OPERATION AND MAINTENANCE MANUAL

FOR Hi-Force® TWH27, TWH54, TWH120, TWH210 AND TWH430

LOW PROFILE HYDRAULIC TORQUE WRENCHES

NOTICE

Series TWH27, TWH54, TWH120, TWH210 and TWH430 Low Profile Hydraulic Torque Wrenches are designed for installing and removing large bolts having minimal wrench clearance at offshore platforms, power plants, steel erection sites and other locations requiring precise high torque during bolt makeup and maximum torque for bolt breakdown.

WARNING

IMPORTANT SAFETY INFORMATION ENCLOSED
READ THIS MANUAL BEFORE OPERATING TOOL.
IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this tool in accordance with International Standards ISO9001 and ANSI B30.1.
- This tool will function using an air or electric powered hydraulic pump. Adhere to the pump safety requirements and follow instructions when connecting the pump to the tool.
- Use only equipment rated for the same pressure and torque.
- Use only a hydraulic pump capable of generating 10,000 psig (700 bar) maximum pressure with this tool.
- Use only twin line hydraulic hose rated for 10,000 psig (700 bar) pressure with this tool.
- Do not interchange the male and female swivel inlets on the tool or the connections on one end of the hose. Reversing the inlets will reverse the power stroke cycle and may damage the tool.
- Do not use damaged, frayed or deteriorated hoses and fittings. Make certain there are no cracks, splits or leaks in the hoses.
- Use the quick connect system to attach the hoses to the tool and pump. Make certain the spring-loaded retaining rings are fully engaged and the safety rings are tightly threaded against the spring-loaded retaining rings to prevent the connectors from disengaging under pressure.
- When connecting hoses that have not been preloaded with hydraulic oil, make certain the pump reservoir is not drained of oil during start-up.
- Do not remove any labels. Replace any damaged labels.

USING THE TOOL

- Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.
- Never pressurize uncoupled couplers. Only use hydraulic equipment in a coupled system.
- Always wear eye protection when operating or performing maintenance on this tool.
- Always wear head and hand protection and protective clothing when operating this tool.

NOTICE

The use of other than genuine Hi-Force replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.
Repairs should be made only by authorised personnel. Consult your nearest Hi-Force Authorised Service centre.
Refer All Communications to the Nearest Hi-Force Office or Distributor.

WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY

USING THE TOOL

- **Keep hands, loose clothing and long hair away from the reaction arm and working area during operation. Do not attempt to support the tool with your hands during operation.**
- **This tool will exert a strong reaction force. Use proper mechanical support and correct reaction arm positioning to control these forces. Do not position the reaction arm so that it tilts the tool off the axis of the bolt and never use the swivel inlets as a reaction stop.**
- **Avoid sharp bends and kinks that will cause severe back-up pressure in hoses and lead to premature hose failure.**
- **Use accessories recommended by Hi-Force.**
- **Use only impact sockets and accessories. Do not use hand (chrome) sockets or accessories.**
- **Use only sockets and accesssories that correctly fit the bolt or nut and function without tilting the tool off the axis of the bolt.**
- **This tool is not designed for working in explosive atmospheres**
- **This tool is not insulated against electric shock. When using this tool with a pump having an electrical power source or circuits, follow the pump instructions for proper grounding.**

Always wear eye protection when operating or performing maintenance on this tool.

Always wear ear protection when operating this tool.

Always turn off the pump and disconnect the power before installing, removing, or adjusting any accessory on this tool, or before performing any maintenance on this tool.

The Torque Reaction Arm must be positioned against a positive stop. Do not use the Arm as a dead handle. Take all precautions to make certain the operator's hand cannot be pinched between the Arm and a solid object.

Operate at 10,000 psig (700 bar) max. pressure.

Keep body stance balanced and firm. Do not overreach when operating this tool.

Do not carry the tool by the hose.

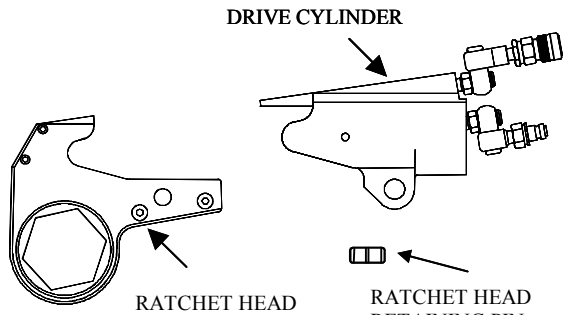
Do not use damaged, frayed or deteriorated hydraulic hoses and fittings.

PLACING THE TOOL IN SERVICE

CONNECTING THE TOOL

1. Attach the twin line hose to the swivel inlets of the Low Profile Drive Cylinder using the spring–loaded quick connect ends. Make certain that they are fully engaged.
2. Connect the opposite ends of the hose to the Pump in the same manner.
3. Push the Link Retaining Pin out of the Low Profile Drive Cylinder.
4. Mate the selected Ratchet Head to the Cylinder by inserting the end of the Cylinder opposite the Swivel Inlets between the Side Plates of the Ratchet Head. (Refer to Dwg. 1)
5. Align the Holes for the Ratchet Head Retaining Pin and insert the Pin through the side plates and Cylinder to keep the units joined together.

Dwg.1



PLACING THE TOOL IN SERVICE

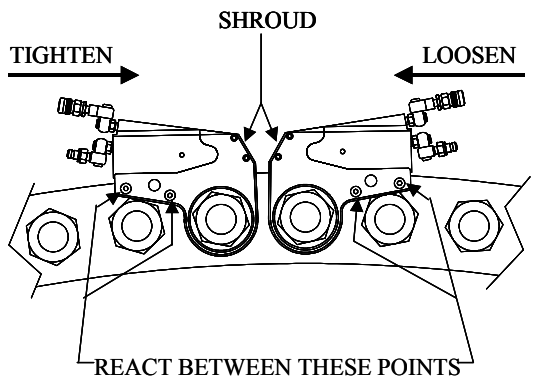
ADJUSTMENTS

SETTING THE TORQUE

After determining the desired torque, use the torque conversion charts on pages 4 and 5 to determine the pressure that is necessary to achieve that torque.

