	8645	–	–	–	
0.32	0.24	0.21	0.19	0.15	0.14	0.12	0.09	0.08						205/2	3190	3919	4638	5346	6045	6749	7444	8143	8828	9511	10197	10893	11571	12262	12938	13613	–	–	
														205/2–G1	2488	3313	4094	4848	5589	6315	7039	7748	8457	9163	9867	10565	11253	11956	12641	13339	–	–	



THE WEIGHT INDICATED IN THIS TABLE HAS BEEN CALCULATED CONSIDERING THE RODS WEIGHT FOR A MAXIMUM STROKE (SEE DWG. 9602/... 9603/...)

9600/52-IN

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TABLE TO DETERMINE THE RATES OF: PRESSURE - SPEED - PUMP - MOTOR RELATIVE TO RAM TYPE AND LOAD

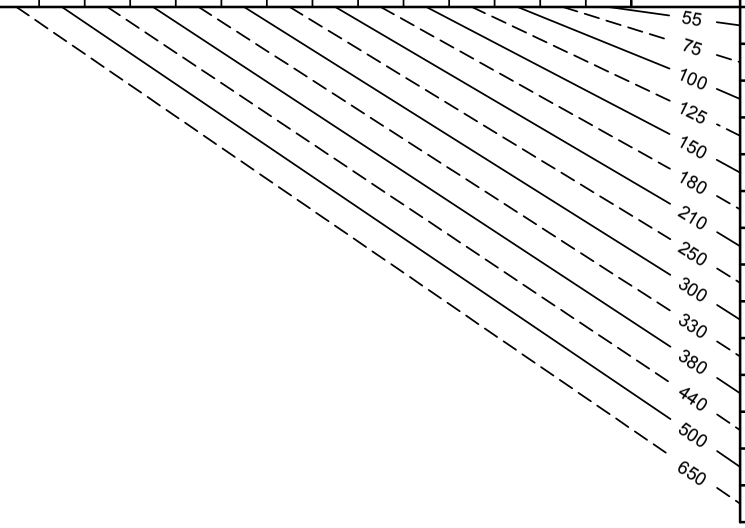
(TELESCOPIC PISTONS WITH THREE EXTRACTORS)

DATE 12/99

DWG.N. 9600/52

SPEED OF RAM IN UPWARD DIRECTIOM M/SEC (AVERAGE LOAD)

PUMP L/1'														RAM TYPE	STATIC PRESSURE IN BARS																						TOTAL LOAD (USEFUL LOAD + CAR + CAR FRAME + ACC. = kg)
650	500	440	380	330	300	250	210	180	150	125	100	75	55		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	
								1.08	0.90	0.75	0.61	0.45	0.32	58/3	267	323	378	432	488	541	596	647	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														58/3-G1	236	293	350	407	463	518	574	628	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														58/3-G2	234	292	350	407	463	518	574	628	656	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
				1.21	1.10	0.91	0.76	0.65	0.53	0.45	0.35	0.28	0.19	75/3	449	544	636	729	822	916	1007	1096	1190	1283	1373	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														75/3-G1	391	491	587	683	777	871	965	1058	1152	1244	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														75/3-G2	355	460	561	660	758	853	948	1043	1138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1.05	0.96	0.80	0.70	0.63	0.54	0.45	0.38	0.32	0.27	0.21	0.15	0.11	98/3	768	931	1089	1250	1410	1565	1726	1882	2036	2192	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														98/3-G1	658	828	994	1158	1322	1484	1644	1805	1966	2124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														98/3-G2	577	763	941	1112	1281	1448	1610	1774	1935	2097	2257	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.17	0.90	0.81	0.68	0.58	0.53	0.45	0.38	0.32	0.27	0.22	0.18	0.13		107/3	880	1076	1266	1458	1646	1837	2024	2206	2395	2579	2762	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														107/3-G1	733	937	1137	1333	1531	1723	1915	2106	2295	2484	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														107/3-G2	550	791	1013	1224	1430	1632	1831	2028	2221	2415	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.84	0.64	0.57	0.47	0.41	0.38	0.32	0.27	0.23	0.19	0.16	0.13			127/3	1261	1536	1806	2073	2338	2608	2872	3130	3401	3662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														127/3-G1	1056	1343	1624	1904	2179	2451	2721	2994	3260	3529	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														127/3-G2	903	1227	1530	1822	2107	2388	2664	2939	3211	3482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.61	0.47	0.41	0.35	0.29	0.27	0.23	0.20	0.16	0.13	0.11				150/3	1756	2140	2519	2896	3269	3635	4007	4376	4742	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														150/3-G1	1431	1834	2229	2619	3005	3390	3770	4145	4522	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														150/3-G2	1272	1726	2149	2556	2955	3345	3730	4115	4494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
0.44	0.33	0.29	0.25	0.23	0.21	0.16	0.13	0.11	0.09					176/3	2343	2876	3397	3921	4437	4947	5463	5974	6477	6990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														176/3-G1	1882	2441	2993	3531	4070	4596	5125	5646	6167	6685	7201	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
														176/3-G2	1216	1952	2592	3190	3764	4324	4874	5412	5945	6476	7001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
6 (4.5)															8 (6)		
6 (4.5)								8 (6)							10 (7.5)		
6 (4.5)				8 (6)				10 (7.5)							13 (9.5)		
8 (6)				10 (7.5)				13 (9.5)							16 (12)		
8 (6)			10 (7.5)			13 (9.5)			16 (12)						20 (15)		
13 (9.5)					16 (12)				20 (15)						25 (18.5)		
13 (9.5)			16 (12)			20 (15)			25 (18.5)						30 (22.5)		
20 (15)						25 (18.5)			30 (22.5)						40 (30)		
16 (12)			20 (15)			25 (18.5)			30 (22.5)						40 (30)		
20 (15)				25 (18.5)			30 (22.5)					40 (30)					50 (37)
20 (15)			25 (18.5)			30 (22.5)			40 (30)						50 (37)		
25 (18.5)				30 (22.5)			40 (30)					50 (37)					60 (45)
25 (18.5)			30 (22.5)			40 (30)			50 (37)			60 (45)			80 (60)		
40 (30)				50 (37)			60 (45)					80 (60)					100 (75)

MOTOR POWER H.P. (Kw)

THE WEIGHT INDICATED IN THIS TABLE HAS BEEN CALCULATED CONSIDERING
THE RODS WEIGHT FOR A MAXIMUM STROKE (SEE DWG. 9602/... 9603/...)

Live load = Q (Kg) _____

Cage weight + frame + Accessories = F (Kg) _____

Weight pulley + Ropes = K (Kg) _____

(Indirect installation 2:1)

Cage speed = S (m/sec) _____

Run + over run cage = C (m) _____

Net axe distance-top of piston = I (m) _____

(Indirect installation 2:1)

Net weight on the piston = P (Kg) _____

Direct installation 1:1 with one jack = Q+F

Indirect installation 2:1 with one jack = (Q+F)x2+K

Direct installation 1:1 with double jack = (Q+F)/2

Indirect installation 2:1 with double jack = Q+F+K

Calculation length of piston = L (m) _____

Direct installation = C

Indirect installation = (C/2)+I

The diagram point at the crossing of the right lines characteristic of load "P" and of piston length "L" excludes the use of all jacks represented by the curves below this point.
Therefore, choose the jack which curve is the closest to this point, above.
The intersection point of the right line extension characteristic of the chosen jack gives the corresponding pressure value at full load, in BAR.
If the pressure at full charge results too high, choose the type of jack just higher.

Jack type _____ Pressure = B (bar) _____

Jack speed = V (m/sec) _____

Direct installation 1:1 with one jack = S

Indirect installation 2:1 with one jack = S/2

Direct installation 1:1 with double jack = Sx2

Indirect installation 2:1 with double jack = S

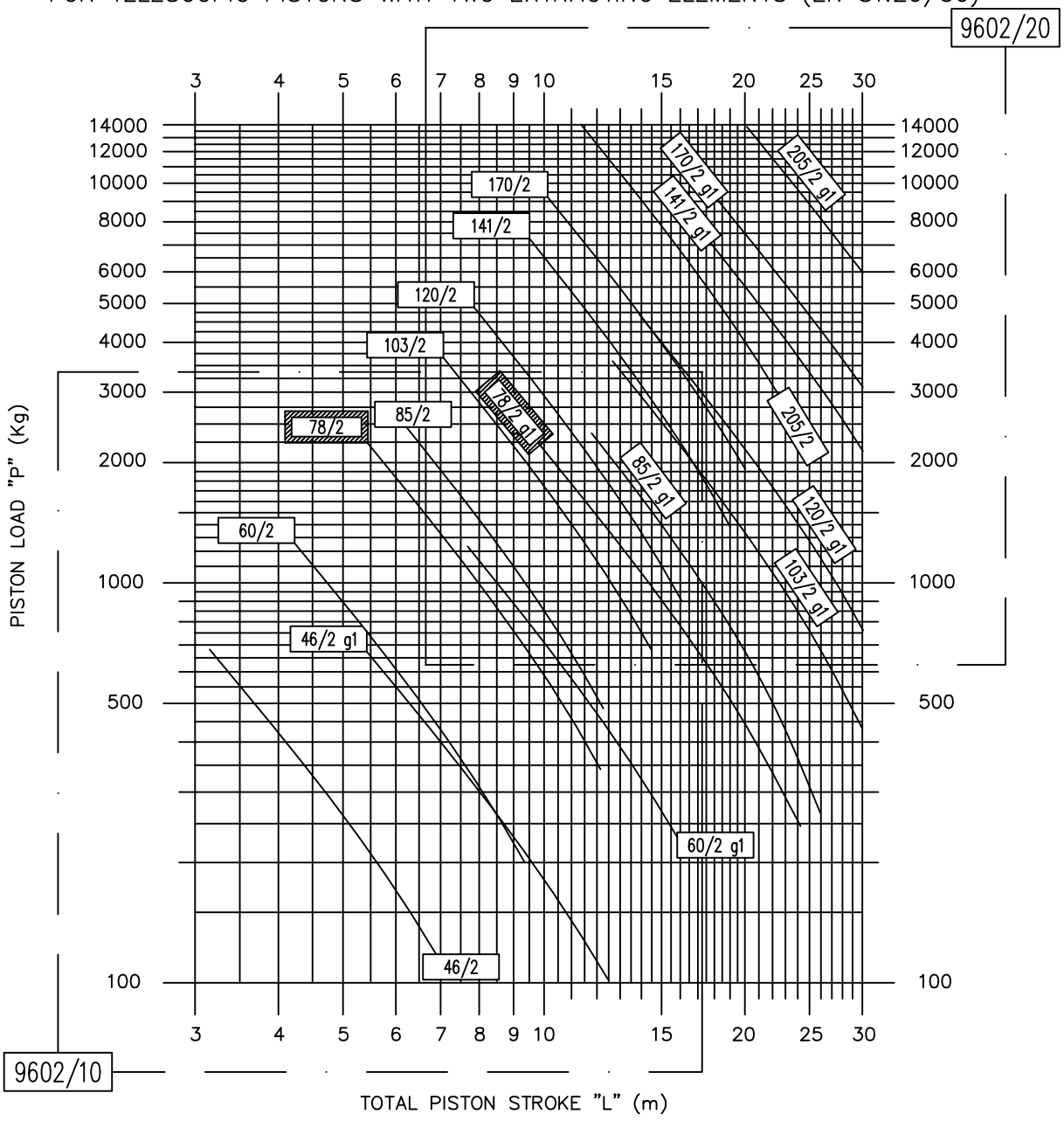
On the speed and power tabulation, choose the type of gear case (L/min) which better corresponds to the value of jack speed "V".
Engine power (CV) is that to which a higher or even static pressure (BAR) correspond to that of the jack "B".

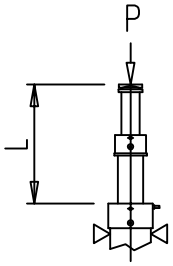
type of gear case: L/min _____ CV _____

UT			CHOICE OF THE PISTON TYPE AND OF THE POWER UNIT	DATE 08/99
				DWG N. 9601

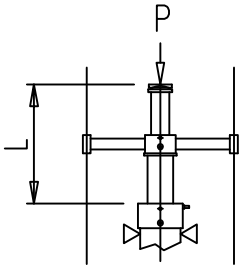
9601-IN

DIAGRAM OF THE PEAK LOADS ACCORDING TO EULERO'S CALCULATION
WITH SAFETY FACTOR 2 AND OVERPRESSURE FACTOR 1.4,
FOR TELESCOPIC PISTONS WITH TWO EXTRACTING ELEMENTS (EN 81.20/50)





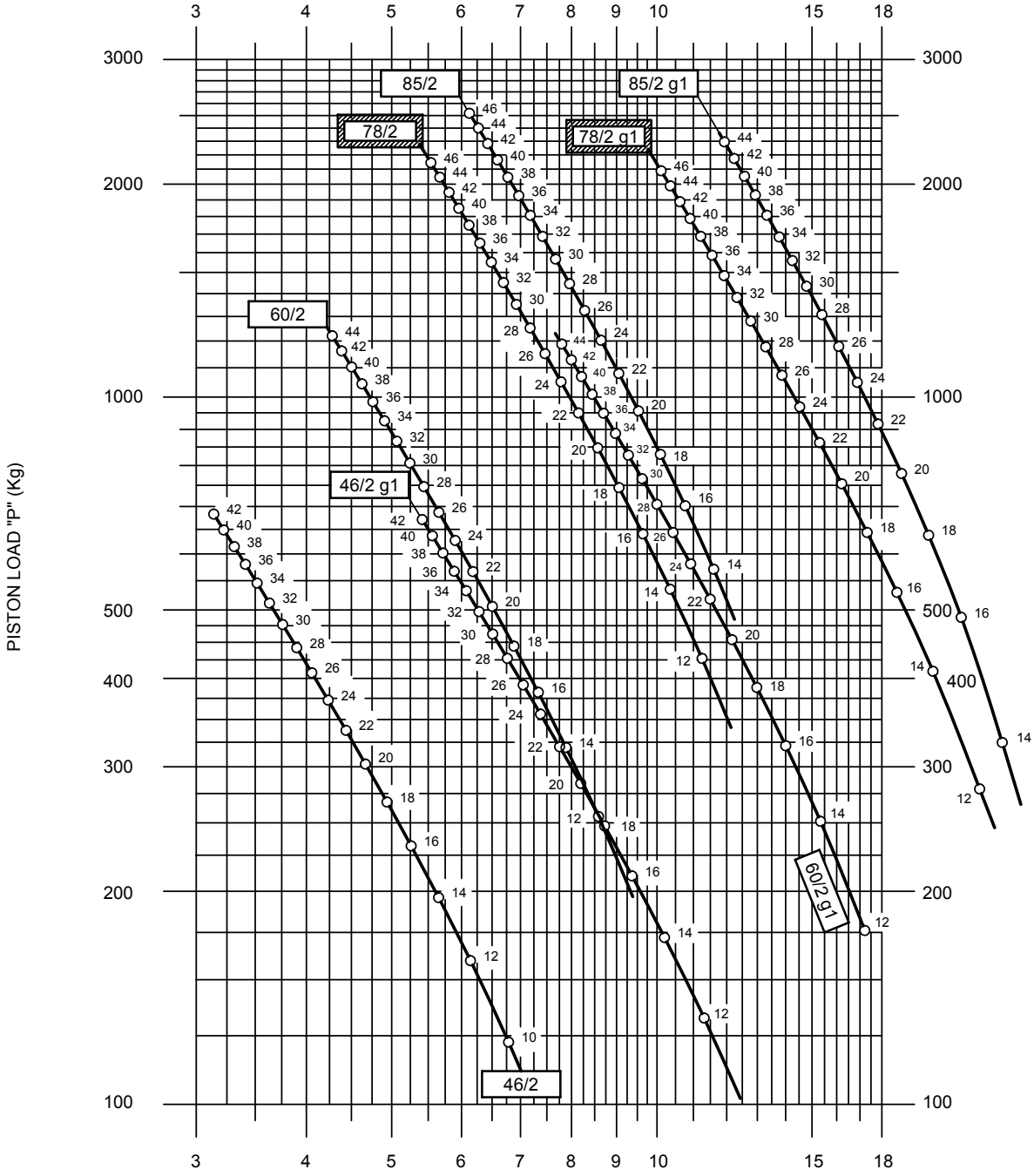
PISTON WITHOUT GUIDANCE
(EX. 46/2)



PISTON WITH ONE GUIDANCE
(EX. 46/2 g1)

