Chapter 5

TELESCOPIC PISTONS

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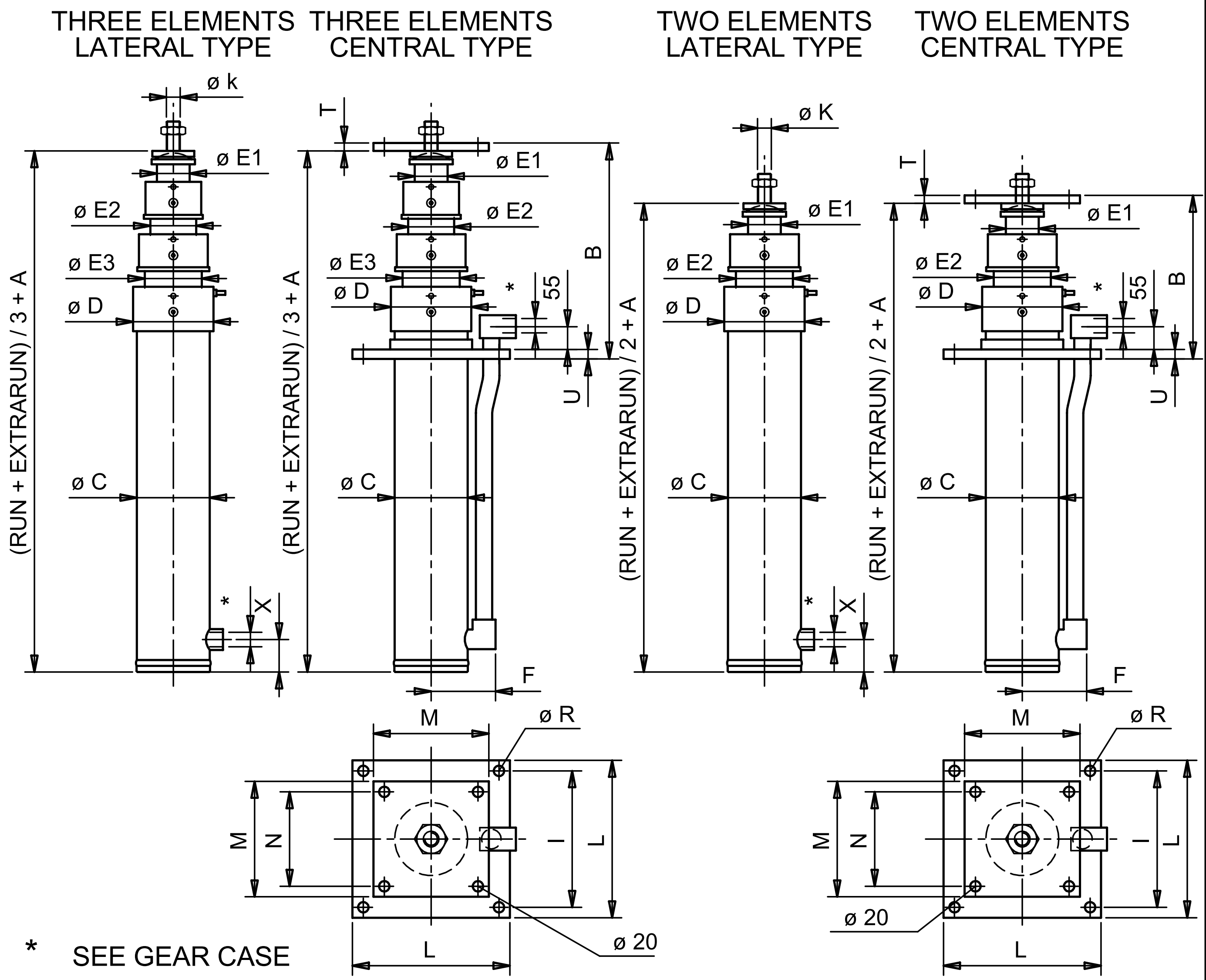
SERIES 9000

DRAWING	DESCRIPTION
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 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



