LINER HANGERS
(BÉLÉSCSŐAKASZTÓK)

CATALOGUE / KATALÓGUS

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Liner Hangers Model M2//

Technical Description

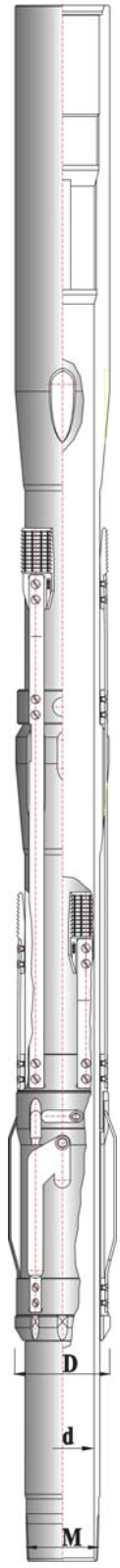
Liner Hangers Model M2// are extraordinarily simple --mechanical acting-- deap-drilling tools with one row of hanger wedges.
They are suitable to set short and middle long liners in deep boreholes. Suggested Max. length are 1000 meters. The special technical solution of joining the liner hanger to the setting tool guarantees the maximal possible technical security of hanging liners successfully for the user. When setting, the liner hanger hangs with no torque on the setting tool. Had the open section of the brothel been well prepared for setting liners, then no mess of setting of the liners and uncoupling of the setting tool from the liner hanger can be made.
Mechanical reliability of the tools is enhanced by the fact, that central load bearing parts of the liner hangers are made with no weldings.
The special left-handed thread to which the setting tool is coupled is located in the upper part of the tubular body. Under the special left-handed thread four setting grooves can be found. The "fin", or springing fin of the setting tool clicks into one of these grooves, when both tools are assembled before running-in.
Under the four grooves one can find the polished hole of the tubular body in which the sealing system of the setting tool and the connected separating plug move after disconnecting of the setting tool.
Lower cylindrical part of the liner hanger joins to the runned-in liner by casing thread.
A multifunctional sleeve moves on the tubular body. The "J"-path formed in this sleeve has the aim to prevent the premature operation, the "sitting out" of the liner hanger in the course of running-in of it, and to secure the reliable operation of the liner hanger after running-in of the liner. The moving sleeve is shaped to protect the hanging wedges against destructions when the liner hanger is running-in sliding on, and rubbing to the wall of the casing like a sledge, unindepently of the obliquity of the borehole. Duty of the stabilizing springs to be found on the moving sleeve is to press the hanging wedges to the cone of the tubular body, or to the inner wall of the casing when the liner hanger is operated.
Note: In order to control the inner diameter of the liner column the setting of a liner calibre into the string of liner is suggested by the last running in before making the string of liners. Deepness of setting of the liner calibre will be defined by the seating place of the liner hanger.

Technical Parameters of Liner Hangers Model M2//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
M2// 140	6-5/8	168.3	28	10.59	147.09	141	140	100	2200	4-1/2”
Drwg.Nr:21050.01.000			32	12.06	144.17					
M2// 146x4-1/2”	6-5/8	168.3	20	7.32	153.64	147	146	100	2200	4-1/2”
Drwg.Nr:21055.01.000			24	8.94	150.40					
	7	177.8	32	11.51	154.78					
M2// 146x5”			35	12.65	152.50			109		5”
Drwg.Nr:21057.01.000			38	13.72	150.36					
M2// 150x4-1/2”	7	177.8	20	6.91	163.98	151	150	100	2200	4-1/2”
Drwg.Nr 21060.01.000			23	8.05	161.70					
M2// 150x5”			26	9.20	159.42			109		5”
Drwg.Nr 21062.01.000			29	10.36	157.08					
M2// 150x5-1/2”	7	177.8	20	6.91	163.98	154	153	122	2200	5-1/2”
Drwg.Nr 21064.01.000			23	8.05	161.70					
			26	9.20	159.42					
M2// 182	8-5/8	219.1	36	10.16	198.76	183	182	122	2500	5-1/2”
Drwg.Nr 21065.01.000			40	11.43	196.22					
			44	12.70	193.68					
			49	14.15	190.78					
M2// 208	9-5/8	244.5	43.5	11.05	222.38	209	208	156	2500	7”
Drwg.Nr:21070.01.000			47.0	11.99	220.50					
			53.5	13.84	216.79					
M2// 212	9-5/8	244.5	32.3	7.92	228.64	213	212	159	2500	7”
Drwg.Nr:21075.01.000			36.0	8.94	226.59					
			40.0	10.03	224.41					
M2// 300	13-3/8	339.7	48.0	8.38	322.96	305	300	220	2800	9-5/8”
Drwg.Nr:21080.01.000			54.5	9.65	320.42					
			61.0	10.92	317.88					
			68.0	12.19	315.34					
			72.0	13.06	313.61					

Liner Hangers Model M22//

Technical Description



Liner Hangers Model M22// are mechanical acting tools, their hanging wedges are located in two rows. They are suitable to hang and cement long liner strings, longer than 1000 meters.
Shaping of the central tool bodies, and geometries of the hanging mechanisms are the same as in the case of liner hangers Model M2// with one row of wedges. Consequently the liner hangers Model M22// with two rows of wedges, and the liner hangers Model M2// with one row of wedges can be run in into the borehole by using the same setting tool.
Technologies of hanging liners and cementing are the same as in the case of liner hangers Model M2//.

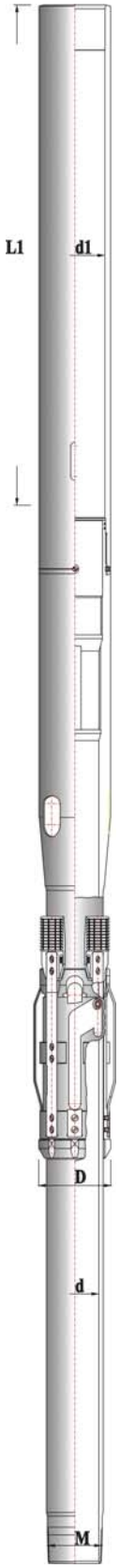
Technical Parameters of Liner Hangers Model M22//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
M22// 140 Drwg.Nr:23050.01.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	2500	4-1/2”
M22// 146x4-1/2” Drwg.Nr:23055.01.000 **M22// 146x5"** Drwg.Nr:23057.01.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7.32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100 109	2500	4-1/2” 5”
M22// 150x4-1/2” Drwg.Nr:23060.01.000 **M22// 150x5”** Drwg.Nr:23062.01.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100 109	2500	4-1/2” 5”
M22// 182 Drwg.Nr:23065.01.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	2750	5-1/2”
M22// 208 Drwg.Nr:23070.01.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	2750	7”
M22// 212 Drwg.Nr:23075.01.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	2750	7”
M22// 300 Drwg.Nr:23080.01.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	2750	9-5/8”

Liner Hangers Model M2TB//

Technical Description

Liner Hangers Model M2TB// are tools of Tie-Back technology. It means, that the liner can be tied-back from the liner hanger to the surface, or it can be completed with a tie-back packer. Maximal length of the liner to be set with this Model of liner hangers are 1000 meters. Longer liners than this should be set by liner hangers Model M22TB//. These liner hangers can be used with setting tools Model M2/22//. One short piece of drilling pipe should be srewed direct to the setting tool when assembling in order to facilitate running-in of the liner hanger, so the connector of the setting tool rod will get into the tie-back sleeve of the liner hanger.
Technologies of hanging liners and cementing are the same as in the case of hangers Model M2//.
Standard length (L1) of tie-back sleeves are: 3 or 6 feet.

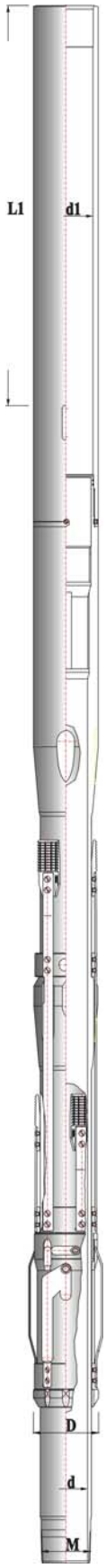


Technical Parameters of Liner Hangers Model M2TB//

Liner Hanger	Casing					Casing Calibre	Liner Hanger				
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	d1/L1	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm/ft)	(BTC)
M2TB// 140 Drwg.Nr:21051.01.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	3285 4185	125/3 125/6	4-1/2”
M2TB// 146/4x1/2” Drwg.Nr:21056.01.000 **M2TB// 146x5”** Drwg.Nr:21058.01.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7.32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100 109	3285 4185 3285 4185	125/3 125/6 130/3 130/6	4-1/2” 5”
M2TB// 150x4-1/2” Drwg.Nr:21061.01.000 **M2TB// 150x5”** Drwg.Nr:21063.01.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100 109	3285 4185 3285 4185	125/3 125/6 130/3 130/6	4-1/2” 5”
M2TB// 182 Drwg.Nr:21066.01.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	3550	158/3	5-1/2”
M2TB// 208 Drwg.Nr:21071.01.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	3565 4465	185/3 185/6	7”
M2TB// 212 Drwg.Nr:21076.01.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	3565 4465	185/3 185/6	7”
M2TB// 300 Drwg.Nr:21081.01.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	4100	255/3	9-5/8”

Liner Hangers Model M22TB//

Technical Description



Liner Hangers Model M22TB// are deep drilling tools with two rows of wedges shaped to run-in liners longer than 1000 meters. They are suitable to the tie-back technology and to the additional installation of liner tie-back packer. To run in these liner hangers Model M2/22// liner hanger setting tools can be used. One short piece of drilling pipe should be screwed direct to the setting tool when assembling in order to facilitate running-in of the liner hanger, so the connector of the setting tool rod will get into the tie-back sleeve of the liner hanger.
Technologies of hanging liners and cementing are the same as in the case of hangers Model M2//.
Standard length (L1) of tie-back sleeves are: 3 or 6 feet.

Technical Parameters of Liner Hangers Model M22TB//

Liner Hanger	Casing					Casing Calibre	Liner Hanger				
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	d1/L1	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm/ft)	(BTC)
M22TB// 140	6-5/8	168.3	28	10.59	147.09	141	140	100	3585	125/3	4-1/2”
Drwg.Nr:23051.01.000			32	12.06	144.17				4485	125/6	
M22TB// 146x4-1/2”	6-5/8	168.3	20	7.32	153.64	147	146	100	3585	125/3	4-1/2”
Drwg.Nr:23056.01.000			24	8.94	150.40				4485	125/6	
	7	177.8	32	11.51	154.78						
M22TB// 146x5"			35	12.65	152.50			109	3585	130/3	5”
Drwg.Nr:23058.01.000			38	13.72	150.36				4485	130/6	
M22TB// 150x4-1/2”	7	177.8	20	6.91	163.98	151	150	100	3585	125/3	4-1/2”
Drwg.Nr:23061.01.000			23	8.05	161.70				4485	125/6	
M22TB// 150x5”			26	9.20	159.42			109	3585	130/3	5”
Drwg.Nr:23063.01.000			29	10.36	157.08				4485	130/6	
M22TB// 182	8-5/8	219.1	36	10.16	198.76	183	182	122	3835	158/3	5-1/2”
Drwg.Nr:23066.01.000			40	11.43	196.22						
			44	12.70	193.68						
			49	14.15	190.78						
M22TB// 208	9-5/8	244.5	43.5	11.05	222.38	209	208	156	3835	185/3	7”
Drwg.Nr:23071.01.000			47.0	11.99	220.50				4735	185/6	
			53.5	13.84	216.79						
M22TB// 212	9-5/8	244.5	32.3	7.92	228.64	213	212	159	3835	185/3	7”
Drwg.Nr:23076.01.000			36.0	8.94	226.59				4735	185/6	
			40.0	10.03	224.41						
M22TB// 300	13-3/8	339.7	48.0	8.38	322.96	305	300	220	3835	255/3	9-5/8”
Drwg.Nr:23081.01.000			54.5	9.65	320.42						
			61.0	10.92	317.88						
			68.0	12.19	315.34						
			72.0	13.06	313.61						

Setting Tools Model M2/22//

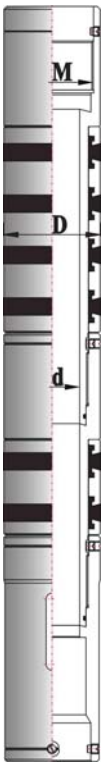
Technical Description

Setting tools are the most important technical elements of liner hanging. The setting tool joins upwards to the drilling pipe. On the special left-handed thread in its central part hangs the liner hanger, to the lower thread of which joins the liner of suitable length. The setting tool Model M2/22// has fully new technical qualities.
Most important is, that the special shear safety thread shall not be tightened by high torque using a machine wrench when joining it to the liner hanger. It means, that after the liner hanger has been seated, the setting tool can be readily disconnected from the liner hanger with no increments of torque. A further important feature of the setting tool is, that the "fin"of it -- which is a springing elelement -- prevents unscrewing it from the liner hanger by the required turning to the right, when seating the liner hanger. This is the highest possible security, which a user can enjoy in the course of seating a liner, which operation is the most critical one when setting liners.
Each setting tool has a "neutral" displacement of a length of 500 mm. It means that the setting tool after having been seated can only be loaded by the required tool-loads for the cementing, if it had been lowered by 500 mm. This length is enough to judge unambiguously if the liner hanger functions, which means the vanishing of the weight of the run in liner in case of any deepness and any obliquity.
There is a swimming bearing in the upper part of the setting tool. The compression loads are beared by the swimming bearing when disconnecting is made. This is of importance when the weight measuring device of the equipment does not function satisfactorily, or the true weight of the tool can not be defined because of the very scew running of the borehole.
There are special gasket rings at lower part of the shaft of the setting tool. The aim is to prevent reflowing of the cement slurry by the side of the setting tool in the liner hanger.
To the most lower element of the setting tool joins the wiper plug, which is an indispensable element of cementing liners.

Setting Tool	Drawing Number	D (mm)	d (mm)	L (mm)	M (IF)
M2/22// 140-146-150x4-1/2”	Drwg.Nr:21060.13.000	123	57.2	2456	3-1/2"
M2/22// 146-150x5"	Drwg.Nr:21061.13.000	128	57.2	2405	3-1/2"
M2/22// 150x5-1/2”	Drwg.Nr:21064.13.000	142	57.2	23145	3-1/2"
M2/22// 182x5-1/2”	Drwg.Nr:21065.13.000	156	76.2	2686	4-1/2"
M2/22// 208x7”x156	Drwg.Nr:21070.13.000	184	95.2	2510	4-1/2"
M2/22// 212x7”x159	Drwg.Nr:21075.13.000	184	95.2	2510	4-1/2"
M2/22// 300x9-5/8”	Drwg.Nr:21080.13.000	253	95.2	2900	4-1/2"

"S" Seals

Technical Description



Making of casing and cementing of boreholes of high temperatures -- above 180 degrees Celsius -- is recommended by the use of "S" Seals. "S" Seals can be changed as whole units at the lower parts of setting tools.

