TORC LLC

TTZ SERIES

OPERATIONAL AND SPARE PARTS MANUAL

MAN-TTZ-2016

This manual applies to all tool part numbers in the TTZ Product Families. The complete part number matrix which applies to this manual can be found in Appendix A and B respectively. It is recommended the manual is kept up-to-date by checking the edition and date code at the bottom of this page by utilizing the TORC, LLC. website and downloading a copy of the most recent edition as needed.

TTZ PRODUCT FAMILY:

TTZ-2, TTZ-4, TTZ-8, TTZ-14, TTZ-20, TTZ-30

EN, EN-ISO, ISO Compliant

For a complete EC declaration of conformity or if you require any further assistance please contact your local TORC, LLC. representative or 1-888-444-TORC (1-888-444-8672) or on the web at www.TORC.com.

TORC LLC
218 Island Road,
Mahwah, New Jersey 07430 U.S.A.

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Restricted Rights Legend: *Use and duplication of the information contained within this manual is limited to the purchaser, end user, or licensed TORC, LLC. representative. It is recommended that proper training for the equipment outlined in this manual be conducted by a TORC, LLC. authorized training representative for any person who is operating or repairing the equipment outlined in this document. Modification, or disclosure by any other agency or representative is strictly forbidden.*

Product Modifications: TORC, LLC. DOES NOT ALLOW *any of the products listed in this manual to be modified by any end user without exception. Should an application require a modification to the tool, or any of the standard accessories please consult with your local TORC, LLC. representative and they will be able to obtain the assistance for any modification that may be required.*

2nd Edition. Printed in USA. January 2016
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THANK YOU FOR PURCHASING

TORC LLC

FREE SAFETY TRAINING

PLEASE READ THE SAFETY INSTRUCTIONS HEREIN. To ensure safe tool operation, please request a FREE Safety Training prior to use by calling your local TORC, LLC. Representative 1-888-444-8672 or www.TORC.com. We recommend one Safety Training every 6 months. These trainings are free of charge. Just call us.

SYSTEM INSPECTION

Prior to any use, please inspect the entire tool system, including hoses, gauge, sockets and backup wrenches. Do not use kinked hoses, oversized or heavily worn sockets, backup wrenches, damaged tools, pumps, connectors or gauges. Connect system to operate from a safe distance. Ensure fasteners are in good shape. Check tool function with drive or hex ratchet turning in one direction only and check out gauge from a safe distance that needle is on zero at no pressure and at 10,000 psi at high pressure. Keep high pressure on and check system visually for leaks. Please keep in mind that hydraulic tools are very strong and work at high pressure.

FREE LOANER TOOLS

In case of tool failure during the warranty or rental period, please contact your local TORC, LLC. Agent for a free loaner tool - 24/7.

HYDRAULIC OIL REPLACEMENT

We recommend that the oil be changed every three months

HOSE REPLACEMENT

Hose replacement is recommend every three years, however we recommend yearly hose inspections.

HELP

If you require any further assistance, please call your local TORC, LLC. Representative or 1-888-444-TORC (1-888-444-8672), on the web at www.TORC.com - 24/7!

PLEASE REVIEW THESE SAFETY TIPS BEFORE EVERY TOOL USE

Made in the U.S.A.

CONTENTS

TTZ SERIES

OPERATIONAL AND SPARE PARTS MANUAL

INTRODUCING TORC, LLC.

THANK YOU FOR BUYING TORC!

This manual is designed to provide you with the basic knowledge required to operate and maintain your TORC, LLC. tool. Please read this manual carefully and follow the instructions provided. If you have any questions regarding your TORC, LLC. tool, please call us directly at 888-444-8672 or fax 888-505-8672.

Finally, your purchase of this TORC, LLC. tool entitles you to the following FREE services:

- **Free annual tool inspection**
- **Free loaner tools in case of failure**
- **Free engineering assistance by calling 1-888-444-TORC.**

Your local TORC, LLC. office was informed of the delivery of this equipment. Should you require immediate training, please feel free to call us directly to arrange an appointment with you at your convenience.

For additional information please visit our website at www.TORC.com

Again, thank you and welcome to TORC, LLC.!

Worldwide Warranty

TORC, LLC. equipment is engineered to the latest technological standards and is backed by our exclusive 13-month no questions asked warranty.

If a TORC, LLC. Tool cannot be repaired, FREE loaner TORC, LLC. equipment will be made available to you upon request.

TORC, LLC. OR ITS DEALERS SHALL NOT BE LIABLE FOR LOSS OF PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS INCURRED BY THE BUYER OR THE USER.

SECTION II

INSTRUCTIONS BEFORE USE

READ CAREFULLY: Most malfunctions in new equipment are the result of improper operation and/or set-up assembly.

PREPARATION: Remove the TORC Torque Machine from shipping container.

INSPECTION: Visually inspect all components for shipping damage. If any damage is found. notify carrier immediately.

2-1
Working Pressure

The tool's maximum working pressure is 10,000 PSI (700 BAR)

Make sure that all hydraulic equipment used with this tool is rated for 10,000 PSI Operating Pressure.

2-2
Hydraulic Connections

With older style pumps, the retract side of the system may remain pressurized after the pump has been switched "off'. This trapped pressure makes it impossible to loosen the retract-side fittings by hand.

To release the pressure, find the 5/16" manual override holes in the end of the black solenoids on the pump. With a welding rod, allen key or similar device, push in on the ends of both solenoids, each in turn, and the residual pressure will be released. All fittings will then be hand tight again.

Newer style pumps (HIGHFLOW, HIGHFLOW AIR or DYNAMIC) are equipped with an auto-pressure relief.

Never disconnect or connect any hydraulic hoses or fittings without first unloading the wrench and the pump. If the system includes a gauge, double check the gauge to assure pressure has been released.

When making connections with quick disconnect couplings, make sure the couplings are fully engaged. Threaded connections such as fittings, gauges etc. must be clean and securely tightened and leak free.

CAUTION: Loose or improper threaded fittings can be potentially dangerous if pressurized, yet, severe over tightening can cause premature thread failure. Fittings need to be only tightened secure & leak free. Never grab, touch or in any way come in contact witb a hydraulic pressure leak. Escaping oil can penetrate the skin and cause injury.

- **HOSES**
  Do not kink hoses. Inspect and replace if damaged.

- **SHROUDS AND COVER PLATES**
  All tools are equipped with shrouds and/or cover plates to cover up moving internal parts. Do not use tools without shrouds but contact your local TORC, LLC. office to fix.

- **MAINTAIN TOOLS WITH CARE**
  For top performance, inspect tool powerpack, hoses, connectors, electric lines and accessories for visual damage frequently. Always follow instructions for proper tool and pump maintenance. Refer to the Operations Maintenance Section for further clarification.