* 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

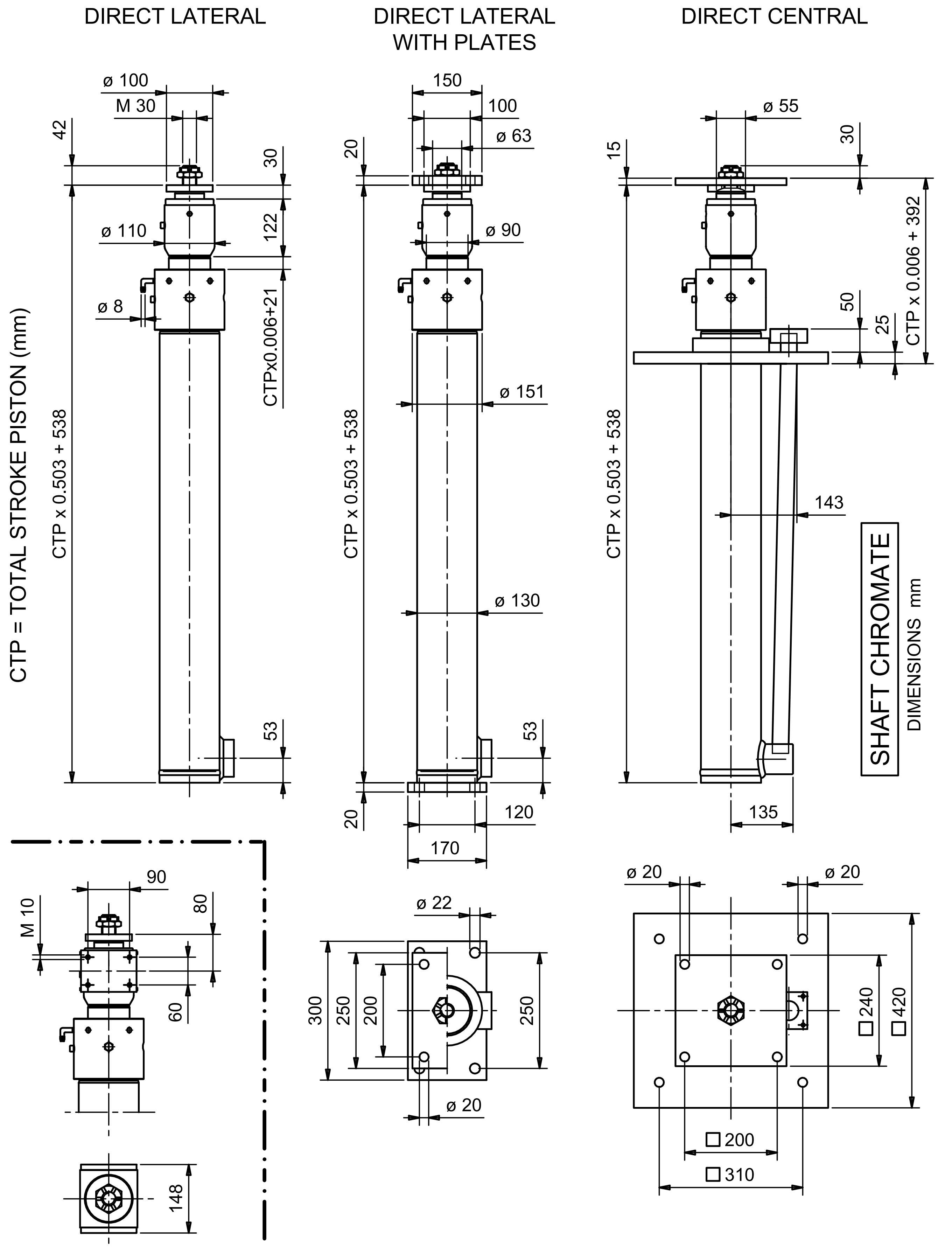
UT

SYNCHRONOUS TELESCOPIC PISTONS

TWO/THREE EXTRACTING ELEMENTS LATRAL/CENTRAL TYPE

DATE 01/04

DWG N. 9604

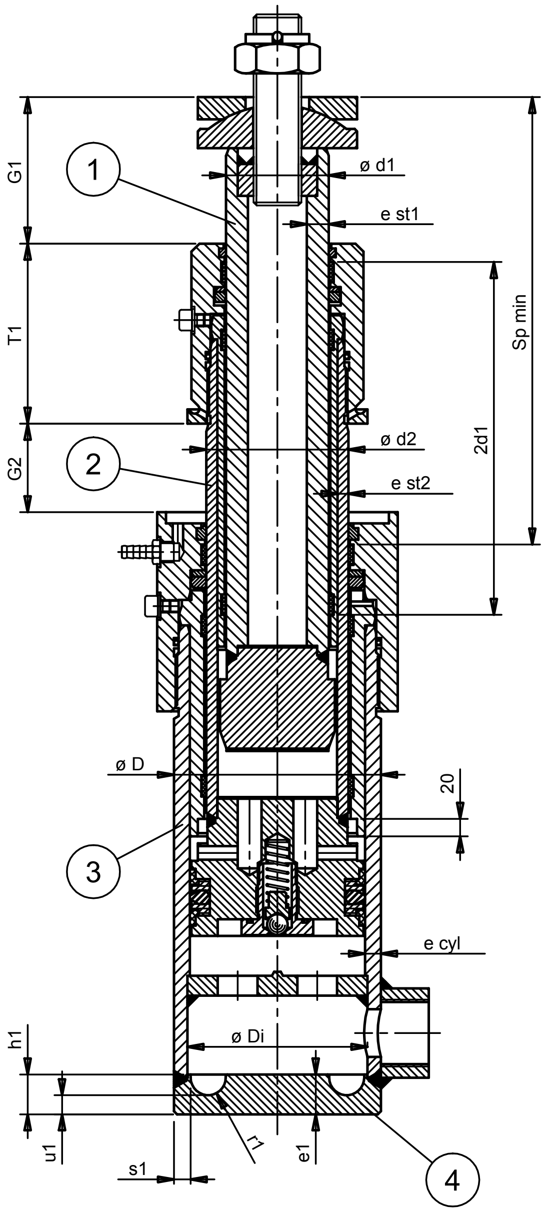


BRACKETS FOR GUIDE ARMS 77/2-G1

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		

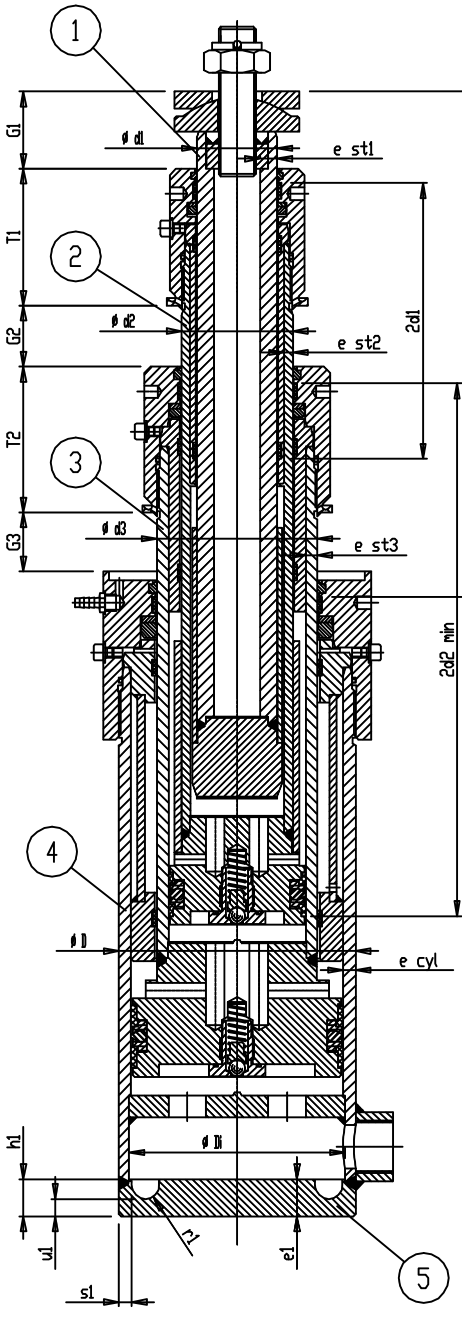
CALCULATION DATA FOR TELESCOPIC PISTONS WITH TWO EXTRACTING ELEMENTS

(OVERPRESSURE FACTOR 1.4)

DATE 01/04

DWG N. 9605

9605-IN



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

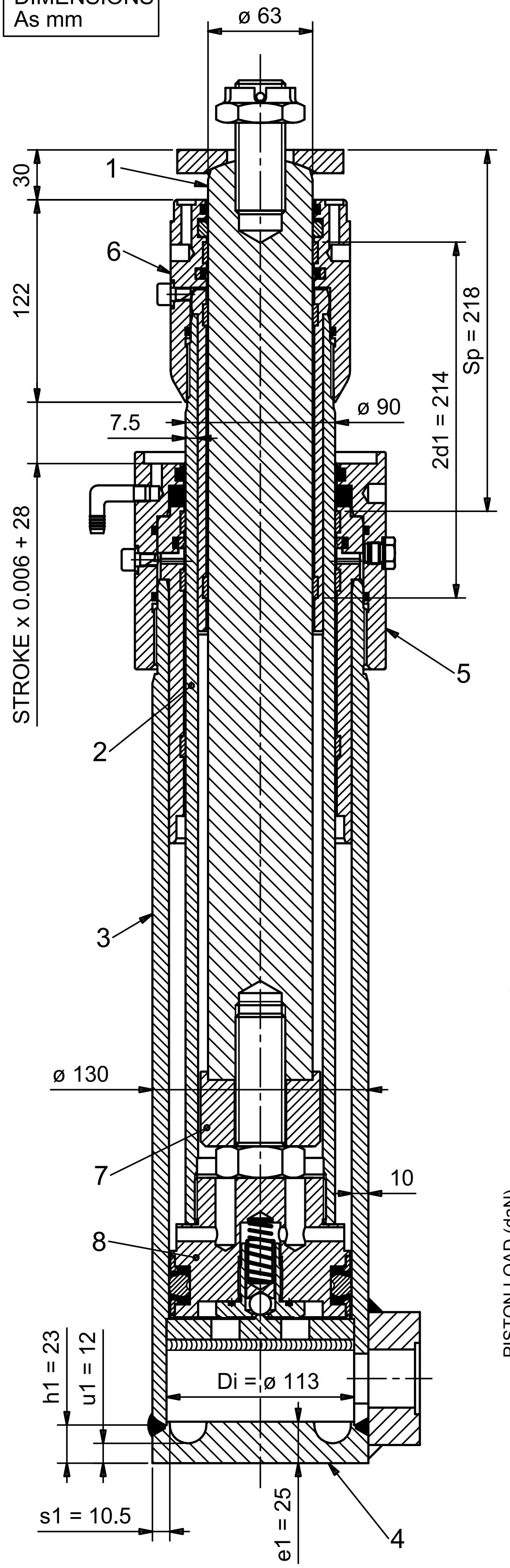
UT

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

DATE 04/00

DWG N. 9607

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 1	FE510
8 -	Rod pipe base 2	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):