"S" Seal	Drawing Number of "S" Seal	D (mm)	d (mm)	L (mm)	M (mm)
D1/100// 4-1/2”	Drwg.Nr:21060.13.045	100	57.2	785	85x2.5
D1/109// 5”	Drwg.Nr:21061.13.045	109	57.2	785	85x2.5
D1/122// 5-1/2”x3-1/2” DP	Drwg.Nr:21064.13.045	122	57.2	785	85x2.5
D1/122// 5-1/2”	Drwg.Nr:21065.13.045	122	76.2	800	95x2.5
D1/156// 7”	Drwg.Nr:21070.13.045	156	95.2	933	135x3
D1/159// 7”	Drwg.Nr:21075.13.045	159	95.2	933	135x3
D1/220// 9-5/8”	Drwg.Nr:21080.13.045	220	95.2	933	195x3

Running Procedures of Liner Hangers Model M2//, and M22//

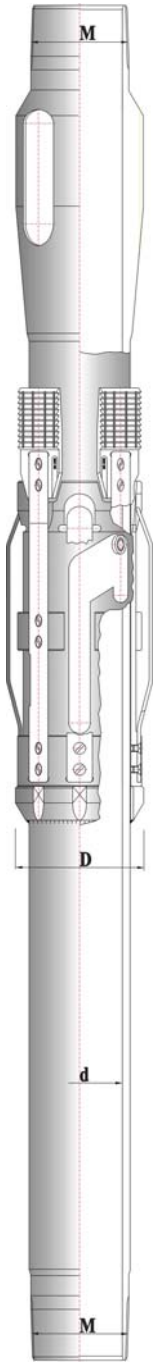
Technical Description

1. Push the setting tool into the liner hanger landing.
   Make up the special left-handed thread by hand.
   Having made up the left-handed thread pull the setting tool upwards in the liner hanger until seating. Displacement until seating is 0.5 meter. This is the unloading length of the setting tool, when the liner hanger is operated. After landing move the setting tool to the right in order to set the "fin" of it into its place (Max. 45°).
2. Run in the liner with the liner hanger.
3. Move the tool at a leghth of about 1 meter at the place of the seating.
4. The tool should be rotated to the right 20 cm above the place of seating:
   In the case of drilling pipe 1000 meter/1 turn to the right.
   In the case of production pipe 1000 meter/ 1.5 turn to the right.
5. Having been turned to the right the tool shall be lowered.
6. In the course of lowering the tool (after a displacement of 20 cm) the liner hanger will operate (seat), the weight of the run in liner will cease to load the lowering equipment.
7. The tool shall be lowered further (0.5 meter = unloading length), then make sure
   -- by using a toolweight of 6 to 12 tons --that the liner hanger has really been seated.
8. Disconnect the setting tool from the liner hanger under load of 0.5-1 tonns.
   25 turn to the right, the torque may not vary when disconnecting.
   Note: When working with production pipe the setting tool should be disconnected from the liner hanger with no loading, that is to say within the unloading length of the setting tool, because the string of production pipes bends out under the influence of a minimal load (macaroni effect), leans against the wall of the casing, and it can not be turned anyway.
9. Does the tool -- in the course of turning to the right -- not turn to the reverse, it means that the special left-handed shear safety thread of the setting tool has been loosened from the liner hanger.
10. The liner hanger shall be loaded by a toolweight of 10 to 12 tons when cementing.
11. Cementing.
12. Run out the setting tool.

Liner Hangers Model M3//

Technical Description

The Liner Hangers Model M3// are mechanical tools with paths "J" operating to the right and with one row of hanging wedges. Length of the liner which can be run in with these liner hangers are 1000 meters. The setting adapter will be connected to the upper inner thread of them. The setting adapter can be a simple one, or it can be provided with a seal nipple. In the letter case the hanged liner can be extended to the surface, or it can be supplemented by a liner tie-back packer.



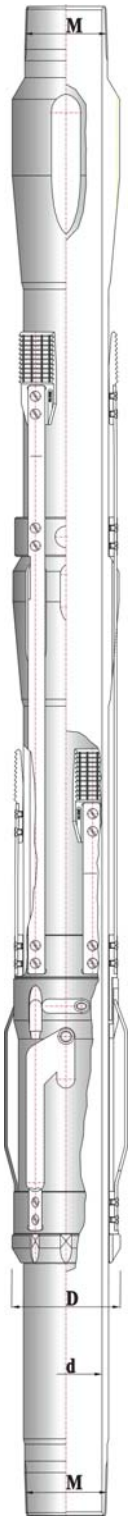
Technical Parameters of Liner Hangers Model M3//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
M3// 140 Drwg.Nr:31050.01.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	1600	4-1/2”
M3// 146x4-1/2” Drwg.Nr:31055.01.000 **M3// 146x/5”** Drwg.Nr:31057.01.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7,32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100 109	1600	4-1/2” 5”
M3// 150x4-1/2” Drwg.Nr:31060.01.000 **M3// 150x5”** Drwg.Nr:31062.01.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100 109	1600	4-1/2” 5”
M3// 182 Drwg.Nr:31065.01.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	1600	5-1/2”
M3// 208 Drwg.Nr:31070.01.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	1700	7”
M3// 212 Drwg.Nr:31075.01.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	1700	7”
M3// 300 Drwg.Nr:31080.01.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	1800	9-5/8”

Liner Hangers Model M33//

Technical Description

The Liner Hangers Model M33// are mechanical tools with paths "J" operating to the right and with two rows of hanging wedges. Length of the liner string which can be run in with these liner hangers are more than 1000 meters. The setting adapter will be connected to the upper inner thread of them. The setting adapter can be a simple one, or it can be provided with a seal nipple. In the letter case the hanged liner can be extended to the surface, or it can be supplemented by a liner tie-back packer.



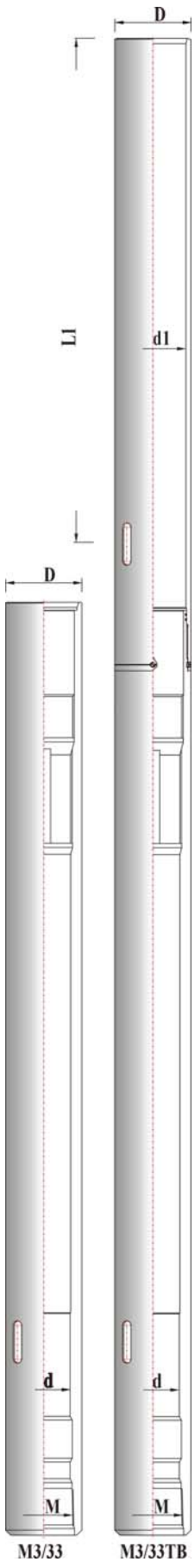
Technical Parameters of Liner Hangers Model M33//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
M33// 140 Drwg.Nr:33050.01.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	2117	4-1/2”
M33// 146x4-1/2” Drwg.Nr:33055.01.000 **M33// 146x5"** Drwg.Nr:33057.01.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7.32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100 109	2117	4-1/2” 5”
M33// 150x4-1/2” Drwg.Nr:33060.01.000 **M33// 150x5”** Drwg.Nr:33062.01.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100 109	2117	4-1/2” 5”
M33// 182 Drwg.Nr:33065.01.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	2117	5-1/2”
M33// 208 Drwg.Nr:33070.01.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	2387	7”
M33// 212 Drwg.Nr:33075.01.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	2387	7”
M33// 300 Drwg.Nr:33080.01.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	2450	9-5/8”

Setting Adapters Model M3/33// and M3/33TB//

Technical Description

The setting tool and the liner hanger are connected by the setting adapter, when running in liners. In the setting adapter can be found the special left-handed inner thread, and the four setting slots to which the setting tool is connected. The cementing bushing which can be run out by the setting tool seats in the "nest" shaped in the hole of the setting adapter. The annular space between the setting tool and the setting adapter will be sealed by the cementing bushing until the end of the cementing operation.



Setting Adapter M3/33//	Drawing Number	D (mm)	d (mm)	L (mm)	M (BTC)
M3/33// 140	Drwg.Nr:31050.12.000	140	100	1769	4-1/2"
M3/33// 146x4-1/2”	Drwg.Nr:31055.12.000	144	100	1769	4-1/2"
M3/33// 146x5”	Drwg.Nr:31057.12.000	144	109	1769	5”
M3/33// 150x4-1/2”	Drwg.Nr:31060.12.000	148	100	1769	4-1/2"
M3/33// 150x5”	Drwg.Nr:31062.12.000	148	109	1769	5”
M3/33// 182	Drwg.Nr:31065.12.000	182	122	1850	5-1/2"
M3/33// 208	Drwg.Nr:31070.12.000	208	156	1850	7"
M3/33// 212	Drwg.Nr:31075.12.000	212	159	1850	7"
M3/33// 300	Drwg.Nr:31080.12.000	300	220	1900	9-5/8"

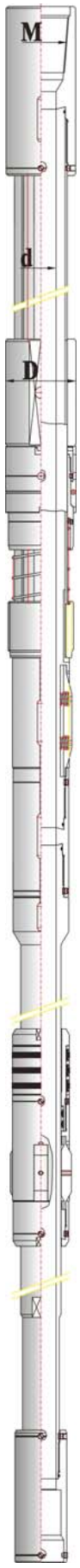
In case of tie-back shaping the setting adapter **"TB"** supplemented by the tie-back sleeve shall be applied.
Note: Length of the tie-back sleeve depends on well structure.
Standard length (L1) of tie-back sleeves are: 3 or 6 feet.

Setting Adapter M3/33TB//	Drawing Number	d1 (mm)	L/L1 (mm/ft)
M3/33TB// 140	Drwg.Nr:31050.12.030	125	2839/3
M3/33TB// 146x4-1/2”	Drwg.Nr:31055.12.030	125	2839/3
M3/33TB// 146x5”	Drwg.Nr:31057.12.030	130	2839/3
M3/33TB// 150x4-1/2”	Drwg.Nr:31060.12.030	125	2839/3
M3/33TB// 150x5”	Drwg.Nr:31062.12.030	130	2839/3
M3/33TB// 182	Drwg.Nr:31065.12.030	158	3200/3
M3/33TB// 208	Drwg.Nr:31070.12.030	185	3200/3
M3/33TB// 212	Drwg.Nr:31075.12.030	185	3200/3
M3/33TB// 300	Drwg.Nr:31080.12.030	255	3250/3

Setting Tools Model M3/33//

Technical Description

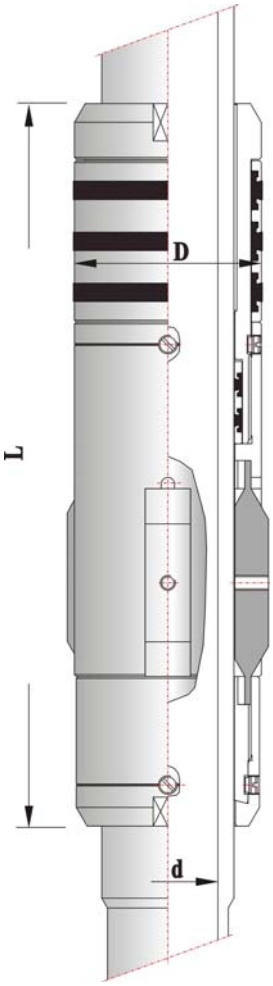
The Setting Tools Model M3/33// will be used with Setting Adapters Model M3/33//. The special left-handed thread fastened with no torque, which can be loosened to the right-hand direction ensures an easy disconnection after seating the liner hanger. The setting tool has a "neutral" displacement of the length of 500 mm. The security of the disconnection is further enhanced by this length and by the "floating bearing" which moves freely on the shaft.
A "fin" moving in radial direction under the disconnecting thread ensures, that the special left-handed thread stays in its place in the course of the required turning to the right of the liner hanger, when seating. The cementing bushing will be operated by the staggered shaft to be find at the lower end of the setting tool. The ribs of the cementing bushing will be held in the "nest" of the setting adapter from the moment of running in of the liner until the end of cementing by the staggered shaft.The cementing bushing remains in this situation until lifting of the setting tool, the annular space will be sealed by its packing. When the setting tool is lifted, the lower transition of the wiping plug lands on the cementing bushing, the ribs of the cementing bushing move radially in the direction of the center point, the locking connection will be ceased, and the setting tool can be run out with no difficulties.



Setting Tool	Drawing Number	D (mm)	d (mm)	L (mm)	M (IF)
M3/33// 140-146-150x4-1/2”	Drwg.Nr:31060.13.000	123	52.4	3768	3-1/2"
M3/33// 146x5"	Drwg.Nr:31061.13.000	129	52.4	3768	3-1/2"
M3/33// 182x5-1/2”	Drwg.Nr:31065.13.000	156	76.2	3768	4-1/2"
M3/33// 208x7”x156	Drwg.Nr:31070.13.000	184	95.2	4000	4-1/2"
M3/33// 212x7”x159	Drwg.Nr:31075.13.000	184	95.2	4000	4-1/2"
M3/33// 300x9-5/8”	Drwg.Nr:31080.13.000	253	95.2	4100	4-1/2"

Cementing Bushings Model M3/33//

Technical Description



Cementing of the liner string should be done in the loosened state of the setting tool. The sealing element of the setting tool operates in this state as a piston under the action of the pressure difference. The higher the diameter of the liner, the higher is the piston effect, and the higher toolweight should be loaded on the setting tool for the time of cementing.
Will the cementing be done with a Cementing Bushing, the piston effect will be diminished, and one can work with lower tool loads. The cementing bushing can be found at the lower part of the setting tool. The "ribs" of the cementing bushing will be pressed outwards in radial direction into the "nest" of the setting adapter by the shaft of the setting tool when running in the liner hanger. The cementing bushing acts in this situation as a standing seal, and it remains in that situation, and seals the annular space between the setting tool and the setting adapter until the setting tool will be lifted. When the setting tool is lifted the "ribs" of the cementing bushing move radially inwards, the locked state ceases, and the setting tool can be run out from the borehole.

Cementing Bushing	Drawing Number	D (mm)	d (mm)	L (mm)
D/100// 4-1/2”	Drwg.Nr:31060.13.030	100	52.4	385
D/109// 5”	Drwg.Nr:31061.13.030	109	52.4	385
D/122// 5-1/2”	Drwg.Nr:31065.13.030	122	76.2	385
D/156// 7”	Drwg.Nr:31070.13.030	156	95.2	400
D/159// 7”	Drwg.Nr:31075.13.030	159	95.2	400
D/220// 9-5/8”	Drwg.Nr:31080.13.030	210	95.2	450

Running Procedures of Liner Hangers Model M3//, and M33//

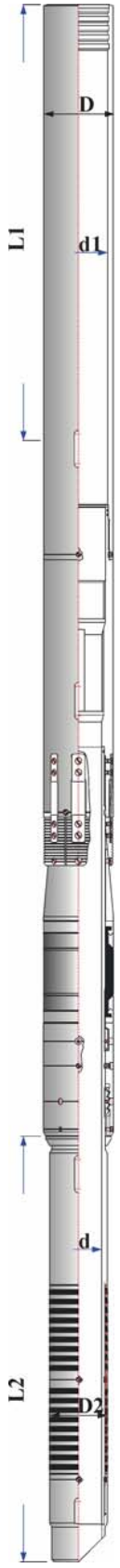
Technical Description

1. Push the cementing bushing into the setting adapter until their lower parts are at the same level.
2. Loosen fully the transition of the wiper plug at the bottom of the setting tool.
3. Push the setting tool into the setting adapter. Make sure that the cementing bushing remains in its place.
4. Turn back the transition of the wiper plug with the plug itself into the end of the setting tool.
5. Make up the special left-handed thread by hand.
   Having made up the left-handed thread pull the setting tool upwards until seating in the setting adapter. Displacement until seating is 0.5 meter. This is the unloading length of the setting tool, when the liner hanger is operated. After landing move the setting tool to the right in order to set the "fin" of it into its place (Max. 45°).
6. Turn the setting adapter together with the liner hanger.
7. Run in the liner with the liner hanger.
8. Move the tool at a length of about 1 meter at the place of the seating.
9. The tool should be rotated to the right 20 cm above the place of seating:
   In the case of drilling pipe 1000 meter/1 turn to the right
   In the case of production pipe 1000 meter/ 1.5 turn to the right
10. Having been turned to the right the tool shall be lowered.
11. In the course of lowering the tool (after a displacement of 20 cm) the liner hanger will operate (seat), the weight of the run in liner will cease to load the lowering equipment.
12. The tool shall be lowered further (0.5 meter = unloading length), then make sure – by using a toolweight of 6 to 12 tons – that the liner hanger has really been seated.
13. The setting tool shall be disconnected from the liner hanger under a load of 0.5 to 1 ton (25 turns to the right). The torque may not vary when disconnecting.
    Note: When working with production pipe the setting tool should be disconnected from the liner hanger with no loading, that is to say within the unloading length of the setting tool, because the string of production pipes bends out under the influence of a minimal load (macaroni effect), leans against the wall of the casing, and it can not be turned anyway. Does the tool -- in the course of turning to the right -- not turn to the reverse, it means that the special left-handed shear safety thread of the setting tool has been loosened from the liner hanger.
14. The liner hanger shall be loaded by a toolweight of 6 to 12 tons when cementing.
15. Cementing.
16. Run out the setting tool.