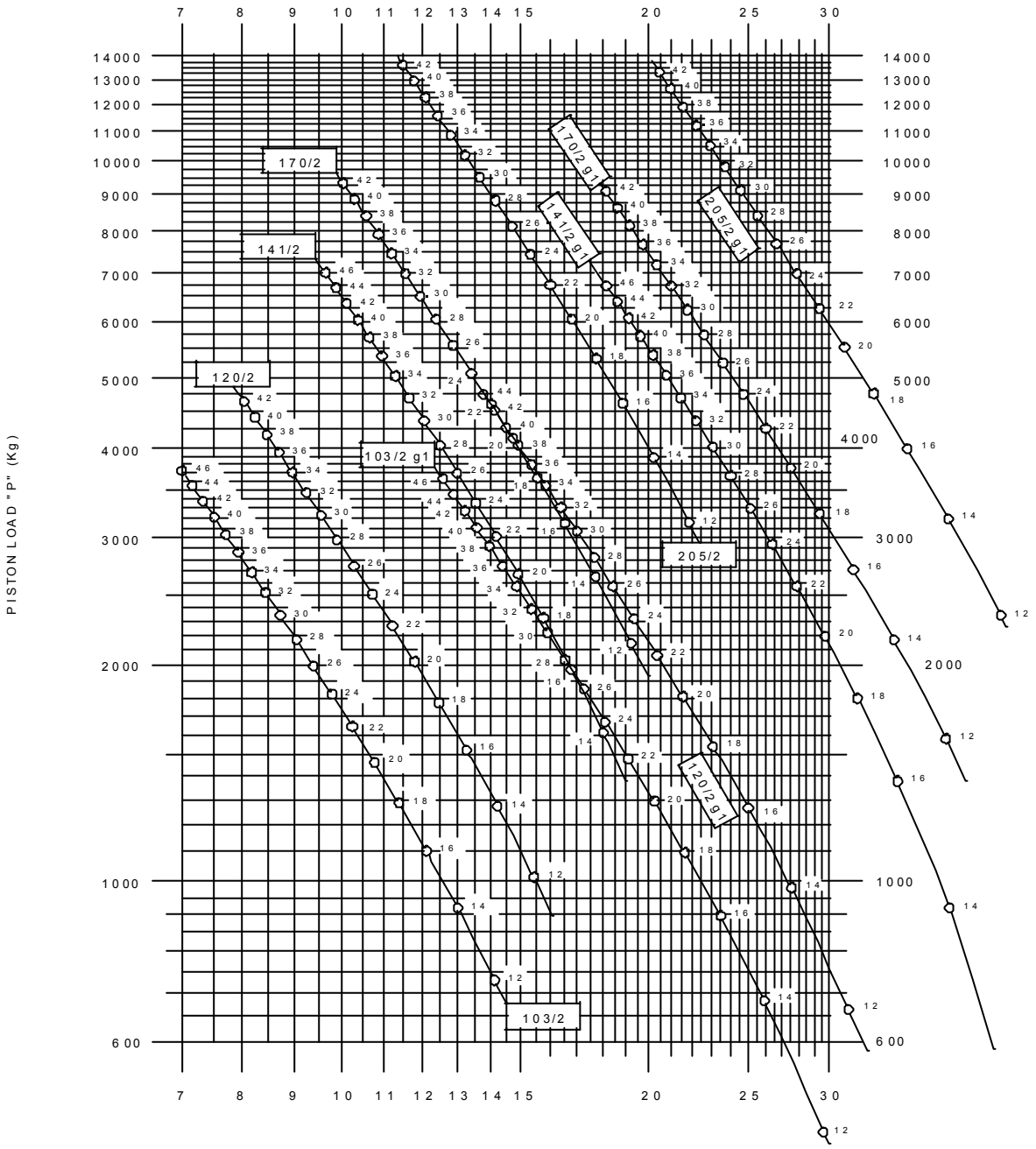
PISTON TYPE OBSOLETE FROM 77/2 – 77/2–g1
FOR DIAGRAM VALUES REF DWG 9607/5

UT	DIAGRAM OF THE PEAK LOADS GUIDELESS TELESCOPIC PISTONS WITH TWO EXTRACTORS (OVERPRESSURE FACTOR 1.4)	DATE 01/04 DWG N. 9602



PISTON TYPE OBSOLETE FROM 77/2 - 77/2-g1
FOR DIAGRAM VALUES REF DWG 9607/5

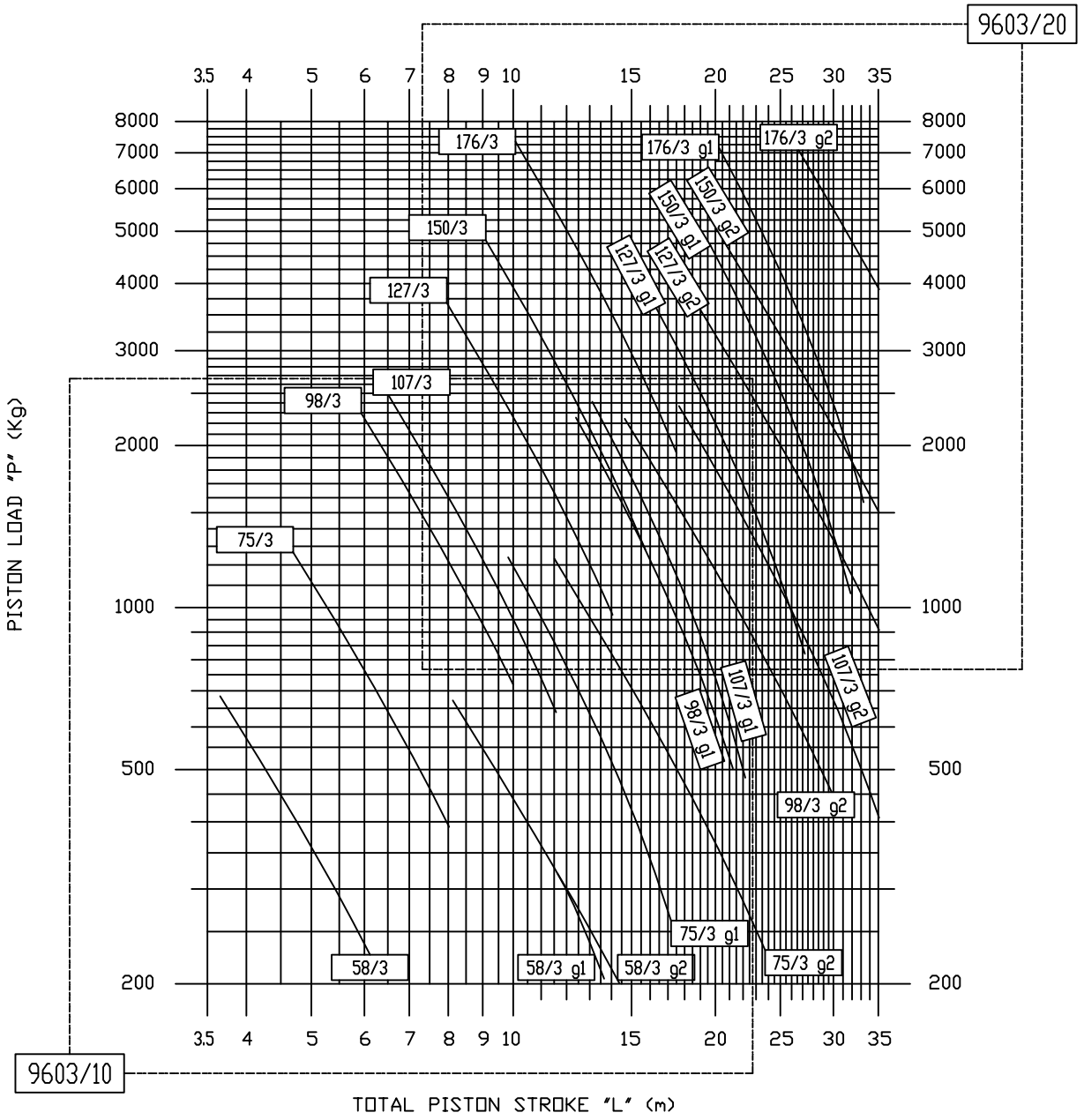
UT			DIAGRAM OF THE PEAK LOADS GUIDELESS TELESCOPIC PISTONS WITH TWO EXTRACTORS (TYPE 46/2 - 60/2 - 78/2 - 85/2) (OVERPRESSURE FACTOR 1.4)	DATE 01/04
				DWG N. 9602/10

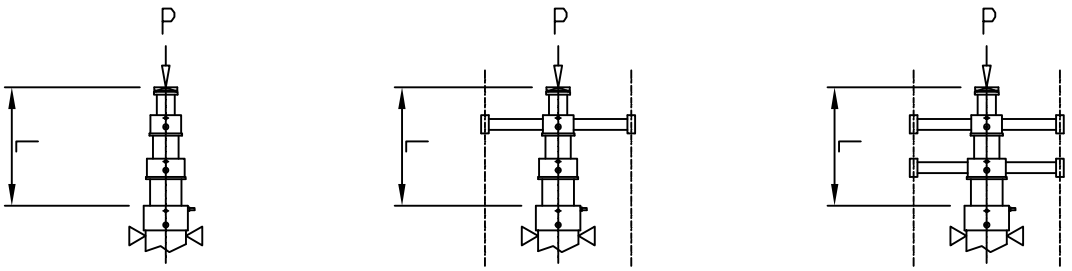


UT	DIAGRAM OF THE PEAK LOADS GUIDELESS TELESCOPIC PISTONS WITH TWO EXTRACTORS (TYPE 103/2-120/2-141/2-170/2-205/2) (OVERPRESSURE FACTOR 1.4)	DATE 04/03
		DWG N. 9602/20

9602/20-IN

DIAGRAM OF THE PEAK LOADS ACCORDING TO EULERO'S CALCULATION
WITH SAFETY FACTOR 2 AND OVERPRESSURE FACTOR 1.4,
FOR TELESCOPIC PISTONS WITH THREE EXTRACTING ELEMENTS (EN 81.20/50)



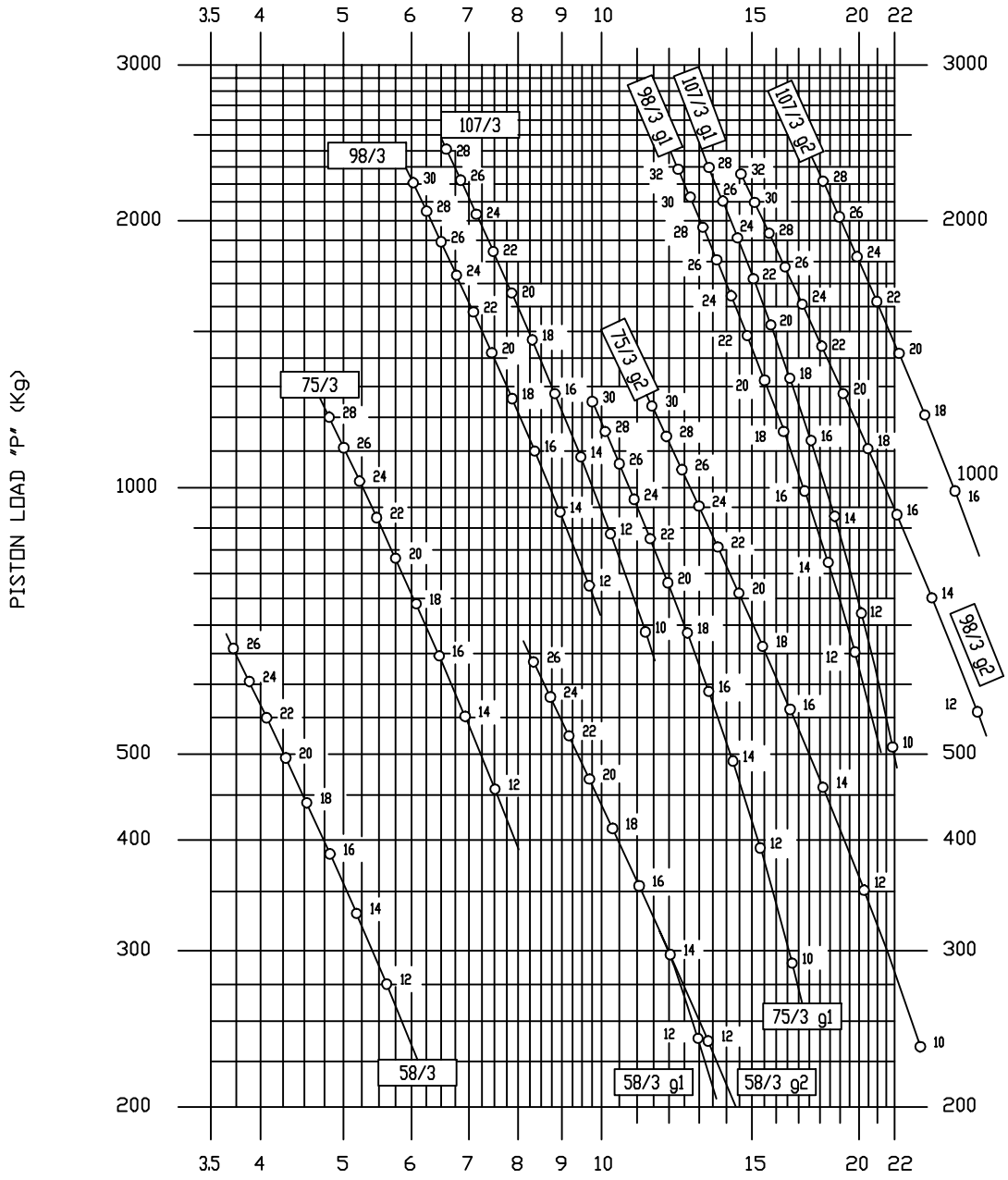


PISTON WITHOUT GUIDANCE
(EX. 58/3)

PISTON WITH ONE GUIDANCE
(EX. 58/3 g1)

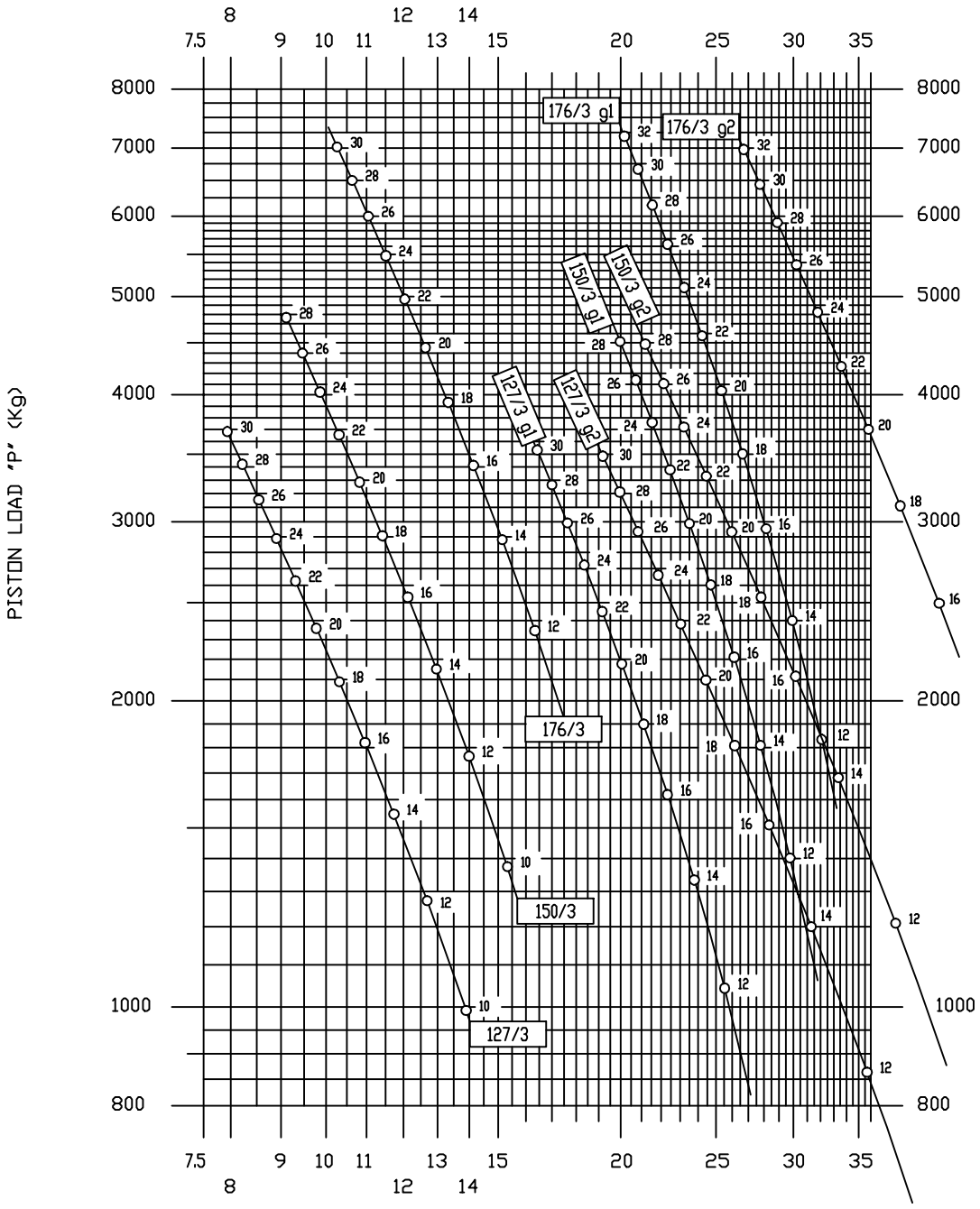
PISTON WITH TWO GUIDANCE
(EX. 58/3 g2)