- **STAY ALERT**
  Watch what you are doing. Use common sense. Do not use power equipment under the influence of any mood altering substances.

- **PRIOR TO OPERATION**
  Ensure that all hydraulic connections are securely connected. Verify that the hydraulic hoses are not kinked. Insure the square drive and its retainer are fully and securely engaged.

- **PRIOR TO USE**
  Cycle tool to ensure proper function. Locate a solid, secure reaction point. Be sure the reaction arm retaining clamp is fully engaged. Be sure the hydraulic hoses are free of the reaction point. Pressurize the system momentarily; if the tool tends to “ride up” or to “creep”, stop and re-adjust the reaction arm to a more solid and secure position.

- **ALWAYS USE QUALITY ACCESSORIES**
  Always use top quality impact sockets in good condition which are the correct size and fully engage the nut. Hidden flaws, however, remain a possibility which could cause breakage, **so stay clear of sockets during operation.**

- **DO NOT USE FORCE**
  Do not hammer on socket or tool to enhance performance. If the nut will not tum with the wrench you are using, use a larger size TORC, LLC. tool.

- **REACTION ARM**
  Proper reaction is required. Adjust reaction arm or plate accordingly. Avoid excessive play. In case of questions, consult with your local TORC, LLC. office.

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2-3
Electrical Connections

Ensure proper power availability to prevent motor failure or dangerous electrical overloading. Compare the motor nameplate for required amperage.

Do not use electric pump if the 3-prong electrical plug is not whole.

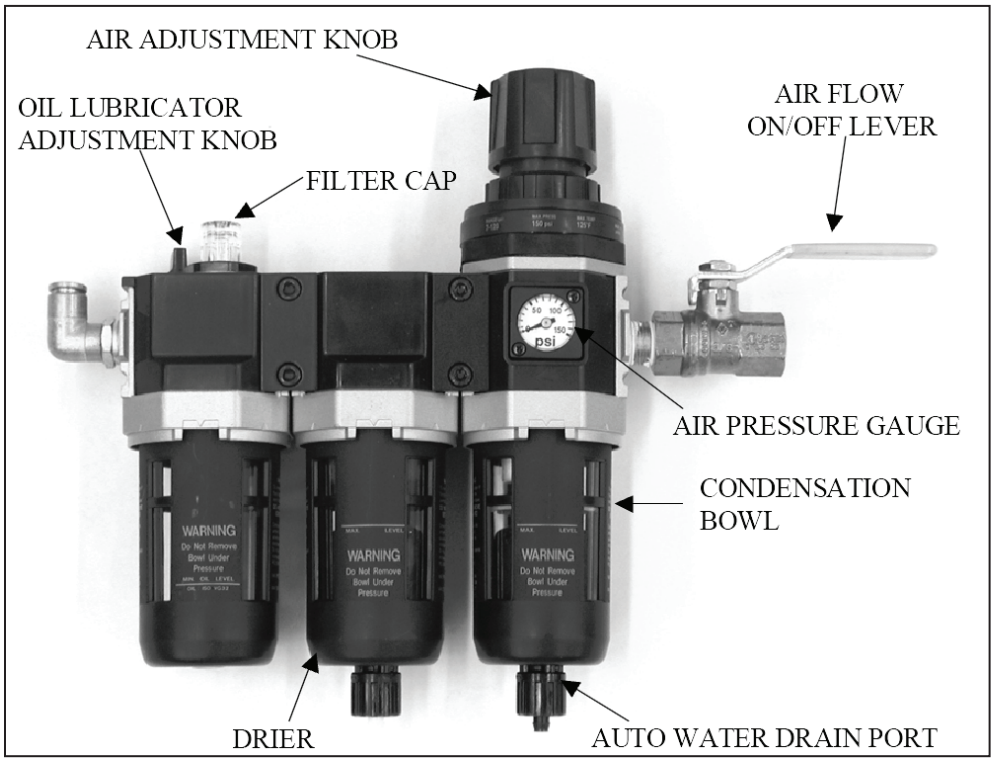
Minimize the length of extension cords and be sure they are of adequate wire size, with ground connections. Extension cord should be #10 AWG gauge.

WARNING: Electric motors may spark. Do not operate in an explosive atmosphere or in the presence of conductive liquids. Use an air motor pump Instead.

2-4
Air Connections

Ensure that you have sufficient air flow (in cfm) to operate your pneumatic pump. If in doubt, compare the pump manufacturer's recommended air flow rating prior to pressurizing pump. Improper air flow may damage the pump motor. For best results use airhoses larger than 3/4" I.D. diameter.

Use of a filter regulator lubricator (FRL) is highly recommended. (Pictured below.)



1. Adjust flow to one drop per 60 - 90 seconds
2. Fill half way with grade 46 hydraulic oil supplied

SECTION III

OPERATION

3-1 General

All TORC, LLC. Torque Machines are supplied completely assembled and ready for use. A TORC Hydraulic Power Pack (for use with your TORC machine) is recommended to provide the speed, pressure, and portability that makes your TORC System efficient and accurate.

The System accuracy of your TORC tool is +/- 3%, based upon manufacturer's specifications. This accuracy may be certified through calibration by TORC or any other qualified calibration facility whose program is traceable to the National Institute of Standards and Technology (N.I.S.T.).

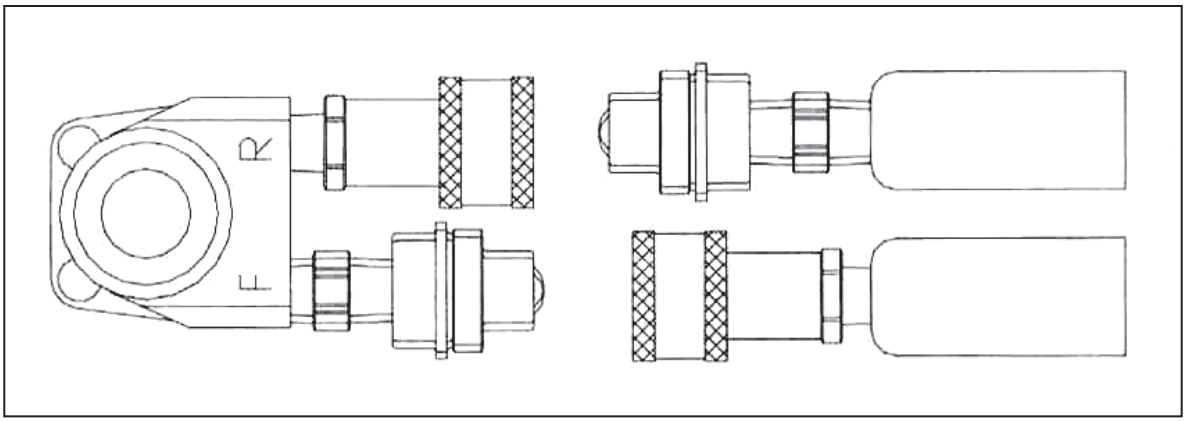
Using a calibrated gauge enhances the accuracy of your TORC System.