1. Connect the tool to the power supply and turn the pump on.
2. Depress the advance remote control button causing the pressure to be shown on the gauge.
3. Adjust the pressure by first loosening the nut that locks the pressure adjustment handle and then rotate the handle clockwise to increase the pressure and counterclockwise to decrease the pressure. When decreasing pressure, always lower the pressure below the desired point and then bring the pressure gauge back up to the desired pressure.
4. When the desired pressure is reached, retighten the wing nut and cycle the tool again to confirm that the desired pressure setting has been obtained.

Wrench Positions
Dwg. 2



OPERATING THE WRENCH

The position of the tool relative to the nut determines whether the action will tighten or loosen the nut. (Refer to Dwg. 2 for application examples). The power stroke of the Piston Assembly will always turn the Ratchet Hex toward the Shroud.

1. Place the Ratchet Hex on the nut. Make certain it is the correct size for the nut and that it fully engages the nut.
2. Position the reaction surface against an adjacent nut, flange or solid system component. Make certain that there is clearance for the hoses, swivels, and inlets. **DO NOT** allow the tool to react against the hoses, swivels, or inlets.
3. After having turned the Pump on and presetting the pressure for the correct torque, depress the remote control advance button to advance the Piston Assembly. If the notch in the piston rod did not engage the Retract Pin in the Ratchet Head when the Head was joined to the Housing, it will engage the Pin automatically during the first advance stroke.
4. When the Ratchet Head is connected to the Housing and the wrench is started, the reaction surface of the wrench will move against the contact point and the nut will begin to turn. Once the piston reaches the end of its stroke depress the remote control return button to retract the piston.
5. Continue this cycling operation of advance and retract until the nut is no longer turning and the Pump Gauge reaches the preset pressure. The piston rod will retract when the retract button is pressed and under normal conditions, an audible “click” will be heard as the tool resets itself.
6. Continue to cycle the tool until it “stalls” and the preset psi/torque has been attained.
7. Once the nut stops rotating, cycle the tool one last time to achieve total torque.

LUBRICATION

Marine Grade Moly Lube

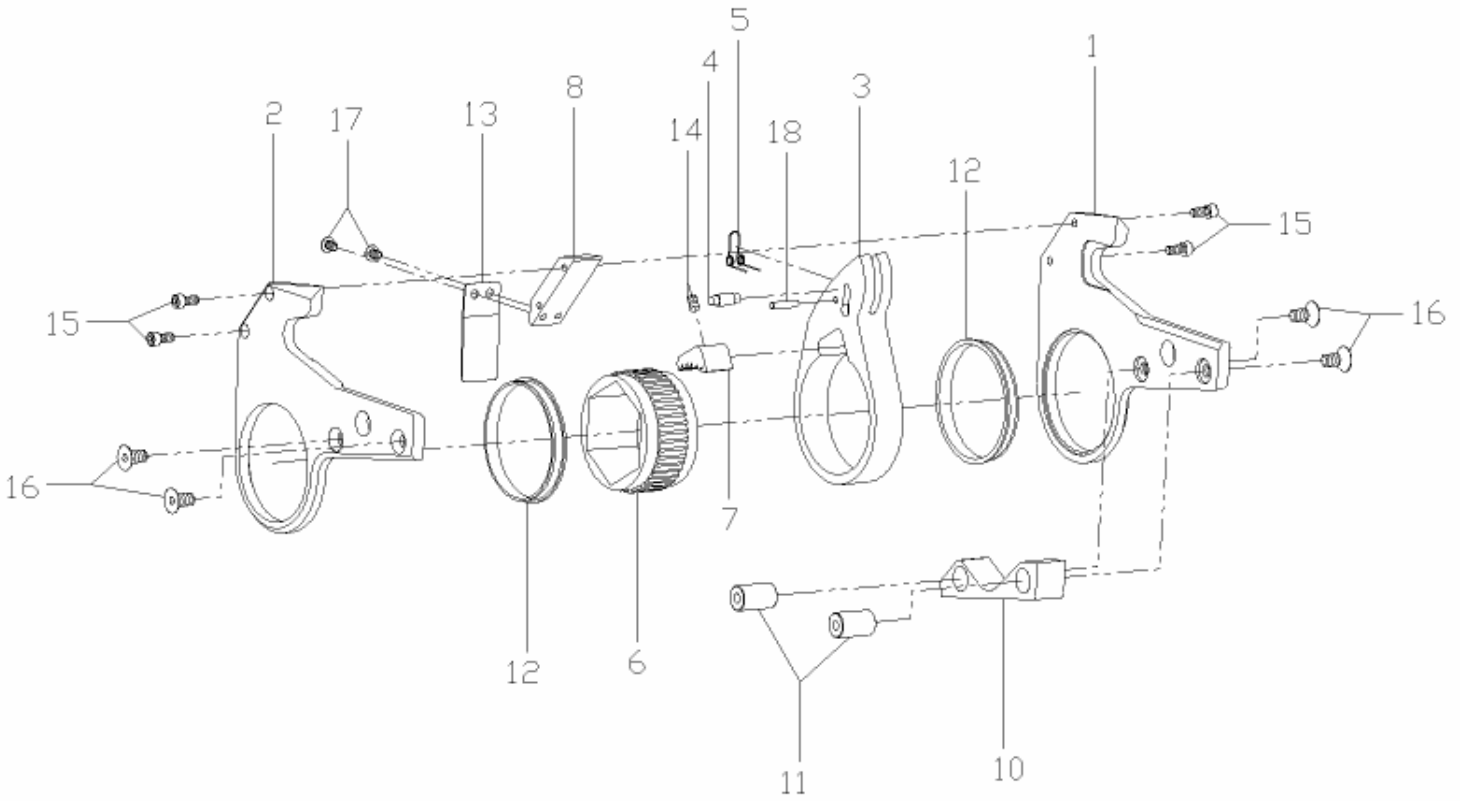
Lubrication frequency is dependent on factors known only to the user. The amount of contaminants in the work area is one factor. Tools used in a clean room environment will obviously require less service than a tool used out-doors and dropped in loose dirt or sand. Marine Grade Moly Lube is formulated not to wash out of the tool in areas where lubrication is critical. Whenever lubrication is required, lubricate as follows:

1. Separate the Low Profile Cylinder from the Ratchet Head if they are joined.
2. After wiping of the old grease, apply a daub of Marine Grade Moly Lube to the hooking notch in the Piston rod and wipe a film of Moly Lube onto the sides and faces of the two Sliders.
3. Disassemble the Ratchet Head as instructed in the Maintenance Section and wash the components in a suitable cleaning solution in a well-ventilated area.
4. Dry the components, then wipe a film of Marine Grade Moly Lube onto the wear surface of both Side Plate Sleeves and the hubs of the Ratchet.
5. Spread a light film of Marine Grade Moly Lube onto the inner faces of both Side Plates covering the area where the Drive and Segment Pawl travel. DO NOT pack the teeth of the Segment Pawl or Ratchet with lube. It can prevent the teeth from engaging properly.
6. Reassemble the Ratchet Head as instructed in the Maintenance Section.