UT	DIAGRAM OF THE PEAK LOADS GUIDELESS TELESCOPIC PISTONS WITH THREE EXTRACTORS (OVERPRESSURE FACTOR 1.4)	DATE 03/17 DWG N. 9603



UT			DIAGRAM OF THE PEAK LOADS GUIDELESS TELESCOPIC PISTONS WITH THREE EXTRACTORS (TYPE: 58/3 - 75/3 - 98/3 - 107/3) (OVERPRESSURE FACTOR 1.4)	DATE 08/99
				DWG N. 9603/10

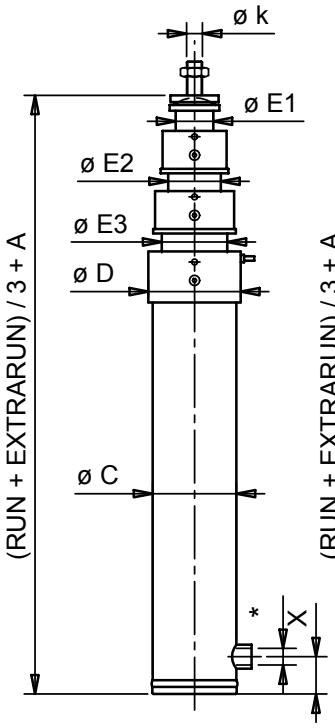
9603/10-IN



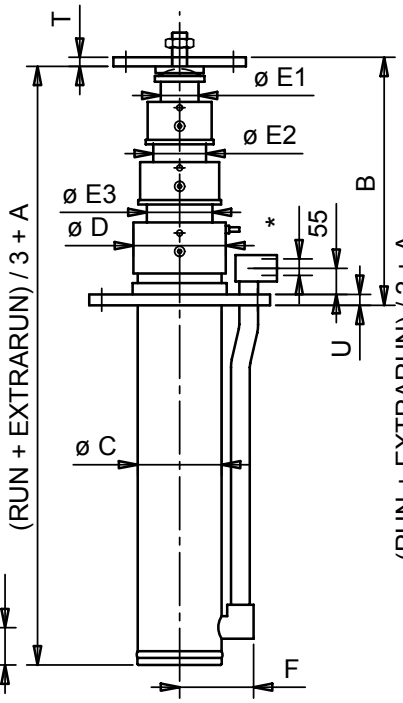
UT			DIAGRAM OF THE PEAK LOADS GUIDELESS TELESCOPIC PISTONS WITH THREE EXTRACTORS (TYPE 127/3 - 150/3 - 176/3) (OVERPRESSURE FACTOR 1.4)	DATE 08/99
				DWG N. 9603/20

9603/20-IN

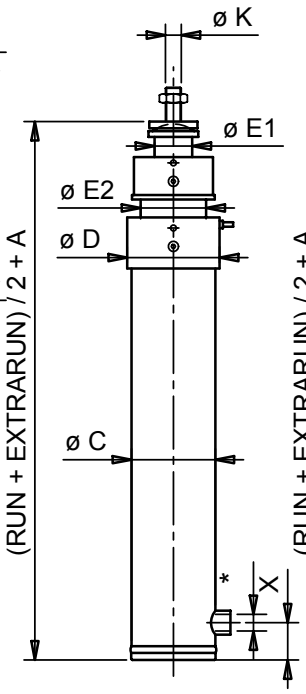
THREE ELEMENTS LATERAL TYPE



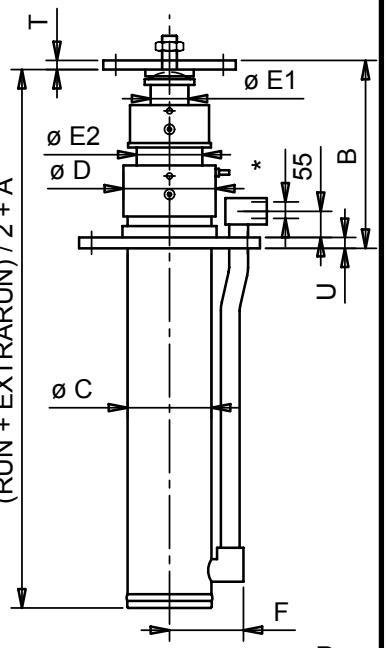
THREE ELEMENTS CENTRAL TYPE

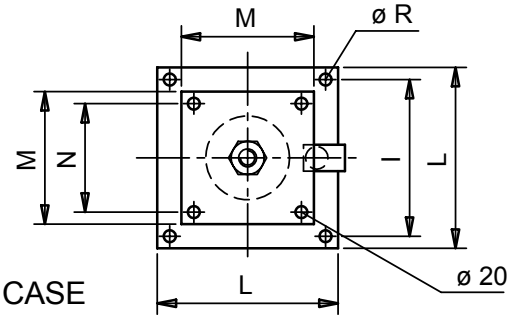


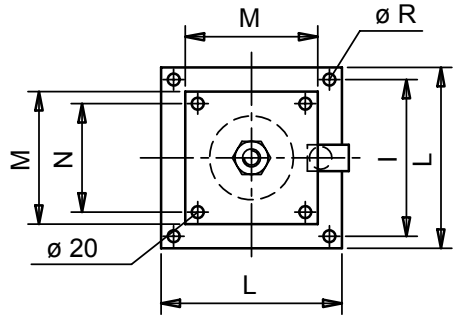
TWO ELEMENTS LATERAL TYPE



TWO ELEMENTS CENTRAL TYPE





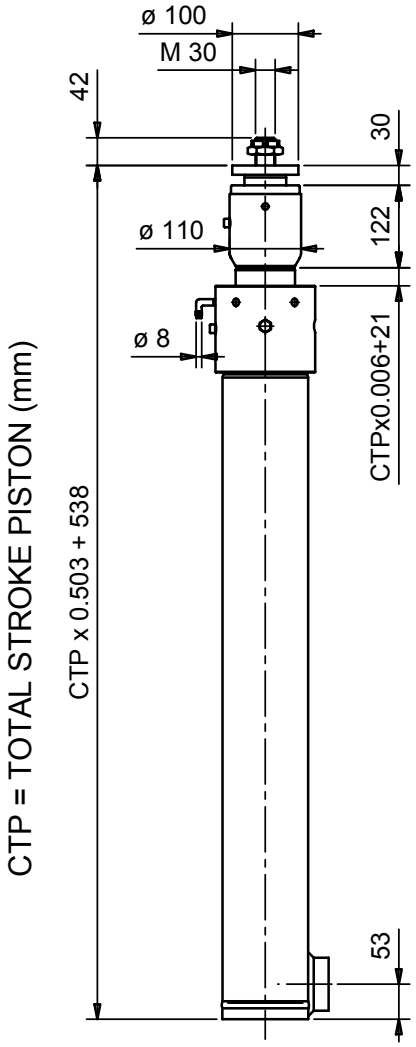


* SEE GEAR CASE

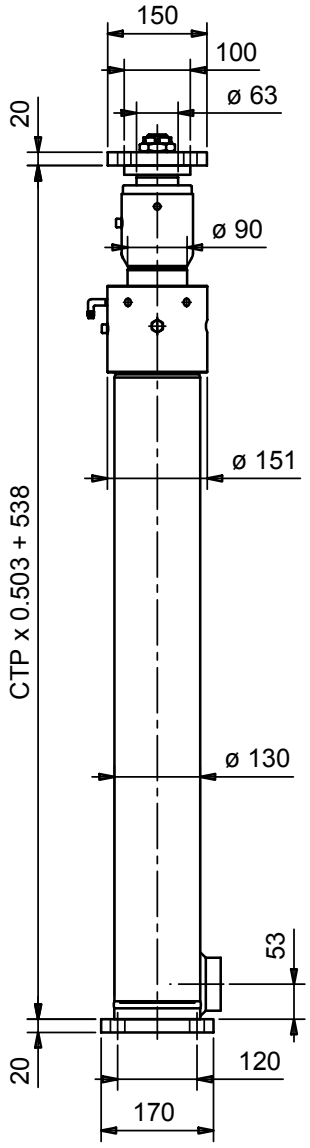
N° ELEMENTS	PISTON TYPE	DIMENSIONS (mm)																
		A	B	øC	øD	øE1	øE2	øE3	F	øK	I	L	M	N	øR	T	U	X
TWO	46/2	425	365	80	100	35	55	/	110	M16	250	300	240	200	20	15	20	50
	60/2	475	380	100	120	48	70	/	120	M20	250	300	240	200	20	15	20	50
	77/2	FOR DIMENSIONS VALUE REF DWG 9604/5																
	85/2	555	420	140	160	70	98	/	145	M30	310	420	240	200	20	15	25	50
	103/2	630	450	165	190	85	118	/	160	M30	310	420	300	260	20	20	25	55
	120/2	670	460	190	220	97	140	/	175	M30	370	500	300	260	24	20	30	60
	141/2	750	480	229	254	120	160	/	205	M30	370	500	300	260	24	25	35	65
	170/2	840	530	273	300	146	190	/	230	M30	450	600	300	260	24	25	40	70
	205/2	910	560	324	350	180	228	/	255	M30	500	600	360	320	24	30	45	70
THREE	58/3	680	520	120	135	35	55	76	140	M16	250	300	240	200	20	15	20	55
	75/3	735	550	150	170	48	70	98.5	150	M20	310	420	240	200	20	15	25	55
	98/3	835	585	190	215	64.5	89	130	170	M30	310	420	240	200	20	20	25	55
	107/3	855	585	219	240	70	98	140	185	M30	370	500	240	200	24	20	30	60
	127/3	955	660	244.5	280	85	118	165	200	M30	370	500	300	260	24	20	35	65
	150/3	1020	680	298	325	97	140	197	240	M30	450	600	300	260	24	25	40	70
	176/3	1115	715	355	380	120	160	230	265	M30	500	600	300	260	24	25	45	75

UT			DATE 01/04
	SYNCHRONOUS TELESCOPIC PISTONS		DWG N. 9604
	TWO/THREE EXTRACTING ELEMENTS LATRAL/CENTRAL TYPE		

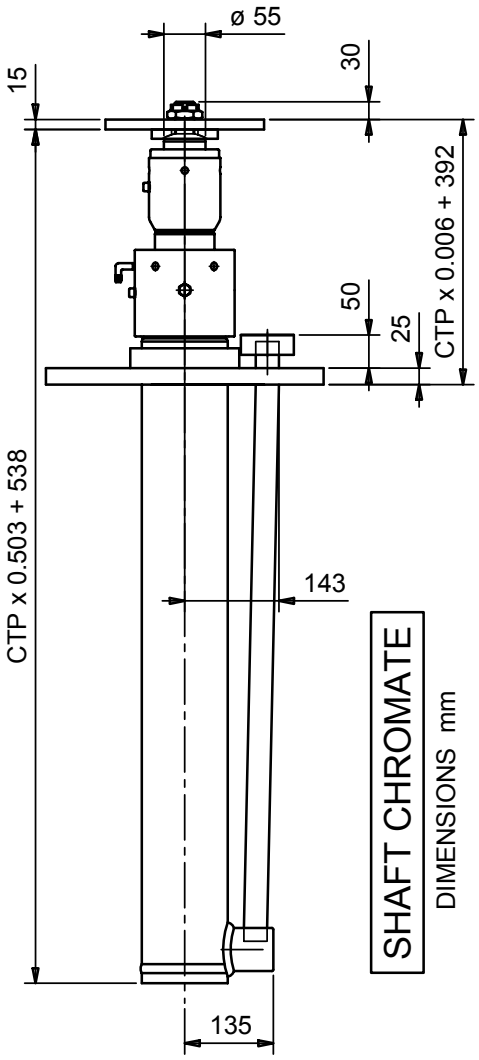
DIRECT LATERAL



DIRECT LATERAL WITH PLATES

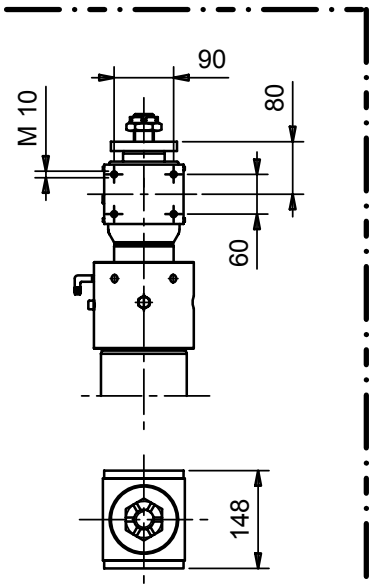


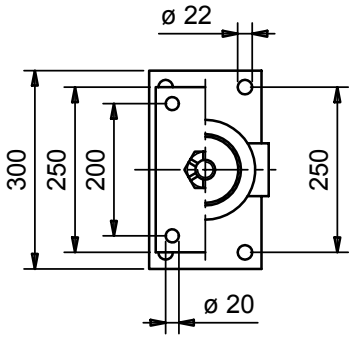
DIRECT CENTRAL

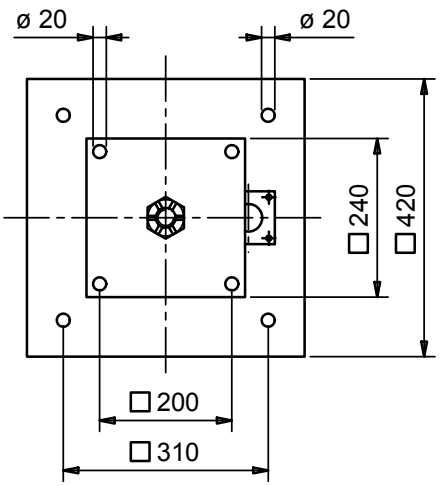


SHAFT CHROMATE

DIMENSIONS mm





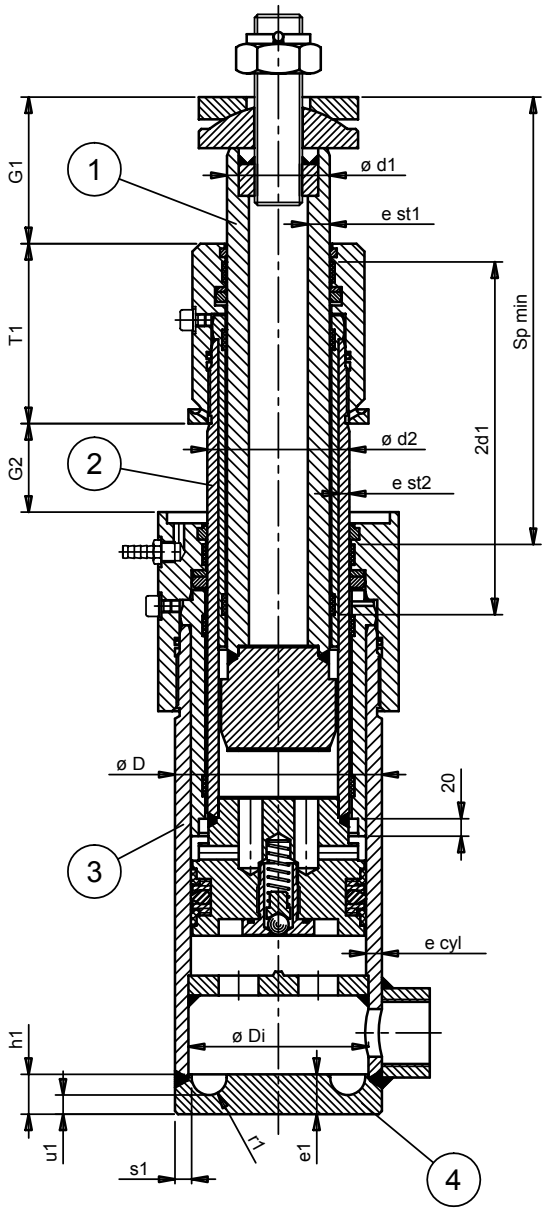


BRACKETS FOR GUIDE ARMS 77/2-G1

WEIGHT OF COMPLETE JACK:

DIRECT LATERAL (daN):	Pt = CTP/1000 x 35 + 70
DIRECT LATERAL WITH PLATES (daN):	Pt = CTP/1000 x 35 + 84
DIRECT CENTRAL (daN):	Pt = CTP/1000 x 35 + 100