Liner Tie-back Packers Model M2/22LTP//

Technical Description

When drilling in a new research area, and when the liner has to be hanged by a liner hanger, the liner hanger Model TB has always to be selected. In this case there is the possibility to close the annular space later with a tie-back packer would the cementing not be succesful. The liner tie-back packer Model M2/22LTP// is a simple drilling tool operating mechanically. It has a tie-back sleeve at its upper part, and a liner tie-back at its lower part. The polished hole of the liner hanger has to be cleaned before running in into the borehole. The cleaning has to be made with a milling tool Model M2TBM.
Standard lengths are (L1, L2): 3 or 6 feet.

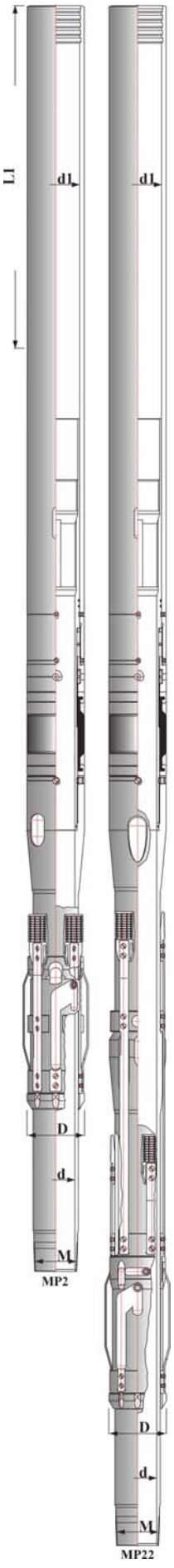


Operating Procedures

Running in of the liner tie-back packer is done by the same setting tool by wich the liner hanger has been seated. The liner tie-back packer shall be sent to its place with a maximal loading-- of toolweight of 3 tons. As the the tie-back packer is set at its place, it hits the top of the liner hanger. By a further loading of toolweight of 8-10 tons the packer rubber shall be pressed together, then by further increasing the toolweight to 15 tons, the fixing wedge preventing the upward movement of the tie-back packer shall be seated outwards. Then the setting tool shall be disconnected from the tie-back packer -- it means 25 turns to the right -- and the closing of the tie-back packer shall be tested.
The setting tool shall be run out.

Tie-back Packer	Drawing Number	D (mm)	d (mm)	d1,D2 (mm)	L/3ft (mm)	L/6ft (mm)
M2/22LTP// 146x4-1/2”	Drwg.Nr:21055.07.000	146	100	125	3365	5115
M2/22LTP// 146x5”	Drwg.Nr:21058.07.000		109	130		
M2/22LTP// 150x4-1/2”	Drwg.Nr:21060.07.000	150	100	125	3365	5115
M2/22LTP// 150x5”	Drwg.Nr:21063.07.000		109	130		
M2/22LTP// 182x5-1/2”	Drwg.Nr:21065.07.000	182	122	158	3400	5180
M2/22LTP// 208x7”	Drwg.Nr:21070.07.000	208	156	185	3488	5239
M2/22LTP// 212x7”	Drwg.Nr:21075.07.000	210	159	185	3488	5239
M2/22LTP// 300x9-5/8”	Drwg.Nr:21080.07.000	300	220	255	3600	5350

Liner Hangers Model MP2//



Technical Description

Liner Hangers Model MP2// are tools acting mechanically having one row of hanging wedges and a packer for the annular space. They are suitable to hang maximally 1000 meters of liners in the case of oil and water wells. They can be used for running in screen pipes, and -- by using their fittings -- to apply gravel packing technology. A slipping sleeve can be found on the tubular body of the liner hanger having a seating forced trajectory Type "**J**". One row of hanging wedges, and centralizing springs needed to operate the liner hangers can be found on the slipping sleeve. The sealing rubber, which serves the closing of the annular space is located on the central part of the liner hanger. The packer rubber can be operated mechanically by using the setting tool. At the upper end of the liner hanger a tie-back receptacle can be found. This tie-back receptacle operates the latch system of the packer rubber, and -- in the case of extending liners -- the tie back nipple has to be located into this receptacle, when the liner has to be extended to the surface. In the upper part of the tie-back receptacle a fishing thread having a high loading capacity is located by which the running out of damaged tool is facilitated in the case of later well repairs. The special left-handed seating thread in the interior of the liner hanger joins to the setting tool. Under the left-handed inner thread 4 longitudinal grooves are located for the "fin" of the setting tool. The "fin" of the setting tool is fixed in one of these grooves and this ensures that the left-handed thread of the setting tool will not be loosened from the thread of the liner hanger when running in, and when it is turned to the right in order to operate it.
Standard length (L1) of tie-back sleeves are 3 or 6 feet.
Thermal stability of the packer rubber of the annular space is 180° Celsius.

Required -pipe weight to operate the packer rubber:

Model of Liner Hanger	**Weight of Drilling Pipe** (tons)
MP2// and MP22// 140-146-150	8
MP2// and MP22// 182	10
MP2// and MP22// 208-212	12
MP2// and MP22// 300	14

Liner Hangers Model MP22//

Liner Hangers Model MP22// have two row of wedges. Technical parameters are identical to Liner Hangers Model MP2//.

Technical Parameters of Liner Hangers Model MP2// and MP22//

Liner Hanger	Casing					Casing Calibre	Liner Hanger				
	Outer Diameter		Wall Thickness		Inner Diameter	D	D	d	L/L1	d1	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm/ft)	(mm)	(BTC)
MP2// 140 Drwg. Nr:24050.00.000 **MP22// 140** Drwg. Nr:25050.00.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	3324/3ft 4044/6ft	125	4-1/2”
MP2// 146 Drwg. Nr:24055.00.000 **MP22// 146** Drwg. Nr:25055.00.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7.32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100	3324/3ft 4044/6ft	125	4-1/2”
MP2// 150 Drwg. Nr:24060.00.000 **MP22// 150** Drwg. Nr:25060.00.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100	3324/3ft 4044/6ft	125	4-1/2”
MP2// 182 Drwg. Nr:24065.00.000 **MP22// 182** Drwg. Nr:25065.00.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	3400/3ft 4125/6ft	158	5-1/2”
MP2// 208 Drwg. Nr:24070.00.000 **MP22// 208** Drwg. Nr:25070.00.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	3700/3ft 4430/6ft	185	7”
MP2// 212 Drwg. Nr:24075.00.000 **MP22// 212** Drwg. Nr:25075.00.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	3700/3ft 4430/6ft	185	7”
MP2// 300 Drwg. Nr:24080.00.000 **MP22// 300** Drwg. Nr:25080.00.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	3800/3ft 4540/6ft	255	9-5/8”

Setting Tools Model MP2/22//

Technical Description

Setting Tools Model MP2/22// are used to run in liner hangers with packers. Special outer threads of them have to be screwed into the inner threads of liner hangers. Before screwing together of the left-handed threads the setting tool shall be pushed into the liner hanger to landing so, that the "springing elements" operating the packer unit be pressed together. The left hand thread shall be tightened fully -- it means about 15 turns -- then the setting tool shall be pulled back (40 cm).
The setting tool shall be turned to the left -- max. 45 degrees -- in order to let the "fin" snap into its place in the liner hanger to prevent premature disconnecting of the left-handed thread.
When running in the tool the "springing elements" operating the packing system of the liner hanger are in a pressed together state in the polished receptacle of the liner hanger until the end of cementing the liner.
The wiper plug required to the cementing joins with shear screws to the lower part of the setting tool.

Liner Hanger	Drawing Nuber of the Setting Tool	D (mm)	d (mm)	L (mm)	M (IF)
MP2/22// 140-146-150x4-1/2”	Drwg.Nr:24060.09.000	123	57.2	3120	3-1/2"
MP2/22// 140-146-150x5”	Drwg.Nr:24061.09.000	128	57.2	3120	3-1/2"
MP2/22// 182x5-1/2”	Drwg.Nr:24065.09.000	156	76.2	3120	4-1/2”
MP2/22// 208x7”x156	Drwg.Nr:24070.09.000	184	95.2	3305	4-1/2"
MP2/22// 212x7”x159	Drwg.Nr:24075.09.000	184	95.2	3305	4-1/2"
MP2/22// 300x9-5/8”	Drwg.Nr:24080.09.000	253	95.2	3500	4-1/2"

Running Procedures of Liner Hangers Model **MP2//**, and **MP22//**

Technical Description

1. Push the setting tool into liner hanger to landing.
   Make up the special left-handed thread by hand.
   Having made up the left-handed thread pull the setting tool upwards until landing in the liner hanger. Displacement until landing is 0.4 meter. This is the unloading length of the setting tool, when the liner hanger is operated. After landing turn the setting tool to the right in order to set the "fin" of it into its place (Max. 45°).
2. Run in the liner with the liner hanger.
3. Move the tool at a length of about 1 meter at the place of the seating.
4. The tool should be rotated to the right 20 cm above the place of seating:
   In the case of drilling pipe 1000 meter/1 turn to the right
   In the case of production pipe 1000 meter/1.5 turn to the right
5. Having been turned to the right the tool shall be lowered.
6. In the course of lowering the tool (after a displacement of 20 cm) the liner hanger will operate (seat), the weight of the run in liner will cease to load the lowering equipment.
7. The tool shall be lowered further (0.4 meter = unloading length), then make sure -by using a toolweight of 10 to 12 tons- that the liner hanger has really been seated.
8. The setting tool shall be disconnected under a load of 0.5 to 1 ton from the liner hanger (25 turns to the right).
9. Does the tool - in the course of turning to the right - not turn to the reverse, it means that the special left-handed shear safety thread of the setting tool has been loosened from the liner hanger.
   The torque may not vary when disconnecting.
10. The liner hanger shall again be loaded by a toolweight of 10 to 12 tons when cementing.
11. The tool shall be lifted by a length of 0.8-1 meter after cementing has been done. Springing elements of the setting tool move from their places outwards in radial direction. The systems of the liner hangers packing the annular space is operated by these springing elements.
12. The tool has to be lowered again. Springing elements of the setting tool land on the top of the liner hanger.
13. Load the liner hanger with a drilling weight of 12-15 tons. The shear screws of the liner hanger are shared by the action of the load.
14. Run out the setting tool from the liner hanger, and rinse back the surplus of the cement slurry from left.
15. Run out the tool.

Liner Hanger Packers Model M2LHP//

Technical Description

The Liner Hanger Packers Model LHP are mechanically operated tools having one row of counterwedges above their sealing elements. They are suitable to shape water and gas wells in which frequent pressure and temperature changes are to be reckoned with. By the tie-back sleeve to be found at the upper part of the liner hanger packer the possibility of extension to the surface is ensured. The variable length of the tie-back sleeve depends on the parameters of the well. Tie-backing is possible by simple or by latch type seal assemblies.
Standard lenghts (L1) are 3 or 6 feet.

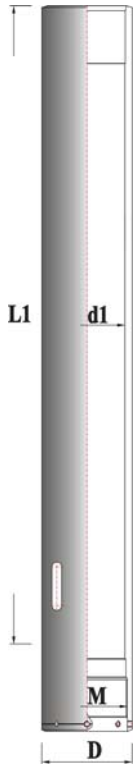
Operating Procedures

Running in of the liner hanger packers Model LHP will be done by the use of the setting tools Model MP2/22//.
-Run in the liner hanger packer with its fittings together to the required deepness.
-Pull it 20 cm above the seating location, and turn the tool to the right.(1000 m / 1 turn to the right).
-Lower the tool, then -- under a load of 1 to 2 tons -- the setting tool shall be disconnected from the hanger (25 turns to the right). Does the torque not change when disconnecting, it means that the shear safety thread of the setting tool has been disconnected.
-Lift the setting tool by 1 meter in order to move the springing elements operating the packer in radial direction from their position.
-Load the liner hanger with a toolweight of 15 tons.
-Test the closing from left.
-Run out the setting tool.

Liner Hanger Packer	Drawing Number	D (mm)	d (mm)	d1 (mm)	L/L1 (mm/ft)	M (BTC)
M2LHP// 146	Drwg.Nr:21055.05.000	146	100	125	3660/3	4-1/2”
M2LHP// 150	Drwg.Nr:21060.05.000	150	100	125	3660/3	4-1/2”
M2LHP// 182	Drwg.Nr:21065.05.000	182	122	158	3900/3	5”
M2LHP// 208	Drwg.Nr:21070.05.000	208	156	185	4100/3	7”
M2LHP// 212	Drwg.Nr:21075.05.000	210	159	185	4100/3	7”
M2LHP// 300	Drwg.Nr:21080.05.000	300	220	255	4300/3	9-5/8”

Tie-back Receptacles

Technical Description

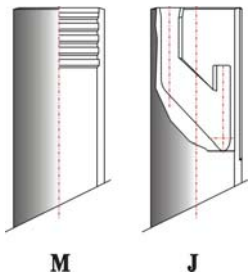


The liner hangers Model M are suitable to extend run in liners to the surface. The liner hangers are to be equipped with tie-back receptacles in this case. Tie-back seal nipples, or tie-back packers fit to these receptacles, and ensure hermetic closing between the inner side of the liner and the annular space.
Note: Lengths of tie-back receptacles depend on the structure of the well.
Standard lengths (L1) are: 3 or 6 feet.

Liner Hanger	Drawing Number of the Tie-back Receptacle	D (mm)	d (mm)	L/L1 (mm/ft)	M (mm)
M2/22TB// 140	Drwg.Nr:21050.11.000	139	125	1200/3	132x3
M2/22TB// 146x4-1/2”	Drwg.Nr:21055.11.000	146	125	1200/3	132x3
M2/22TB// 146x5"	Drwg.Nr:21057.11.000	146	150	1200/3	137x2.5
M2/22TB// 150x4-1/2”	Drwg.Nr:21060.11.000	149	125	1200/3	137x3
M2/22TB// 146x5"	Drwg.Nr:21062.11.000	149	130	1200/3	137x2.5
M2/22TB// 182	Drwg.Nr:21065.11.000	182	158	1200/3	162x3
M2/22TB// 208	Drwg.Nr:21070.11.000	208	185	1200/3	192x3
M2/22TB// 212	Drwg.Nr:21075.11.000	212	185	1200/3	192x3
M2/22TB// 300	Drwg.Nr:21080.11.000	300	255	1200/3	260x3

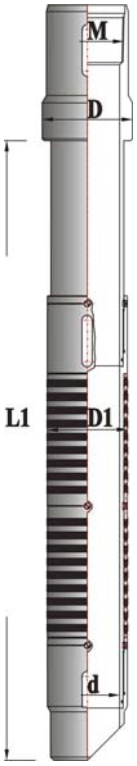
L=2100/6ft

Shape of the upper part of the tie-back receptacle is Latch Type or Jay-Latch Type as reqired.



Tie-back Seal Assemblies

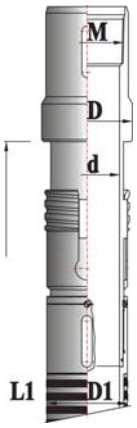
Technical Description



Extension of the hanged liner to the surface makes necessary the use of a fitting, which ensures the hermetic sealing of the liner pipe in the liner hanger. Packing rings of the tie-back seal nipple ensure perfect sealing in the liner hanger and they do not permit getting through of liquid or gas from the liner into the space between the liner and the casing.. The place of the tie-back seal nipple in the liner hanger has to be cleaned wit a milling tool before running in the the seal nipple. Note: Length of the tie-back seal nipple depends on the length of the tie-back receptacle.
Standard lengths (L1) are: 3 or 6 feet.