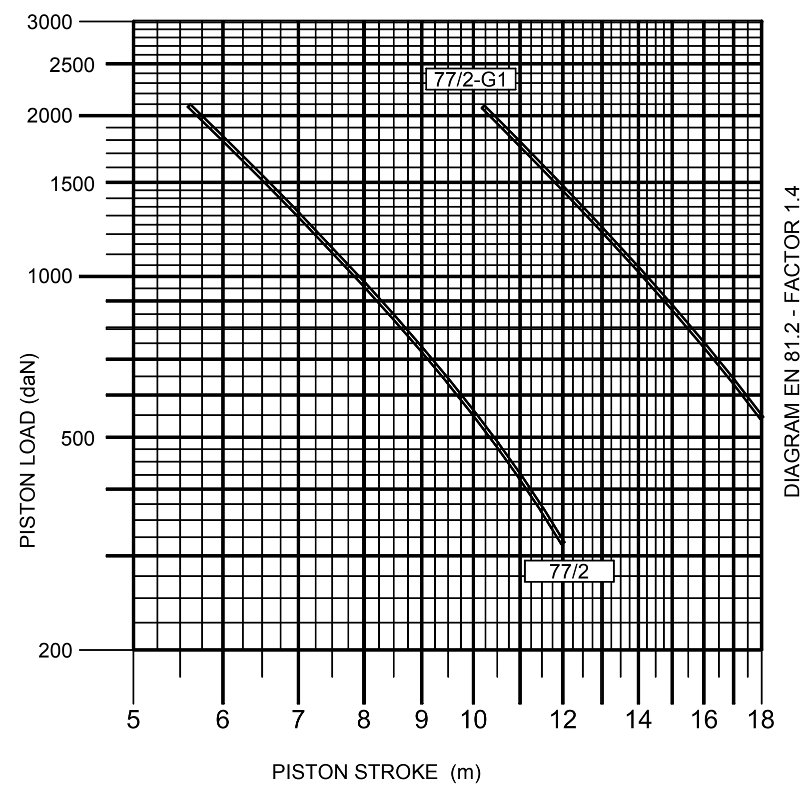
Qt = Travel range x 7

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

Ps1 = Travel range x 12.25 + 15.2

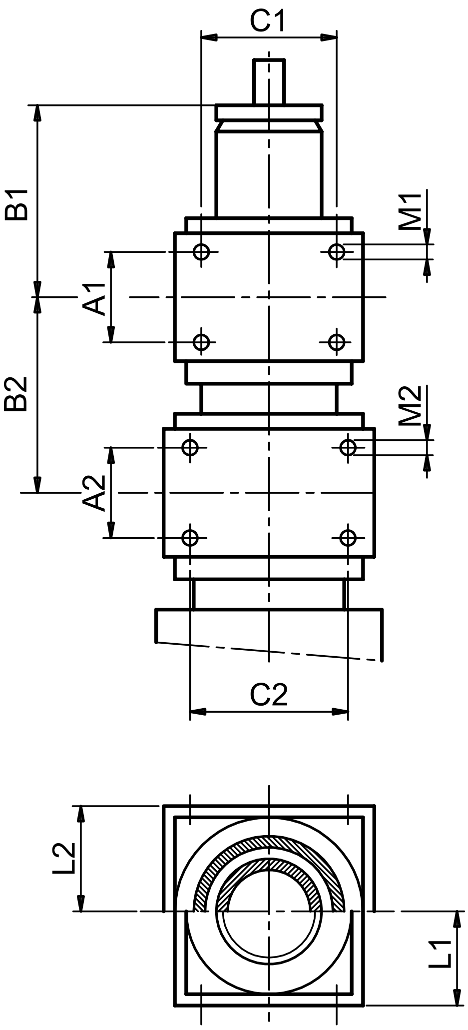
Shaft weight 2 (daN) in function of travel range of the piston (m):

Ps2 = Travel range x 7.64 + 18.8



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

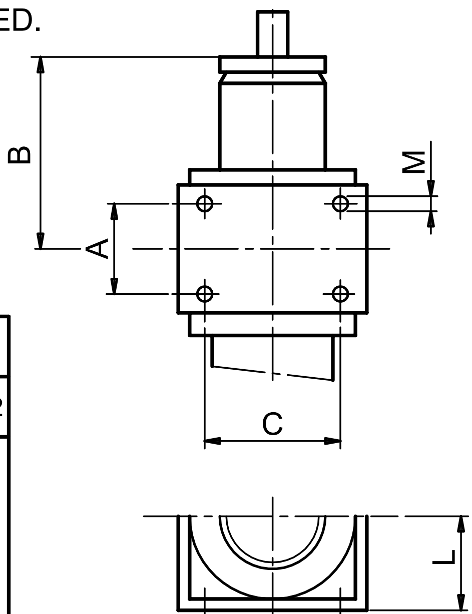
UT	DIMENSIONS AND CALCULATION DATA TELESCOPIC PISTON 77/2	DATE 01/04
		DWG No 9607/5



	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

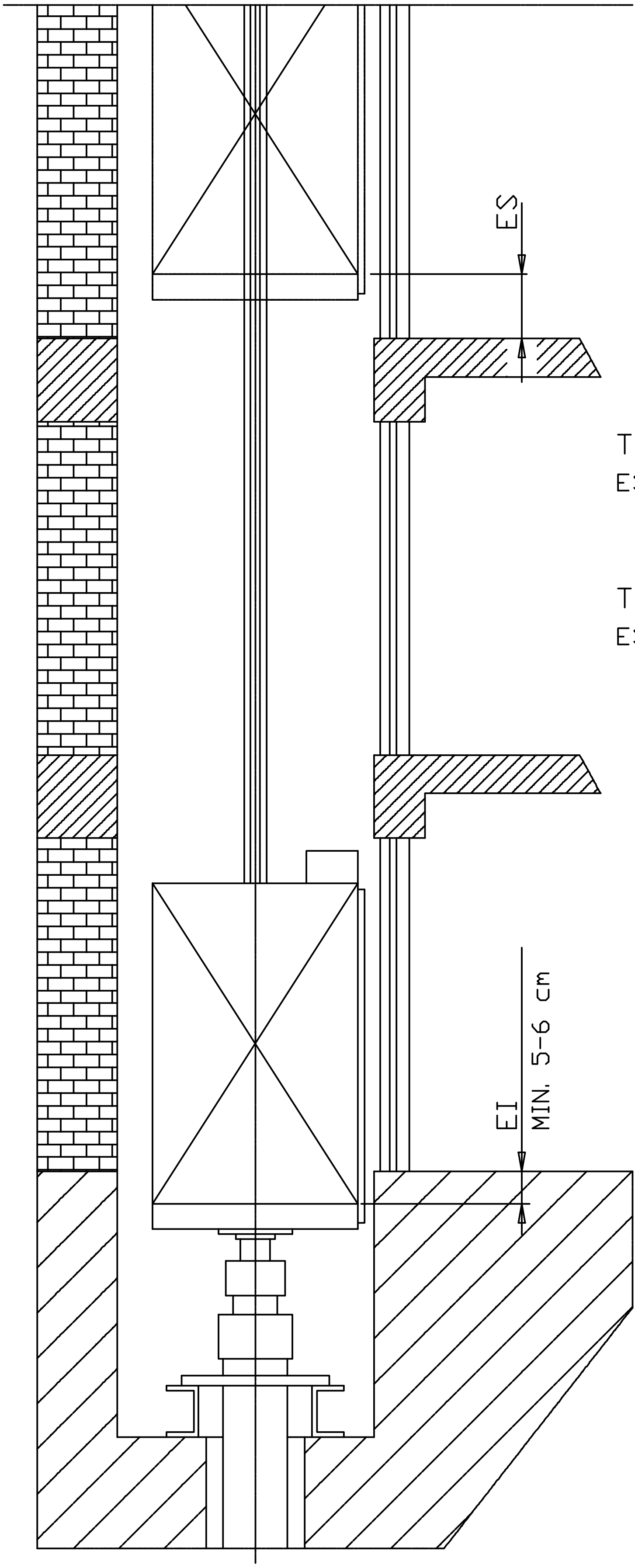
UT		

GUIDED SYNCHRONOUS TELESCOPIC PISTONS

BRACKETS FOR GUIDE ARMS FASTENING
TO THE PISTON HEADS

DATE 01/04

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 (Vl 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 (Vl 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 (Vl 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