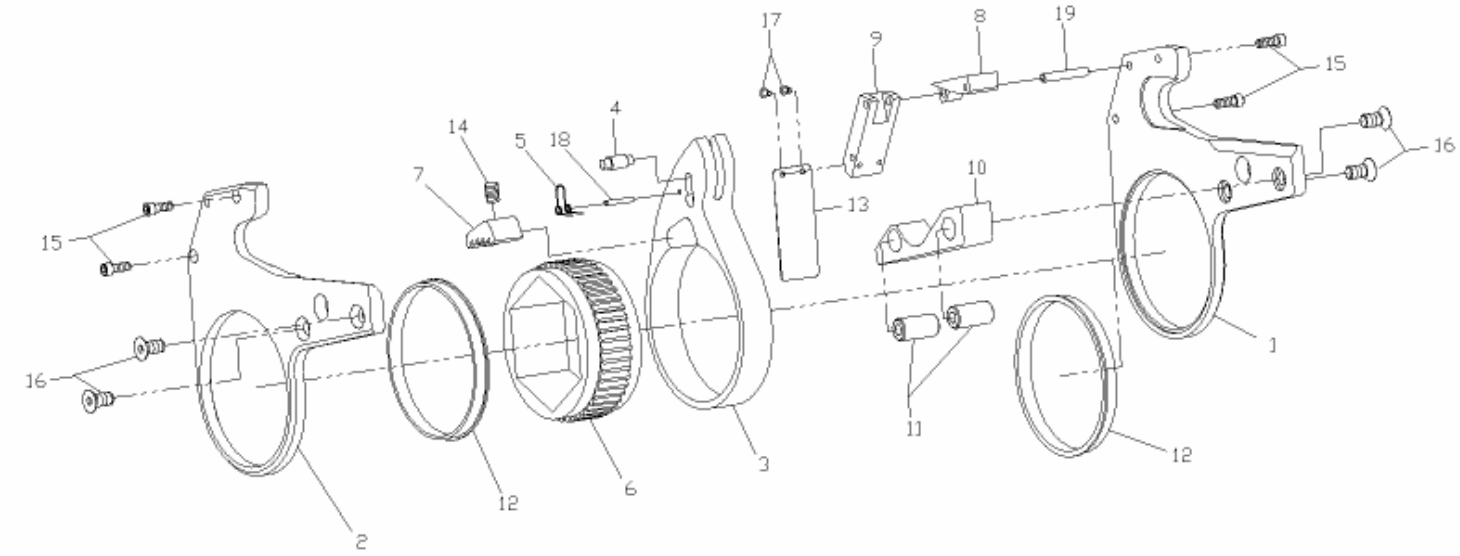
Hex Sizes Bar	TWH Series Torque Conversion Chart (Bar/Nm)							
	TWH27		TWH54	TWH120	TWH210		TWH430	
	3/4" to 1-13/16" 19 to 46MM Nm	1-7/8" to 2-3/8" 47 to 60MM Nm	All Hex Sizes Nm	All Hex Sizes Nm	2-5/8" to 3-15/16" 65 to 100MM Nm	4" to 4-5/8" 105 to 115MM Nm	2-7/16" to 4-5/8" 80 to 115MM Nm	4-11/16" to 6-1/2" 115 to 155MM Nm
68	259	288	529	1,157	2,091	2,250	4,316	5,016
82	312	347	638	1,395	2,521	2,714	5,204	6,048
95	361	402	740	1,616	2,921	3,144	6,029	7,007
109	415	462	849	1,854	3,352	3,607	6,918	8,040
122	464	517	950	2,075	3,751	4,037	7,743	8,999
136	517	576	1,059	2,313	4,182	4,501	8,632	10,031
150	571	635	1,168	2,552	4,612	4,964	9,520	11,064
163	620	690	1,269	2,773	5,012	5,394	10,345	12,023
177	673	749	1,378	3,011	5,442	5,857	11,234	13,056
190	723	804	1,479	3,232	5,842	6,288	12,059	14,014
204	776	864	1,588	3,470	6,273	6,751	12,947	15,047
218	829	923	1,697	3,708	6,703	7,214	13,836	16,080
231	879	978	1,799	3,929	7,103	7,644	14,661	17,039
245	932	1,037	1,908	4,167	7,533	8,108	15,549	18,071
258	981	1,092	2,009	4,389	7,933	8,538	16,374	19,030
272	1,035	1,152	2,118	4,627	8,363	9,001	17,263	20,063
286	1,088	1,211	2,227	4,865	8,794	9,465	18,152	21,095
299	1,137	1,266	2,328	5,086	9,194	9,895	18,977	22,054
313	1,191	1,325	2,437	5,324	9,624	10,358	19,865	23,087
326	1,240	1,380	2,538	5,545	10,024	10,788	20,690	24,046
340	1,293	1,440	2,647	5,783	10,454	11,252	21,579	25,078
354	1,347	1,499	2,756	6,022	10,885	11,715	22,467	26,111
367	1,396	1,554	2,857	6,243	11,285	12,145	23,292	27,070
381	1,449	1,613	2,966	6,481	11,715	12,608	24,181	28,103
394	1,499	1,668	3,068	6,702	12,115	13,039	25,006	29,061
408	1,552	1,727	3,177	6,940	12,545	13,502	25,895	30,094
422	1,605	1,787	3,286	7,178	12,976	13,965	26,783	31,127
435	1,655	1,842	3,387	7,399	13,375	14,395	27,608	32,086
449	1,708	1,901	3,496	7,637	13,806	14,859	28,497	33,118
462	1,757	1,956	3,597	7,859	14,206	15,289	29,322	34,077
476	1,811	2,015	3,706	8,097	14,636	15,752	30,210	35,110
490	1,864	2,075	3,815	8,335	15,067	16,216	31,099	36,142
503	1,913	2,130	3,916	8,556	15,466	16,646	31,924	37,101
517	1,967	2,189	4,025	8,794	15,897	17,109	32,812	38,134
530	2,016	2,244	4,127	9,015	16,296	17,539	33,638	39,093
544	2,069	2,303	4,236	9,253	16,727	18,003	34,526	40,125
558	2,123	2,363	4,345	9,492	17,157	18,466	35,415	41,158
571	2,172	2,418	4,446	9,713	17,557	18,896	36,240	42,117
585	2,225	2,477	4,555	9,951	17,988	19,359	37,128	43,150
598	2,275	2,532	4,656	10,172	18,387	19,790	37,953	44,108
612	2,328	2,591	4,765	10,410	18,818	20,253	38,842	45,141
626	2,381	2,650	4,874	10,648	19,248	20,716	39,730	46,174
639	2,431	2,706	4,975	10,869	19,648	21,146	40,555	47,133
653	2,484	2,765	5,084	11,108	20,078	21,610	41,444	48,165
666	2,533	2,820	5,185	11,329	20,478	22,040	42,269	49,124
680	2,587	2,879	5,294	11,567	20,909	22,503	43,158	50,157