UT	DIMENSIONS AND CALCULATION DATA TELESCOPIC PISTON 77/2	DATE 01/04
		DWG N 9604/5



TYPE PISTON	ps0 (Kg)	ps1 (Kg/m)	Pt0 (Kg)	Pt0c (Kg)	Ptl (Kg/m)	Qt (lt/m)	qc (lt/m)
46/2	17	6.8	28	57	13.5	2.5	1.7
60/2	23	11.2	36	65	19.8	4.2	2.8
77/2	FOR DIMENSIONS VALUE REF DWG 9607/5						
85/2	39	22.3	64	100	38.3	8.5	5.7
103/2	50	24.2	98	140	43.3	12.2	8.3
120/2	73	29.7	149	200	52.0	17.1	11.4
141/2	102	41.7	193	245	80.1	23.4	15.7
170/2	137	39.6	267	340	91.9	33.6	22.6
205/2	189	51.7	364	470	116.2	49	33

ps0 = BASIC WEIGHT OF PISTON
ps1 = WEIGHT OF PISTONS FOR METER RUN
Pt0 = BASIC WEIGHT OF COMPLETE JACK
Pt0c = BASIC WEIGHT OF COMPLETE CENTRAL JACK (WITH PLATES)
Ptl = WEIGHT OF COMPLETE JACK FOR METER RUN
Qt = OIL IN CYLINDER PER METER RUN WITH PISTON COMPLETELY OUTSIDE (TO BE ADDED TO THE MINIMAL QUANTITY OF OIL IN THE TANK)
qc = CIRCULATING OIL FOR PISTON METER RUN (TO BE COMPARED TO THE AVAILABLE QUANTITY IN TANK)

FEEDING PRESSURE CALCULATION

PISTON	FORMULA
46/2	Ps = (P3+Q+8+(5.3xC))x9.81/166
60/2	Ps = (P3+Q+12+(9.2xC))x9.81/284
77/2	FOR DIMENSIONS VALUE REF DWG 9607/5
85/2	Ps = (P3+Q+16+(18.7xC))x9.81/566
103/2	Ps = (P3+Q+21+(18.2xC))x9.81/826
120/2	Ps = (P3+Q+34+(21.8xC))x9.81/1135
141/2	Ps = (P3+Q+42+(32.5xC))x9.81/1571
170/2	Ps = (P3+Q+64+(28.7xC))x9.81/2262
205/2	Ps = (P3+Q+85+(36.4xC))x9.81/3303

P3+Q = LOAD ON PISTON IN Kg
C = TOTAL RUN OF PISTON IN METERS
Ps = FEEDING PRESSURE AT FULL CHARGE IN BAR

TYPE PISTON	d1 (mm)	e st1 (mm)	2d1 (mm)	d2 (mm)	e st2 (mm)	D (mm)	e cyl (mm)	Di (mm)	e1 (mm)	r1 (mm)	s1 (mm)	h1 (mm)	u1 (mm)	Sp (mm)	G1 (mm)	T1 (mm)	G2 (mm)
46/2	34.8	/	128	54.9	4.95	80	7.5	68	20	9	8	18	9	210	55	105	30
60/2	48	/	158	70.2	5.1	100	7.5	88	20	9	8	18	9	210	55	105	30
77/2	FOR DIMENSIONS VALUE REF DWG 9607/5																
85/2	70	/	205	97.6	6.3	140	10	123	25	11	10.5	23	12	230	62	113	30
103/2	84.8	13.9	255	117.8	8.9	165	10	148	30	11	10.5	28	14	245	70	120	30
120/2	97	13.5	285	139.7	9.85	190	10	173	30	11	10.5	28	14	245	68	122	30
141/2	120	18.5	350	160	10	229	14.5	203	35	11	15.5	33	18	245	60	125	30
170/2	146.2	10.6	420	189.7	9.85	273	16.5	243	40	11	17.5	38	20	265	69	131	35
205/2	180	10	420	228	11.5	324	17	293	40	11	17.5	38	20	290	70	135	35

MATERIAL STRENGTH

(1) A) SOLID Rm=410, Rp0.2=240 N/mm2 B) PIPE Rm=510, Rp0.2=360 N/mm2 (2) Rm=510, Rp0.2=360 N/mm2

(3) Rm=510, Rp0.2=360 N/mm2 (4) Rm=510, Rp0.2=360 N/mm2

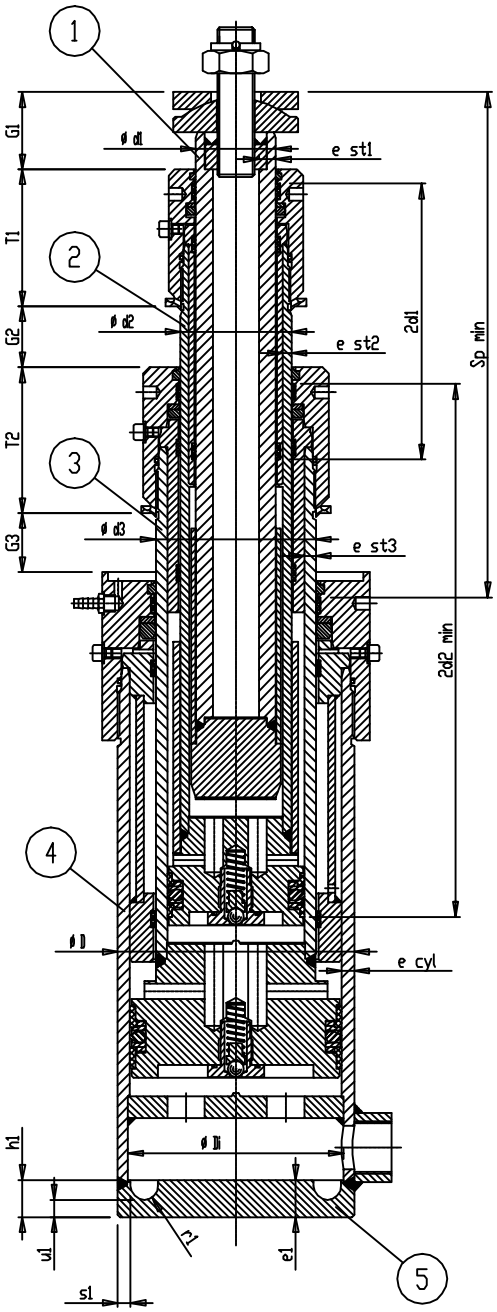
UT

CALCULATION DATA FOR TELESCOPIC PISTONS WITH TWO EXTRACTING ELEMENTS

(OVERPRESSURE FACTOR 1.4)

DATE 01/04

DWG N. 9605



TYPE PISTON	ps0 (Kg)	ps1 (Kg/m)	Pt0 (Kg)	Pt0c (Kg)	Ptl (Kg/m)	Qt (lt/m)	qc (lt/m)
58/3	34	7.7	52	80	16.8	5.1	2.6
75/3	49	12.6	75	110	24.2	7.9	4.4
98/3	80	20.2	12.5	160	35	13.1	7.6
107/3	95	25.3	155	200	53.6	15.5	9
127/3	134	29.2	227	275	52.6	21.7	12.7
150/3	195	40	345	416	83.7	30.7	17.7
176/3	272	54.4	472	560	122.3	41.9	24.4

ps0 = BASIC WEIGHT OF PISTON
ps1 = WEIGHT OF PISTONS FOR METER RUN
Pt0 = BASIC WEIGHT OF COMPLETE JACK
Pt0c = BASIC WEIGHT OF COMPLETE CENTRAL JACK (WITH PLATES)
Ptl = WEIGHT OF COMPLETE JACK FOR METER RUN
Qt = OIL IN CYLINDER PER METER RUN WITH PISTON COMPLETELY OUTSIDE (TO BE ADDED TO THE MINIMAL QUANTITY OF OIL IN THE TANK)
qc = CIRCULATING OIL FOR PISTON METER RUN (TO BE COMPARED TO THE AVAILABLE QUANTITY IN TANK)

FEEDING PRESSURE CALCULATION

PISTON	FORMULA
58/3	Ps = (P3+Q+16+(4.9xC))x9.81/262
75/3	Ps = (P3+Q+20+(8.3xC))x9.81/442
98/3	Ps = (P3+Q+29+(12.2xC))x9.81/757
107/3	Ps = (P3+Q+33+(16.7xC))x9.81/896
127/3	Ps = (P3+Q+46+(17.8xC))x9.81/1267
150/3	Ps = (P3+Q+69+(23.1xC))x9.81/1770
176/3	Ps = (P3+Q+90+(32.6xC))x9.81/2435

P3+Q = LOAD ON PISTON IN Kg
C = TOTAL RUN OF PISTON IN METERS
Ps = FEEDING PRESSURE AT FULL CHARGE IN BAR

TYPE PISTON	G1 (mm)	T1 (mm)	G2 (mm)	T2 (mm)	G3 (mm)
58/3	45	105	30	110	30
75/3	45	105	30	115	30
98/3	47	113	30	120	30
107/3	50	113	30	120	30
127/3	65	120	30	125	30
150/3	70	122	30	132	30
176/3	71	125	30	140	35

TYPE PISTON	d1 (mm)	e st1 (mm)	2d1 (mm)	d2 (mm)	e st2 (mm)	2d2 (mm)	d3 (mm)	e st3 (mm)	D (mm)	e cyl (mm)	D1 (mm)	e1 (mm)	r1 (mm)	s1 (mm)	h1 (mm)	u1 (mm)	Sp (mm)
58/3	34.8	/	128	54.9	4.95	280	76	5.5	120	10	103	25	11	10.5	23	12	345
75/3	48	/	158	70.2	5.1	320	98.5	6.75	150	10	133	25	11	10.5	23	12	350
98/3	64.5	13.75	220	89.23	7.1	400	129.6	9.83	190	10	173	30	11	10.5	28	14	370
107/3	70	/	205	97.6	6.3	400	139.6	9.8	219	17	187	35	11	18	33	15	370
127/3	84.8	13.9	255	117.8	8.9	480	165.5	10.25	244.5	12.25	223	35	11	12.75	33	15	390
150/3	97	13.5	285	139.7	9.85	500	196.7	13.38	298	19	263	40	11	19.75	38	20	410
176/3	120	18.5	350	160	10	580	230	15	355	25	308	45	11	25.5	43	25	430

MATERIAL STRENGTH

(1) A) SOLID Rm=410, Rp0.2=240 N/mm2 B) PIPE Rm=510, Rp0.2=360 N/mm2 (2) Rm=510, Rp0.2=360 N/mm2

(3) Rm=510, Rp0.2=360 N/mm2 (4) Rm=510, Rp0.2=360 N/mm2 (5) Rm=510, Rp0.2=360 N/mm2

UT

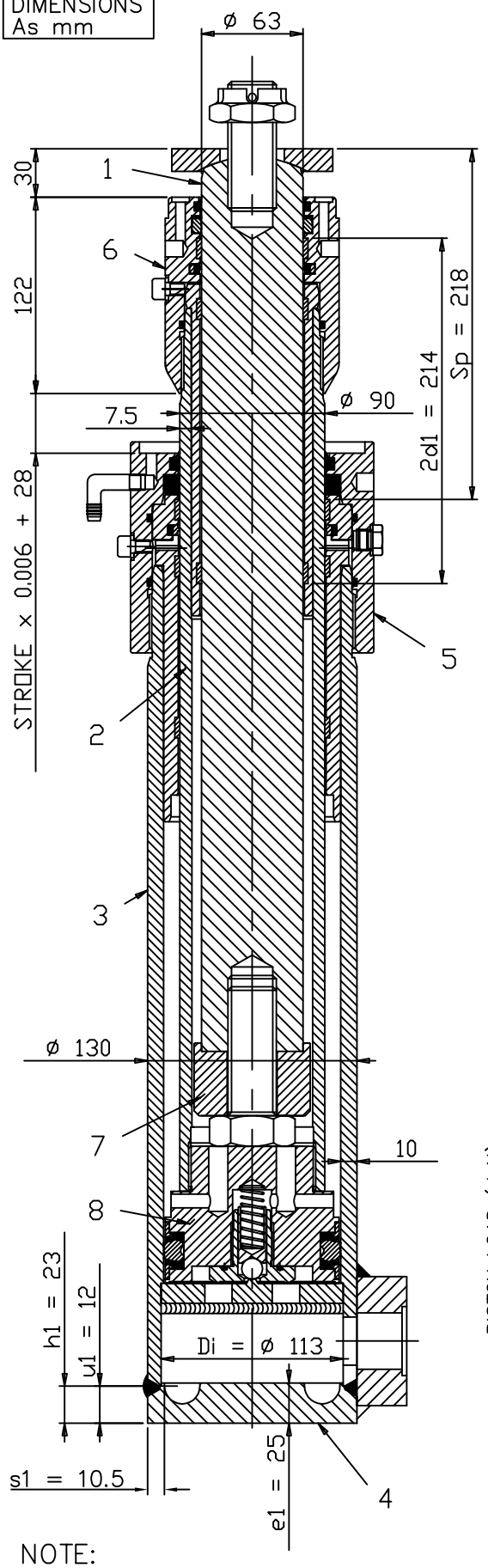
CALCULATION DATA FOR TELESCOPIC PISTONS WITH THREE EXTRACTING ELEMENTS
(OVERPRESSURE FACTOR 1.4)

DATE 04/00

DWG N. 9607

9607-IN

DIMENSIONS
As mm



MATERIALS		
1 –	Rod pipe 1	C45
2 –	Rod pipe 2	FE510
3 –	Cylinder	FE510
4 –	Cylinder base	FE510
5 –	Cylinder head	FE510
6 –	Rod pipe head	FE510
7 –	Rod pipe base	FE510
8 –	Rod pipe base	FE510

Calculation of speed (m/s) as a function of the pump output (litres/sec):

V = Pump output / 286.71

Calculation of the pressure of pump discharge (Mpa) as a function of load on the piston (daN) and of the travel range (m):

Ps = (16 X Travel range + Load + 25) / 475.1

Oil in the circuit (litres) with shafts completely out as a function of the travel range of the travel range of the piston (m) (tobe compared with the quantity available in the tank):

qe = Travel range X 4.8

Oil in the cylinder (litres) as a function of the travel range of the piston (m)
(To be added to the minimum quantity of oil in the tank):

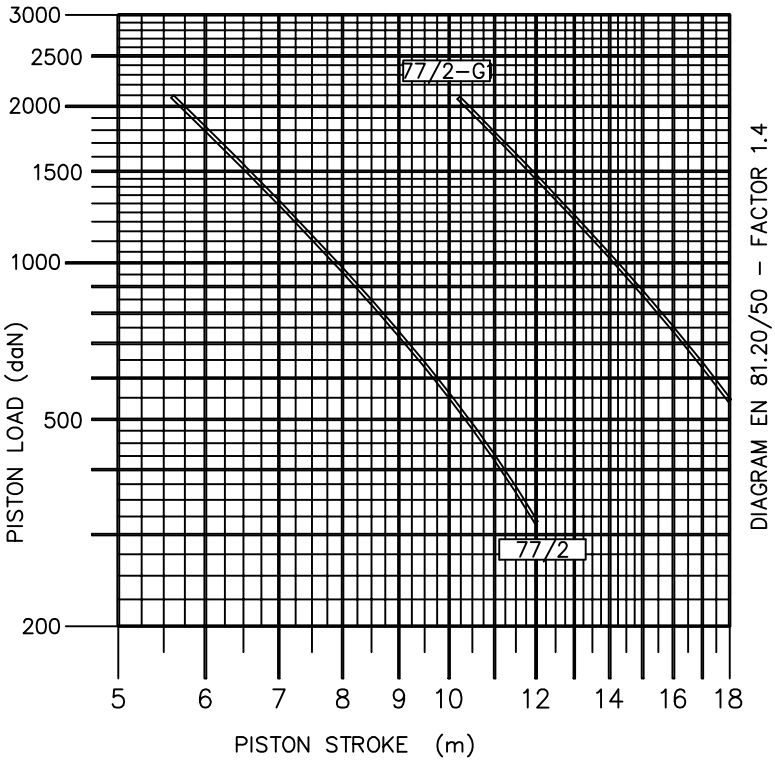
Qt = Travel range x 7

Shaft weight 1 (daN) in function of travel range of the piston (m):

Ps1 = Travel range x 12.25 + 15.2

Shaft weight 2 (daN) in function of travel range of the piston (m):

Ps2 = Travel range x 7.64 + 18.8

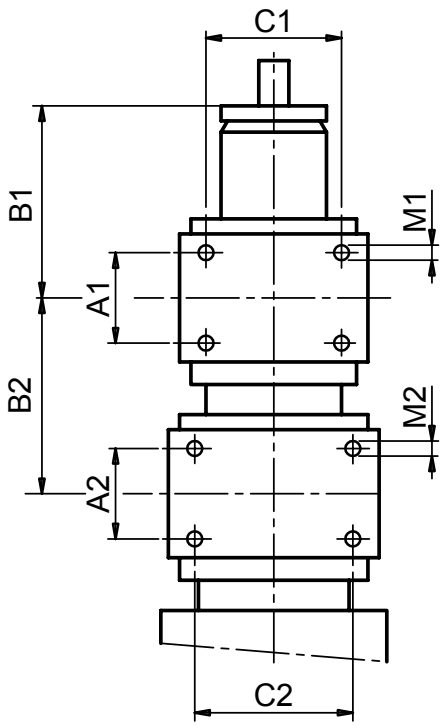


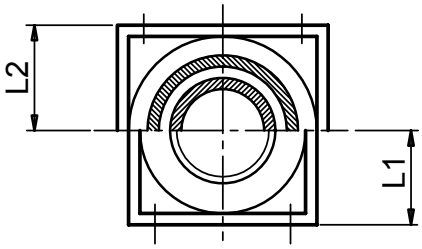
NOTE:
"TRAVEL RANGE" MEANS THE TOTAL TRAVEL RANGE
OF THE PISTON (INCLUDING THE EXTRA TRAVEL RANGE)

UT		DIMENSIONS AND CALCULATION DATA TELESCOPIC PISTON 77/2	DATE 03/17
			DWG No 9607/5

9607/5-IN

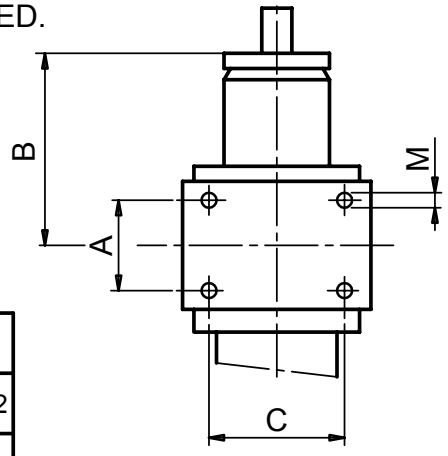
	TYPE PISTON: THREE EXTRACTING ELEMENTS						
	58/3	75/3	98/3	107/3	127/3	150/3	176/3
A1	60	60	60	60	60	60	80
B1	85	85	87	90	115	120	136
C1	60	70	90	100	110	130	150
M1	M10	M10	M10	M10	M10	M12	M16
L1	57	65	74	78	89	101	109
A2	60	60	60	60	80	80	80
B2	145	145	153	153	165	167	155
C2	80	100	120	130	150	180	200
M2	M10	M10	M12	M12	M16	M16	M16
L2	68	79	87	101	109	123	143

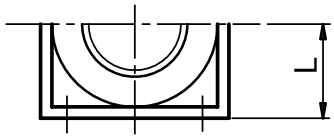




N.B.:

VERTICAL DISTANCES SEPARATING THE GUIDING ARMS, THE BOTTOM OF THE PIT AND THE LOWEST SECTIONS OF THE CAR SHALL BE COMPUTED AND CONTROLLED WITH THE RAM ENTIRELY CLOSED.