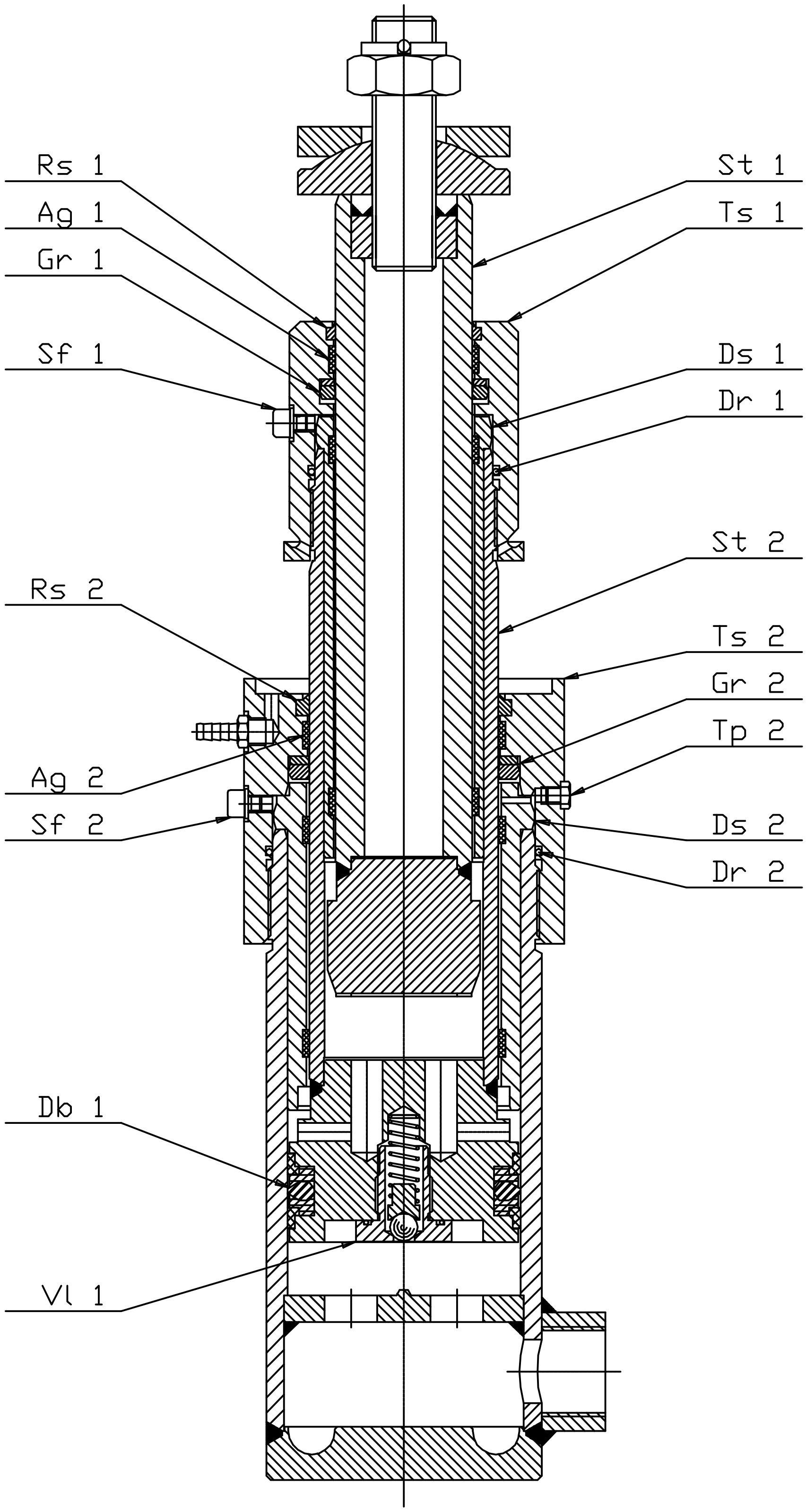


FIGURE 1/A

UT		

CHANGING SEALING ELEMENTS
IN TELESCOPIC PISTONS
(TELESCOPIC PISTONS WITH TWO EXTRACTORS)