TWH Series Torque Conversion Chart (PSI / lbf.ft)								
Hex Sizes Bar	TWH27		TWH54	TWH120	TWH210		TWH430	
	3/4" to 1-13/16" 19 to 46MM	1-7/8" to 2-3/8" 47 to 60MM	All Hex Sizes	All Hex Sizes	2-5/8" to 3-15/16" 65 to 100MM	4" to 4-5/8" 105 to 115MM	2-7/16" to 4-5/8" 80 to 115MM	4-11/16" to 6-1/2" 115 to 155MM
	PSI / lbf.ft	PSI / lbf.ft	PSI / lbf.ft	PSI / lbf.ft	PSI / lbf.ft	PSI / lbf.ft	PSI / lbf.ft	PSI / lbf.ft
1,000	193	215	395	863	1,560	1,660	3,220	3,700
1,200	232	258	474	1,036	1,872	1,992	3,864	4,440
1,400	270	301	553	1,208	2,184	2,324	4,508	5,180
1,600	309	344	632	1,381	2,496	2,656	5,152	5,920
1,800	347	387	711	1,553	2,808	2,988	5,796	6,660
2,000	386	430	790	1,726	3,120	3,320	6,440	7,400
2,200	425	473	869	1,899	3,432	3,652	7,084	8,140
2,400	463	516	948	2,071	3,744	3,984	7,728	8,880
2,600	502	559	1,027	2,244	4,056	4,316	8,372	9,620
2,800	540	602	1,106	2,416	4,368	4,648	9,016	10,360
3,000	579	645	1,185	2,589	4,680	4,980	9,660	11,100
3,200	618	688	1,264	2,762	4,992	5,312	10,304	11,840
3,400	656	731	1,343	2,934	5,304	5,644	10,948	12,580
3,600	695	774	1,422	3,107	5,616	5,976	11,592	13,320
3,800	733	817	1,501	3,279	5,928	6,308	12,236	14,060
4,000	772	860	1,580	3,452	6,240	6,640	12,880	14,800
4,200	811	903	1,659	3,625	6,552	6,972	13,524	15,540
4,400	849	946	1,738	3,797	6,864	7,304	14,168	16,280
4,600	888	989	1,817	3,970	7,176	7,636	14,812	17,020
4,800	926	1,032	1,896	4,142	7,488	7,968	15,456	17,760
5,000	965	1,075	1,975	4,315	7,800	8,300	16,100	18,500
5,200	1,004	1,118	2,054	4,488	8,112	8,632	16,744	19,240
5,400	1,042	1,161	2,133	4,660	8,424	8,964	17,388	19,980
5,600	1,081	1,204	2,212	4,833	8,736	9,296	18,032	20,720
5,800	1,119	1,247	2,291	5,005	9,048	9,628	18,676	21,460
6,000	1,158	1,290	2,370	5,178	9,360	9,960	19,320	22,200
6,200	1,197	1,333	2,449	5,351	9,672	10,292	19,964	22,940
6,400	1,235	1,376	2,528	5,523	9,984	10,624	20,608	23,680
6,600	1,274	1,419	2,607	5,696	10,296	10,956	21,252	24,420
6,800	1,312	1,462	2,686	5,868	10,608	11,288	21,896	25,160
7,000	1,351	1,505	2,765	6,041	10,920	11,620	22,540	25,900
7,200	1,390	1,548	2,844	6,214	11,232	11,952	23,184	26,640
7,400	1,428	1,591	2,923	6,386	11,544	12,284	23,828	27,380
7,600	1,467	1,634	3,002	6,559	11,856	12,616	24,472	28,120
7,800	1,505	1,677	3,081	6,731	12,168	12,948	25,116	28,860
8,000	1,544	1,720	3,160	6,904	12,480	13,280	25,760	29,600
8,200	1,583	1,763	3,239	7,077	12,792	13,612	26,404	30,340
8,400	1,621	1,806	3,318	7,249	13,104	13,944	27,048	31,080
8,600	1,660	1,849	3,397	7,422	13,416	14,276	27,692	31,820
8,800	1,698	1,892	3,476	7,594	13,728	14,608	28,336	32,560
9,000	1,737	1,935	3,555	7,767	14,040	14,940	28,980	33,300
9,200	1,776	1,978	3,634	7,940	14,352	15,272	29,624	34,040
9,400	1,814	2,021	3,713	8,112	14,664	15,604	30,268	34,780
9,600	1,853	2,064	3,792	8,285	14,976	15,936	30,912	35,520
9,800	1,891	2,107	3,871	8,457	15,288	16,268	31,556	36,260
10,000	1,930	2,150	3,950	8,630	15,600	16,600	32,200	37,000