Tie-back Seal Assemblies	Drawing Number	D (mm)	D1 (mm)	d (mm)	L/L1 (mm/ft)	M (BTC)
D1/125//	Drwg.Nr:21060.14.000	140	125	100	1170/3	4-1/2”
D1/130//	Drwg.Nr:21056.14.000	145	130	109	1170/3	5”
D1/158//	Drwg.Nr:21065.14.000	182	158	122	1210/3	5-1/2”
D1/185//	Drwg.Nr:21070.14.000	208	185	159	1210/3	7”
D1/255//	Drwg.Nr:21080.14.000	300	255	220	1300/3	9-5/8”

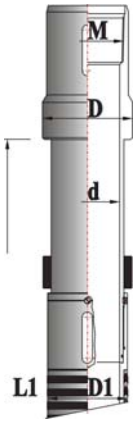
Latch Type Seal Assemblies



Latch Type of Seal Assemblies are recommended when frequent changes of pressure and temperature can be expected in the well.
The springing element of the seal assembly of latch type will be connected to the tie-back receptacle of the the tie-back seal nipple or of the liner hanger packer under the action of loading. This mechanical connection will be ceased by elevating (cca. 100 mm) and turning the liner to the right. Then the seal assembly of latch type can be run out.
Standard lengths (L1) are: 3 or 6 feet.

Latch Type Seal Assemblies	Drawing Number	D (mm)	D1 (mm)	d (mm)	L/L1 (mm/ft)	M (BTC)
D1/125// M	Drwg.Nr:21060.14.M00	140	125	100	1170/3	4-1/2”
D1/130// M	Drwg.Nr:21056.14.M00	145	130	109	1170/3	5”
D1/158// M	Drwg.Nr:21065.14.M00	182	158	122	1210/3	5-1/2”
D1/185// M	Drwg.Nr:21070.14.M00	208	185	159	1210/3	7”
D1/255// M	Drwg.Nr:21080.14.M00	300	255	220	1300/3	9-5/8”

„J” Latch Type Seal Assembly

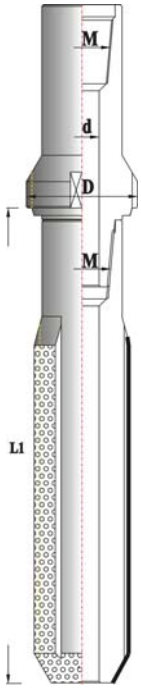


„J” Latch Type Seal Assemblies can be removed easily from liner hangers in case of repairing wells. Use of them is recommendable in case of very offset wells and water wells.
Standard lengths (L1) are: 3 or 6 feet.

„J” Latch Type Seal Assembly	Drawing Number	D (mm)	D1 (mm)	d (mm)	L/L1 (mm/ft)	M (BTC)
D1/125// J	Drwg.Nr:21060.14.J00	140	125	100	1170/3	4-1/2”
D1/130// J	Drwg.Nr:21056.14.J00	145	130	109	1170/3	5”
D1/158// J	Drwg.Nr:21065.14.J00	182	158	122	1210/3	5-1/2”
D1/185// J	Drwg.Nr:21070.14.J00	208	185	159	1210/3	7”
D1/255// J	Drwg.Nr:21080.14.J00	300	255	220	1300/3	9-5/8”

Tie-back Mills

Technical Description

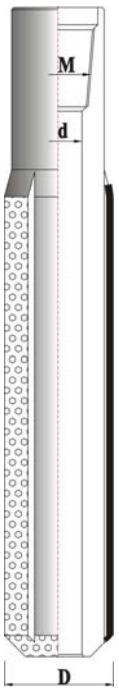


Has the hanged liner hanger a liner tie-back of packer type or a tie-back receptacle, the hole of the tie-back receptacle has to be cleaned before the operation of tying-back of the liner, or the inner diameter of it has to be controlled. This operation can be done by the use of a milling tool.
At the upper part of the milling tool a conical landing shoulder can be found. At the end of the milling operation this conical sholulder lands on the top of the tie-back receptacle and closes the rinsing circuit. It is suggested to run in a stabilizer after the first drilling pipe above the milling tool, equipped with rubber ribs the outer diameter of which fits to the inner diameter of the casing. Note: The length of the milling tool depends on the length of the tie-back receptacle.
Standard lengths (L1) are: 3 or 6 feet.

Tie-back Mill	Drawing Number of the Tie-back Milling Tool	D (mm)	d (mm)	L/L1 (mm/ft)	M (IF)
M2TBM// 125	Drwg.Nr:21060.32.000	146	44.45	1200/3	2-7/8"
M2TBM// 130	Drwg.Nr:21058.32.000	146	57.2	1200/3	3-1/2"
M2TBM// 158	Drwg.Nr:21065.32.000	165	57.2	1200/3	3-1/2"
M2TBM// 185	Drwg.Nr:21070.32.000	205	95.20	1200/3	4-1/2"
M2TBM// 255	Drwg.Nr:21080.32.000	275	95.20	1200/3	4-1/2"

Polishing Mills

Technical Description



Inner holes of liner hangers Model M are prepared with exact measures with polished finish.The sealing system of the setting tool fits to these holes during cementing, or so does the packer of the production pipe if it is run in to handle rocks in the case of shaped wells. In this case the unneeded cement stones are to be removed from the hole of the liner hanger. This can only be well done by the use of a milling tool of suitable diameter and quality. When milling, it is recommendable to run in one grief stem, then a stabilizer with rubber ribs above the mill, the outer diameter of which fits to the inner diameter of the casing. This tool arrangement ensures appropriate centralization in order to ensure a hole of good quality for the tubing nipple.

Polishing Mill	Drawing Number of the Polishing Mill	d (mm)	L (mm)	M (IF)
M2PM// 100	Drwg.Nr:21060.34.000	44.4	600	2-3/8"
M2PM// 109	Drwg.Nr:21058.34.000	44.4	600	2-3/8"
M2PM// 122	Drwg.Nr:21065.34.000	53.9	800	2-7/8"
M2PM// 156	Drwg.Nr:21070.34.000	68.2	800	3-1/2"
M2PM// 159	Drwg.Nr:21075.34.000	68.2	800	3-1/2"
M2PM// 220	Drwg.Nr:21080.34.000	95.2	800	4-1/2"

Pump Down Plugs

Technical Description

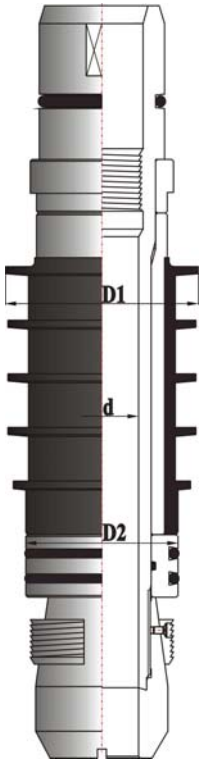
The cementing slurry forms only cement stone with suitable strength in the annular space if it does not mix with the drilling fluid. This mixing in the drilling pipe has to be prevented at any means. The Pump Down Plug serves this purpose. The rubber bells on the aluminum body wipe down the cement slurry from the walls of the drilling pipe and prevent running ahead of the setting drilling liquid. The pump down plug shall be placed into the cementing head to be found at the top of the drilling pipe. Pumping down of the cement slurry into the well shall be done under the pump down plug. When finished, the rinsing circuit shall be led -- by a by-pass pipe -- into the space above the pump down plug. In the same time as feeding in of the setting fluid begins, the pump down plug starts off downwards into the well, then it joins to the wiper plug.

Pump Down Plug	Drawing Number	D1 (mm)	D2 (Inch)	D2 (mm)	L (mm)
M2// 2-7/8”	Drwg.Nr:21055.03.000	62	1-11/16	42.9	365
M2// 3-1/2”	Drwg.Nr:21060.03.000	76	1-13/16	46.0	365
M2// 3-1/2”DShoe	Drwg.Nr:21061.03.000	76	2	50.8	365
M2// 4”	Drwg.Nr:21065.03.000	85	2	50.8	365
M2// 5”	Drwg.Nr:21075.03.000	115	2-9/16	65.1	470
M2// 5-1/2”	Drwg.Nr:21081.03.000	115	2-1/8	79.4	470

Wiper Plugs

Technical Description

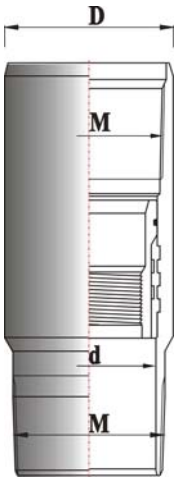
To reach a good quality of cementing is not enough to ensure the separation of the cement slurry and the setting drilling liquid in the drilling pipe. It also is necessary in the hanged liner. In the hole of the wiper plug fixed at the bottom of the setting tool by shear screws (30 bar/piece) a locking seat is shaped for the pump down plug. When setting the cement slurry, the pump down plug moving downwards reaching the wiper plug will be fixed in the hole of it having a lock. A tight plug will be formed by the two plugs which can only be moved by a high excess pumping pressure able to shear the shear screws of the wiper plug. From this moment on the pump down and the wiper plugs move together as one unit in the liner ensuring the separation of the cement slurry and the drilling fluid.



Wiper Plug	Drawing Number	D1 (mm)	D2 (mm)	d (Inch)	d (mm)	L (mm)
M2// 4-1/2”x2-7/8”	Drwg.Nr:21055.10.000	107	85	1-7/16	36.5	421
M2// 4-1/2”x3-1/2”	Drwg.Nr:21060.10.000	107	85	1-5/8	41.3	421
M2// 4-1/2”x3-1/2”DShoe	Drwg.Nr:21061.10.000	107	85	1-13/16	46.0	421
M2// 5”x3-1/2”	Drwg.Nr:21062.10.000	117	85	1-5/8	41.3	421
M2// 5”x3-1/2”DShoe	Drwg.Nr:21063.10.000	117	85	1-13/16	46.0	421
M2// 5-1/2”x3-1/2”	Drwg.Nr:21064.10.000	128	85	1-5/8	41.3	421
M2// 5-1/2”x4”	Drwg.Nr:21065.10.000	128	100	1-13/16	46.0	421
M2// 6-5/8”x5”	Drwg.Nr:21070.10.000	156	130	2-3/16	55.6	465
M2// 7”x5”	Drwg.Nr:21075.10.000	162	130	2-3/16	55.6	465
M2// 9-5/8”x5”	Drwg.Nr:21080.10.000	228	130	2-3/16	55.6	465
M2// 9-5/8”x5-1/2”	Drwg.Nr:21081.10.000	228	130	3-9/16	65.1	465

Landing Collars

Technical Description

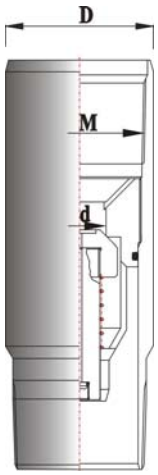


Landing Collars are to be mounted in after 1 or 2 strands of liners into the liner string. The inner shaping of them is suitable to receive wiper plugs. The wiper plug gets stuck, gets locked in the landing collar when pumping down of the cement slurry has been ended, and closes the rinsing circuit. Placing of the cement ends with this action. The seated landing collar is fixed in the landing collar by the action of a latch stucture so the upward movement of it becomes also impossible. This would be the case if the casing shoe would not close and -- because of the density difference of the fluids -- a reflow would start into the hanged liner.

Landing Collar	Drawing Number	D (mm)	d (mm)	L (mm)	M (BTC)
M2// 4-1/2”	Drwg.Nr:21060.04.000	127.0	77	315	4-1/2”
M2// 5”	Drwg.Nr:21061.04.000	141.3	77	340	5”
M2// 5-1/2”	Drwg.Nr:21065.04.000	153.0	87	340	5-1/2”
M2// 6-5/8”	Drwg.Nr:21070.04.000	187.5	117	450	6-5/8”
M2// 7”	Drwg.Nr:21075.04.000	194.5	117	450	7”
M2// 9-5/8”	Drwg.Nr:21080.04.000	270.0	117	500	9-5/8”

Float Collars

Technical Description

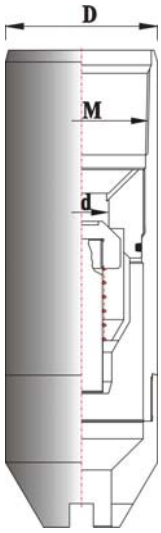


Float Collars are suitable to cement standard strings of casings or liners. In case of cementing liners the float collar has to be run in one or two pipe length above the tie-back seal nipple. The closing screw has to be removed from the valve shaft of the tie-back seal nipple before running in in order to ensure equalizing the pressures in the spaces under and above the float collar.

Float Collar	Drawing Number	D (mm)	d (mm)	L (mm)	M (BTC)
M2// 4-1/2”	Drwg.Nr:21060.08.000	127.0	45	350	4-1/2"
M2// 5”	Drwg.Nr:21061.08.000	141.3	45	350	5"
M2// 5-1/2”	Drwg.Nr:21065.08.000	153.0	45	400	5-1/2"
M2// 6-5/8”	Drwg.Nr:21070.08.000	187.5	55	450	6-5/8”
M2// 7”	Drwg.Nr:21075.08.000	194.5	55	450	7"
M2// 9-5/8”	Drwg.Nr:21080.08.000	270.0	60	500	9-5/8"

Float Shoes

Technical Description

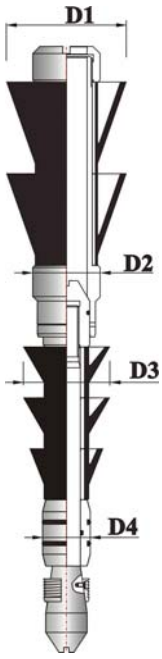


Float shoes are suitable for cementing casing and liner strings. The float shoe is the first element of the pipestring in both cases. Float shoes are back-pressure valves to prevent flowing of fluids into the piping string, consequently the piping string is floated. When running in pipes, the run in pipe shall be filled for the whole of the run in time according to the technological specification.

Float Shoe	Drawing Number	D (mm)	d (mm)	L (mm)	M (BTC)
M2// 4-1/2”	Drwg.Nr:21060.15.000	127.0	45	405	4-1/2"
M2// 5”	Drwg.Nr:21061.15.000	141.3	45	405	5"
M2// 5-1/2”	Drwg.Nr:21065.15.000	153.0	45	455	5-1/2"
M2// 6-5/8”	Drwg.Nr:21070.15.000	187.5	55	505	6-5/8”
M2// 7”	Drwg.Nr:21075.15.000	194.5	55	505	7"
M2// 9-5/8”	Drwg.Nr:21080.15.000	270.0	60	550	9-5/8"

Stage Pump Down Plugs

Technical Description

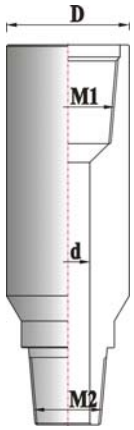


Predrilling and cementing of the liner is made by using combined drilling pipes in some cases. Because of the diameter differences a Stage Pump Down Plug is used to cement the liner.
The stage pump down plug consists of two parts connected by a shearing pin. When cementing the upper "holed" part of the stage pump down plug lands in the transition connecting the combined drilling pipes, the shear pin will be sheared, and the lower part of the plug acts as a tight plug until the end of cementing.