3-2 Connecting the System

The wrench head and power pack are connected by a 10,000 PSI operating pressure (40,000 PSI burst) twinline hose assembly. Each end of the hose will have one male and one female connector to assure proper interconnection between pump and wrench heads.

IMPORTANT: To avoid tool malfunction. Do not reverse connectors.

Connect the twinline hose to the uni-swivel as shown below:



Ensure the connectors are fully engaged and screwed snugly and completely together.

3-3
Inserting the Ratchet Link

Simply insert power head into the cut out on the top of the link plate then swing down to rest along the base of the link side plate. At this point, the link pin hole of the power head and link will align. Insert the link pin to secure.

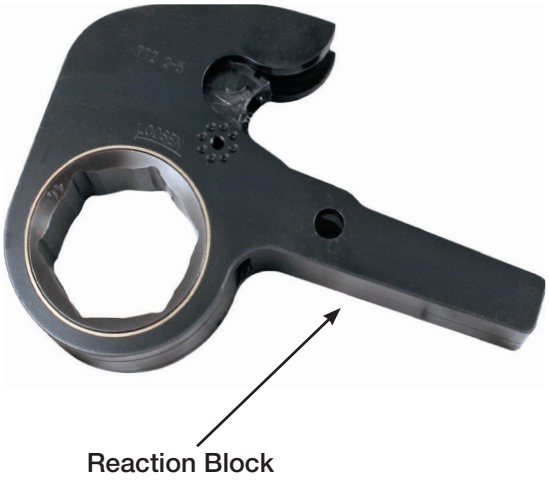
Torquing Proceedures

Select the appropriate size low clearance ratchet link and insert it into the tool.

The TTZ low clearance ratchet links are supplied complete with a long reaction block. This reaction block is designed to react against an adjacent nut on most normal flange type applications. Before operating the tool, place the tool with the low clearance link on the nut to be tightened/loosened. If the reaction block abuts against an adjacent nut or to some other secure stationary object, then use of the reaction block is appropriate.

Reaction Block

If bolt spacing is such that the reaction block does not reach the adjacent bolt, use of the extended reaction arm is needed. This will allow reaction to be taken against the side of the flange. To attach the extended reaction arm, remove the standard link retaining pin, align with the holes of the extended reaction arm with those of the reaction block and insert the long link retaining pin to secure.



3-4
Setting Torque

Once the system is fully connected and the proper power supply available, it is time to adjust the pump pressure to the level needed on your job.

When tightening, use the manufacturer's specifications to determine the torque value which you will ultimately require.

Torc.com/en/support/torque-conversion-charts - gives typical torque values specified for the most commonly ecountered fasteners.

Torque sequence may vary from plant to plant and even within individual plants, depending upon the gasket material, etc. Always abide by local procedures.

Next, find the pressure-torque conversion table applicable to the tool which you intend to use. A complete copy of that chart appears in torc.com/en/support/torque-conversion-charts.

An EXAMPLE of finding the desired torque required is as follows:

Assume you are going to use a TORC TTZ-2 tool to torque a 1-1/4" bolt to 1,265 ft lbs.

Start by going to the chart on the following pages and read left-to-right across the top line to the column TTX.

Read straight down to the number closest to 1,265 ft lbs, which in this case is 1,280 - about 1.1% over the targeted torque value.

Now, using 1,280, read back to the left on that same line and read the pump pressure, under the PSI column, 4,000 PSI.

To be technically correct, you should diminish that 4,000 PSI by 1.1% (to 3956), but 1,280 is well within the tool's +/- 3% accuracy range, so proceed to set 4,000 PSI on your pump's regulator valve.

**Log on to torc.com to view proper torque values for the most commonly encountered fasteners*

3-5
Setting the Pressure on the Pump

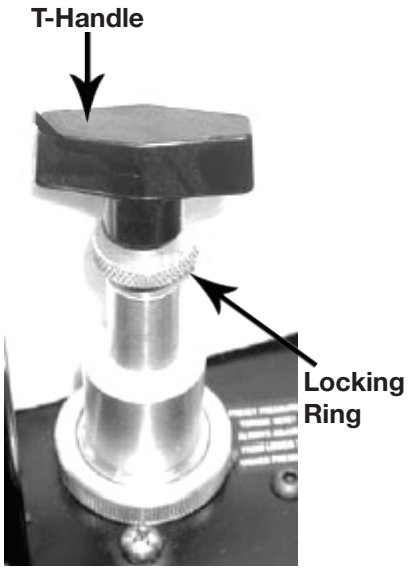
To set the pressure on the pump, follow this procedure:

1. Loosen the knurled locking ring below the "T" handle on the pump's external pressure regulator. Then tum the "T" handle (shown in figure 6) counterclockwise (CCW) until it turns freely and easily.

2. Tum the pump "on". Using the pump's remote control pendant, push down the advance switch (or button on air pumps) and hold it.

3. While holding the pump in the advance mode, slowly tum the "T" handle clockwise and observe the pump pressure gauge rise.

NOTE: Always adjust the regulator pressure up - never down.



4. When your gauge reaches 4,000 PSI, stop turning the "T" handle and let the gauge settle out.

5. If the pressure continues to rise (above 4,000), release the advance button and back off your pressure slighitly - by turning CCW on the "T" handle. Then re-depress the advance switch on your remote and slowly bring pressure up to 4,000 again.

6. When the pressure is correct, tum the pump "off' and tighten the knurled lock nut provided under the "T" handle. This sets pump pressure, which determines torque tool output.

7. Once your target pressure is set and locked, cycle the pump once more to ensure that your pressure setting did not change as you turned down the knurled knob.

3-6
Applying the Torque Machine - the Tightening Process

1. Having set your target pressure, cycle the tool three or four times to full pressure prior to putting it on the application. Cycling the tool ensures that the system is operating properly and removes trapped air, if any.

2. Place the proper size link on the power head and secure properly with pin.

3. Place the tool with link on the nut, making sure that the ratchet has fully engaged the nut. Further ensure that the locking pin is engaged.

4. Make sure the reaction arm is firmly abutted against a stationary object (i.e. an adjacent nut, flange, equipment housing etc.)

5. When positioning the wrench, make sure that the hose connections are well clear of any obstructions, and that all body parts are safely out of harm's way.