DATE 08/99

DWG N. 9620/6

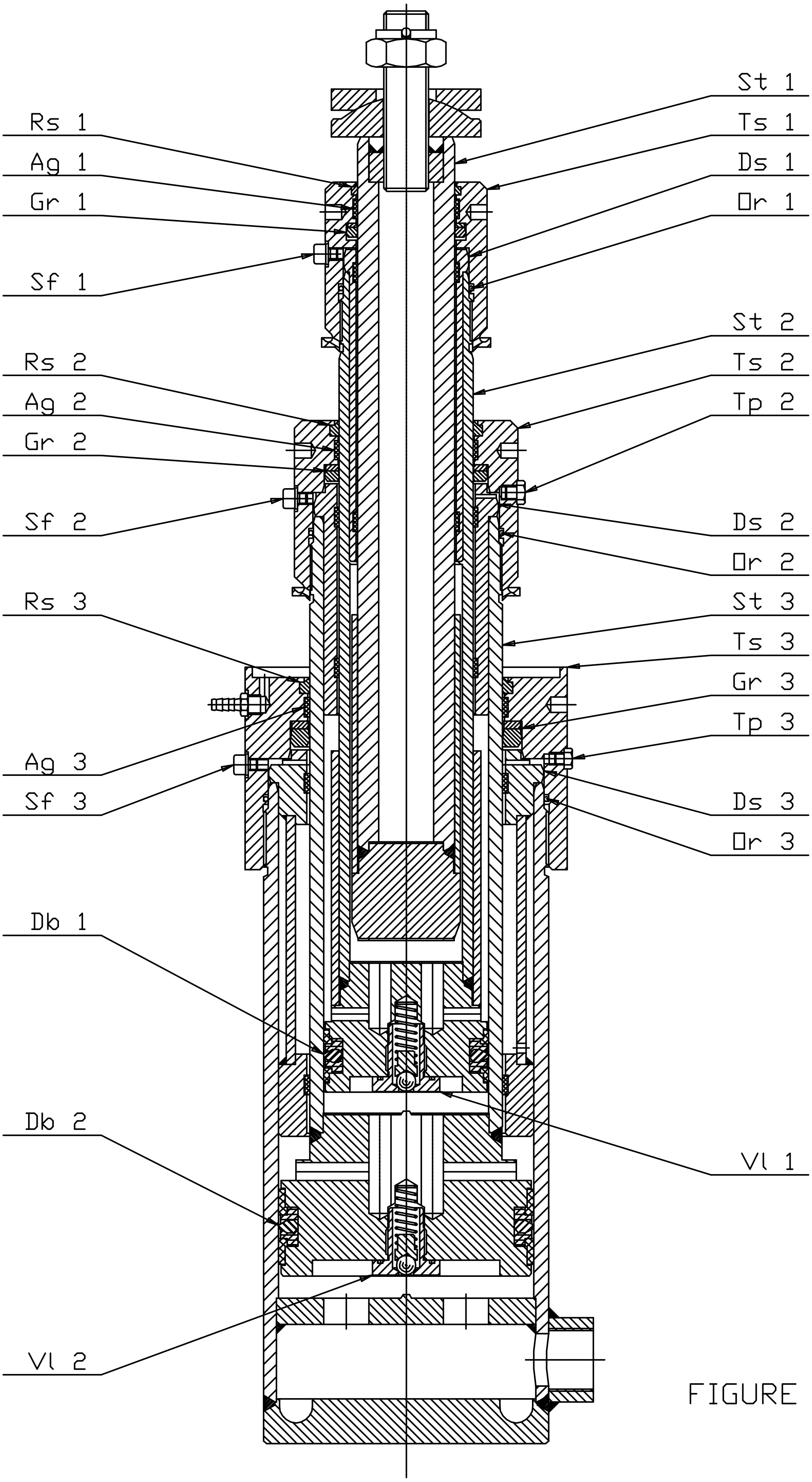


FIGURE 1/B

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

9620/7-IN

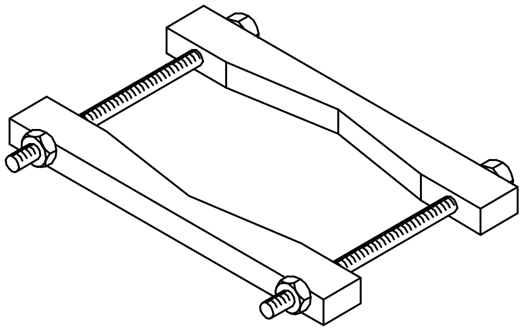


FIGURE 2

VALVE TYPE 1

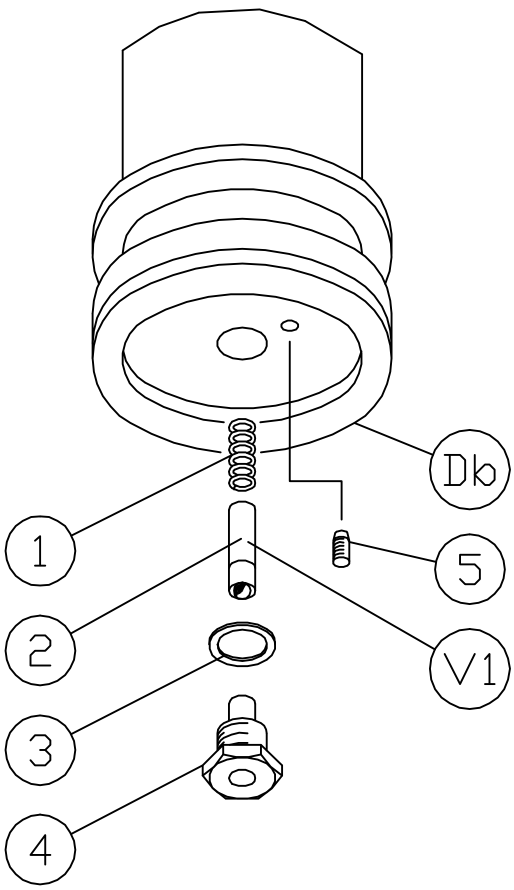


FIGURE 3

VALVE TYPE 2

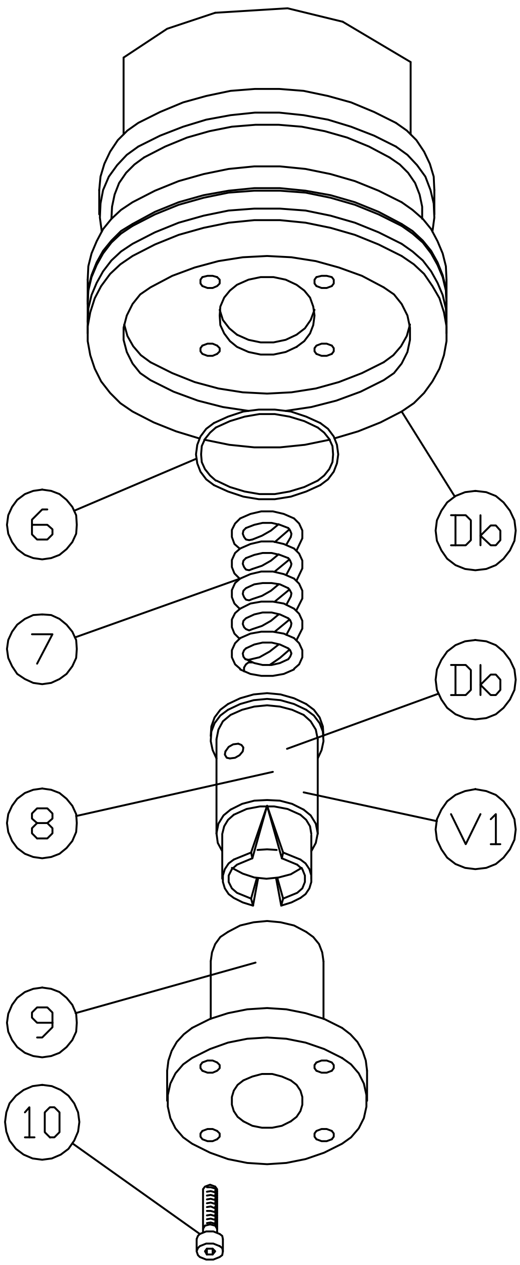


FIGURE 4

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

9620/8-IN

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):

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

Min static pressure:

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

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Date : 09/07

Car speed calculation:

V = car speed [m/s]:

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

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

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

<u>Table of jack speed reffer to the pump flow</u> [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	/	

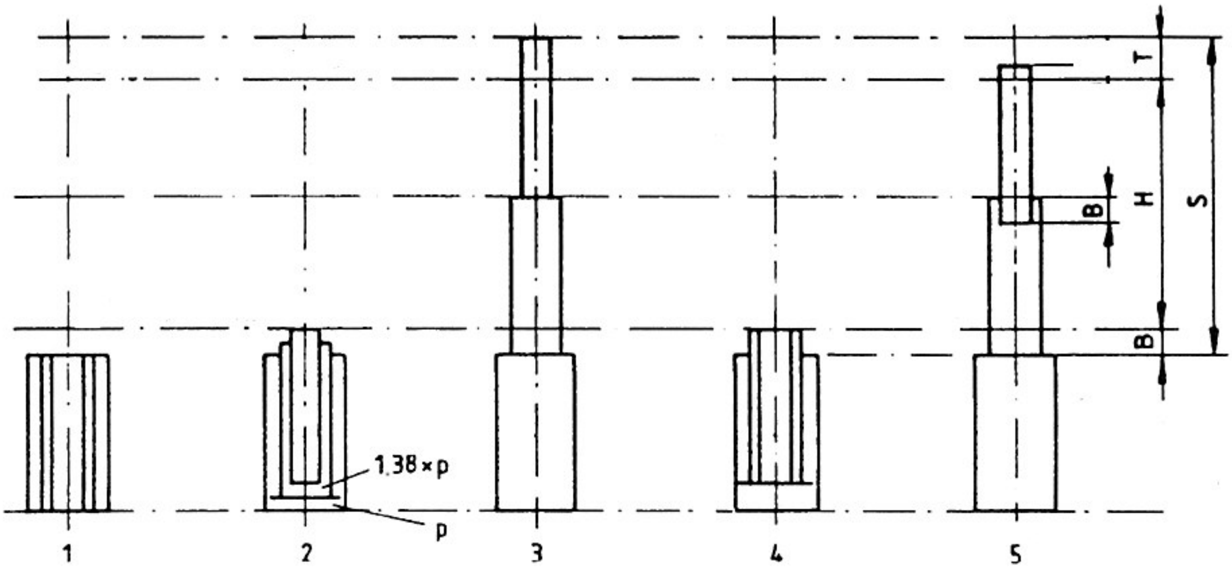
Note:

- 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.