MODEL NRS. TWH27, TWH54, TWH120 RATCHET HEAD

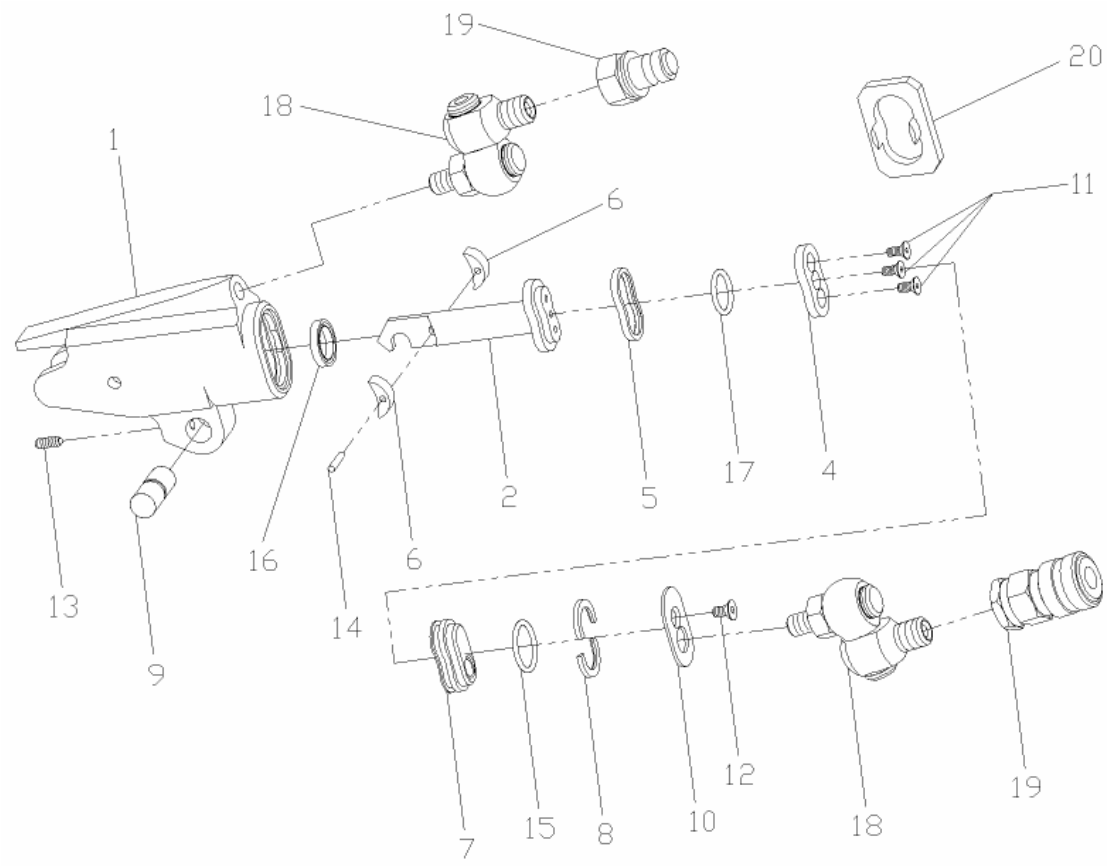


MODEL NRS. TWH210, TWH430 RATCHET HEAD

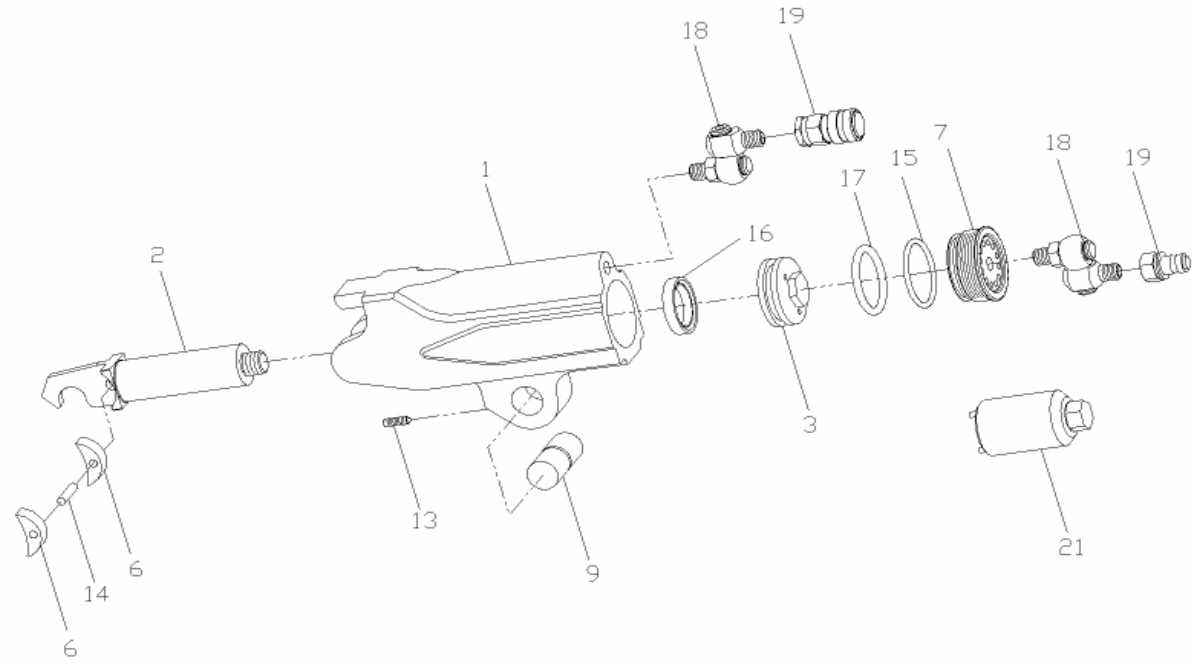


Part Numbers for Ordering (RATCHET HEADS)						
	Part	**TWH27**	**TWH54**	**TWH120**	**TWH210**	**TWH430**
1	SIDE PLATE - L	TWH27-L01	TWH54-L01	TWH120-L01	TWH210-L01	TWH430-L01
2	SIDE PLATE - R	TWH27-L02	TWH54-L02	TWH120-L02	TWH210-L02	TWH430-L02
3	DRIVE PLATE	TWH27-L03	TWH54-L03	TWH120-L03	TWH210-L03	TWH430-L03
4	DRIVE PIN	TWH27-L05	TWH54-L05	TWH120-L05	TWH210-L05	TWH430-L05
5	DRIVE PIN SPRING	TWH27-L07	TWH54-L07	TWH120-L07	TWH210-L07	TWH430-L07
6	RATCHET	TWH27-L09	TWH54-L09	TWH120-L09	TWH210-L09	TWH430-L09
7	DRIVE SEGMENT	TWH27-L11	TWH54-L11	TWH120-L11	TWH210-L11	TWH430-L11
8	UPPER SPACER	TWH27-L13	TWH54-L13	TWH120-L13	TWH210-L13	TWH430-L13
9	MIDDLE SPACER	N/A	N/A	N/A	TWH210-L14	TWH430-L14
10	LOWER SPACER	TWH27-L15	TWH54-L15	TWH120-L15	TWH210-L15	TWH430-L15
11	LOWER SPACER PIN	TWH27-L17	TWH54-L17	TWH120-L17	TWH210-L17	TWH430-L17
12	SLEEVES - SIDEPLATE	TWH27-L19	TWH54-L19	TWH120-L19	TWH210-L19	TWH430-L19
13	SHROUD	TWH27-L21	TWH54-L21	TWH120-L21	TWH210-L21	TWH430-L21
14	SEGMENT SPRING	TWH27-L25	TWH54-L25	TWH120-L25	TWH210-L25	TWH430-L25
15	SCREWS - UPPER SPACER	TWH27-L27	TWH54-L27	TWH120-L27	TWH210-L27	TWH430-L27
16	SCREWS - LOWER SPACER	TWH27-L29	TWH54-L29	TWH120-L29	TWH210-L29	TWH430-L29
17	SHROUD SCREWS	TWH27-L31	TWH54-L31	TWH120-L31	TWH210-L31	TWH430-L31
18	DRIVE PIN SPRING ROLL PIN	TWH27-L33	TWH54-L33	TWH120-L33	TWH210-L33	TWH430-L33
19	SPACER ROLL PIN	N/A	N/A	N/A	TWH210-35	TWH430-L35

MODEL NRS. TWH27, TWH54, TWH120 DRIVE CYLINDER



MODEL NRS. TWH210, TWH430 DRIVE CYLINDER



WARNING

Always turn off the power supply, bleed off hydraulic fluid from the hose connections on the cylinder assembly and disconnect the hoses before attempting to repair or perform maintenance on this tool.
Always wear eye protection when operating or performing maintenance on this tool.

DISASSEMBLY

General Instructions

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. Use extra care not to score, nick or damage surfaces that will contain hydraulic oil under pressure.
3. Whenever grasping a tool in a vice, always use leather–covered or copper–covered vice jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
4. Do not remove any part that is a press fit in or on an assembly unless the removal of that part is necessary for repairs or replacement.
5. Do not disassemble the hydraulic cylinder assembly unless you have a complete set of seals and o–rings for replacement.
6. Use only British Standard fractional size tools when disassembling these tools.

Disassembly of the Tool

1. Push the Link Pin (9) out of the Housing (1) and Side Plates (1 & 2).
2. Lift the Housing from between the Side Plates and separate the two units.

Disassembly of the TWH27, TWH54, and TWH120 Cylinder Assemblies

1. Grasp the Housing (1) in copper-covered or leather-covered vice jaws with the inlet end upward and using a ¾" wrench, unscrew and remove the two Swivel Inlets (18) with their attached Couplers (19).