Stage Pump Down Plug	Drawing Number	D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	L (mm)
5"//3-1/2"	Drwg.Nr:21070.03.000	115	65	83	46	595

Drill Pipe Subs

Technical Description

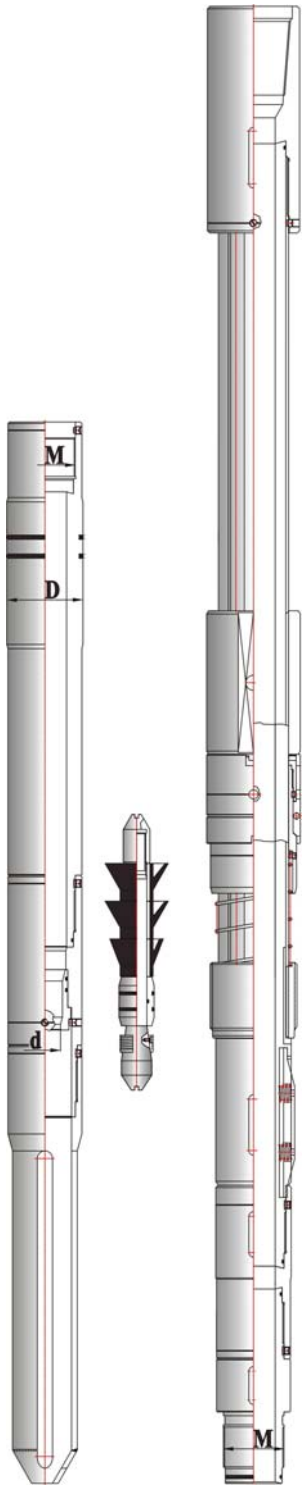


The transition is an important part of the combined drilling pipe string. It is strengthened, and the stage pump down plug lands on the inner conical shoulder of it. After having landed the upper holed part of the plug remains in the transition of the drilling pipe, the lower part of it moves further in the drilling pipe as a tight plug between the cement slurry and the pumped down liquid.

Drill Pipe Sub	Drawing Number	D (mm)	d (mm)	L (mm)	M1 (IF)	M2 (IF)
5"//3-1/2"	Drwg.Nr:21070.35.000	159	57.2	500	4-1/2"	3-1/2"

Cementing Valves
for Short Liners

Technical Description

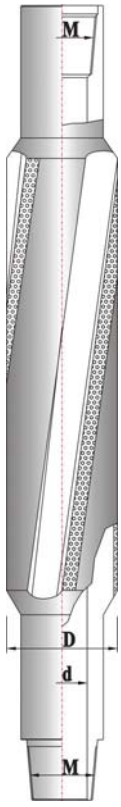


Cementing of very short liners consisting of 1 or 2 strands is not an easy task. Because of the low weight of the liner, reduction of the weight can not be detected, when the setting tool is disconnected from the liner hanger. In order to execute this task secure, using a Cementing Valve is recommended. The setting tool equipped with cementing valve can easily be lifted out of the liner hanger after seating of the liner.
The shaft equipped with packing rings shall be removed from the bottom of the setting tool Model M2/22//, and the cementing valve shall be connected to the place of it. One valve seat is fixed in the cementing valve by 4 shear screws (30 bar/piece), which can be fired out. The conventional pump down plug lands on it after pumping down of the cement slurry.
The setting tool shall be loosened off after having the liner hanger seated, then lifted about 1 meter and lowered again. Equals the location of the "seating" of the tool and the location of disconnection, the hanging of the short liner is successful, and the cementing can be executed.
A short perforated pipe can be found under the cementing valve to receive the valve seat fireable out. After the cementing has been done, the cementing valve and the perforated pipe can be run out.
Warning: After landing of the pump down plug (cca. 80 - 100 bar), the setting tool shall be lifted out of the liner hanger, and the pressure of the rinsing circuit shall be increased in order to fire out the valve seat.

Cementing Valve (mm)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M** (mm)	**Pump Down Plug**
D/100//	Drwg.Nr:21060.33.000	100	41.3	1405	80x2.5	3-1/2”
D/109//	Drwg.Nr:21061.33.000	109	46.0	1405	80x2.5	3-1/2”D
D/122//	Drwg.Nr:21065.33.000	122	46.0	1500	80x2.5	4”
D/156//	Drwg.Nr:21070.33.000	156	55.6	1500	135x3	5”/65
D/159//	Drwg.Nr:21075.33.000	159	55.6	1500	135x3	5”/65
D/220//	Drwg.Nr:21080.33.000	220	55.6	1500	135x3	5”/65

Casing Calibres

Technical Description

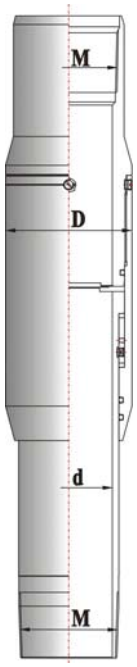


Because liner hangers can be very easy damaged, the inner diameter of the liner string has to be controlled before running in the liner hanger. It is most important in the case of old wells, because damages of the liner are here real danger. This control can be done by the use of a Casing Calibre. The well shall be controlled by the use of this calibre to the location of the seating. The calibre has to move free of any obstacle in the liner string when running in or out the drilling tool.

Casing Calibre	Drawing Number	D (mm)	d (mm)	L (mm)	M (IF)
M2CC// 140	Drwg.Nr:21050.28.000	141	68.2	1500	3-1/2"
M2CC// 146	Drwg.Nr:21055.28.000	147	68.2	1500	3-1/2"
M2CC// 150	Drwg.Nr:21060.28.000	151	68.2	1500	3-1/2"
M2CC// 182	Drwg.Nr:21065.28.000	183	95.2	1500	4-1/2"
M2CC// 208	Drwg.Nr:21070.28.000	209	95.2	1500	4-1/2"
M2CC// 212	Drwg.Nr:21075.28.000	213	95.2	1500	4-1/2"
M2CC// 300	Drwg.Nr:21080.28.000	305	95.2	1500	4-1/2"

Liner Bearings

Technical Description



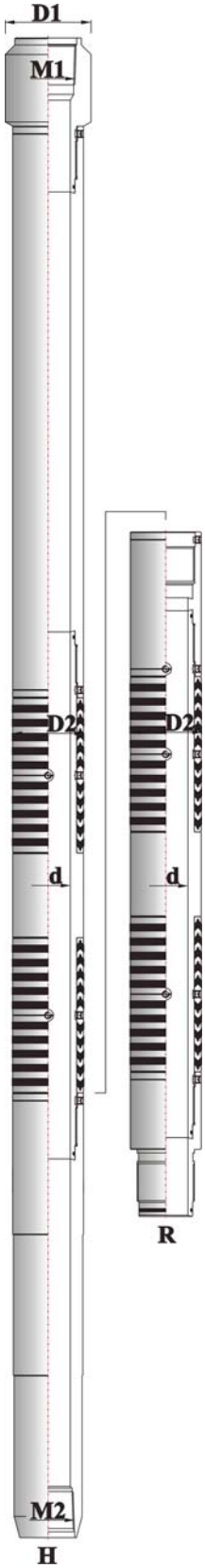
A good cement mantel can only be shaped in case of a suitably centralised liner. As number of stabilizers grows, functioning of liner hangers becomes more and more doubtful, because the whole tool string - liner string included - has to be rotated in order to seat liner hangers. The situation is the same in case of oblique wells. Mounting of a Liner Bearing is recommended in between liner hanger and liner in wells sort of these, so the liner has not to be rotated when operating the liner hanger.
Can the liner hanger not be set, the clutch inside the liner bearing prevents rotation of the liner set on bottom, while setting tool is being released.

Liner Bearing	Drawing Number	D (mm)	d (mm)	L (mm)	M (BTC)
M2LB// 4-1/2”	Drwg.Nr:21060.30.000	146	100	745	4-1/2”
M2LB// 5”	Drwg.Nr:21061.30.000	146	109	745	5”
M2LB// 5-1/2”	Drwg.Nr:21065.30.000	180	122	800	5-1/2”
M2LB// 7”	Drwg.Nr:21075.30.000	205	159	900	7”
M2LB// 9-5/8”	Drwg.Nr:21080.30.000	300	220	1000	9-5/8”

Tubing Nipples

Technical Description

This is an extraordiniraly simple tool with the help of which numeral well-operation can be executed economically. When using it, no packer has to be run in into the well in the interest of success of the operation, because the Tubing Nipple -- pushed into the hole of the liner hanger acts as a packer. On the occasion of swabbing or feeding in fluids only the fluid quantity according to the volume of the drilling pipe has to be moved by the use of the pump of the equipment or by using the common aggregates. If the strain of the production pipe makes it desirable, the sealing length of the system can be increased by srewing together more tubing nipples (H+R+R). In the case of blasting rocks mounting of an anchor above the tubing nipple is recommended. The anchor will be operated by the hydraulic pressure of the operation. The system of wedges of the anchor is pressed to the wall of the casing by the high differential pressure, and the movement upwards of the tubing nipple is prevented by this action.
Control, occasionally cleaning of the inner side of the liner hanger is recommended by using a polishing mill Model M2PM before running in the tubing nipple.

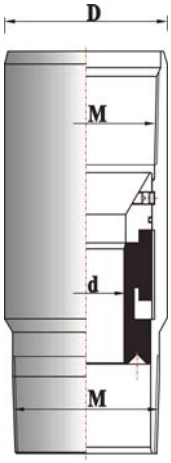


Liner Hanger	Drawing Number of the Tubing Nipple	D1 (mm)	D2 (mm)	d (mm)	L (mm)	M1	M2
M// 140-146-150 (4-1/2”)	D.Nr:21060.06.000/H D.Nr:21060.06.000/R	120	100 100	62.0 62.0	2125 875	2-7/8"EU	2-7/8"NU
M// 146-150 (5”)	D.Nr:21062.06.000/H D.Nr:21062.06.000/R	130	110 110	62.0 62.0	2125 875	2-7/8"EU	2-7/8"NU
M// 182 (5-1/2”)	D.Nr:21065.06.000/H D.Nr:21065.06.000/R	150	122 122	76.0 76.0	2305 800	3-1/2"EU	3-1/2"NU
M// 208 (7”)	D.Nr:21070.06.000/H D.Nr:21070.06.000/R	180	156 156	100.5 100.5	2485 1250	5-1/2"BTC	4-1/2"BTC
M// 212 (7”)	D.Nr:21075.06.000/H D.Nr:21075.06.000/R	180	159 159	100.5 100.5	2485 1250	5-1/2"BTC	4-1/2"BTC

„H”=long type
„R”=short type

Tail Pipe Bushings

Technical Description

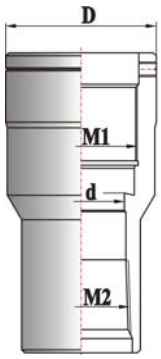


Tail Pipe Bushings are important elements of wells storing water or gas. They shall be run in direct under the screen pipe or perforated liner. The inner cup-like rubber elements of them receive the production ("washing") pipe which covers the screen pipe on the full length of it ensuring the possibility of rinsing the annular space behind the screen.

Tail Pipe Bushing (Inch)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M** (BTC)
4-1/2	Drwg.Nr:24060.02.000	127.0	59.5	315	4-1/2”
5	Drwg.Nr:24061.02.000	141.3	59.5	315	5”
5-1/2	Drwg.Nr:24065.02.000	153.0	59.5	340	5-1/2”
6-5/8	Drwg.Nr:24070.02.000	187.7	59.5	340	6-5/8”
7	Drwg.Nr:24075.02.000	194.5	59.5	450	7”

Setting Tool Sub

Technical Description



When cleaning the annular space behind the seeve using a tail pipe bushinga production pipe section of diameter of 2 3/8" (a so called "washing pipe") has to be connected to the setting tool with a preplanned length. This has to be designed so, that it extends 1.5 - 2 meters beyond the tail pipe bushing. This will be ensured by the setting tool sub.

Drawing Number of the Setting Tool	**Drawing Number of the Setting Tool Sub**	**D** (mm)	**d** (mm)	**L** (mm)	**M1** (mm)	**M2** (EU)
Rsz:24060.09.000	Drwg.Nr:24060.09.055	99.0	57.5	200	74x2.5	2-3/8”
Rsz:24070.09.000	Drwg.Nr:24070.09.055	155.0	57.5	200	125x3	2-3/8”

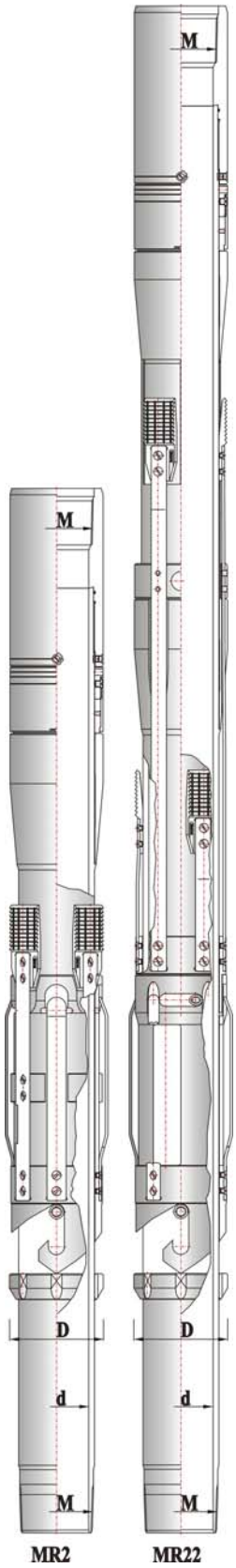
Table for Running in Liner Hangers

Liner Hanger	Casing			Rock Bit		Casing Calibre	Liner Hanger
	Outer Diameter D (Inch)	Minimal Inner Diameter d (mm)	Minimal Controlled Diameter d (mm)	Outer Diameter D (Inch)	(mm)	Outer Diameter D (mm)	Outer Diameter D (mm)
M// 140	6-5/8	144.17	140.98	5-5/8	142.87	141	140
M// 146	6-5/8 or 7	150.36	147.18	6	152.40	147	146
M// 150	7	157.08	153.90	6	152.40	151	150
M// 182	8-5/8	190.78	187.60	7-1/2	190.00	183	182
M// 208	9-5/8	216.79	212.83	8-1/2	215.90	209	208
M// 212	9-5/8	224.41	220.45	8-1/2	215.90	213	212
M// 300	13-3/8	313.61	309.63	12-1/4	311.15	305	300

Mechanical Rotating Liner Hangers Model **MR2//** and **MR22//**

Technical description:

By using a Model MR// mechanical liner hanger, the liner can be rotated during cementing. During rotation of the liner, the liner hanger is in seated out position, while the setting tool is loosened off. The Model MR2// has one row of wedges, while the Model MR22// has a double row of them. Both Models of Liner Hangers have mechanically operating, right-handed, activating "J" mechanisms. After the liner has been cemented, the setting tool can be run out of the drilling hole by lifting of the setting string.