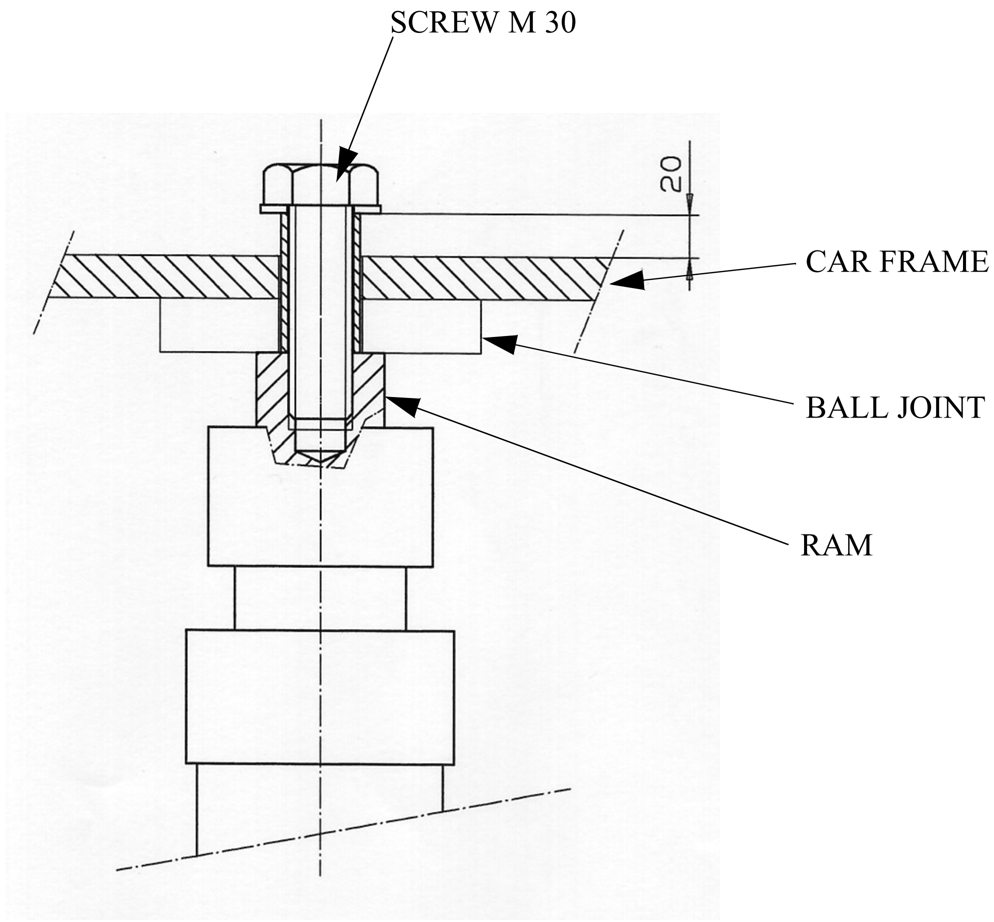
H= car travel
B = lower overtravel; according to the code + 20 mm
S = total stroke of the telescopic jack
T = upper overtravel = B + 50 mm
Fig. 1: jack fully collapsed before the putting in service of the elevator.
Fig. 2: jack during normal service, correctly synchronizated, car at rest at the lower 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]

ATTENTION: to comply with the rule UNI-EN 81-2 (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



JACK SELECTION USING GRAPHICS

The right jack can be selected using graphics reporting max admitted buckling load (safety factor = 2,8). Buckling calculations meet EN81/2 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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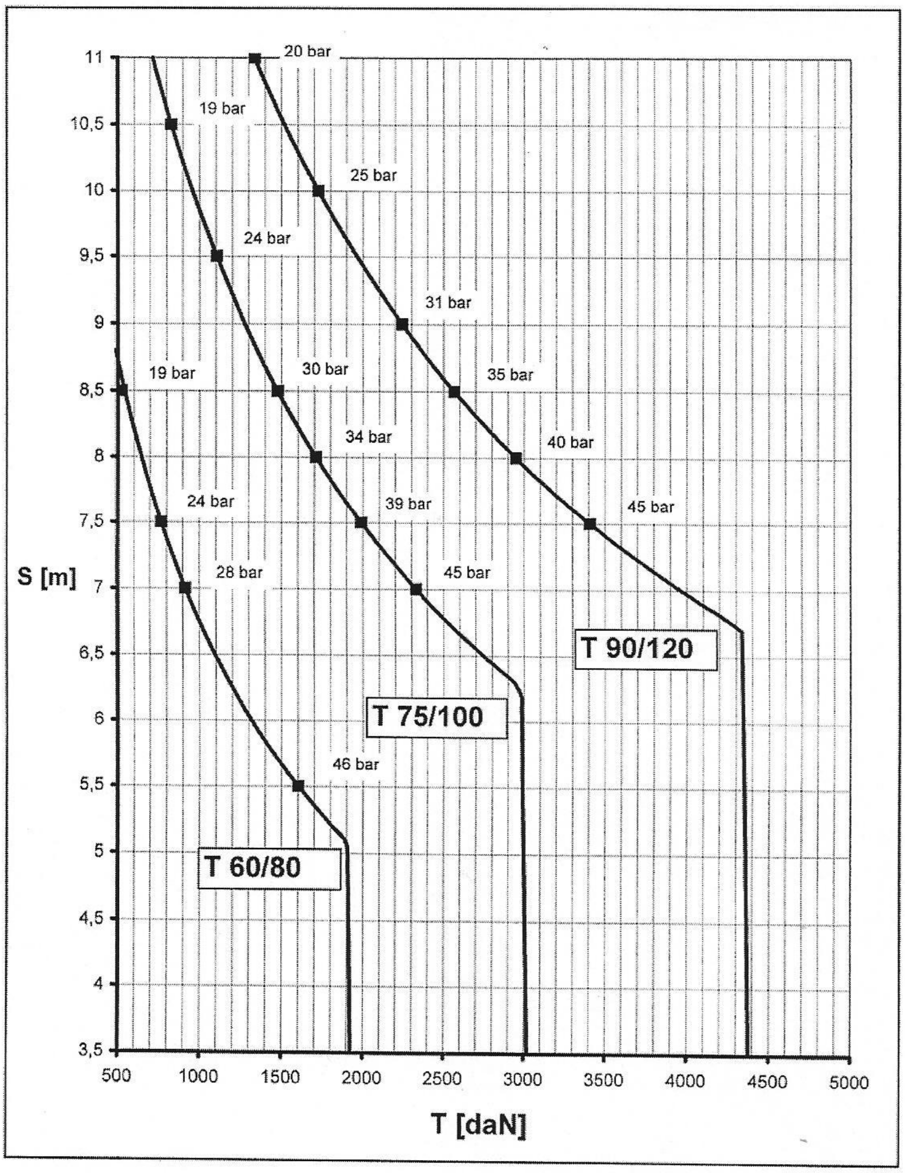
Rev:B
Date:11-04

Buckling diagram for telescopic jacks type T 60/80, T 75/100 and T 90/120
According to EN 81.2