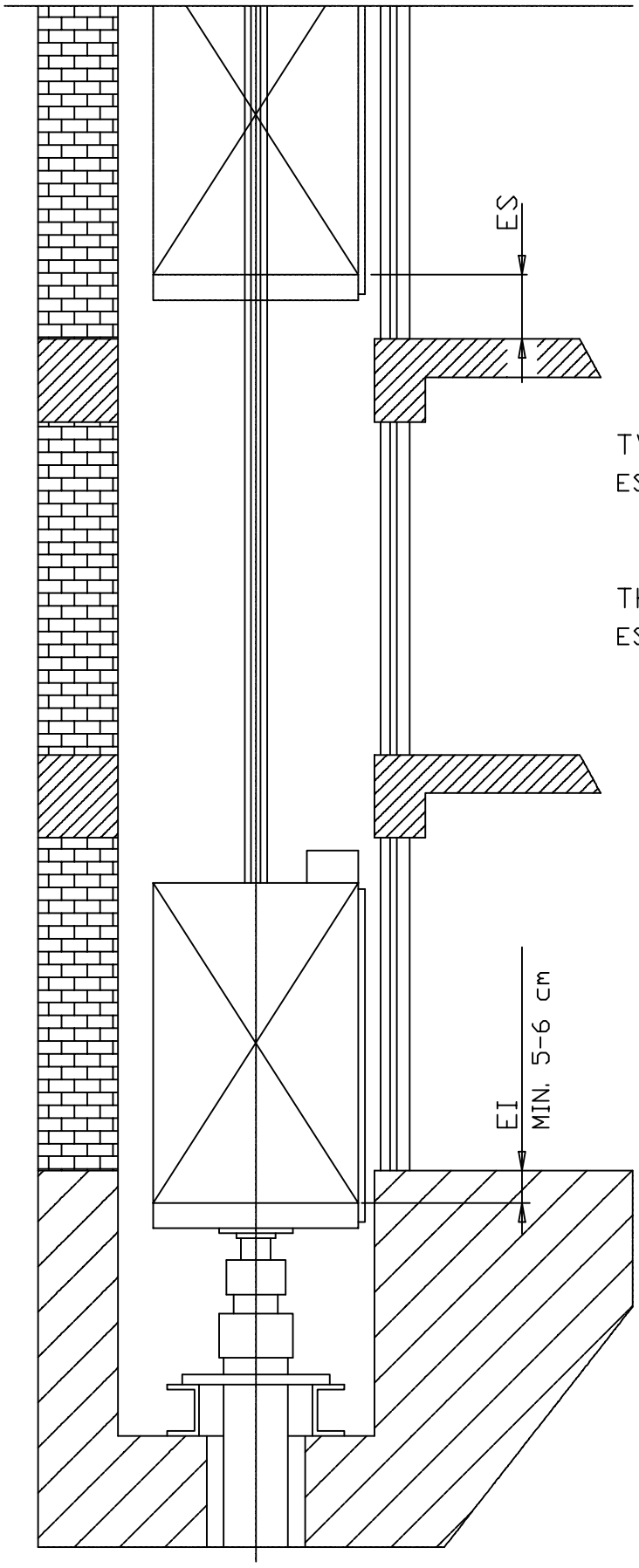




	TYPE PISTON: TWO EXTRACTING ELEMENTS								
	46/2	60/2	77/2	85/2	103/2	120/2	141/2	170/2	205/2
A	60	60		60	60	60	80	80	80
B	95	95		102	120	118	125	134	135
C	60	70	◆	100	110	130	150	180	200
M	M10	M10		M10	M10	M12	M16	M16	M16
L	57	65		78	89	101	109	123	143

◆ FOR DIMENSIONS VALUE REF DWG 9604/5

UT			GUIDED SYNCHRONOUS TELESCOPIC PISTONS	DATE 01/04
			BRACKETS FOR GUIDE ARMS FASTENING TO THE PISTON HEADS	DWG N. 9608



TWO ELEMENT PISTONS

ES MUST BE GREATER THAN EI
(BY SOME CENTIMETERS)
-Ex.: EI = 100 < ES = 150 mm

THREE ELEMENT PISTONS

ES MUST BE GREATER THAN EI
(BY SOME CENTIMETERS)
MEASURED WITH TOTALLY
CLOSED PISTON
(REMOVED THE CAR SUPPORTS)
-Es.: EI = 100 < ES = 250 mm

TO PROVIDE FOR THE AUTOMATIC RETURN AT THE LOWEST FLOOR

(ASSURE THE AUTOMATIC REGULATION AND THE RELATIVE NORMAL OPERATION)

ATTENTION:

IF THE ABOVE INDICATIONS WILL NOT BE OBSERVED, THE OPERATION OF THE INSTALLATION WILL BE COMPROMISED.

UT	SYNCHRONOUS TELESCOPIC PISTONS SUBDIVISION OF THE OVERSTROKE	DATE 07/00 DWG N. 9609

9609-IN

1. INTRODUCTION

1.1 A prope subdivision of piston extra strokes allows to automatically recover the small phase differences of stems due to unavoidable leaks in the sliding on gaskets. Insted, in case of remarkable leaks which are visible on stems or with phase differences which do not allow a regular stroke of the piston, it is necessary to cnsider the possible replacement of worn out sealing elements.
In the schematic drawing of Figure 1/A – Figure 1/B the main components involved into the procedure of replacement for sealing elements is shown.

1.2 Two types of problems due to the sealing of telescopic piston can appear.

1.2.1 The first type, which is easier to be solved, is due to leaks visible outside. Usually, external leaks correspond to **dynamic** leaks located on the gaskets of the stem (Gr 1-2-3), whose advanced wearing out is due to non-perfect conditions of the stem (dent or impurites).
Static leaks can appear as well, located at the head gaskets (Or 1-2-3) on at exhaust screw (Sf 1-2-3).

1.2.2 The second type of leaks refers to the sealing of gaskets (Db 1-2) and of filling valves (VI 1-2), located at the basis of rougher withdrawing elements. Their replacement involves the full withdrawal of the involved stem.
An advanced wearing out of these components can be due to impurities in the oil. A sealing inspection of these components can be performed ever under static conditions, keeping the withdrawn piston and the delivery faucet on gearcase on closed position.

1) If the first stem (St 1) tends to enter again, whereas the second stem (St 2) tends to outcome, people can suppose the gasket leaking (Db 1) or the valve leaking (VI 1).

2) If the first and second stems (St 1-2) tend to enter again, whereas the third stem (St 3) tends to outcome, people can suppese the gasket (Db 2) or the valve leaking (VI 2).

2. REPLACEMENT OF EXTERNAL GASKETS

2.1 Verify it on the stems appear irregularities or bumps, in this event, use some fine rate emery cloth, passing it over the involvd part and placing some rags as a protection of the head.

2.2 Lock the cab on the easiest position to work next the piston head, detach the stem from the cab and the possible guiding braces, have the lower beat stem lowered.

2.3 Clean the head, the stem and particulary remove the faults on the outcoming stem part.

2.4 Using a section key or a punch, unscrew(in a counter-clockwise sense) the head (Ts 1-2-3), starting with a hammer beat to contrast the stem roattion, or withdraw it from the stem.

2.5 Using a screwdriver, remove the gasket (Gr 1-2-3).
In some pistons the gasket is groove seat mounted and always remains in the head; instead in many other pistons the gasket is mounted in open seat and could remain in a working position, then, it is to be withdraw from the stem.

2.6 Remove the scrapes (RS 1-2-3) and O ring gasket (Or 1-2-3). Verify the cleaning status of guiding rings (Ag 1-2-4).

2.7 Mount a new gasket again, do not use metal bodies to force it into its lodgement. Always mount the gasket keeping the **rubber side bottom-ward**. If the gasket is of the Teflon extrusion-proof type, as a first thing mont the ringless gasket and later insert the ring into tis lodgement.

2.8 Remount a new scraper (Rs 1-2-3) and a new O ring gaskets on the head (please pay attention not to confound the OR lodgement with the thread discharge).

2.9 Verify the proper position of the OR and the perfect cleaning of threads. Lubricate threads (better to use a size-proof grease) and slightly screw without forcing. After reaching the beat, give some hard hits when screwing.

2.10 The piston is ready to work.
If necessary, exhaust air.

3. REPLACEMENT OF INTERNAL GASKETS

3.1 This operation requires you to be equipped with a system for drawing and suspending the stem outside its cylinder, eventually using a tie as shown at Figure 2, to be tight on the stem and drawing on the head (Ts 1-2) which is screwed on it. In addition, it is necessary to avail of a tank and a recovery pipe with arubber holder which can be screwed on exhaust bores (Sf 2-3) of the piston.

3.2 Lock the cab on the easiest position to work next the piston head, datach the stem from the cab and the possible guiding braces, have the lower beat stem lowered.

3.3 Remove the exhaust screw (ex. Sf 3) or the proper cap (ex. Tp 3) located on the head where the stem to be lifted is inserted (ex St 3) then, on its position screw the rubber-holder to which the oil recovery pipe in tank is to be connected. Open an exhaust screw on the gearcase or, in absence of this, remove the manometer and open the exclusion faucet to allow air to enter into the cylinder during the lifting.

3.4 Gradually lift the stem, veryfing the outflow of the oil from the recovery pipe. After reaching the beat on the head (ex. Ts 3) stopp and get ready to unscrew the very head.

3.5 Using a section key or a punch, unscrew (in a counter-clockwise sense) the head (Ts 3) starting with a hammer beat to contrast the stem rotation, or withdraw it from the stem.

3.6 By keeping the head fully unscrewed, futher lift the stem until it fully exist.

3.7 The stem base gets a gasket (Db 2) which can have two different executions based on the piston type (see table n° 1 Ref. 9620/5)

3.7.1 The **type A** is composed by a 5-piece gasket, of which the central one is the sealing element and the lateral ones are the black support shoulders and the white guiding rings. Remove the guiding rings, the support shoulders and then, using a screwdriver the sealing element. Mount the new gasket leaving from the central element and in case screw-drivers are to be used pay attention not to ruin the gasket contact surfaces. Then, insert the two support shoulders and the guiding rings.

3.7.2 The sealing **type B** is composed by a single piece gasket plus two guiding rings located into separated areas.
The replacement of this type of sealing involves the drawing of the gasket from the upper part, as it cannot pass through the stem base.
Always mount the gasket keeping **the rubber part top-ward.**
In case screwdrivers are to be used pay attention not to ruin the gasket contact surfaces.
Then verify the integrity of the two guiding rings.

3.8 After changing the gasket, replace the filling valve.
Even in this case, there are two types of valves (Fig. 3 or 4) based on the pistontype (see table 1 Ref. 9620/5).

3.8.1 To replace **type 1** valve, operate as follow:

1) Unscrew the safety grain <5>.
2) Unscrew the cap <4> using a hexagonal 45 key, by starting with a hammer stroke to contrast the stem rotation.
3) Then accede to the valve <2> and the spring <1>, in additon, the gasket <3> should remain into thegroove on the cap.
4) Remount the new full valve without tightening the cap too-much and then verify the valve sliding by pushing the spherical part projecting from the cap.

3.8.2 Instead, to replace the **type 2** valve, operate as follow:

1) Unscrew the four hexagonal MB screw <10>.
2) Withdraw the valve-holder <9>.
3) Then accede to the valve <8> and the spring <7>, in addition the gesket <6> should remain inserted into othe valve-holder.
4) Remount the new full valve and then verify the valve sliding by puching the projecting part.

3.9 When inserting the stem pay attention to the alignment with the cylinder.

3.9.1 Drop the stem until it reaches the gasket mouth (Db 2).

3.9.2 After dropping for further 40-50 cm, insert the stem spacer (Ds 3) and screw the head (Ts 3).

3.9.3 Verify the proper position of the OR and the perfect cleaning of threads.
Lubricate threads (better to use a size-proof grease) and slightly screw without forcing.
After reaching the beat, give some hard hits when screwing.

3.9.4 Then gradually drop the stem until the lower beat is reached.

3.9.5 Remove the lifting tie.

3.10 Repeat the procedure from the point 3.9 to remount the stem (St 2) reffering to the relevant elements (Db 1, Ds 2, Ts 2).

3.11 Closed the exhausts on the heads (Sf 3, Tp 3, Sf 2, Tp 2) and on the gearcase.

TABELLA 1 - Types of **Db** gaskets and **Vl** filling valves.