Technical Parameters of Mechanical Rotating Liner Hangers Model MR2//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
MR2// 140	6-5/8	168.3	28	10.59	147.09	141	140	100	1640	4-1/2”
Drwg.Nr:41050.01.000			32	12.06	144.17					
MR2// 146	6-5/8	168.3	20	7.32	153.64	147	146	100	1640	4-1/2”
Drwg.Nr:41055.01.000			24	8.94	150.40					
	7	177.8	32	11.51	154.78					
			35	12.65	152.50					
			38	13.72	150.36					
MR2// 150	7	177.8	20	6.91	163.98	151	150	100	1640	4-1/2”
Drwg.Nr:41060.01.000			23	8.05	161.70					
			26	9.20	159.42					
			29	10.36	157.08					
MR2// 182	8-5/8	219.1	36	10.16	198.76	183	182	122	1900	5-1/2”
Drwg.Nr:41065.01.000			40	11.43	196.22					
			44	12.70	193.68					
			49	14.15	190.78					
MR2// 208	9-5/8	244.5	43.5	11.05	222.38	209	208	156	1900	7”
Drwg.Nr:41070.01.000			47.0	11.99	220.50					
			53.5	13.84	216.79					
MR2// 212	9-5/8	244.5	32.3	7.92	228.64	213	212	159	1900	7”
Drwg.Nr:41075.01.000			36.0	8.94	226.59					
			40.0	10.03	224.41					
MR2// 300	13-3/8	339.7	48.0	8.38	322.96	305	300	220	2200	9-5/8”
Drwg.Nr:41080.01.000			54.5	9.65	320.42					
			61.0	10.92	317.88					
			68.0	12.19	315.34					
			72.0	13.06	313.61					

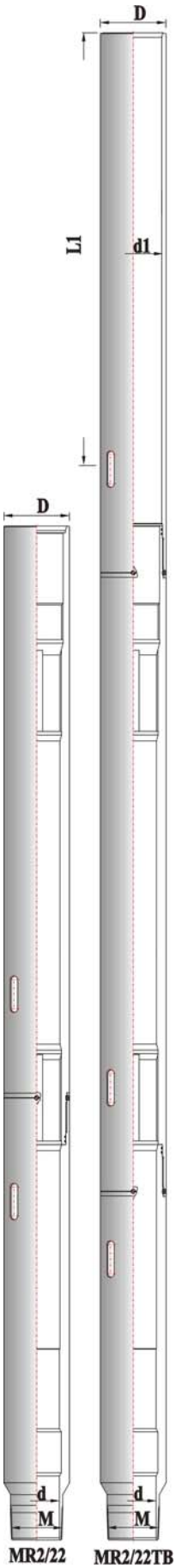
Technical Parameters of Mechanical Rotating Liner Hangers Model MR22//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
MR22// 140	6-5/8	168.3	28	10.59	147.09	141	140	100	2400	4-1/2”
Drwg.Nr:43050.01.000			32	12.06	144.17					
MR22// 146	6-5/8	168.3	20	7.32	153.64	147	146	100	2400	4-1/2”
Drwg.Nr:43055.01.000			24	8.94	150.40					
	7	177.8	32	11.51	154.78					
			35	12.65	152.50					
			38	13.72	150.36					
MR22// 150	7	177.8	20	6.91	163.98	151	150	100	2400	4-1/2”
Drwg.Nr:43060.01.000			23	8.05	161.70					
			26	9.20	159.42					
			29	10.36	157.08					
MR22// 182	8-5/8	219.1	36	10.16	198.76	183	182	122	2700	5-1/2”
Drwg.Nr:43065.01.000			40	11.43	196.22					
			44	12.70	193.68					
			49	14.15	190.78					
MR22// 208	9-5/8	244.5	43.5	11.05	222.38	209	208	156	2700	7”
Drwg.Nr:43070.01.000			47.0	11.99	220.50					
			53.5	13.84	216.79					
MR22// 212	9-5/8	244.5	32.3	7.92	228.64	213	212	159	2700	7”
Drwg.Nr:43075.01.000			36.0	8.94	226.59					
			40.0	10.03	224.41					
MR22// 300	13-3/8	339.7	48.0	8.38	322.96	305	300	220	2900	9-5/8”
Drwg.Nr:43080.01.000			54.5	9.65	320.42					
			61.0	10.92	317.88					
			68.0	12.19	315.34					
			72.0	13.06	313.61					

Setting Adapters Model **MR2/22//** and **MR2/22TB//**

Technical description:

Setting adapter Model MR2/22// is connected direct to the rotating liner hanger. The inner thread loosening in the direction right is in the upper part of the setting adapter, to which the setting tool Model MR2/22// can be connected. The recesses under the loosening inner thread are necessary for setting the liner hanger, while the ones in the middle part are needed to the rotation of the liner hanger. The "seating" formed in the lower part of the setting adapter receives the cementing bushing Model M3/33// of the setting tool, closing the annual space between the setting adapter and the setting tool during cementing, while the liner is rotated. In case of the form "tie-back" the setting adapter Model MR2/22TB// completed by a seal nipple shall be used.
Note: length of the seal nipple depends on the structure of the well.
Standard lengths (L1): 3 or 6 feet.



Setting Adapter MR2/22//	Drawing Nuber	D (mm)	d (mm)	L (mm)	M (BTC)
MR2/22// 140	Drwg.Nr:41050.12.000	140	100	2230	4-1/2"
MR2/22// 146x4-1/2”	Drwg.Nr:41055.12.000	144	100	2230	4-1/2"
MR2/22// 146x5”	Drwg.Nr:41057.12.000	144	109	2230	5”
MR2/22// 150x4-1/2”	Drwg.Nr:41060.12.000	148	100	2230	4-1/2"
MR2/22// 150x5”	Drwg.Nr:41062.12.000	148	109	2230	5”
MR2/22// 182	Drwg.Nr:41065.12.000	182	122	2330	5-1/2"
MR2/22// 208	Drwg.Nr:41070.12.000	208	156	2500	7"
MR2/22// 212	Drwg.Nr:41075.12.000	212	159	2500	7"
MR2/22// 300	Drwg.Nr:41080.12.000	300	220	2600	9-5/8"

Setting Adapter MR2/22TB//	Drawing Nuber	d1 (mm)	L/L1 (mm/ft)
MR2/22TB// 140	Drwg.Nr:41050.12.030	125	3315/3
MR2/22TB// 146x4-1/2”	Drwg.Nr:41055.12.030	125	3315/3
MR2/22TB// 146x5”	Drwg.Nr:41057.12.030	130	3315/3
MR2/22TB// 150x4-1/2”	Drwg.Nr:41060.12.030	125	3315/3
MR2/22TB// 150x5”	Drwg.Nr:41062.12.030	130	3315/3
MR2/22TB// 182	Drwg.Nr:41065.12.030	158	3500/3
MR2/22TB// 208	Drwg.Nr:41070.12.030	185	3600/3
MR2/22TB// 212	Drwg.Nr:41075.12.030	185	3600/3
MR2/22TB// 300	Drwg.Nr:41080.12.030	255	3800/3

Setting Tools Model **MR2/22//**

Technical description:

Setting Tool Model MR2/22// is used with mechanical rotating liner hangers Models MR2//, and MR22//. The setting tool is connected by a special left-handed thread, loosening to the direction right, to the setting adapter Model MR2/22//. The setting tool has a natural movement of 900 mm. This length is enough to securely loosen the setting tool from the liner hanger. Two "fins" can be found under the left-handed, loosening thread of the setting tool, which are needed to set, and to rotate the rotating liner hanger.
The shouldered shaft at the lower part of the setting tool operates the cementing bushing Model M3/33//, having the task of closing the annular space between the setting tool, and the setting adapter. After completed cementing the setting tool will be removed from the rotating liner hanger by lifting the setting string.

Setting Tool	Drawing Nuber	D (mm)	d (mm)	L (mm)	M (IF)
MR2/22// 140-146-150x4-1/2”	Drwg.Nr:41060.13.000	123	52.4	4478	3-1/2"
MR2/22// 146x5"	Drwg.Nr:41061.13.000	129	52.4	4478	3-1/2"
MR2/22// 182x5-1/2”	Drwg.Nr:41065.13.000	156	76.2	4700	4-1/2"
MR2/22// 208x7”x156	Drwg.Nr:41070.13.000	184	95.2	4900	4-1/2"
MR2/22// 212x7”x159	Drwg.Nr:41075.13.000	184	95.2	4900	4-1/2"
MR2/22// 300x9-5/8”	Drwg.Nr:41080.13.000	253	95.2	5100	4-1/2"

Running Procedures of Mechanical Rotating Liner Hangers Model **MR2//,** and **MR22//**

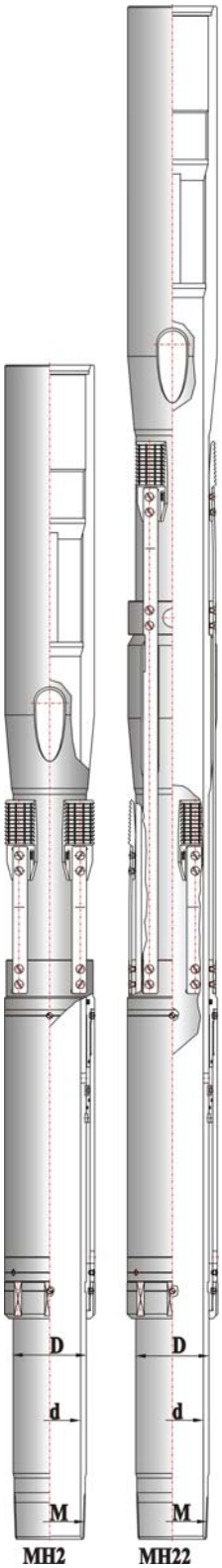
Technical description:

1. Place cementing bushing Model M3/33// into the setting adapter MR2/22// so as their lower ends are in the same level.
2. Unscrew wiper plug transition to be found at the bottom of the setting tool Model MR2/22//.
3. Push setting tool into the setting adapter until seating, taking care of leaving the cementing bushing at its place.
4. Screw back the wiper plug transition with the wiper plug together to the end of the setting tool.
5. Pull the setting tool upwards about 0.5 Meters, and screw the special left-handed thread of the setting tool and of the setting adapter together by hand. After completed screwing of the left-handed threads together, pull the setting tool upwards until it is seated in the setting adapter. After seating move the setting tool to the right (by. Max. 45°) in order to move the two „fins" into their places. Make sure by moving the setting tool up and down, that it can be moved free along 900 mm (neutral length).
6. Screw together the setting adapter with the rotating liner hanger.
7. Run in the liner with the rotating liner hanger.
8. Move the tool along 1 meter length at the place of the setting.
9. The tool shall be rotated to the right 20 cm above the place of setting. (1000 meter/1 turn to the right)
10. Having done the right turns, the tool shall be lowered.
11. During lowering (beyond 20 cm) the liner hanger operates (sets), and the weight of the run in liner dissapears.
12. The tool shall be further lowered by approximately 0.5 meters, and the setting tool shall be unscrewed from the rotating liner hanger (25 turns to the right). The moment of rotation may not lowered when unscrewing!
    If you want to be confirmed by lifting of the setting string, that the setting tool is unscrewed, you may only lift the setting string by Max. 0.5 meters above the neutral length.
13. Load the rotating liner hanger with 8 to 10 tons of toolweight, and begin to rotate the liner.
14. During rotation complete the cementing.
15. Run out the setting tool.

Hydro-Hanger Model **MH2//** and **MH22//**

Technical description:

Hydraulically actuated liner hangers are suitable to set short and middle long liners where rotating of liner is difficult or completely impossible. Liner hangers are available in two versions: with one or with two rows of hanging wedges. For actuating the liner hanger there is no need to turn off the setting tool. Operating of liner hangers is done with the help of a ball arrester. Hydraulically actuated liner hangers operate on the effect of an overpressure of 90-110 bar. At this pressure the share bolts of the liner hanger will be sheared, the hydraulic cylinder presses the wedges to the cones of the liner hanger, and the liner hanger "sits up". Hydraulically actuated liner hangers are made in normal and in "tie-back" versions. Standard lengths (L1) of tie-back receptacles of tie-back models are 3 or 6 feet.



Technical Parameters of Hydro-Hangers Model MH2//

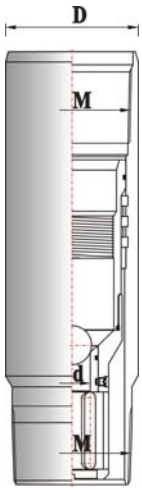
Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diamerer		Wall thickness		Inner diameret	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
MH2// 140 Drwg.Nr:51050.01.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	1915	4-1/2”
MH2// 146 Drwg.Nr:51055.01.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7.32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100	1915	4-1/2”
MH2// 150 Drwg.Nr:51060.01.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100	1915	4-1/2”
MH2// 182 Drwg.Nr:51065.01.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	1915	5-1/2”
MH2// 208 Drwg.Nr:51070.01.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	2110	7”
MH2// 212 Drwg.Nr:51075.01.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	2110	7”
MH2// 300 Drwg.Nr:51080.01.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	2500	9-5/8”

Technical Parameters of Hydro-Hangers Model MH22//

Liner Hanger	Casing					Casing Calibre	Liner Hanger			
	Outer diameter		Wall thickness		Inner diameter	D	D	d	L	M
	(Inch)	(mm)	(lb/ft)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(BTC)
MH22// 140 Drwg.Nr:53050.01.000	6-5/8	168.3	28 32	10.59 12.06	147.09 144.17	141	140	100	2500	4-1/2”
MH22// 146 Drwg.Nr:53055.01.000	6-5/8 7	168.3 177.8	20 24 32 35 38	7.32 8.94 11.51 12.65 13.72	153.64 150.40 154.78 152.50 150.36	147	146	100	2500	4-1/2”
MH22// 150 Drwg.Nr:53060.01.000	7	177.8	20 23 26 29	6.91 8.05 9.20 10.36	163.98 161.70 159.42 157.08	151	150	100	2500	4-1/2”
MH22// 182 Drwg.Nr:53065.01.000	8-5/8	219.1	36 40 44 49	10.16 11.43 12.70 14.15	198.76 196.22 193.68 190.78	183	182	122	2500	5-1/2”
MH22// 208 Drwg.Nr:53070.01.000	9-5/8	244.5	43.5 47.0 53.5	11.05 11.99 13.84	222.38 220.50 216.79	209	208	156	2750	7”
MH22// 212 Rsz:53075.01.000	9-5/8	244.5	32.3 36.0 40.0	7.92 8.94 10.03	228.64 226.59 224.41	213	212	159	2750	7”
MH22// 300 Drwg.Nr:53080.01.000	13-3/8	339.7	48.0 54.5 61.0 68.0 72.0	8.38 9.65 10.92 12.19 13.06	322.96 320.42 317.88 315.34 313.61	305	300	220	2750	9-5/8”

Ball Catching Landing Collar

Technical description:



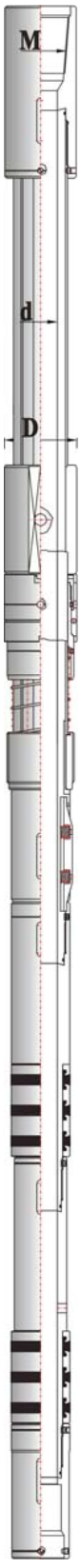
The hydraulic liner hanger can be actuated with the help of the landing collar. The ball seat inside the liner hanger is fixed by share bolts. Hydraulically actuated liner hangers operate on the effect of an overpressure of 90-110 bar. As the overpressure increases, the share bolts will be sheared, and the ball seat falls in the basket, that is onto the bottom of the ball catching landing collar, this way ensuring the flushing cycle for further works in the well.
The wiper plug hits the ratchet in the upper part of the ball catching landing collar with the purpose to separate drilling liquid from cement grout, and to close backwards the flushing cycle in case of failure of the cementing casing-shoe.

Ball Catching Landing Collar	**Drawing Number:**	**D** (mm)	**d** (mm)	**Ball** (mm)	**L** (mm)	**M** (BTC)
GF// 4-1/2”	Drwg.Nr:51060.04.000	127.0	35	38	420	4-1/2”
GF// 5”	Drwg.Nr:51061.04.000	141.3	35	38	420	5”
GF// 5-1/2”	Drwg.Nr:51065.04.000	153.0	35	38	420	5-1/2”
GF// 6-5/8”	Drwg.Nr:51070.04.000	187.5	45	48	450	6-5/8”
GF// 7”	Drwg.Nr:51075.04.000	194.5	45	48	450	7”
GF// 9-5/8”	Drwg.Nr:51080.04.000	270.0	50	55	500	9-5/8”

Setting Tool Model **MH2/22//**

Technical description:

Main parts of setting tool Model MH2/22// correspond to parts of other setting tools Model M. The single difference is the sealing system at the lower part of the tool. During setting the liner the operating hole of the hydraulic liner hanger is straddled by this sealing system in any position of the setting tool. The setting tool connects to the liner hanger with no torsion moment. In case of liner hangers having two rows of hanger wedges an intermediate piece shall be fitted in. The wiping plug connects to the setting tool by means of share bolts. The actuator ball shall be pumped through this setting tool.