Max. static pressure 5 MPa

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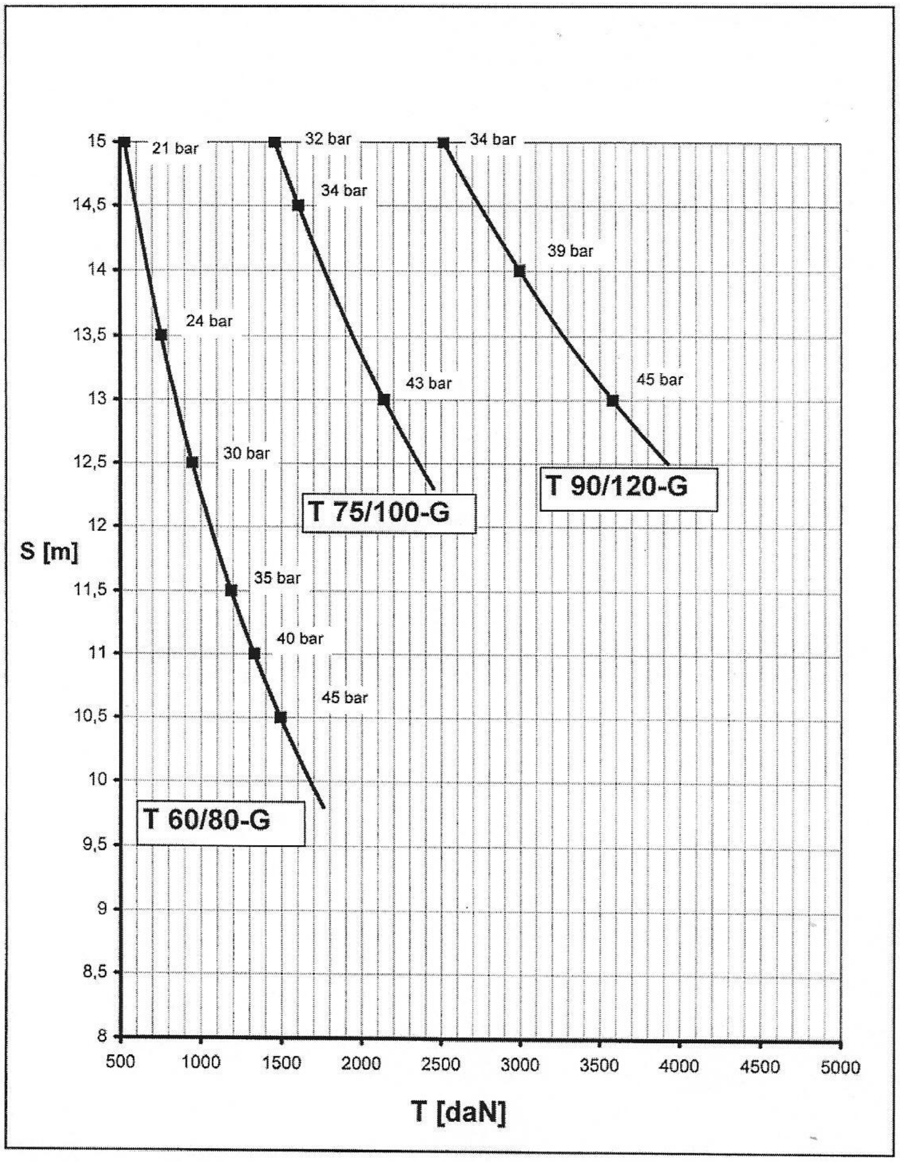
Rev:B
Date:11-04

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 81.2



Max. static pressure 5 MPa

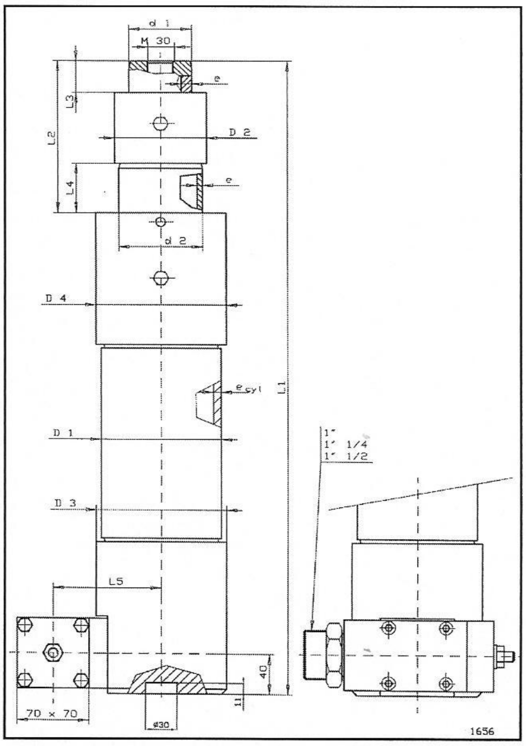
HL 09.01 8/10
Rev:C
Date:10-06

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.