2. Remove the Housing Assembly from the vice jaws and over a container to catch the oil, move the Piston Rod (2) back and forth several times to purge the hydraulic oil from the Housing.
3. Grasp the Housing in copper-covered or leather-covered vice jaws with the inlet end upward.
4. **For TWH27** use a Phillip's Head screw-driver **and TWH54 models,** use a hex wrench to unscrew and remove the End Cover Screw (12). Remove the End Cover (14).
5. Push the End Cap (7) inward approximately ½" and remove the two Retaining Rings (8) by working them out of the groove in the Cylinder.
6. Install the Seal Insertion Tool (20) on the inlet end of the Housing.

NOTICE

The purpose of the Seal Insertion Tool in the following step is to prevent the End Plug Seal from expanding into the Retaining Ring groove. If the Tool is not used, place two thin pieces of flat stock at the midpoint of the opening against opposite walls to control the Seal expansion.

7. Thread one of the Swivel Inlets or a threaded pipe with a tee into the End Cap (7). Use the Inlet or tee as a handle to pull the End Cap and End Plug Seal (15) out of the Housing through the Seal Insertion Tool.
8. Push the Piston Rod toward the inlet end of the Housing and using a hex wrench, unscrew and remove the two Retaining Screws (11).
9. Insert a hooked tool through each screw hole in the Piston Seal Plate (4) and work the Plate upward out of the Housing.
10. Using an o-ring pick, pull the Seal Ring (5) and Piston O-ring (17) off of the Piston Rod.
11. Push the piston end of the Piston Rod forward in the Housing until the Slider Pin (14) aligns with the cross holes in the Housing.
12. Using a small drift, tap the Slider Pin out of the Sliders (5) and position shaft and remove the two Sliders.
13. Push the piston out of the Housing.
14. If the Rod Seal (16) needs replacement, use a hooked tool to pull it out of the Housing.

Disassembly of the TWH210 and TWH430 Cylinder Assemblies

1. Grasp the Housing (1) in copper-covered or leather-covered vice jaws with the inlet end upward and using a ¾" wrench, unscrew and remove the two Swivel Inlets (18) with their attached Couplers (19).
2. Remove the housing assembly from the vice jaws and over a container to catch the oil, move the Piston Rod Assembly (2 & 3) back and forth several times to purge the hydraulic oil from the Housing.
3. Grasp the Housing in copper-covered or leather-covered vise jaws with the inlet end upward.
4. Insert the pins of the End Plug Wrench (21) into the holes of the End Cap (7). Using a wrench on the hex of the End Plug Wrench, unscrew and remove the End Cap with the End Plug Seal (15).
5. Push the Piston Rod far enough into the Housing to expose the hex on the piston head.
6. Using a socket on the hex of the piston head, unscrew

NOTICE

During removal and after the piston shaft is removed; DO NOT grasp the round portion of the shaft with any holding device that will damage the surface. Any nicks or scratches to the surface will allow hydraulic oil to leak from the Cylinder when the tool is reassembled.

and remove the piston head from the shaft with the Piston O-ring (17).