6. THEN, AND ONLY THEN, apply momentary pressure to the system to ensure proper tool placement. If it doesn't look or act right, stop and re-adjust the reaction arm.

3-7
Operating the Torque Machine

1. By pushing down on the remote control button in the advance position, the rear of the tool will be pushed back until its reaction arm will contact its reaction point.

2. Continuing to hold down the remote control button will result in a rapid buildup of pressure to the point of where the gauge reads what was preset prior to applying the wrench.

IMPORTANT: The reading of full preset pressure after the cylinder is extended DOES NOT INDICATE that this pressure (torque) is applied to the bolt. It only indicates that the cylinder is fully extended and cannot turn the socket further until the tool automatically resets itself.

Releasing the remote control button will retract the cylinder. The tool will automatically reset itself and the opperator will hea)" an audible "click" indicating he can again push the remote control button and the socket will tum. Each time the cylinder is extended and retracted, it is called a cycle. Successive cycles are made until the tool "stalls" at the pre-set Torque/PSI with an accuracy of + 1- 3%. Repeatability is + 1- 1 %.

IMPORTANT: ALWAYS ATTEMPT ONE FINAL CYCLE TO INSURE THE "STALL" POINT HAS BEEN REACHED.

3-8
Loosening Procedures

First, set the pump to 10,000 PSI. Change the drive and the reaction arm to the loosening mode, assurring the reaction arm abuts squarely off a solid reaction point. Press and hold the remote control button down. Pressure will decrease as the socket begins to tum. As the cylinder extends fully, you will hear an audible "click". Release the remote control button, and the cylinder automatically retracts, at which time you again hear the audible "click". Repeat this process until the fastener can be removed by hand.

NOTE: IF THE BOLT DOES NOT LOOSEN WITH THE ABOVE PROCEDURE. IT IS AN INDICATION THAT YOU REQUIRE THE NEXT LARGER SIZE TOOL TO LOOSEN THE BOLT.

SECTION IV

TORC POWER PACKS

4-1
General Information

All TORC, LLC. Power Packs operate at a pressure range from 500 to 10,000 PSI and are fully adjustable. They have been engineered and designed for portability and high flow for increased speed. Before using your TORC, LLC. power pack, check the following points:

- **Is the reservoir filled with oil?**
- **Where is the closest electrical outlet at the job site?**
- **Is there enough air pressure (100 PSI) and flow at the job site? (Air units only)**
- **Is the gauge mounted and rated for 10.000 PSI?**
- **Is the oil filler plug securely in place?**

4-2
Working Pressure

The Pump's maximum working pressure is 10,000 PSI(700 bar). Make sure all hydraulic equipment and accessories are rated for 10,000 PSI operating pressure.

4-3
Hydraulic Connections

Never disconnect or connect hydraulic hoses or fittings without first unloading the wrench. Unplug the electrical cord of the pump, and open all hydraulic controls several times to assure that the system has been depressurized. If the system includes a gauge, double check the gauge to assure pressure has been released.

When making a connection with quick disconnect couplings, make sure the couplings are fully engaged. Threaded connections such as fittings, gauges etc. must be clean and securely tightened and leak free.

CAUTION: Loose or improperly threaded couplers can be potentially dangerous if pressurized. However, severe over tightening can cause premature thread failure. Fittings need to be only tightened secure and leak free. Never grab, touch, or in any way come in contact with a hydraulic pressure leak. Escaping oil could penetrate the skin and cause injury.

Do not subject the hose to potential hazards such as sharp surfaces, extreme heat or heavy objects. Do not allow the hose to kink and twist. Inspect the hose for wear before it is used.

4-4
Electrical Power

1. CHECK FOR PROPER ELETRICAL SUPPLY BEFORE CONNECTING.

2. THIS MOTOR MAY SPARK. DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE OR IN PRESENCE OF CONDUCTIVE LIQUIDS.

a. Do not use a power or extension cord that is damaged or has exposed wiring.
b. All single phase motors come equipped with a three prong grounding type plug to fit the proper grounded type electrical outlet. Do not use a two prong ungrounded extension cord as the pump's motor must be grounded.

3. COMPARE MOTOR NAMEPLATE AGAINST POWER AVAILABILITY TO PREVENT MOTOR BURN OUT OR DANGEROUS ELECTRICAL OVERLOADING.

4-5
Prior to Use

Check hydrauilc oil level to prevent possible pump burnout. Open the filler plug located on the reservoir plate. Look at oil fill level on the oil sight gauge. The oil level should be approximately 2" from the top of the reservoir plate- with motor off. Add TORC, LLC. oil as necessary. Do not mix different grades of oil.

Make sure all desired gauge, valve, hose and quick coupler connections are tight and secure before operating.

The use of a pressure gauge is required for normal pump operation. Mounted on the manifold, the gauge permits the operator to monitor the load on the wrench. 1/4% calibrated gauges are available for most applications.

4-6
Operation

Before starting your electric pump, connect your hydraulic hoses to both the pump and torque wrench.

Place the toggle switch in the ON position and the rocker switch on the hand control pendant in the OFF position. To start the pump, depress and release the yellow safety button.

NOTE: The safety button is an added feature designed to prevent premature starting and should ouly be depressed by the tool operator.

Push the rocker switch to advance and release. This will start your pump and place it in the retract position.

NOTE: Read the section labeled TORC, LLC. OPERATIONS and SETTING TORQUE prior to installing the torque wrench onto the application.

Your TORC hydraulic pump has been designed with an auto shut off system. The pump will shut off after approximately 30 seconds of non-cycling. This will prevent overheating and unnecessary wear which will prolong the life of your pump. To restart the pump, the yellow safety button must again be depressed prior to use.

SECTION V

PREVENTIVE MAINTENANCE

5-1 Preventive Maintenance - Torque Machines

Tool failure, although rare, does occur. Such failure is most often in the hydraulic couplers or hoses. These items are repairable or replaceable immediately, since they are available universally. Failure of structural members of the tool are quite rare, but replacement parts are available from stock. All repairs to TORC, LLC. tools may be made by reasonably experienced individuals according to the aforementioned instructions.

- **Lubrication**

All moving parts should periodically be coated with a good quality NLGI #2 molybdenum disulfide grease. Under harsh environmental conditions, cleaning and lubricating should be performed more frequently.

- **Hydraulic Hoses**

Hoses should be checked for cracks and leaks after each job. Hydraulic fittings can become plugged with dirt and should be flushed periodically.

- **Quick-Connects**

Fittings should be kept clean and not allowed to be dragged along the ground or floor, as even small particles of dirt can cause the internal valves to malfunction.