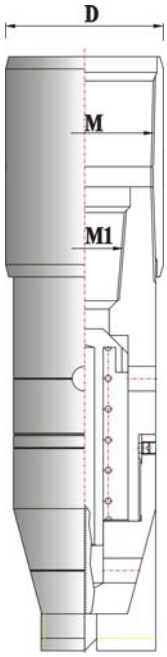
Setting Tool	Drawing Number:	D (mm)	d (mm)	L (mm)	M (IF)
MH2/22// 140-146-150x4-1/2”	Dr.Nr:51060.13.000	123	57.2	2346/2931	3-1/2"
MH2/22// 146x5"	Dr.Nr:51061.13.000	129	57.2	2346/2931	3-1/2"
MH2/22// 182x5-1/2”	Dr.Nr:51065.13.000	156	76.2	2550/3150	4-1/2"
MH2/22// 208x7”x156	Dr.Nr:51070.13.000	184	95.2	2550/3150	4-1/2"
MH2/22// 212x7”x159	Dr.Nr:51075.13.000	184	95.2	2550/3150	4-1/2"
MH2/22// 300x9-5/8”	Dr.Nr:51080.13.000	253	95.2	2700/3350	4-1/2"

Running Procedures of Liner Hangers Model MH2//, and MH22//

Technical Description

1. Push the setting tool into the liner hanger landing.
   Make up the special left-handed thread by hand.
   Having made up the left-handed thread pull the setting tool upwards in the liner hanger until seating. Displacement until seating is 0.5 meter. This is the unloading length of the setting tool, when the liner hanger is operated. After landing move the setting tool to the right in order to set the "fin" of it into its place (Max. 45°).
2. Run in the liner with the liner hanger.
3. Move the tool at a length of about 1 meter at the place of the seating.
4. Pump down the activating ball.
   Having hit the ball increase the pressure up to a pressure of 120 bar, after that sink the tool at this pressure.
   While the tool sinks (leaving 20 cm) the hydro-hanger works (sits up), the liner “looses” its weight.
5. Disconnect the setting tool from the liner hanger under load of 0.5-1 tons.
   25 turn to the right, the torque may not vary when disconnecting.
   Note: When working with production pipe the setting tool should be disconnected from the liner hanger with no loading, that is to say within the unloading length of the setting tool, because the string of production pipes bends out under the influence of a minimal load (macaroni effect), leans against the wall of the casing, and it can not be turned anyway.
6. Does the tool -- in the course of turning to the right -- not turn to the reverse, it means that the special left-handed shear safety thread of the setting tool has been loosened from the liner hanger.
7. Increase the pressure and shoot out the valve of the ball catching landing collar.
8. When the flushing cycle is ensured, load the setting tool for cementing with a tool weight of 10-12 tons.
9. Cementing.
10. Run out the setting tool.

Screen Shoes

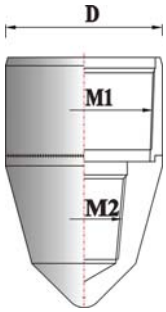


Technical Description

Running in of screens into shallow water wells is done by a special technology. A "back-pressure valve" or Screen Shoe, having a left-handed drilling pipe thread, will be run in under the screen. A left-handed/right handed transitional piece, then a drilling pipe joins to the left-handed thread of the shoe. Suitable number of screens has to be stringed onto the drilling pipe. When running in, the drilling pipe is naturally always longer than the screens. After having set the screen, the annular space can be cleaned through the drilling pipe or through the screen shoe as required. After having washed through the annular space, the screen string shall be seated onto the bottom of borehole, then the drilling pipe shall be disconnected from the left-handed thread of the screen shoe. After having the drilling pipe run out, the annular space shall be closed by the use of a stuffing. Is the type of the stuffing "GP" the gravelling operation shall be executed.

Screen Shoe (Inch)	Drawing Number	D (mm)	L (mm)	M (LTC)	M1 Left (IF)
4-1/2	Drwg.Nr:24060.38.000	127.0	450	4-1/2”	2-3/8”
6-5/8	Drwg.Nr:24070.38.000	187.7	540	6-5/8”	3-1/2”
7	Drwg.Nr:24075.38.000	194.5	540	7”	3-1/2”

Tail Pipes



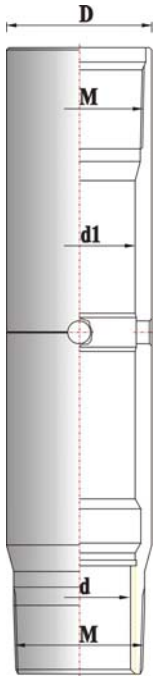
Technical Description

Has the screen been run in with screen hanger then the first element of the screen string is a Tail Pipe. In a tail pipe one can find a left-handed inner thread alleviating the later fishing or changing of screens.

Tail Pipe (Inch)	Drawing Number	D (mm)	L (mm)	M1 (LTC)	M2 Left (IF)
4-1/2	Drwg.Nr:24060.31.000	127.0	300	4-1/2”	2-3/8”
6-5/8	Drwg.Nr:24070.31.000	187.7	300	6-5/8”	3-1/2”
7	Drwg.Nr:24075.31.000	194.5	300	7”	3-1/2”

Port Collars

Technical Description

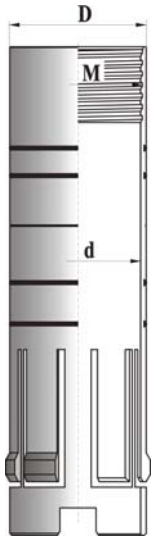


Port Collars are the first tools after screen hangers. On the mantle of them 4 holes can be found through which the gravel or the sand exits into the annular space behind the screen. Under the holes orienting pins can be found. By these orienting pins it is ensured that the holes of the port collar coincide with the holes of the crossover in the time of gavel setting, and make possible disconnecting of the closing sleeve from the setting tool after gravelling has been executed.

Port Collar (Inch)	**Drawing Number**	**D** (mm)	**d1** (mm)	**d** (mm)	**L** (mm)	**M** (LTC)
4-1/2	Drwg.Nr:24060.22.000	127.0	98	90	550	4-1/2”
7”	Drwg.Nr:24070.22.000	194.5	155	142	840	7”

Closing Sleeves

Technical Description

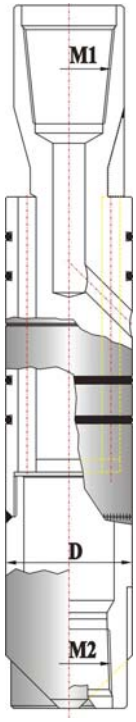


The holes of the port collar, or in the case of shallow water wells the gravel setting holes can be found at the bottom of the stuffing become needless, actually they disturb the screen in executing the task of it after having the gravel set. These holes have to be closed. This task is served by Closing Sleeves. The holes are surrounded by seals found on the mantle of the closing sleeves. The closing sleeves can be furthered into their place with a possible maximal security by using a closing sleeve setting tool. After having the closing sleeve landed, the setting tool shall be disconnected by turning it to the right. This operation requires great attention, exact measuring of length, and a good weight metering device. In the port collar and in the stuffing orienting pins can be found. These orienting pins -- get caught by the grooves at the bottom of the closing sleeve -- make possible the disconnecting by turning to the right. The springing nails at the lower part of the closing sleeve secure the closing sleeve against displacement in the course of operating the well.

Closing Sleeve (Inch)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M** (mm)
4-1/2	Drwg.Nr:24060.23.000	98	90.0	355	93x8
6-5/8	Drwg.Nr:24070.23.000	155	142.5	560	145x10
7	Drwg.Nr:24075.23.000	172	156.0	400	160x10

Crossovers

Technical Description

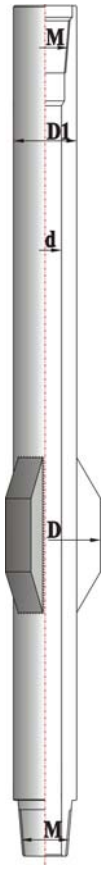


After having set the screens and closed the annular space, the gravelling can be executed. The crossover shall be run in by the use of the drilling or production pipe. On the outer mantle of the crossover a forced trajectory can be found. This forced trajectory makes possible that the holes of the port collar and the crossover coincide preventing the minor possibility of clogging in the time of gravelling. In the lower part of the crossover a production pipe inner thread can be found. The washing pipe of suitable length shall be screwed into this thread by inserting a double outer threaded crossover. By the washing pipe is ensured the rinsing through of the annular space on the full length of the screen. The sleeve of the washing pipe has always a bevelled shape.

Crossover (Inch)	**Drawing Number**	**D** (mm)	**L** (mm)	**M1** (IF)	**M2** (EU)
4-1/2	Drwg.Nr:24060.24.000	98	550.0	2-3/8”	2-3/8”
6-5/8	Drwg.Nr:24070.24.000	155	830.0	3-1/2”	2-7/8”
7	Drwg.Nr:24075.24.000	172	677.5	3-1/2”	2-7/8”

Stabilizers

Technical Description



Any operation of deep-drilling can only be perfectly executed by using well stabilized tools. This is particularly true, when forming gas or water wells by GP technology. Ribs of the stabilizer get into the hole of the liner hanger Model M-2-T when gravelling by using a crossover or – after having the operation of gravelling completed – when the closing sleeve will be run in. By using the stabilizer the central position of the tools will always be ensured even if the borehole is eventually oblique.

Stabilizer (Inch)	**Drawing Number**	**D** (mm)	**D1** (mm)	**d** (mm)	**L** (mm)	**M** (IF)
7	Drwg.Nr:24060.37.000	150	85.7	44.4	3000	2-3/8”
9-5/8	Drwg.Nr:24080.37.000	180	146.0	68.3	3500	3-1/2”

Closing Sleeve Setting Tools

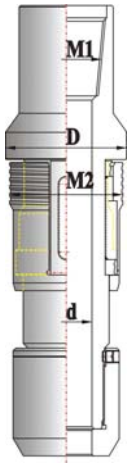
Technical Description

Into the special, beared, left-handed loosening thread of this tool shall be screwed the closing sleeve, which serves the closing of the holes of the port collar in the liner hanger or in the stuffing. After running in and landing of the closing sleeve setting tool, it shall be turned to the right under a load of 0.5 to 1 tons. After 15 turns the left-handed "floating" inner thread of the closing sleeve setting tool disconnects from the closing sleeve. The closing sleeve remains it its place, and the setting tool can be run out.

Closing Sleeve Setting Tool (Inch)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M1** (IF)	**M2** (mm)
4-1/2	Drwg.Nr:24060.25.000	98	44.5	716	2-3/8”	93 x 8
6-5/8	Drwg.Nr:24070.25.000	155	60.3	1088	3-1/2”	145 x 10
7	Drwg.Nr:24075.25.000	170	60.3	940	4-1/2”	160 x 10

Closing Sleeve Fishing Tools

Technical Description

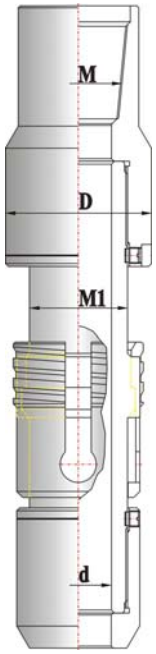


The poosible running out of the closing sleeve is done by the use of a closing sleeve fishing tool. The springing left-handed inner thread of the closing sleeve fishing tool automatically engages into the inner thread of the closing sleeve under the action a load of 1 to 2 tons. Than the closing sleeve can be run out with overpulling.

Closing Sleeve Fishing Tool (Inch)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M1** (IF)	**M2** (mm)
4-1/2	Drwg.Nr:24060.26.000	98	44.5	500	2-3/8”	93 x 8
6-5/8	Drwg.Nr:24070.26.000	155	60.3	585	3-1/2”	145 x 10
7	Drwg.Nr:24075.26.000	170	60.3	620	4-1/2”	160 x 10

Fishing Tool for Liner Hanger

Technical Description

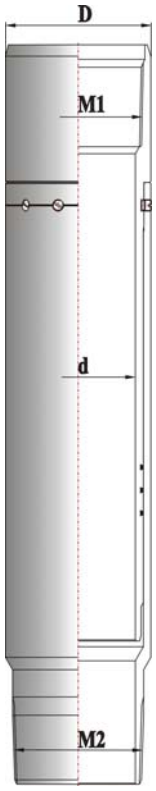


In case of changing the screen the liner hanger has to be run out. In the upper part of the packer liner hangers a left-handed inner thread with a great loading capacity can be found to join to the Fishing Tool. The fishing tool joins automatically to the liner hanger under applying a load of 0.5 to 1 ton. From that moment on the liner hanger can be run out by overpulling from the borehole. The fishing tool can be disconnected from the liner hanger by turning it to the right.

Fishing Tool (Inch)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M** (IF)	**M1** (mm)
4-1/2	Drwg.Nr:24060.27.000	146	66	640	3-1/2”	130x20