7. Pull the Piston shaft out of the Housing.

8. If the Sliders (5) must be replaced, position the Slider Pin (14) over a clearance opening in a soft block and use a small drift to tap the Pin out of the Sliders and shaft.
9. If the Rod Seal (16) needs replacement, use a hooked tool to pull it out of the Housing.

Disassembly of the Ratchet Head

1. Lay the Ratchet Head flat on a workbench with the Left Side Plate (1) downward and using a hex wrench, unscrew and remove the two Lower Spacer Screws (16).
2. Using a hex wrench, unscrew and remove the two Upper Spacer Screws (15).
3. For Series TWH210 and TWH430, use a roll pin punch to tap the Spacer Roll Pin (19) out of the Right Side Plate (2).
4. While applying thumb pressure to the edge of the Ratchet (6), carefully lift the Side Plate off the Assembly.
5. Grasp the Ratchet and Drive Plate (3) and, while maintaining their relationship, lift them both off the Left Side Plate.
6. Push the Ratchet out of the Drive Plate and Remove the Drive Segment (7) and the Segment Spring (14) from the Drive Plate Recess.

NOTICE

In the following step, when the Ratchet is removed from the Drive Plate, the Drive Segment and Segment Spring will be free to fall from the Drive Plate recess. Do not allow the Drive Segment to fall on a hard surface that might chip the teeth.

7. If the Drive Pin (4) or Drive Pin Spring (5) must be replaced, use a roll pin punch to push the Drive Pin Spring Roll Pin (18) out of the Drive Plate. Once the Pin Spring is removed, the Drive Pin (4) will drop down to the large opening at the bottom of the slot for easy removal.
8. Lift the Lower Spacer (10) off the Lower Spacer Pins (11). If the Pins must be replaced, use a hex wrench to remove the two Lower Spacer Screws from the Right Side Plate. Pull the Pins out of the holes on the inner face of the Right Side Plate.
9. **For Series TWH27, TWH54, and TWH120**, unscrew the two Spacer Screws and remove the Upper Spacer (8) from the Right Side Plate. **For Series TWH210 and TWH430,** use a roll pin punch to remove the Spacer Roll Pin (19) from the Right Side Plate. Unscrew the two Spacer Screws and remove the Middle Spacer (9) and Upper Spacer (8) from the Right Side Plate.
10. If the Side Plate Sleeves (12) must be replaced, press the Sleeves out toward the inner face of the Side Plate.

ASSEMBLY

General Instructions

1. Use extra care not to score, nick or damage surfaces that will contain hydraulic oil under pressure.
2. Whenever grasping a tool in a vice, always use leather-covered or copper-covered vice jaws to protect the surface of the part and help prevent distortion. This is particularly true if threaded members and housings.
3. Apply o-ring lubricant to all o-rings before final assembly.

Assembly of the Ratchet Link

1. If the Side Plate Sleeves (12) were removed, press new sleeves, shoulder end trailing, into the Right and Left Side Plates (1 & 2) from the inner face of the side Plates. Make certain the Sleeves are square with the side plate faces and the shoulder of the Sleeves enters the recesses in the Side Plates and are pressed flush with the faces.
2. **For Series TWH27, TWH54, and TWH120,** position the Upper Spacer (8) against the inside face of the Right Side Plate Apply a non-permanent thread-locking compound to the threads of the two Upper Spacer Screws (15) and secure the Spacer with the Screws through the Side Plate. **For Series TWH210 and TWH430,** press the Spacer Roll Pin (19) into the Right Side Plate with one end of the Pin flush with the external face of the Side Plate. Insert the tab of the Upper Spacer (8) into the slot in the Middle Spacer (9), and after aligning the holes in both pieces, install them on the Spacer Roll Pin (19). When they are correctly positioned, apply a non-permanent thread-locking compound to the threads of the two Upper Spacer Screws (15) and secure the Spacers with the Screws through the side plate.
3. Insert the two Lower Spacer Pins (11) into the holes in the lower edge of the Right Side Plate. Apply a non-permanent thread-locking compound to the threads of the Lower Spacer Screws (16) and secure the Pins with the Screws through the Side Plate.
4. Place the Lower Spacer (10) over the Pins against the Side Plate. Make certain it is correctly oriented so that no part of the Spacer extends beyond the edge of the Side Plate.
5. Insert the Drive Pin (4) into the small cross-hole and slot in the Drive Plate (3). Invert the Plate causing the ends of the Pin to enter the slot and move the Pin to the narrow end.
6. Position the Drive Pin Spring (5) in the drive plate slot with the two non-connected ends between the Drive Pin and the large hole in the slot. Position the closed end of the Spring on the opposite side of the Pin and then apply pressure on the Spring to align the hole through it with the hole in the Drive Plate for the Drive Pin Spring Roll Pin (18). Insert the Spring Roll Pin into the Drive Plate, through the Spring and into the far wall of the Drive Plate.
7. Wipe a thin film of Marine Grade Moly Lube onto the inner race of the large opening in the Drive Plate.
8. Position the Ratchet (6) in the central opening of the Drive Plate.

NOTICE

In the following step, an excessive amount of grease will prevent proper tooth engagement between the Ratchet and the Drive Segment causing the tool to malfunction.

9. Insert the Drive Segment (7) into the opening adjacent to the Ratchet. **Make certain the teeth of the Ratchet correctly engage the teeth of the Drive Segment.** Reverse the Ratchet if they do not properly engage.
10. Slide the Drive Segment sideways to expose the spring hole. Install the Segment Spring (14) into the hole. While compressing the Spring, slide the Drive Segment inward until the Drive Plate captures the Segment Spring.
11. Apply a light coat of Marine Grade Moly Lube to both sides of the Drive Plate and Drive Segment. Apply some of the Moly Lube to the inner races of both Side Plate Sleeves (12).
12. While keeping the assembly together, insert the hub of the Ratchet into the Side Plate Sleeve of the assembled Side Plate.
13. Place the Left Side Plate Sleeve on the hub of the Ratchet and align the screw holes for the Spacers.
14. After applying a non-permanent thread-locking compound to the threads and using hex wrenches, install the two remaining Lower Spacer Screws.