- **Springs**

Springs are used for the drive assembly and for accuracy assurance. These springs can be replaced if necessary.

- **Cylinder Seals**

If the cylinder requires disassembly, it is recommended that the cylinder seals be replaced at the same time. Seal kits are readily available.

- **Structural Members**

All structural parts on the tool should be inspected once a year to determine if there are any cracks, chips or deformities. If so, immediate replacement is required.

5-2
Preventive Maintenance - Hydraulic Power Packs

TORC, LLC. Hydraulic Power Packs are precision-built units and, as such, do require a certain amount of care and maintenance.

- **Hydraulic Oil**

Oil should be completely changed after every 40 hours of operation, or at least twice a year. Always make sure the reservoir is filled with fluid. If additional oil is required, use only high-grade hydraulic oil.

- **Quick-Disconnects**

Fittings should be checked periodically for leaks. Dirt or foreign materiais should be kept away from fittings. Clean before use.

- **Hydraulic Gauge**

Some gauges are liquid filled. Should this liquid level drop, it indicates external leakage, and replacement is necessary. Should the gauge fill with hydraulic oil, it indicates internal failure and it should be discarded.

- **Filter on Pump**

The filter should be replaced twice a year in normal use and more often if the pump is used daily or in a dirty, harsh environment.

- **Remote Control**

(Air Unit) The air line to the remote control unit should be checked for obstructions or kinks in the line periodically. If there is a bend or break in the line, it must be replaced. The spring-loaded buttons on the remote handle should be checked in the event of operating difficulties. (Electric Unit) The rocker switch should be checked periodically if any indication of problems exist.

- **Air Valve**

This valve should be checked twice a year.

- **Brushes and Brush Holders**

(Electric Unit) Check and replace, if worn.

- **Armature**

(Electric Unit) Check yearly.

SECTION VI

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REQUIRED ACTION
Gauge shows pressure build-up but the tool will not cycle	1. Couplings loose or inoperative	1. Tighten and/or replace couplings. Use Test #1 listed below to isolate problem.
	2. Solenoid inoperative	2. Check using test #2 below. If solenoid is bad, replace.
Cylinder will not retract.	1. See above	1. See Above
	2. Voltage to electric pump is too low to line drop or inadequate amperage is available.	2. Get shorter extension cord or upgrade to 12AWG, 25 amp rating or better. If shop power is adequate, draw power from welding machine or cal rod transformer.
	3. Linkage between piston rod and drive arms are broken.	3. Replace parts as necessary.
Cylinder pressure will not build.	1. Oil blow by in tool (Piston seal leak, blown O-ring, cracked piston)	1. Replace defective parts. SHOP JOB
	2. Pump Problem	2. Check to see if sub-plate is worn by; a) Remove screws from pump motor to reservoir, slide Pump motor to the side, turn pump on and while holding down on the button, put your finger on the dump tube (round tube under the directional control valve) - if you feel pressure, then replace the sub-plate and shear seals. 2A. Check to see if you have leaks from the external relief valve and the 2 oil line connections (bottom of relief valve and connection into pump body's other end) of oil line. If leaking, retighten with 9/16" open end wrench. SHOP JOB 2B. If pump sounds like alot of pebbles in a tin can, the problem may be a worn motor coupling. Remove motor from base plate - using a pair of needle nose pliers remove the motor coupling - if worn, replace. SHOP JOB 2C. AIR PUMPS - Faulty Air Valve due to excessive moisture and/or dirt in air supply. Disassemble air valve and wipe any residue from air valve piston. Spray brake cleaner into air valve body, dry thoroughly. Disassemble all small air lines and blow out with compressed air. Lubricate both air valve piston and body with hydraulic oil (sparingly) and reassemble. SHOP JOB 2D. Air pumps - Faulty remote control valve cartridge. Replace.

SYMPTOM	PROBABLE CAUSE	REQUIRED ACTION
Cylinder/Tool leaks	1. Safety relief valve on swivel has lifted.	1A. Tighten all hose and couplers. If leak continues, adjust safety setting - Test #4 1B. Check to see if the system is properly plumbed by running test #5 (high pressure on retract side will lift the safety relief valve)
	2. Blown O-ring in cylinder	2. Replace O-Ring with proper high pressure O-Ring. SHOP JOB
	3. Defective gland seal.	3. Replace gland seal. SHOP JOB
Tool operates backwards	1. Couplings reversed	1. Run test #5. Replumb system as necessary.
	2. Multiple hoses in even numbers	2. As plumbed, TORC, LLC. hoses may only be joined together in odd numbers ONLY. If it is necessary to use 2,4,6 hoses - make an adapter from spare high pressure couplings and nipples.
Ratchet returns with retract stroke	1. Broken or otherwise inoperable drive segment.	1. Replace drive segment and/or spring. SHOP JOB.
Ratchet will not take successive strokes	1. Broken or otherwise inoperative drive segment I or spring	1. Replace drive segment and/or spring. SHOP JOB
	2. Cylinder not retracting completely	2. Remove tool from nut and cycle freely for several strokes. If problem persists, check pawls. 2A. Operator not allowing adequate time for cylinder to retract fully.
	3. Linkage between piston rod and drive plates is broken	3. Replace parts as necessary - SHOP JOB.
Tool locks onto nut	1. Drive segment is loaded when the tool is max'd out in torque	1. Press advance button on remote and build pressure - continue to press down on remote while pulling back on one of the accuracy assurance levers - release remote while continuing to hold back on levers
	2. Tool is operating backwards	2. Push advance button down - tool should immediately fall free- Run test #5
	3. Tool is wedged under a fixed object	3. Remove shroud from around ratchet. Using any tool available, pry the drive segment out of the ratchet and at the same time pull back on the accuracy assurance levers. Tool should swing free or burn away the socket or obstruction.