UT		

TELESCOPIC PISTONS
TYPE "H"
TELESCOPIC JACKS SELECTION

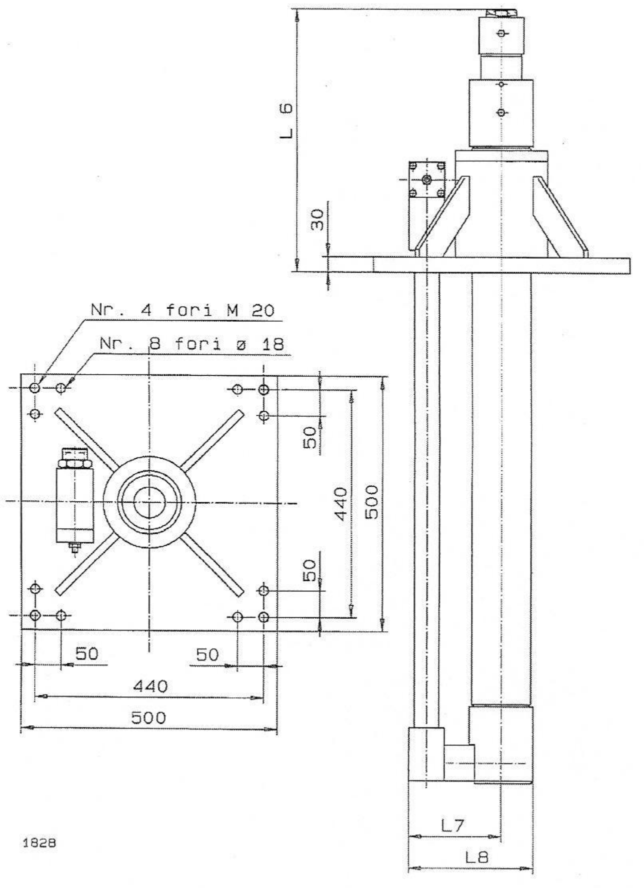
DATE 09/07

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

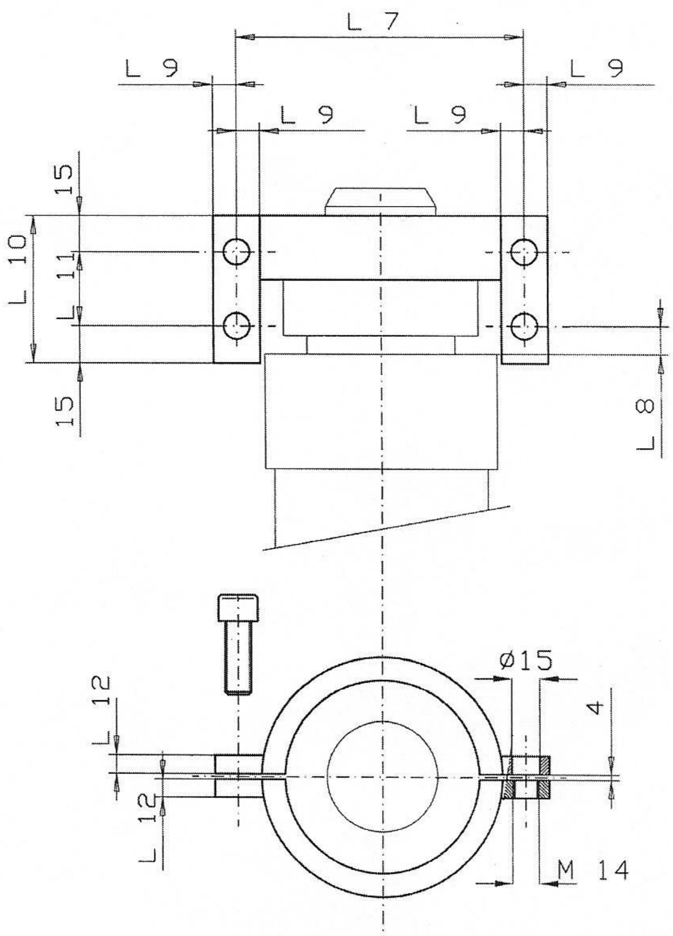


UT			TELESCOPIC PISTONS TYPE "H" TELESCOPIC JACKS SELECTION	DATE 09/07
				HL 09.01 9/10 REV: D

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



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 outgoing 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 operation 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.

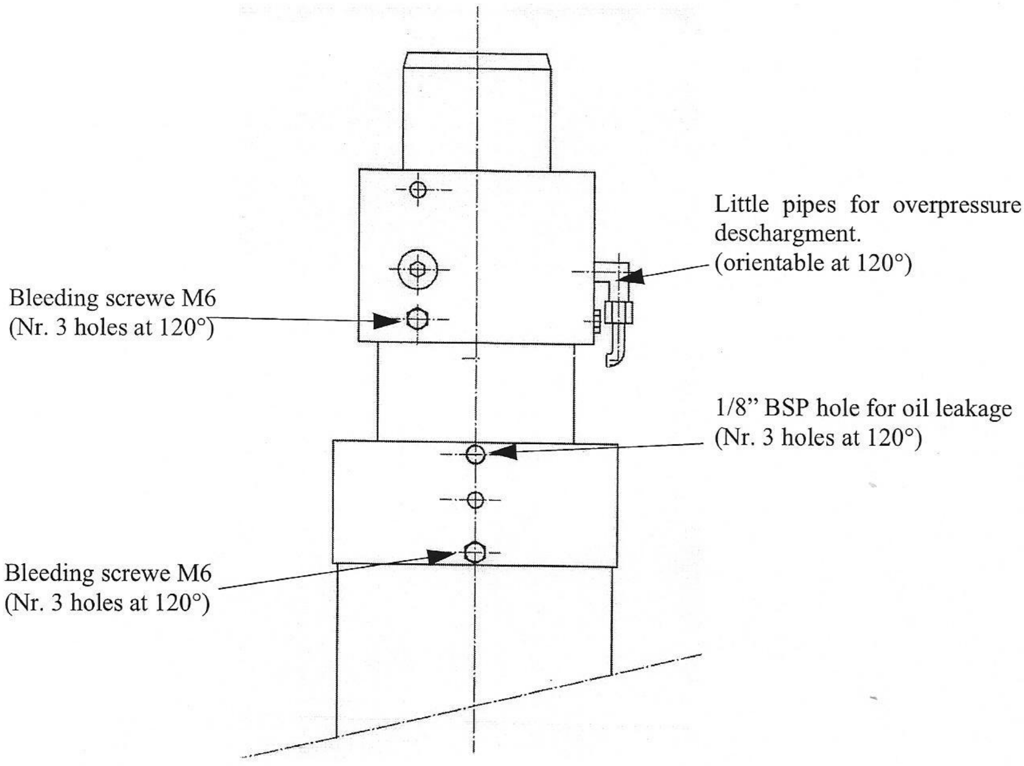
HL 09.02 3/3
Rev:B
Data:10-05

TEST BEFORE PUTTING INTO SERVICE

To effect the test as requested by UNI-EN 81-2 par. D.2.t (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

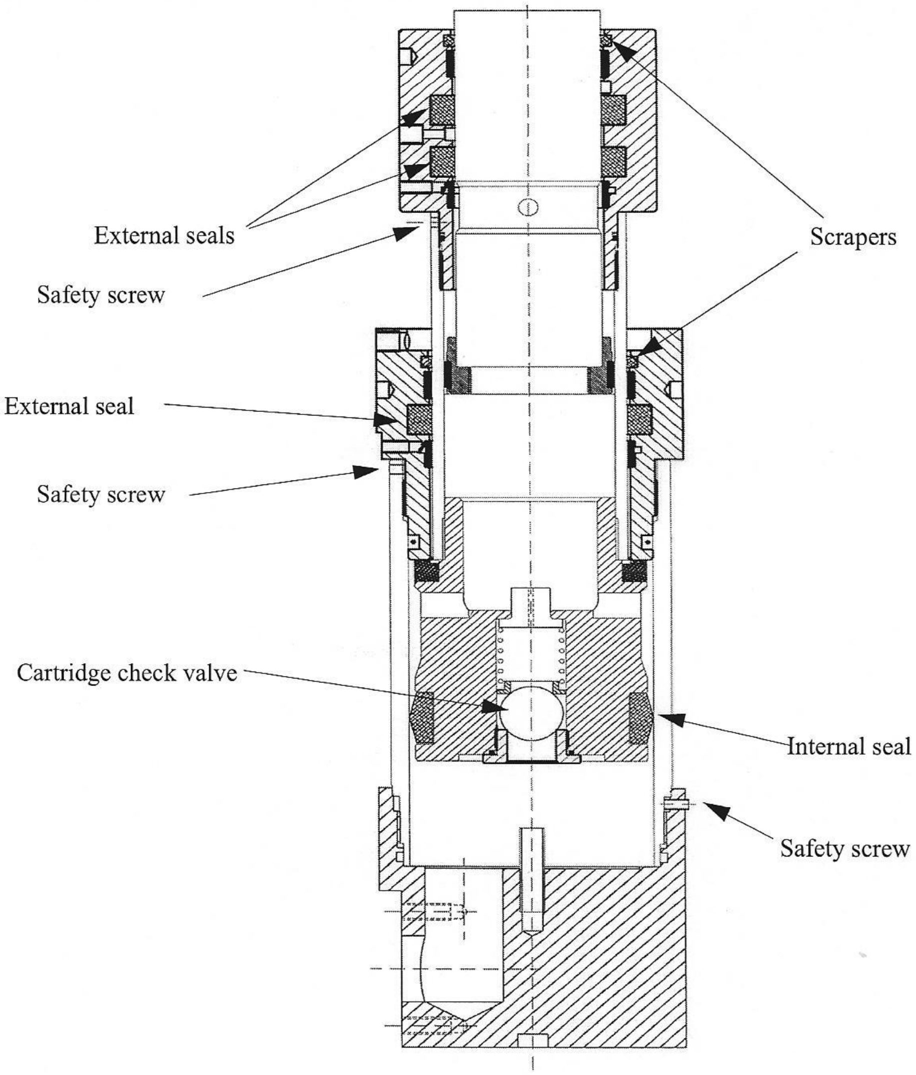
– Substitute the seal: mounting the new sealing, pay attention first to insert the rubber central part and then the black lateral broken rings and the white ones. To substitute the non return valve disassemble the "seeger" ring and the washer which locks it to the bottom of the lower ram and pull out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

HL 09.03 4/4
Rev:A
Data:03-06

Location of the internal parts



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TELESCOPIC PISTONS
TYPE "H"
SEALS SUBSTITUTION

DATE 09/07