Assembly of the TWH210 and TWH430 Cylinder Assemblies

1. Grasp the link retaining pin lug in copper-covered, vise jaws with the Housing (1) horizontal.
2. If the Rod Seal (16) was removed from the Housing, apply a coat of o-ring lubricant to the Seal and install it, lip end trailing, in the recess at the bottom of the piston bore.
3. Press the Slider Pin (14) into one of the Sliders (5) flush with one side. Install the Pin through the hole in the piston shaft and press the remaining Slider onto the Pin.
4. Install the Piston O-ring (17) in the groove of the piston head.
5. Insert the piston rod, threaded end leading, into the small central opening from the non-piston end of the Housing. The notch in the trailing end of the shaft should be toward the Ball Plunger (13).
6. Insert the piston, hex end trailing, into the bore of the Housing, and use socket to thread and tighten the piston onto the piston shaft.
7. Install the End Plug Seal (15) in the groove on the hub of the End Cap (7).
8. Using the End Plug Wrench (21), thread the assembled End Cap, o-ring end leading, into the piston end of the Housing and tighten it.
9. Wrap the threads of the Swivel Sets (18) with Teflon tape and thread the swivel with the male hose Coupler (19) into the center of the End Cap. Thread the Swivel with the female Coupler into the hole in the Housing directly above the End Cap.

Assembly of the TWH27, TWH54, and TWH120 Cylinder Assemblies

1. Grasp the link retaining pin lug in copper-covered vise jaws with the Housing (1) horizontal.
2. If the Rod Seal (16) was removed from the Housing, apply a coat of o-ring lubricant to the Seal sand install it, lip end trailing, in the recess at the bottom of the piston bore.
3. Insert the piston rod, notched end leading, into the Rod Seal and the small central opening from the piston end of the Housing. The notch in the leading end of the shaft should be toward the Ball Plunger (13).
4. Push the Piston Rod (2) inward until the hole for the Slider Pin (14) aligns with the holes in the walls of the Housing.
5. Position one Slider (6) on each side of the piston shaft and insert the Slider Pin through the hole in the Housing into both Sliders and the piston shaft. The fit between the Pin and Sliders is an interference fit. Use a brass hammer and drift to set the Slider Pin below the outer edge of both Sliders or deep enough to prevent the shaft ends from dragging on the Housing walls.
6. Install the Piston O-ring (17) in the internal groove of the Seal Ring (5).
7. Install the assembled Seal Ring and Piston O-ring on the hub at the large end of the Piston Rod.
8. Install the Piston Seal Plate (4) in the inlet end of the Housing with the side having the countersunk screw holes trailing.

NOTICE

In the following step, DO NOT use thread-locking compound on the screw threads.

9. Using a hex wrench and an alternating tightening procedure, install the Retaining Screws (11). Tighten each Screw a little at a time to obtain even compression and expansion of the Piston O-ring and Seal Ring.
10. Place the Seal Insertion Tool (20) on the inlet end of the Housing.
11. Install the End Plug Seal (15) in the groove of the End Cap (7)
12. Insert the assembled End Cap into the Housing through the Tool with the O-ring end leading and the threaded inlet hole upward. Push the Cap inward beyond the Retaining Ring groove and approximately ½" into the Cylinder.
13. Remove the Seal Insertion Tool from the Housing.
14. Install the Retaining Rings (8) in the housing grooves at the inlet end of the Housing. Install the Rings with the open ends of both rings at the middle of the opening and the beveled side of the Rings toward the End Cap.
15. If an air hose is available, inject some air into the threaded opening of the End Cap to seat the Retaining Rings. If air is not available, temporarily thread one of the Swivel Sets (18) into the threaded opening and

pull the End Cap back against the Retaining Rings to seat them.

16. **For TWH27 and TWH54 models** position the End Cover (10) against the Housing and after applying a non-permanent thread-locking compound to the threads, install the End Cover Screw (12).
17. Wrap the threads of the Swivel Sets (18) with Teflon tape and thread the swivel with the male hose Coupler (19) into the threaded hole in the End Cap.
18. Apply some Marine Grade Moly Lube to the notch in the Piston Rod and the face of the Sliders.

Assembly of the Tool

1. With the Cylinder Assembly in one hand and the Ratchet Link in the other, hook the notch on the shaft of the Piston Rod (2) onto the Drive Pin (4) and bring the two assemblies together.
2. Insert the Link Pin (9) into the hole in the Side Plate (1 or 2) until the Ball Plunger (13) snaps into the annular groove around the center of the Link Pin.

Troubleshooting Guide		
Trouble	**Probable Cause**	**Solution**
Piston will not advance or retract	Couplers are not securely attached to the tool or pump	Check the Coupler connections and make certain that they are connected.
	Coupler is defective	Replace any defective Coupler.
	Defective remote control unit	Replace the button and/or control pendent
	Dirt in the direction-control valve of the pump unit	Disassemble the pump and clean the direction-control valve.
Piston will not retract	Hose connections reversed	Make certain the advance on the pump is connected to the advance on the tool and retract on the pump is connected to the retract on the tool.
	Retract hose not connected	Connect the retract hose securely
	Retract pin and/or Spring broken	Replace the broken pin and/or spring
Cylinder will not build up pressure	Piston Seal and/or End Plug Seal leaking	Replace any defective O-rings
	Retaining Screws sheared	Replace any broken screws.
	Coupler is defective	Replace any defective Coupler
Ratchet will not turn	Grease or dirt build up in the teeth of the Ratchet and Segment Pawl	Disassemble the Ratchet and clean the grease or dirt out of the teeth
	Worn or broken teeth on Ratchet and/or Segment Pawl	Replace any worn or damaged parts
Pump will not build up pressure	Defective relief valve	Inspect, adjust or replace the relief valve
	Air supply too low or air hose too small	Make certain the air supply and hose size comply with the pump manual recommendations.
	Electric power source is too low	Make certain the amperage, voltage and any extension cord size comply with the pump manual requirements
	Defective Gauge	Replace the Gauge
	Low oil level	Check and fill the pump reservoir
	Clogged filter	Inspect, clean and/or replace the pump filter
Pressure reading erratic	Defective Gauge	Replace the Gauge

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.