SYMPTOM	PROBABLE CAUSE	REQUIRED ACTION
Gauge records no pressure	1. Gauge connection is loose	l. Tighten coupling.
	2. Bad gauge	2. Replace gauge
	3. Pump will not build pressure	3. See cylinder pressure will not build pressure-above
	4. Tool seals are blown	4. Replace defective seals. SHOP JOB
Pump will not build pressure	1. Air or electric supply is low	1. Check air pressure or voltage.
	2. Defective relief or regulator valve	2. Replace valve. SHOP JOB
	3. Low oil or clogged filter	3. Fill reservoir and clean filter.
	4. Internal leak in oil line from external relief valve to pump body.	4. Open reservoir, inspect oil line while trying to build pressure - if leaking tighten fittings or replace.
	5. Worn sub-plate	5. See cylinder pressure will not build pressure-above
Motor sluggish and inefficient "sounds sick" slow to build pressure	1. Air or electric supply is low	1. See #1 in preceding block
	2. Clogged filter	2. Clean or replace filter
Pump heats up	1. Improper use	1. Operator is continuing to hold down Pump heats up on the advance stroke after the cylinder has reached end of stroke - this causes a lot of oil to go through a very small hole in relief-valve - causing heat build-up. Have operator release advance stroke after accuracy assurance levers spring forward.
	2. Remote control is left in "on" position when pump is not actively in use.	2. Turn pump off whenever not actually being used. DO NOT leave pump running when tool is not in use.
Hose or tool fitting is damaged or leaks	1. Broken or melted plastic outer covering	1. If underlying Kevlar or steel is still intact continue operation. Inspect frequently.
	2. Frayed Kevlar or steel strands	2. Cut hose In half and discard. Replace Hose.
	3. Oil leaks through fibers	3. Cut hose in half and discard. Replace hose.
	4. Broken fittings	4. Remove old fitting and replace with STEEL high pressure fittings only. After changing fittings, always run test #5 to insure proper plumbing.
Electric pump will not run	1. Loose electric connections in control box.	1. Open control box and visually inspect for loose threaded or push-on connectors. Reconnect loose wires. If in doubt check wiring diagram. DANGER· BOX CONTAINS HIGH VOLTAGE· ALWAYS UNPLUG PRIOR TO TOUCHING ANYTHING IN CONTROL BOX.
	2. Bad brushes	2. Change brushes. SHOP JOB
	3. Motor burned up	3. Replace motor or components whichever is necessary. SHOP JOB .

TEST #1

Attach hoses to pump and tool in the normal manner. Press the advance button and hold it down. If the pump pressure builds and the hoses “flex” but the tool still refuses to cycle, the problem is most likely a loose or defective coupling connection. To find out where the bad coupling is, remove the tool from the hoses and marry the loose ends together and cycle the pump. If the gauge pressure reads no more than 500 PSI, then the bad fitting is on the tool. A significantly greater pressure indicates that the problem is in either the pump or a hose fitting.

TEST #2

Place a welding rod or thin screwdriver in the opening of either side of the solenoid. Press and then release the advance button. Repeat this process on the opposite side of the solenoid. You should feel the solenoids moving back and forth. If either side is “dead” the solenoid is bad and needs to be replaced. Note: if in an urgent situation, the tool may be cycled manually by pushing the solenoids back and forth through these access holes.

TEST #3

Remove tool from hoses. Cycle pump. If pump fails to build pressure, the problem is with the pump. If it does build pressure, the problem is with hydraulic blow-by in the tool.

TEST #4

Connect tool, pump, and hoses together normally and turn pump “on”. As oil leaks from the small port under the uni-swivel, use a proper size Allen wrench and slowly tighten (clockwise) the set screw positioned between the couplings on the uni-swivel. Continue to tighten until the flow stops plus a quarter turn.

TEST #5

THIS TEST SHOULD BE RUN PRIOR TO EVERY USE OF A TORC, LLC. TOOL

Connect the tool, pump, and hoses together as normal. Cycle the pump several times. Cycle the system once more and observe the sequence of operation. As you depress the advance button, the tool drive should turn about. 24 degrees and you should hear an audible “click”. On square drive tools, you will also notice that the accuracy assurance levers will move to the rear of the tool and spring forward. At this point, release the advance button. You should see no further movement and after a moment you will hear another audible “click”. This is how the tools are designed to operate. If you observe any other sequence of operation, the system is out of order and cannot deliver more than 10% of its designed capacity, Take immediate corrective action. For reference, tools and pumps are de signed from the factory plumbed as follows. This ensures that the tool, pump and ONE hose cannot possible be connected up incorrectly.

Tool Advance Side - Male
Retract Side - Female

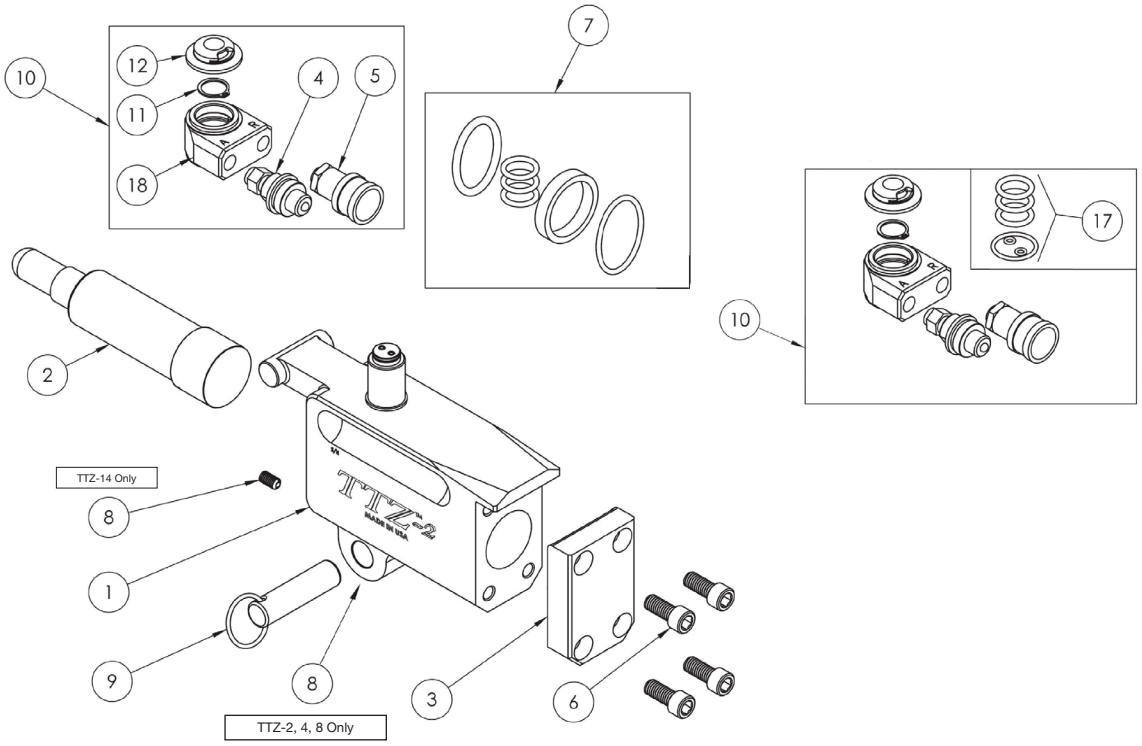
Hose Advance Side - Female to Female
Retract Side - Male to Male

Pump Advance Side - Male
Retract Side - Female

Note that connecting two (or any EVEN number) of hoses together creates “one” hose which is plumbed backwards! Male to Female and Female to Male. This will cause the system to operate backwards per Test #5 above. If your hose isn’t long enough, connect 3 hoses together, move your pump or call TORC, LLC. for a longer hose assembly.