Piston type	**Db**	**Vl1**	**Piston type**	**Db1**	**Vl1**	**Db2**	**Vl2**
46/2	A	1	58/3	A	1	A	1
60/2	A	1	75/3	A	1	A	1
77/2	A	1	98/3	A	1	A	1
78/2 (*)	A	1	107/3	A	1	A	1
85/2	A	1	127/3	A	2	A	2
103/2	A	2	150/3	A	2	A	2
120/2	A	2	176/3	A	2	A	2
141/2	A	2					
170/2	A	2					
205/2	A	2					

NOTE:

(*) OUT OF PRODUCTION

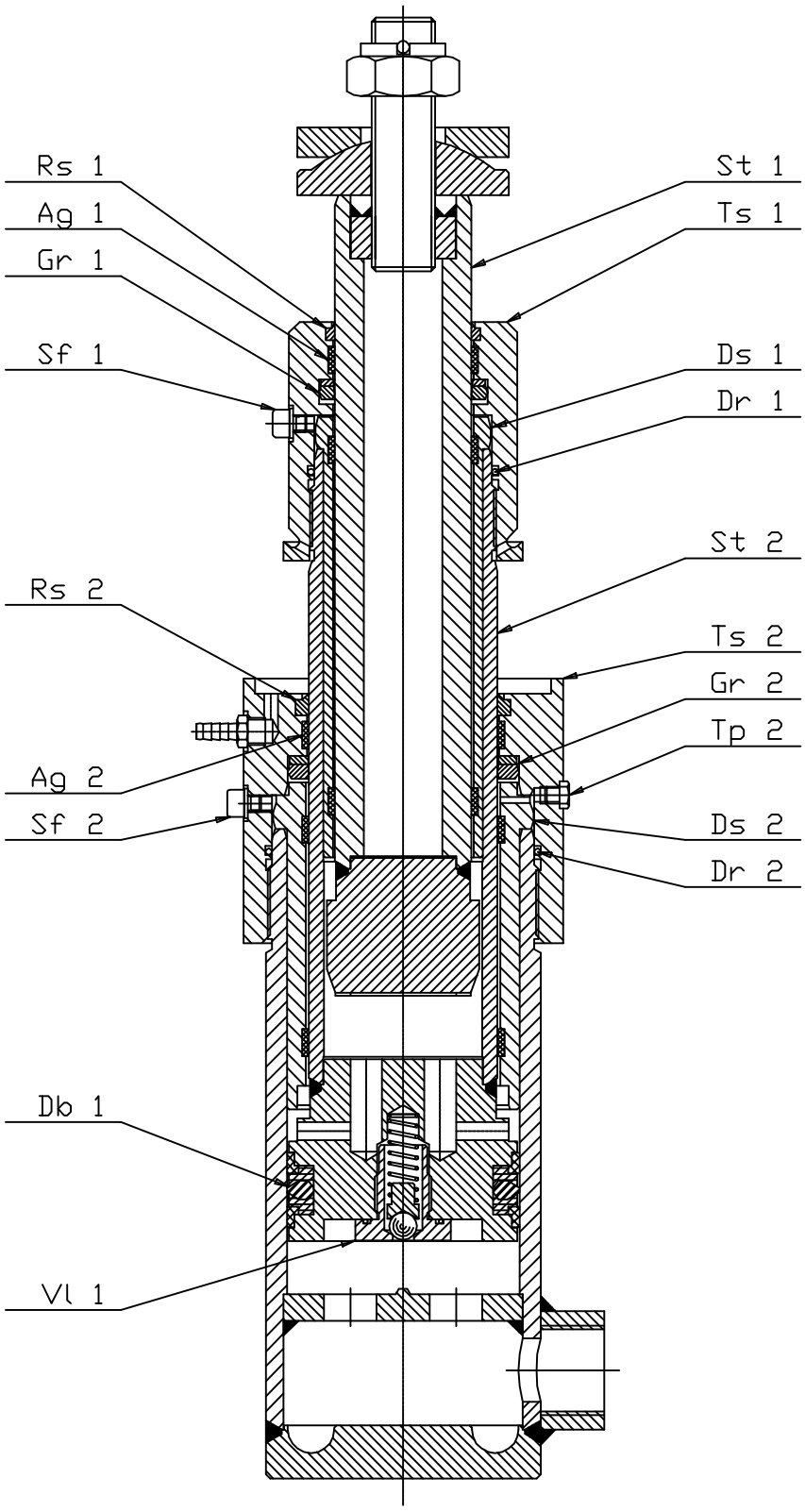


FIGURE 1/A

UT			CHANGING SEALING ELEMENTS IN TELESCOPIC PISTONS (TELESCOPIC PISTONS WITH TWO EXTRACTORS)	DATE 08/99
				DWG N. 9620/6

9620/6-IN

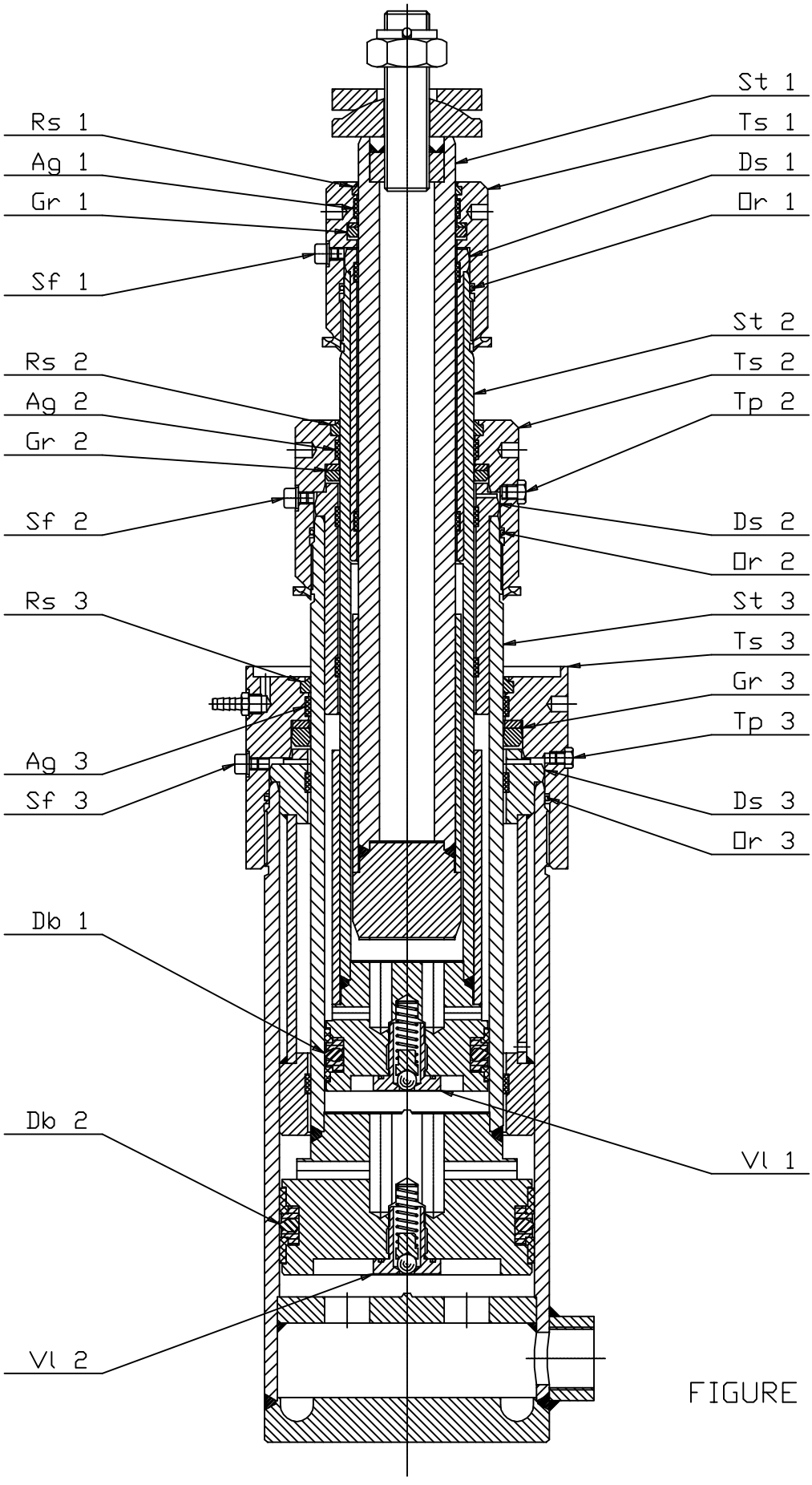


FIGURE 1/B

UT			CHANGING SEALING ELEMENTS IN TELESCOPIC PISTONS (TELESCOPIC PISTONS WITH THREE EXTRACTORS)	DATE 08/99
				DWG.N. 9620/7

9620/7-IN

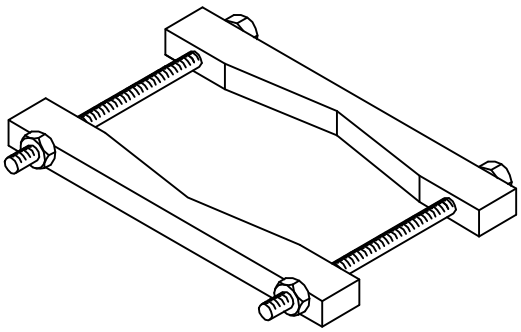


FIGURE 2

VALVE TYPE 1

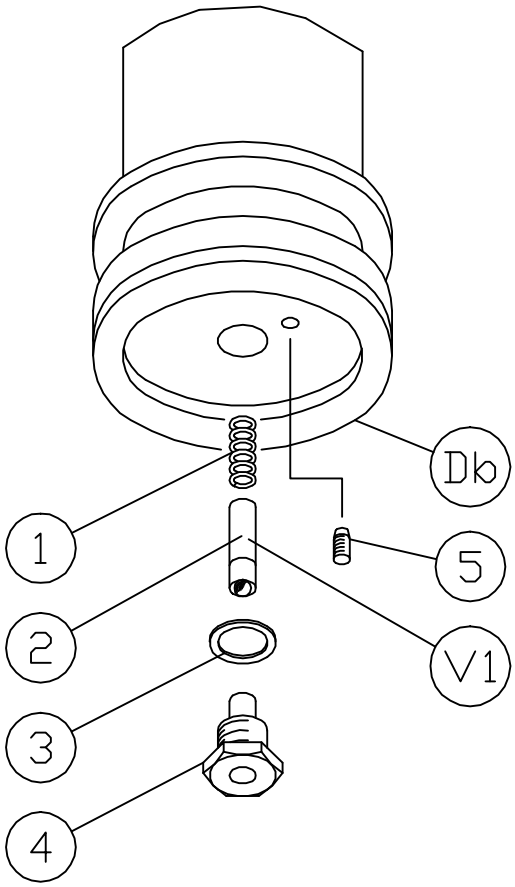


FIGURE 3

VALVE TYPE 2

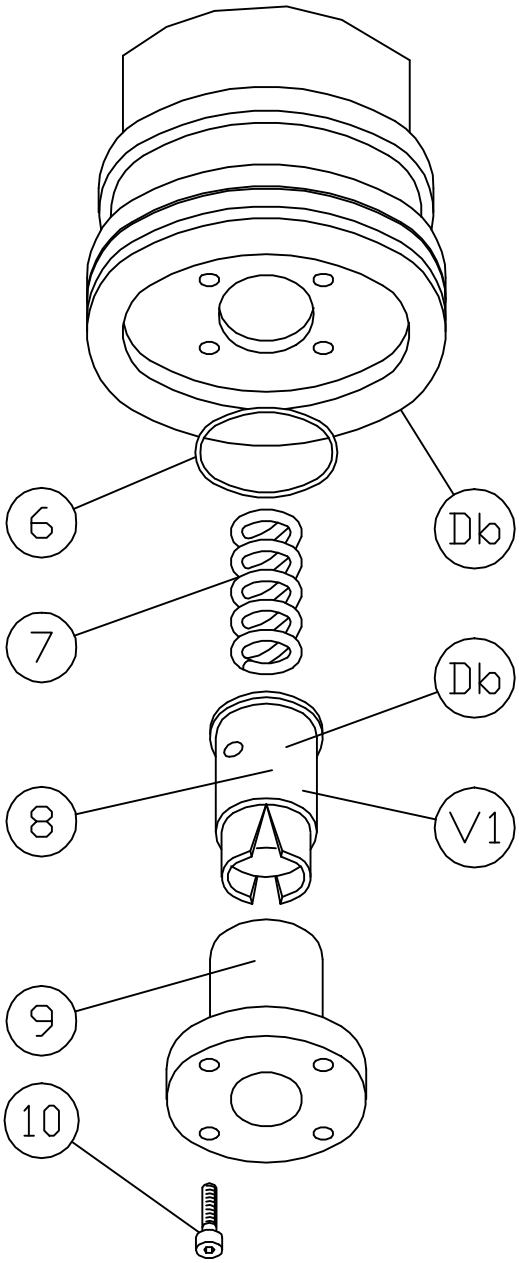


FIGURE 4

UT			CHANGING SEALING ELEMENTS IN TELESCOPIC PISTONS	DATE 08/99
				DWG N. 9620/8

9620/8-IN

HL/9017-ING

UT

TABLE TO DETERMINE THE RATES OF:
PRESSURE - SPEED - PUMP - MOTOR
RELATIVE TO RAM TYPE AND LOAD
(TELESCOPIC PISTON WITH TWO EXTRACTORS)

PUMP L/1'														RAM TYPE "H"	STATIC PRESSURE IN BARS																					
650	500	440	380	330	300	250	210	180	150	125	100	75	55		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
						1.06	0.89	0.76	0.64	0.53	0.42	0.32	0.23	60/80	302		380		459		537		616		694		773		852		930		1009		1087
														60/80-G	188		266		345		423		502		581		659		738		816		895		973
			1.03	0.90	0.82	0.68	0.57	0.49	0.41	0.34	0.27	0.20	015	75/100	441		563		686		809		931		1054		1177		1300		1422		1545		1668
														75/100-G	329		451		574		697		820		942		1065		1188		1310		1433		1556
	0.94	0.83	0.72	0.62	0.57	0.47	0.40	0.34	0.28	0.23	0.19	0.14	0.10	90/120	783		959		1136		1313		1490		1666		1843		2020		2196		2373		2550
														90/120-G	695		871		1048		1225		1402		1578		1755		1932		2108		2285		2462

STATIC PRESSURE IN BARS																																		
33	34	35	36	37	38	39	40	41	42	43	44	45	46																					
	1087		1166		1244		1323		1401		1480		1558		1637																				
	973		1052		1130		1209		1287		1366		1444		1523																				
	1668		1790		1913		2036		2158		2281		2404		2526																				
	1556		1678		1801		1924		2046		2169		2292		2415																				
	2550		2726		2903		3080		3256		3433		3610		3787																				
	2462		2638		2815		2992		3168		3345		3522		3699																				

55	6 (4.5)																																8 (6)	
75	6 (4.5)																														8 (6)		10 (7.5)	
100	6 (4.5)				8 (6)																								10 (7.5)				13 (9.5)	
125	8 (6)						10 (7.5)																						13 (9.5)				16 (12)	
150	8 (6)				10 (7.5)				13 (9.5)																				16 (12)				20 (15)	
180	13 (9.5)						16 (12)																						20 (15)				25 (18.5)	
210	13 (9.5)				16 (12)				20 (15)																				25 (18.5)				30 (22.5)	
250	20 (15)						25 (18.5)				30 (22.5)																		40 (30)					
300	16 (12)				20 (15)				25 (18.5)				30 (22.5)																40 (30)					
330	20 (15)				25 (18.5)				30 (22.5)																				40 (30)				50 (37)	
380	20 (15)				25 (18.5)		30 (22.5)				40 (30)																		50 (37)					
440	25 (18.5)				30 (22.5)				40 (30)				50 (37)																60 (45)				80 (60)	
500	25 (18.5)				30 (22.5)		40 (30)				50 (37)				60 (45)														80 (60)				100 (75)	
650	40 (30)				50 (37)				60 (45)				80 (60)																100 (75)					

MOTOR POWER H.P. (Kw)

▲ = SPEED OF RAM IN UPWARD DIRECTION m/sec
(AVERAGE LOAD)

◆ = TOTAL LOAD
(USEFUL LOAD + CAR + CAR FRAME + ACC. = Kg)

- THE WEIGHT INDICATED IN THIS TABLE HAS BEEN CALCULATED CONSIDERING
THE RODS WEIGHT FOR A MAXIMUM STROKE (SEE DWG : HL 09.01 6/10 + HL 09.01 7/10)

DATE 09/07

DWG Nr. HL/9017

TELESCOPIC JACKS TYPE “H”

TELESCOPIC JACKS SELECTION

Here below the needed data for the selection of the right telescopic jack:

Q	=	rated car load	[kg]
P_3	=	empty car weight + car sling + accessories	[kg]
H	=	car travel	[m]
B	=	lower car overtravel	[m]
T	=	upper car overtravel	[m]
S	=	jack stroke	[m]
g_n	=	acceleration of gravity	[9,80665 m/s^2]
P_r	=	rams weight (see tab. OVERALL DIM. AND TECHNICAL DATA)	[kg]
A_r	=	small ram area (see tab. OVERALL DIM. AND TECHNICAL DATA)	[mm^2]

The data needed for jack selection can be obtained using the following formulas:

T = total load applied [daN]:

– direct acting:

• single jack: $$T = (Q + P_3) \times \frac{g_n}{10} \qquad [1a]$$

• double jack: $$T = \frac{(Q + P_3)}{2} \times \frac{g_n}{10} \qquad [1b]$$

Max static pressure (function of jack travel and max load T):

$$Pstmax = (Q + P3 + Pr) \times \frac{7,06}{Ar} \qquad [MPa] \qquad [2]$$

Min static pressure:

$$Pst = (P3 + Pr) \times \frac{7,06}{Ar} \qquad [MPa] \qquad [3]$$

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Date : 09/07

Car speed calculation:

V = car speed [m/s]**:**

* single jack : $$V = \frac{P\ pump\ flow}{0.083 \times Ar} \quad [4a]$$

* double jack : $$V = \frac{P\ pump\ flow}{0.083 \times Ar \times 2} \quad [4b]$$

With P pump flow = pump flow [l/min.]