Shear Safety Joints

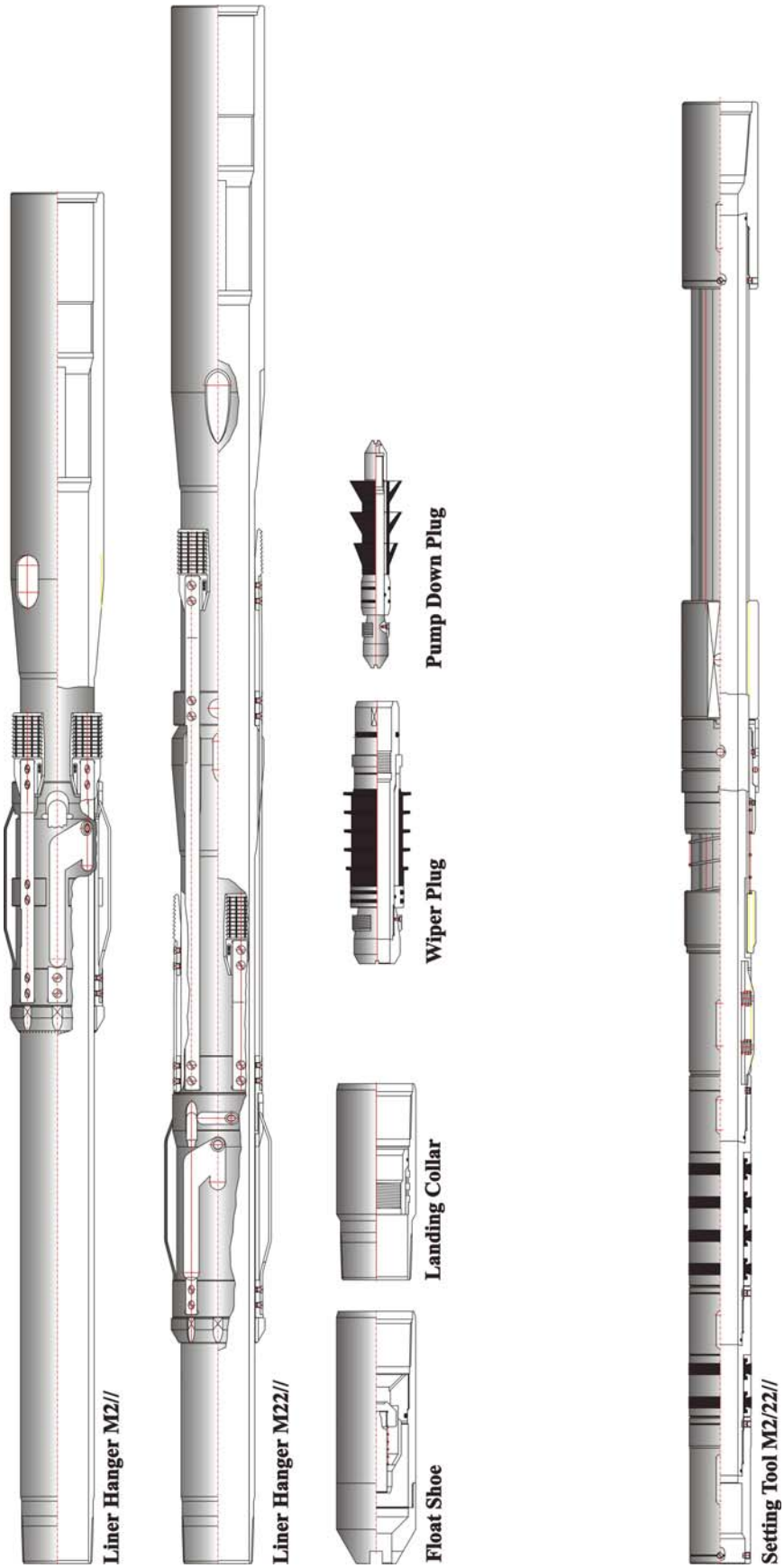
Technical Description



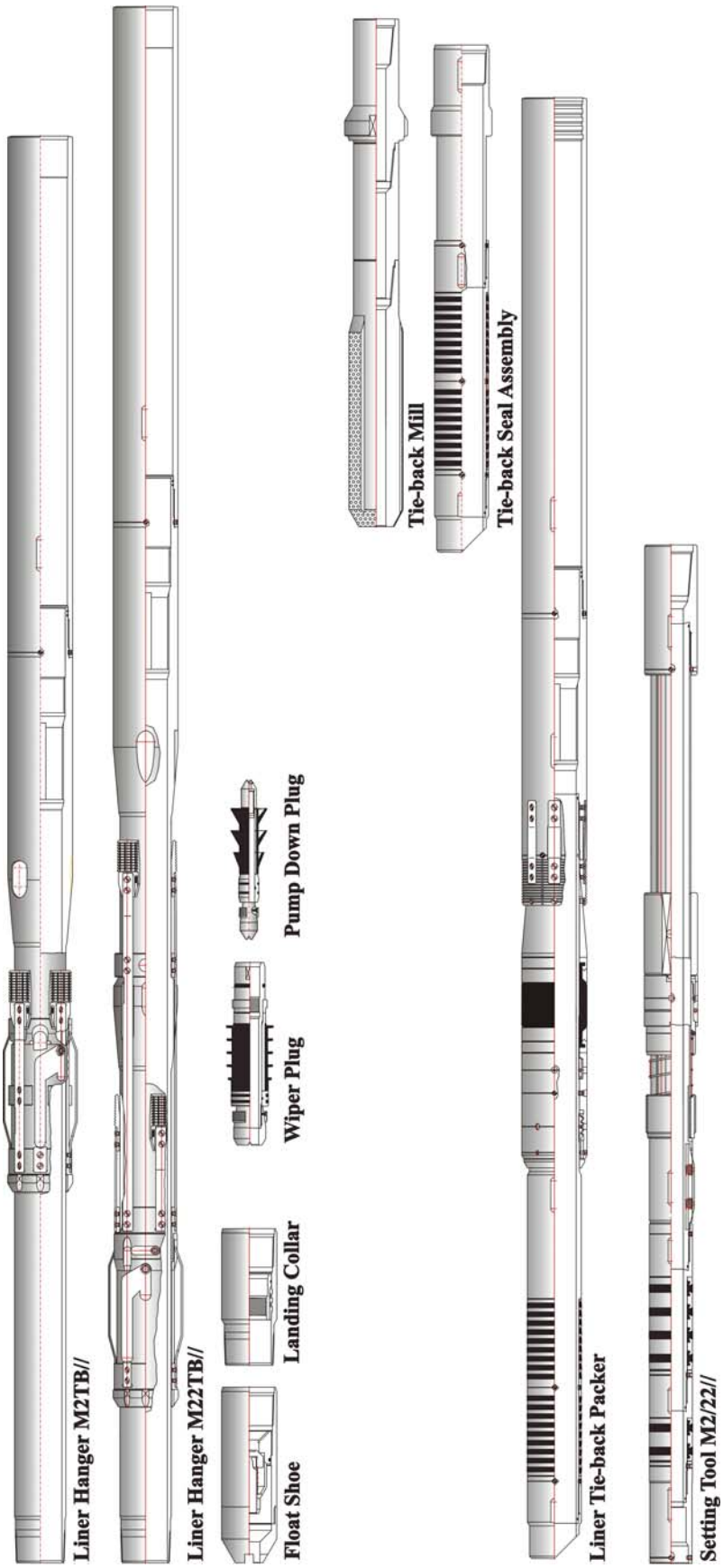
Screens of water wells are generally run in with liner hangers. Are the screens damaged in the course of the operation, they have to be replaced. Fishing of the screens can be alleviated by building in a Shear Safety Joint between the liner hanger and the string of screens. The shear safety joint disconnects under the action of overpulling when pulling the liner hanger upwards in the course of fishing. The screening pipe can be circumdrilled after the liner hanger has been fished out.

Shear Safety Joint (Inch)	**Drawing Number**	**D** (mm)	**d** (mm)	**L** (mm)	**M1** (LTC)	**M2** (LTC)
4-1/2	Drwg.Nr:24060.17.000	127.0	100.0	645	4-1/2"	4-1/2"
5-1/2	Drwg.Nr:24065.17.000	153.0	124.3	645	5-1/2"	5-1/2"
6 5/8	Drwg.Nr:24070.17.000	187.7	150.4	700	6-5/8”	6-5/8”
7	Drwg.Nr:24075.17.000	194.5	150.4	700	7”	6-5/8”
9-5/8	Drwg.Nr:24080.17.000	270.0	196.2	750	9-5/8”	8-5/8"

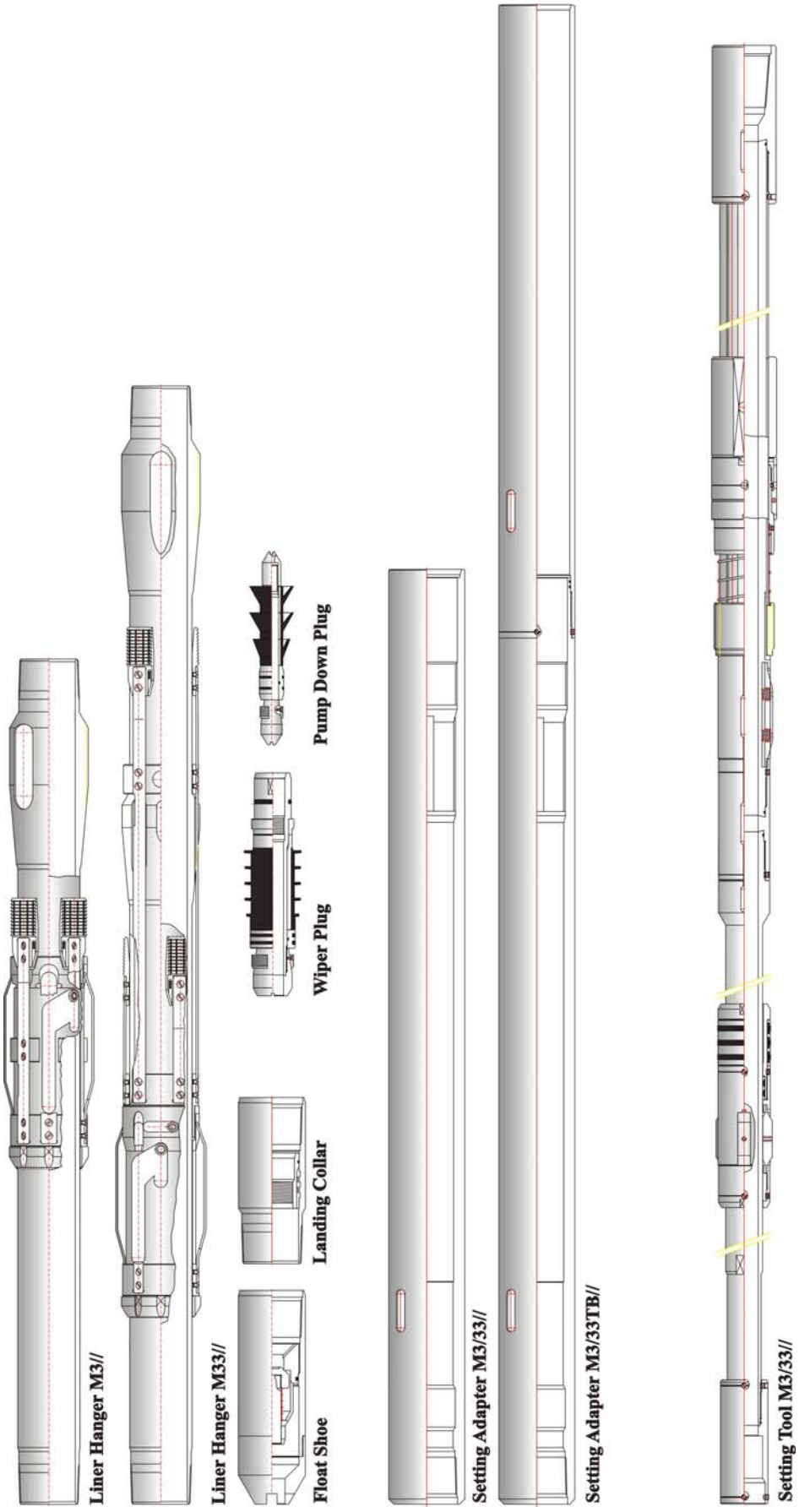
Liner Hangers Model M2//, M22// and Cementing Equipment



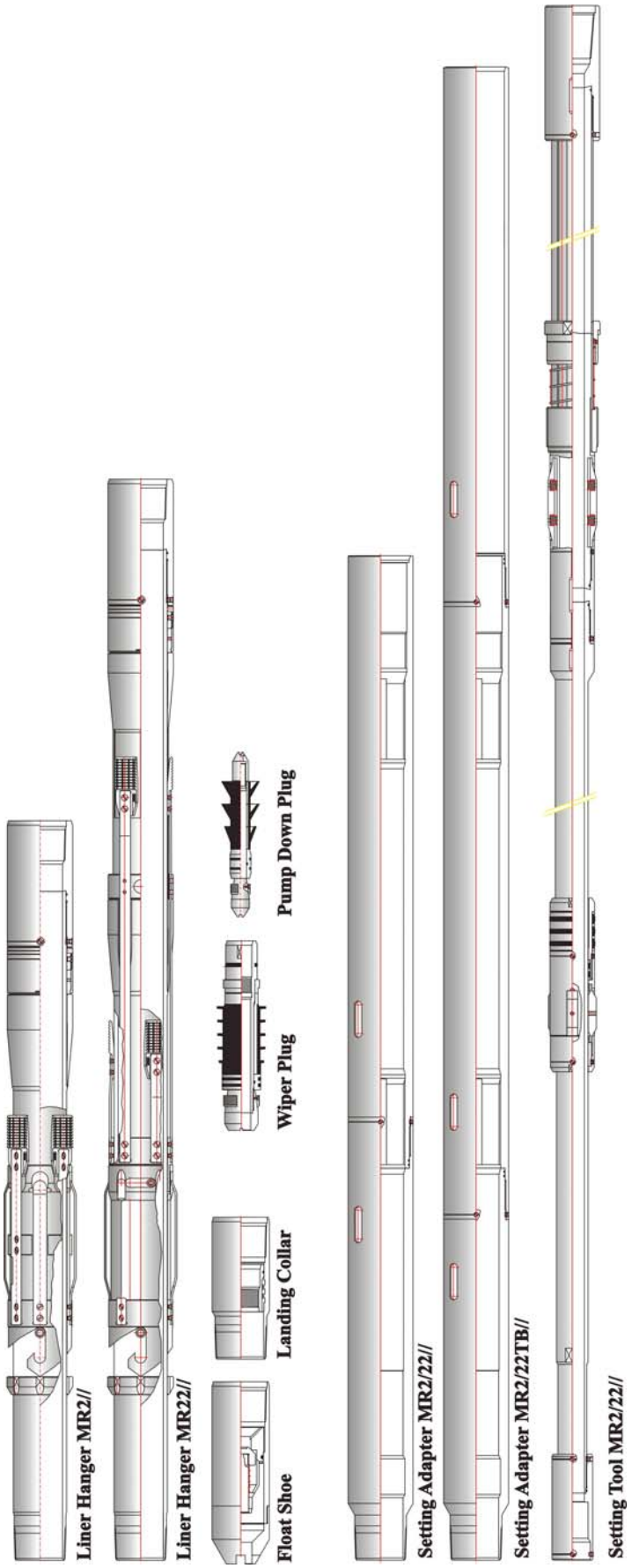
Liner Hangers Model M2TB//, M22TB// and Cementing Equipment



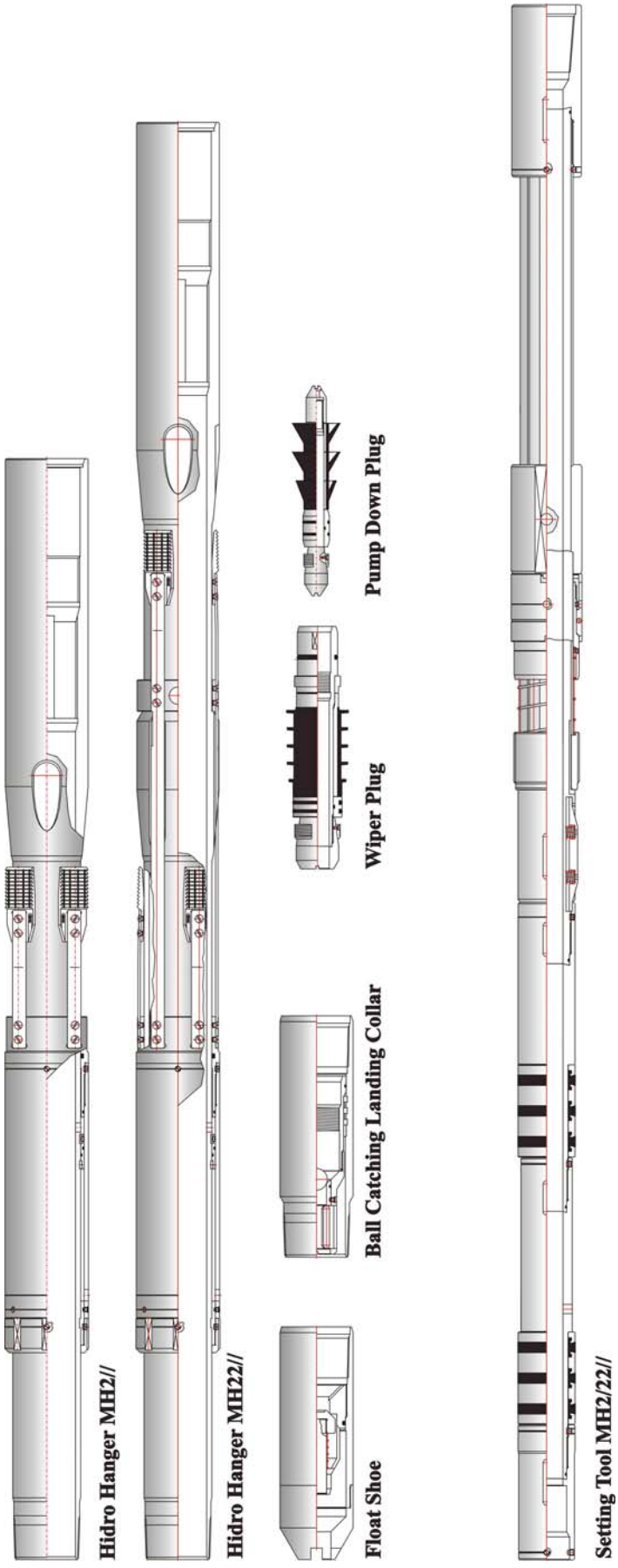
Liner Hangers Model M3//, M33// and Cementing Equipment



Mechanical Rotating Liner Hangers Model MR2//, MR22// and Cementing Equipment



Hydro Hangers Model MH2//, MH22// and Cementing Equipment



Accessories of Gravel Packing Equipments of Gas and Water Wells