APPENDIX A

TTZ TOOL PARTS LIST

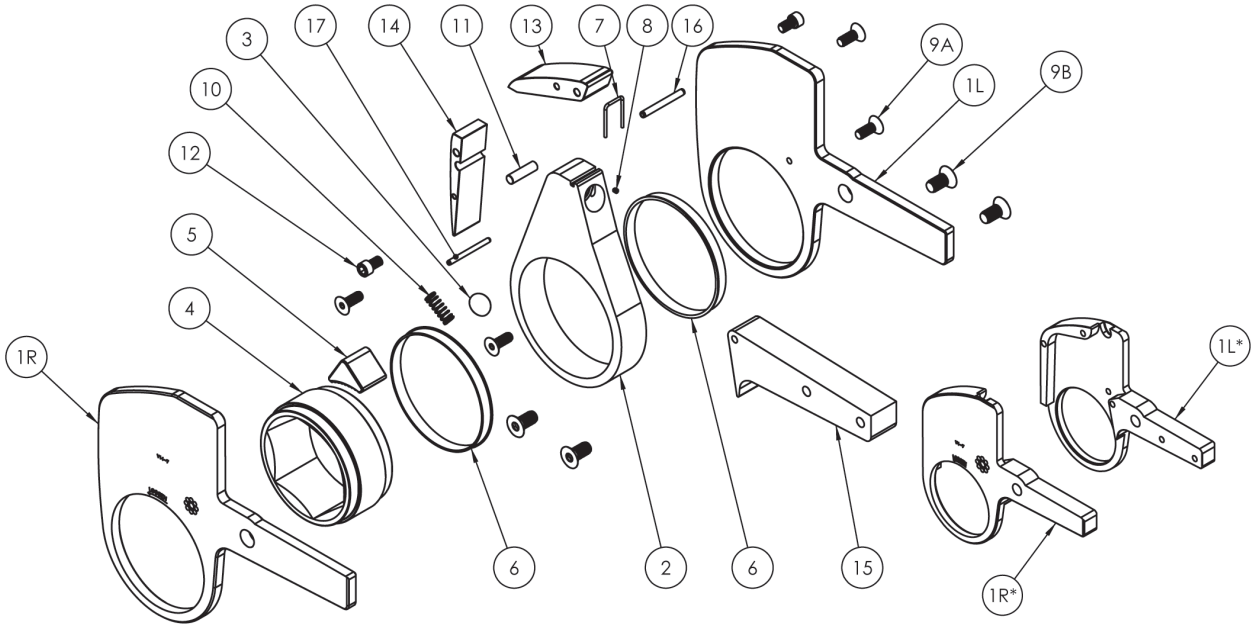


ITEM	DESCRIPTION	TTZ-2	TTZ-4	TTZ-8	TTZ-14
1	HOUSING	TTZ-02-01	TTZ-04-01	TTZ-08-01	TTZ-12-01
2	PISTON ROD ASSEMBLY	TTZ-02-06	TTZ-04-06	TTZ-08-06	TTZ-12-06
3	END CAP WITH SEAL	TTZ-02-02	TTZ-04-02	TTZ-08-02	TTZ-12-02
4	MALE COUPLER	090155-1/8	090155-1/4	090155-1/4	090155-1/4
5	FEMALE COUPLER	090156-1	90156	90156	90156
6	END CAP SCREWS	TTZ-02-34	TTZ-04-34	TTZ-08-34	TTZ-12-34
7	SEAL KIT	TTZ-02-13	TTZ-04-13	TTZ-08-13	TTZ-12-13
8	LINK PIN RETAINER	ST-02-19	ST-04-19	ST-08-19	TTZ-12-12
9	LINK PIN WITH RING	TTZ-02-10	TTZ-04-10	TTZ-08-10	TTZ-12-10
10	UNISWIVEL ASSEMBLY	TTZ-002	TTZ-004	TTZ-004	TTZ-004
11	SAFETY CAP RETAINING RING	TTZ-02-504	TTZ-04-504	TTZ-04-504	TTZ-04-504
12	SAFETY CAP	TTZ2-SF013	XLT-SF003	XLT-SF003	XLT-SF003
13	FEMALE COUPLER	N/A	N/A	N/A	N/A
14	MALE COUPLER	N/A	N/A	N/A	N/A
15	SWIVEL POST	N/A	N/A	N/A	N/A
16	POST MOUNTING SCREWS	N/A	N/A	N/A	N/A
17	UNISWIVEL SEAL KIT	TTZ-002-00	TTZ-004-00	TTZ-004-00	TTZ-004-00
18	SWIVEL BLOCK WITH COUPLERS	TTZ-002	TTZ-004	TTZ-004	TTZ-004
19	TOOL MAINTENANCE KIT (NOT SHOWN)	MK-TTZ-02	MK-TTZ-04	MK-TTZ-08	MK-TTZ-12
20	360 X 180 UNISWIVEL (OPTIONAL)	TTZ-002-1	TTZ-004-1	TTZ-004-1	TTZ-004-1

Technical data and specifications are subject to change without notice.