Table of jack speed reffer to the pump flow [m/s]

Table bolow is reffer to :

- motor 50 Hz
- single jack lift
- reeven ratio 1:1

		Pump rated flow [l/min]														
		55	75	100	125	150	180	210	250	300	330	380	440	500	650	
Ram type	T 60/80	0,23	0,32	0,42	0,53	0,64	0,76	0,89	1,06	/	/	/	/	/	/	Piston speed [m/sec]
	T 75/100	0,15	0,20	0,27	0,34	0,41	0,49	0,57	0,68	0,82	0,90	1,03	/	/	/	
	T 90/120	0,10	0,14	0,19	0,23	0,28	0,34	0,40	0,47	0,57	0,62	0,72	0,83	0,94	/	

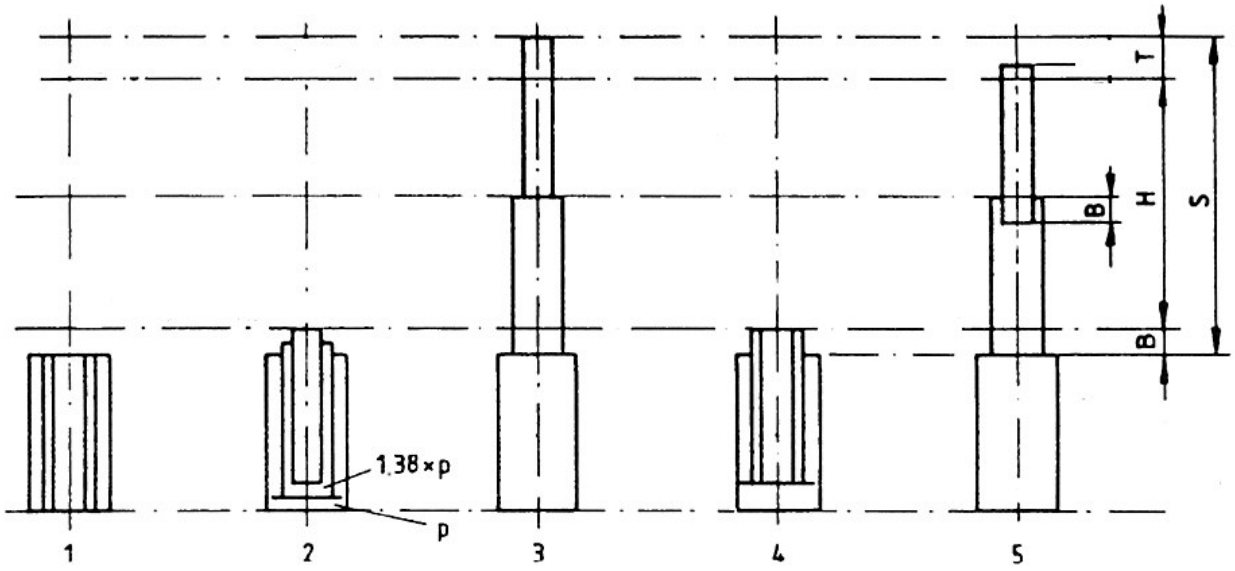
Note:

- for lift with more than one jack the above speed must be divided by the number of jack.

Rev. B Reference only MORIS Firm

Jack stroke calculation and telescopic jack syncronization

A normal feature of the telescopic jacks with hydraulic syncronization is that, due to leakages throug the sealings during normal use, the total stroke gets shorter and shorter nd in certain cases it's not possible to reach properly the top floor level.
The company who takes care of the lift maintenance has the duty of scheduling the synchronization procedure (see next chapter) with a time step ranging from 3-4 months to 1 year, according to the average numbers of run s/day of the elevator.



H= car travel
B = lower overtravel; according to the code + 20 mm
S = total stroke of the telescopic jack
T = upper overtravel = B + 50 mm
Fig. 1: jack fully collapsed before the putting in service of the elevator.
Fig. 2: jack during normal service, correctly synchronizated, car at rest at the lower floor.
Fig. 3: correctly synchronized jaack, fully extended.
Fig. 4: a jack that lost synchronization, car at reast at lower floor.
Fig. 5: a jack that lost synchronization, fully extended.

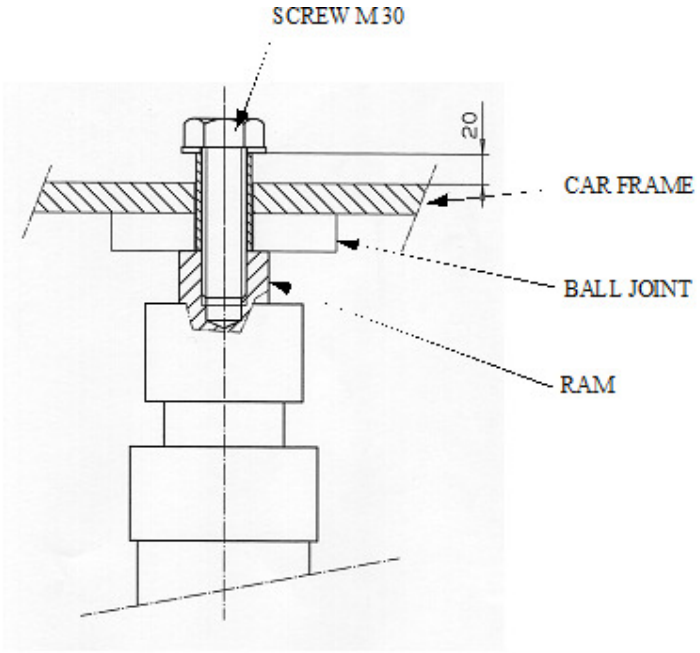
S = jack stroke [m]

- Total jack stroke: $S = H + B + T$ [5a]

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ATTENTION: to comply with the rule UNI-EN 81-20/50 (par. 12.2.3.3 " Cuschioned stop") and the maximum allowed stress of material it is necessary to leave a 20 mm free space of car frame stroke from mechanical stop of the cylinder.

Car frame fixing example



HL 09.01 5/10
Rev:A

JACK SELECTION USING GRAPHICS

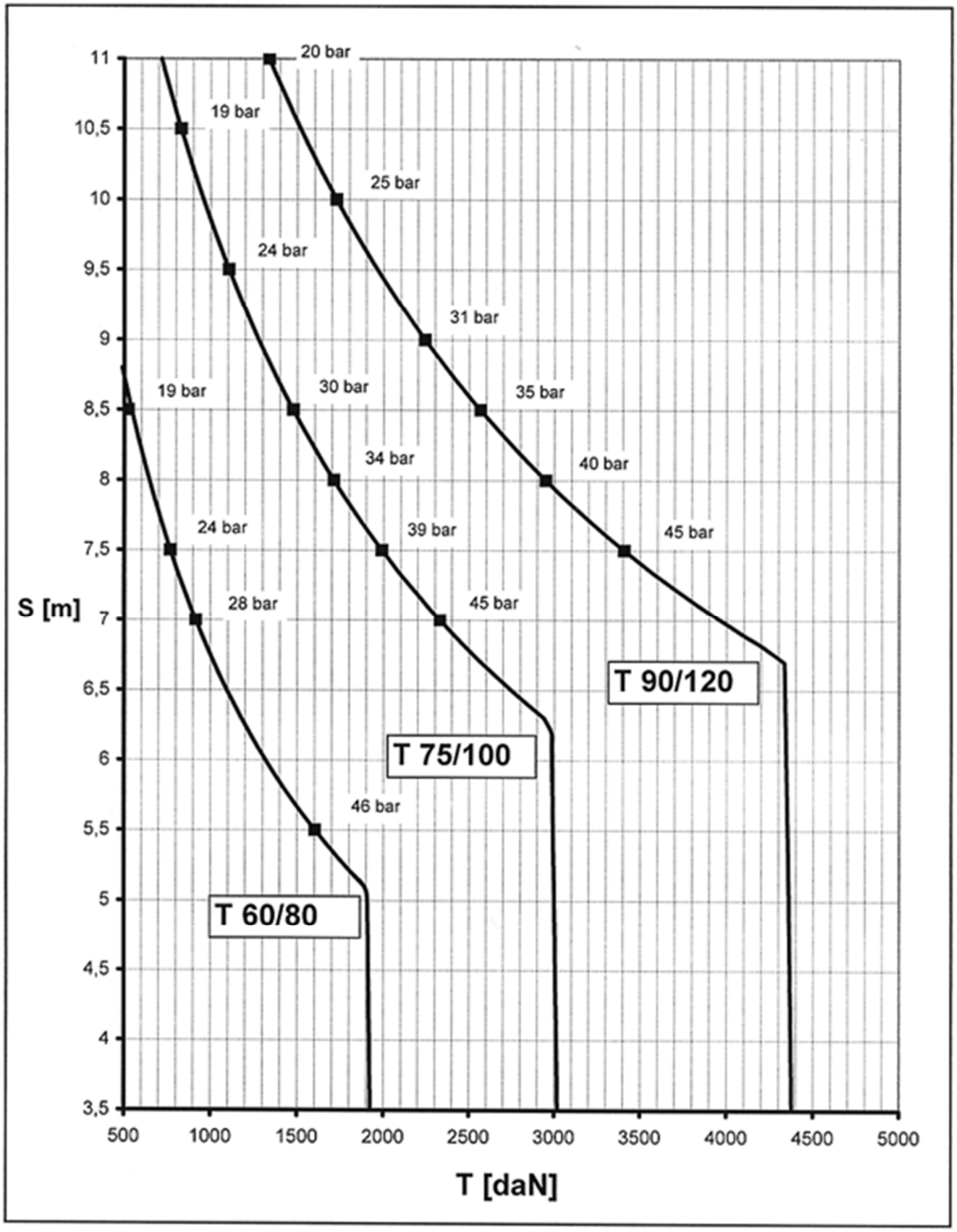
The right jack can be selected using graphics reporting max admitted buckling load (safety factor = 2,8). Buckling calculations meet EN81.20/50 requirement.

If a selection based only on graphics is preferred, the process is the following:

- calculate the total load on the ram T (formulae 1a, 1b); trace on the graphic concerning the selected jack a vertical line starting from T value.
- calculate buckling length (formulae 5a) and trace the horizontal line starting from L value;
- find the intersection of the two lines and select the jack whose max load curve is just above the intersection point;
- verify that min. static pressure and max. static pressure (formulae 2, 3) are in the admitted pressure range (max. 5,0 MPa, min 1,2 MPa).

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Rev:B

Buckling diagram for telescopic jacks type T 60/80, T 75/100 and T 90/120 According to EN 81.20/50

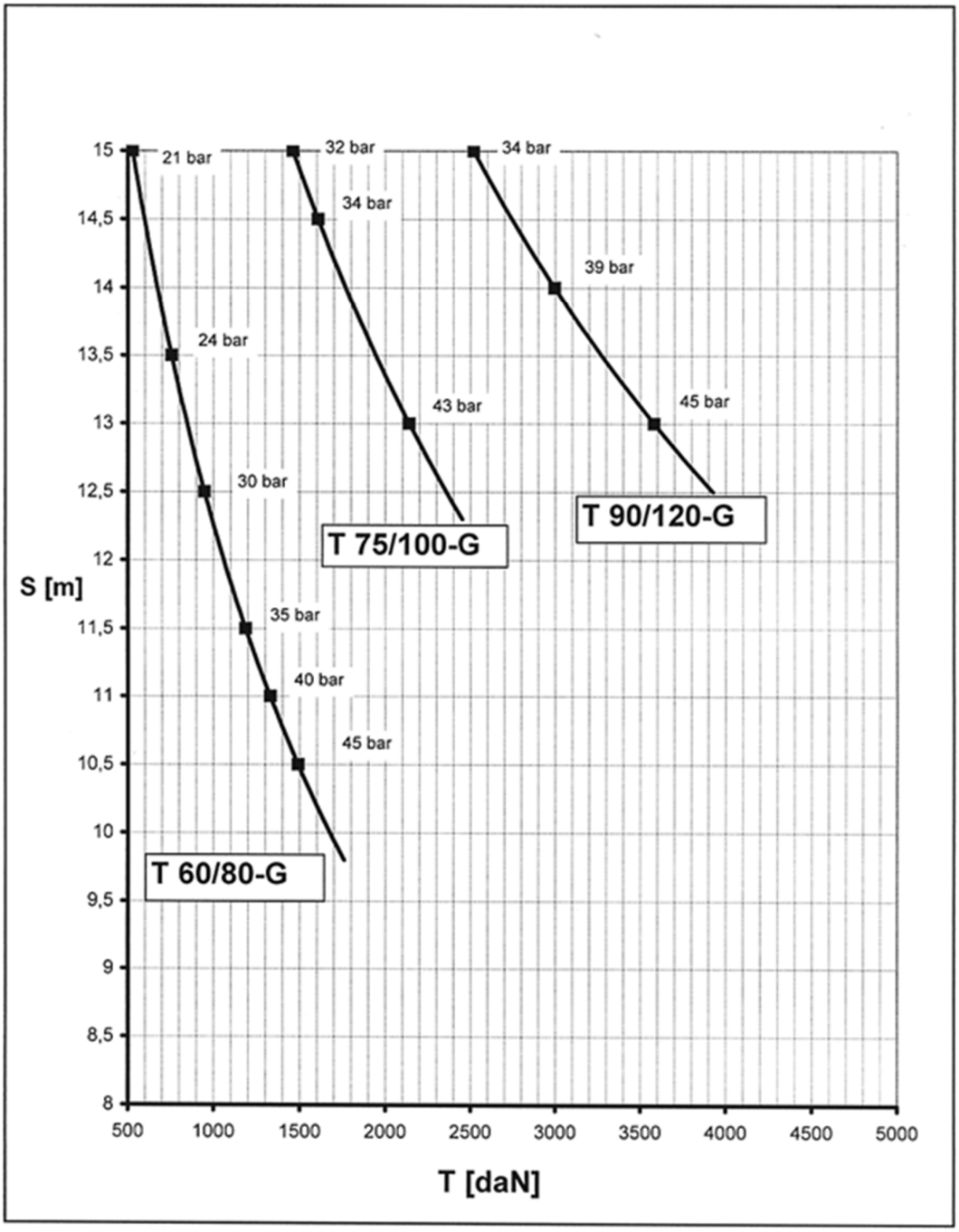


Max. static pressure 5 MPa

UT			TELESCOPIC PISTONS TYPE "H" TELESCOPIC JACKS SELECTION	DATE 08/17
				HL 09.01 6/10 REV: B

HL 09.1 /10
Rev:B

Buckling diagram for telescopic jacks with guide yoke type T 60/80-G, T 75/100-G and T 90/120-G According to EN 81.20/50.



Max. static pressure 5 MPa

UT	**TELESCOPIC PISTONS** **TYPE "H"** **TELESCOPIC JACKS SELECTION**	DATE 08/17 HL 09.01 7/10 REV: B

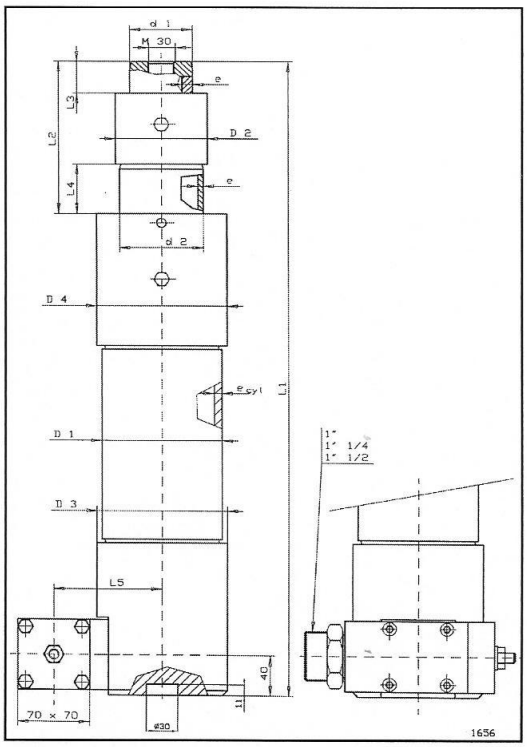
HL 09.01 8/10
Rev:C
Date:10-06

Overall dimensions and technical data for direct lateral jacks type T 60/80, T 75/100, T 90/120
Avaiable jack stroke from 3000 mm up to 15000 mm.

JACK type "T"	DIMENSIOS [mm]												RAM AREA [mm^2]	TOTAL JACK WEIGHT [Kg]
TIPO	**d1-d2**	**e**	**D1**	**D2**	**D3**	**D4**	**e_{cyl}**	**L1**	**L2**	**L3**	**L4**	**L5**	**Ar**	**P_r**
T 60/80	60	30	115	105	125	125	7,5	500 x **S** + 443	143	17	38	107	2827	17.5 x **S** + 20
	80	5												
T 75/100	75	17.5	140	120	160	145	7,5	500 x **S** + 467	127	13	26.5	124	4418	25 x **S** + 32
	100	7												
T 90/120	90	12	170	135	190	175	10	500 x **S** + 497	117	12	17	138	6362	22 x **S** + 35
	120	7												

JACK Type "T"	OIL VOLUME [l/m]	
TIPO	**Filling oil**	**Working oil**
T 60/80	5 x S/2	7.8 x S/2
T 75/100	7.8 x S/2	12.5 x S/2
T 90/120	11.3 x S/2	17.8 x S/2

Jacks are delivered filled of oil.

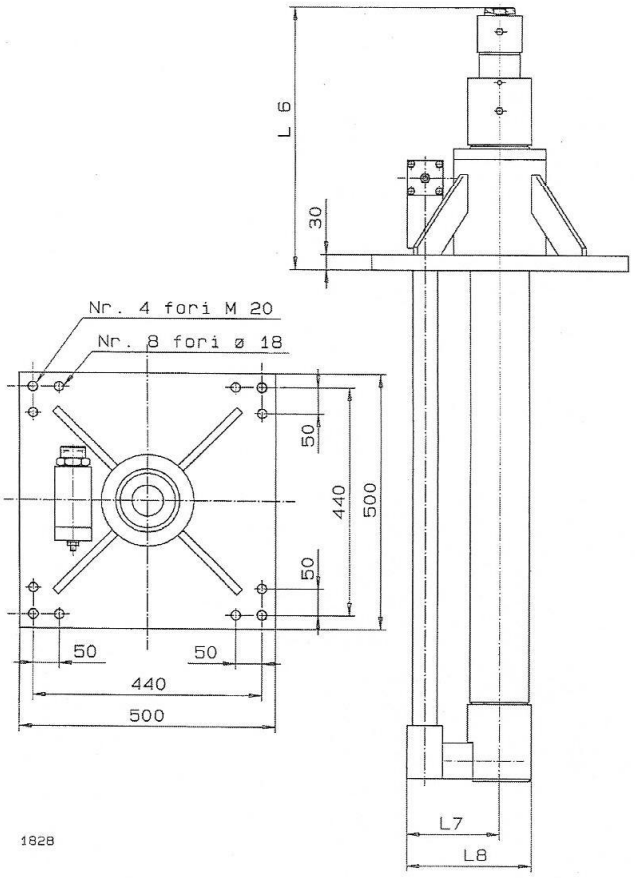


HL 09.01 9/10
Rev:D
Date:10-06

Overall dimension direct central inground jacks type T 60/80, T 75/100, T90/120
Avaiable jack stroke from 3000 mm up to 15000 mm.

JACK TYPE T	L6 [mm]		L7 [mm]	L8 [mm]	JACK WEIGHT[Kg]
	min.	max.			
T 60/80	400	650	205	270	26.5 x **S** + 105
T 75/100	395	650	225	305	39 x **S** + 133
T 90/120	385	650	230	312	42.5 x **S** + 172

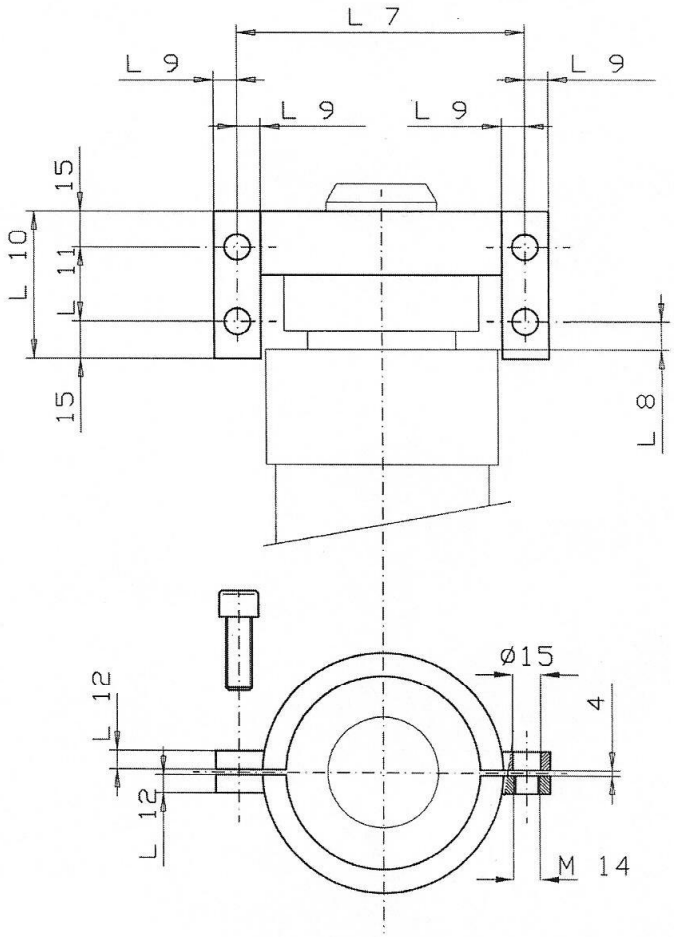
Direct central jacks, for the missing dimensions see HL 09.01 8/10



HL 09.01 10/10
Rev:B
Data:09-07

Overall dimensions telescopic jacks with guide yoke types T 60/80-G, T 75/100-G, T90/120-G

JACKS TYPE T	DIMENSIONS [mm]					
TYPE	L7	L8	L9	L10	L11	L12
T 60/80-G	155	54	12.5	60	30	10
T 75/100-G	170	70	12.5	60	30	10
T 90/120-G	200	25	20	95	60	15



UT	**TELESCOPIC PISTONS** **TYPE "H"** **TELESCOPIC JACKS SELECTION**	DATE 09/07 HL 09.01 10/10 REV: B

BLEEDING, RE-SYNCHRONIZATION AND TEST BEFORE PUTTING INTO SERVICE PROCEDURE HYDRONIC TELESCOPIC JACK

General carachteristics of the product :

- Jacks are delivered filled of oil.
- In dimensioning the lift it is suggested to calculate jack extra-stroke so that upper extra-stroke is > of at least 5 cm than low extra-stroke
- Jacks are delivered with shim for intermediate element which MUST be removed after oil inlet hose connection has been executed
- Inside the jacks there is a device that deschargs, throught a little copper pipe, the induced pressure when the upper ram arrive to the maximum extention.
- On the two heads of the jacks the holes for the bleeding, the oil leakage and the pressure descharge are three 120° oriented. Plug the holes that aren't in use.

During first installation:

After the connection of oil inlet hose to the installed jack and with car frame connected .

- Remove cabin pit bottom spring.
- Remove completely air bleed screw M6 from both cylinder head sealings of the jack, taking care to cover with a cloth the thread so to avoid oil splash.
- Remove coil of the high speed pilot valve of power unit and remove external shim of jack intermediate element.
- Make several short upward call (1-3 sec.) . Rams will slide out of the jack during working of motorpump and get down once the motorpump doesn't work anymore.
- When some oil is outgoing from air bleed screws M6, close them down . Probably out-going of oil will not take place from both sides together, but it can happen that it gets out first from one cylinder head and then from the other.
- Once the two air bleed screw have been closed, make an upward call. Rams will have to move together. In case one ram delays the movement compared to the other, of the same jack, there must be some few air in internal space of cilynder. Repeat bleed oper-ation moving the bleed screw correspondent to the delayed ram.

During normal use of lift:

To bleed air in case of its presence inside cylinder:

- Rest the lift so that the cylinder is fully collapsed (remove pit bottom springs)
- Remove bleed air screw
- Act as for the first installation

Synchronizing of a ram (two procedures are available):

Procedure A : as per air bleed

Procedure B :

- Make a full upward call, at slow speed, up to the internal mechanical stop of the jack (the elevator will be in upper extra travel).
- Keep working the motorpump for the time needed for complete extention of jack stages

CAUTION:

- when rams get stopped this means that complete fullfilment of synchronism, DO NOT insist with motorpump working but stop the lift immediately.

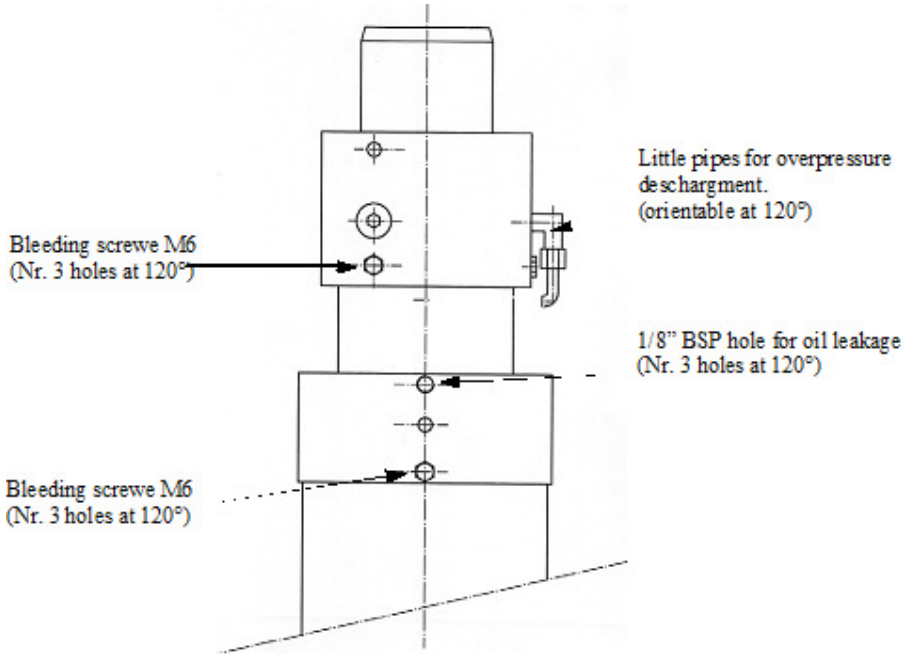
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TEST BEFORE PUTTING INTO SERVICE

To effect the test as requested by UNI-EN 81.20/50 (pressure test at 200% - max static pressure) act as follows:

- Remove from upper head the little pipes with 90° fitting (two pieces) to discharge cylinder overpressure.
- Mount two plug ERMETO type male thread 1/8" BSP to close the holes which is now free.
- Effect the test in compliance with the Rule.
- At the end of the test leave the two plugs ERMETO type and reconnect the two little pipes with 90° fitting to the upper head.

ATTENTION: remove the plugs and recollect little pipes otherwise device to discharge the pressure which could develop inside the cylinder does not work.
During normal work little pipes must always be installed.



SEALS SUBSTITUTION IN TELESCOPIC JACKS

Introduction

A correct distribution of cylinder extra-stroke allows to automathically recover little out of phase of the ram due to unavoidable losses during shifting on seals. In case of considerable losses, visible on ram or with out of phase of the ram which does not allow a regular work of the cylinder, it is necessary to consider a possible substitution of damaged seals.

We can have two different kind of problem depending on seals of telescopic jacks

First type, which is easily solvable, is the one due to losses visible from external side.
External losses are usually the dinamic ones located in seals of ram due to early wear and tear or the static ones due to damages in seals.
Other oil loss from inside to external side can occure due to defects or damages in air bleed caps or in O-Ring located inside the cylinder head, but they do not occur very often

Second type of losses is about internal sealing or non-return valve located at the bottom of the biggest ram: to substitute this seal it is needed to completely unthread the ram. An early wear and tear of these parts can be caused from impurity which are present in the oil.

We can test cylinder seals in static conditions, with partially unthread ram and shut off valve on power unit off:

- If top ram tries to shift down, and the bottom ram tries to exit from the cylinder, we can suppose a loss in internal seal or of non return valve.
- If both rams try to go into the cylinder and we have oil loss from cylinder head, we must substitute external seals.

Substitution of external seals

Change the seals only if there are more than 1.5 liter per mounth oil leakage

- Check if on ram you can see irregularities or roughnesses; in this case use some sand paper directioning it in a transversal way on the irregular part putting some rags to protect the cylinder head.
- Stop the cabin in the right position which allows you to better work on cylinder ram piston head. Untie the ram from the cabin and lower the rams till it reaches the cylinder bulkhead.
- Clean the ram piston head, the ram, and particularly remove defetcs from the ram presently out of ram
- Unscrew the locking screw from the cylinder head
- Unscrew the cylinder head (giving a blow with a hammer to initially unthread it) and remove the cylinder head from the ram.
- Remove ram seal and scraper. Upper ram seal is closed site type therefore it remains on the cylinder head; lower ram seal is open site type and it remains in the fix part of the cylinder.
- Check cleaning of ram guide rings.
- Assemble the new seal: do not use metallic or sharping objects to put it in its site. Pay attention in assembling the seals in the correct way: on the seals there is the indication PRESSURE SIDE for the right location
- Assemble the scraper in its site; before re-assembling the cylinder head be sure that the static O-Ring of the cylinder head not damaged. If it is damaged provide to substitute it.
- Check cleaning of cylider ram and ram threading and if needed, provide to grease them.
- Provide to slowly screw and finally tight with a resolute stroke
- Provide to screw the locking screw for the cylinder head.
- The jack is now ready to work, but before making it work an accurate air bleed must take place not to compromise the synchronization of the cylinder.

Subsitution of internal seal

N.B.:
- change the seal only when you must sincronize the jack every 15 days
- in case of replacement of the internal seal take note that:

  – replacement of internal seal takes more time that replacemento of external seals (two men for 8 hours)

  – replacement must be performed by practise and trained people to avoid damage of the rams, jack and contamination of oil

To make this operation possible, it is needed to have an equipment to be able to pull and keep the ram out of its cylinder, using, if needed, a clamp tied on lower ram which pulls on head cap. Moreover it is needed to have a plastic bottle to collect the oil and a plastic tube suitable to be screwed in the air bleed hole of the cylinder.

– Stop the cabin in the right position which allows you to better work on cylinder plunger. ATTENTION: be sure to have enough space around the cylinder which allows you to completely unthread the lower ram.

– Provide to separate the upper ram from the car frames and lower the rams till cylinder bulkhead

– If power unit is located lower than the cylinder, provide to separate the pipe line disassembling the shut off valve from the control valve on the power unit and leave the oil flow to the tank. The pipe line has anyway to be disconnected to allow the air flow inside the cylidner during unthreading of it

– Connect the hose for oil leakage to one fo the bleed air hoses.

– Pull out slowly the ram checking the oil flow in the hose till the ram stops itself at the upper mechanical stop.

– Unscrew the locking screw of the upper cylinder head and unscrew the upper cylinder head

– After having completely unscrewed the upper cylinder head, pull the ram till the internal seal are completely out of the cylinder

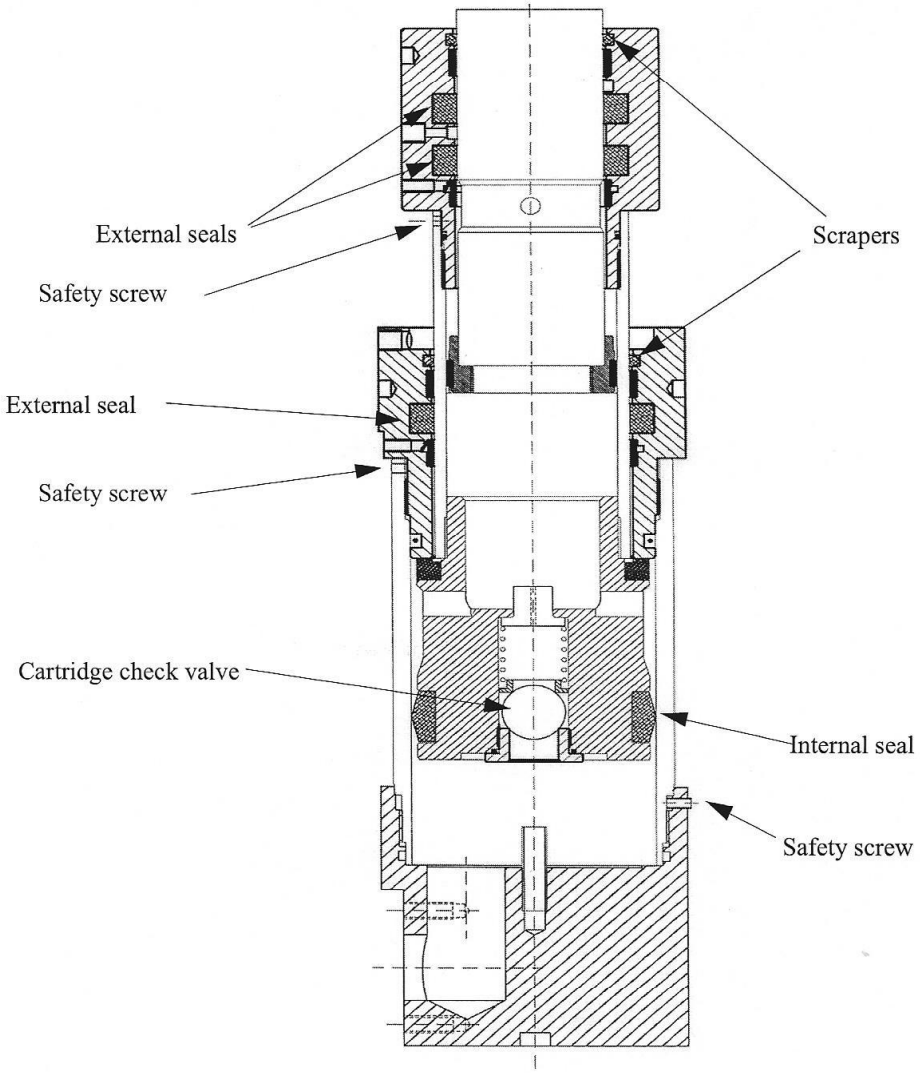
– Substitute the seal: mounting the new sealing, pay attention first to insert the rubber central part and then the black lateral broken rings and the white ones. To substitute the non return valve disassemble the "seeger" ring and the washer which locks it to the bottom of the lower ram and pull out the cartridge check valve using some "seeger" pliers.

– Re-insert the ram in the cylinder and leave it slowly down till it reaches the bottom of head cylinder locking it with its nut.

– The jack is now ready to work, but before making it work an accurate air bleed must take place not to compromise the synchronization of the cylinder.

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Location of the internal parts



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