APPENDIX B

TTZ LOW CLEARANCE LINK PARTS LIST



*TTZ-1 PARTS ONLY

NOTE: "#" DESIGNATES LINK BLANK NUMBER

ITEM	DESCRIPTION	TTZ-1	TTZ-2	TTZ-4	TTZ-8	TTZ-12	TTZ-30
1	SIDE PLATE RIGHT/LEFT	TTZ-01-52R/L #	TTZ-02-52R/L #	TTZ-04-52R/L #	TTZ-08-52R/L #	TTZ-12-52R/L #	TTZ-30-52R/L #
2	DRIVE PLATE	TTZ-01-35 #	TTZ-02-35 #	TTZ-04-35 #	TTZ-08-35 #	TTZ-12-35 #	TTZ-30-35 #
3	SPHERE SEGMENT	TTZ-01-21	TTZ-02-21	TTZ-04-21	TTZ-08-21	TTZ-12-21	TTZ-30-21
4	RATCHET	TTZ-01-28 #	TTZ-02-28 #	TTZ-04-28 #	TTZ-08-28 #	TTZ-14-28 #	TTZ-30-28 #
5	DRIVE SEGMENT	TTZ-01-20 #	TTZ-02-20 #	TTZ-04-20 #	TTZ-08-20 #	TTZ-14-20 #	TTZ-30-20 #
6	SIDE PLATE SLEEVE	TTZ-01-55 #	TTZ-02-55 #	TTZ-04-55 #	TTZ-08-55 #	TTZ-14-55 #	TTZ-30-55 #
7	SPRING WIRE	TTZ-01-37	TTZ-02-37	TTZ-04-37	TTZ-08-37	TTZ-14-37	TTZ-30-37
8	SPRING WIRE SET SCREW	TTZ-01-38	TTZ-02-38	TTZ-04-38	TTZ-08-38	TTZ-14-38	TTZ-30-38
9A	SIDE PLATE SCREW TOP	TTZ-01-51	TTZ-02-51	TTZ-04-51	TTZ-08-51	TTZ-14-51	TTZ-30-51
9B	SIDE PLATE SCREW REAR	TTZ-01-51	TTZ-02-51	TTZ-04-51	TTZ-08-51	TTZ-14-49	TTZ-30-49
10	DRIVE SEGMENT SPRING	TTZ-01-27	TTZ-02-27	TTZ-04-27	TTZ-08-27	TTZ-14-27	TTZ-30-27
11	DRIVE PLATE STOPPER ROD	TTZ-01-42	TTZ-02-42	TTZ-04-42	TTZ-08-42	TTZ-14-42	TTZ-30-42
12	SIDE PLATE SCREW MIDDLE	TTZ-01-50	TTZ-02-50	TTZ-04-50	TTZ-08-50	TTZ-14-50	TTZ-30-50
13	TOP SPACER	N/A	TTZ-02-45T-01/ 02	TTZ-04-45T-01/ 02	TTZ-08-45T	TTZ-14-45T	TTZ-30-45T
14	FRONT SPACER	N/A	TTZ-02-45F #	TTZ-04-45F #	TTZ-08-45F #	TTZ-14-45F #	TTZ-30-45F #
15	REAR SPACER	N/A	TTZ-02-45R #	TTZ-04-45R #	TTZ-08-45R #	TTZ-14-45R #	TTZ-30-45R #
16	SIDE PLATE ROLL PIN TOP	N/A	TTZ-02-48T	TTZ-04-48T	TTZ-08-48T	TTZ-14-48T	TTZ-30-48T
17	SIDE PLATE ROLL PIN MIDDLE	N/A	TTZ-02-48F	TTZ-04-48F	TTZ-08-48F	TTZ-14-48F	TTZ-30-48F
18	LINK MAINTENANCE KIT (NOT SHOWN)	MK-TTZ-01-LK	MK-TTZ-02-LK	MK-TTZ-04-LK	MK-TTZ-08-LK	MK-TTZ-14-LK	MK-TTZ-30-LK

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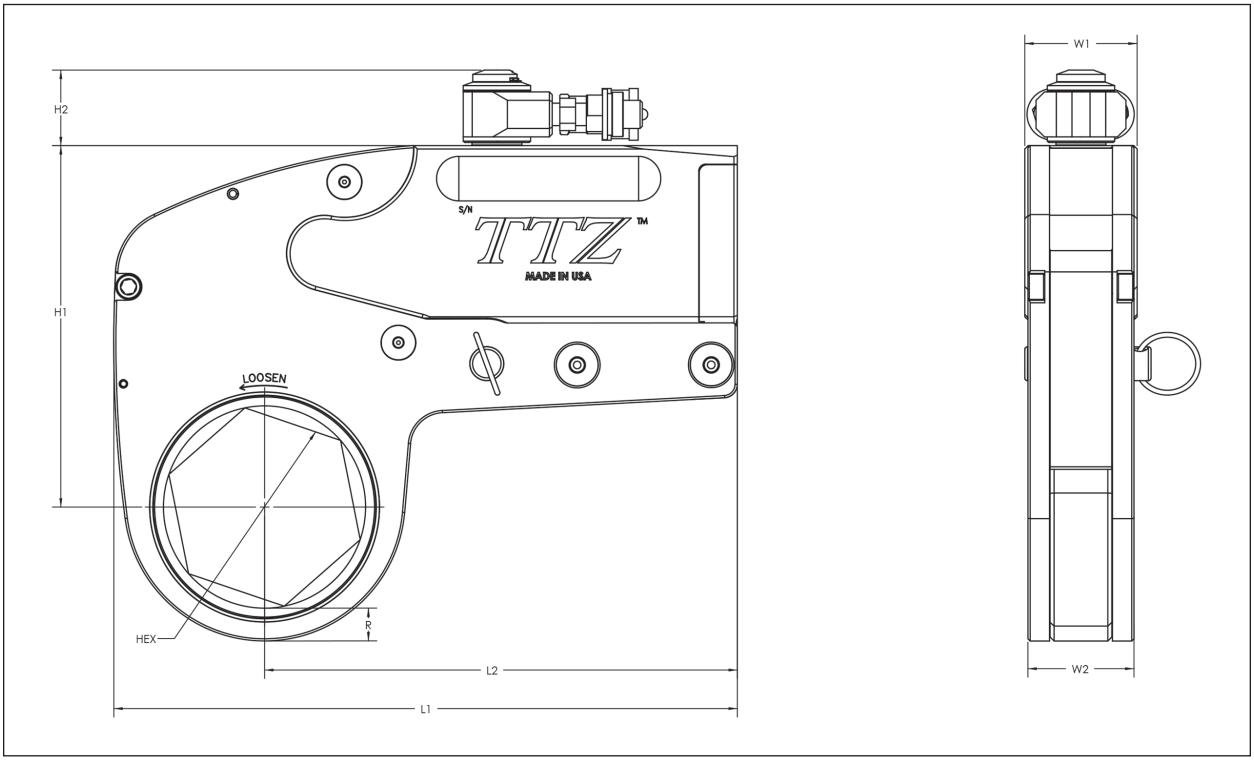
APPENDIX D

TTZ DIMENSIONAL DATA

IMPERIAL



MODEL	HEX	TORQUE RANGE*	RADIUS (R)	OVERALL LENGTH (L1)	LINK HEIGHT (H1)	SWIVEL HEIGHT (H2)	TOOL WIDTH (W1)	LINK WIDTH (W2)
TTZ- 2	1” - 2-3/8”	269-1,875 ft. lbs.	0.38”	6.97”	3.73”	1.09”	1.25”	1.13”
TTZ-4	1-7/16” - 3-1/8”	655-4,538 ft. lbs.	0.51”	9.20”	5.51”	1.68”	1.67”	1.50”
TTZ-8	2” - 3-7/8”	1,202-8,308 ft. lbs.	0.72”	11.62”	6.53”	1.68”	2.10”	1.89”
TTZ-14	2-3/4” - 4-5/8”	2,062-14,576 ft. lbs.	0.73”	13.88”	8.04”	1.68”	2.50”	2.36”

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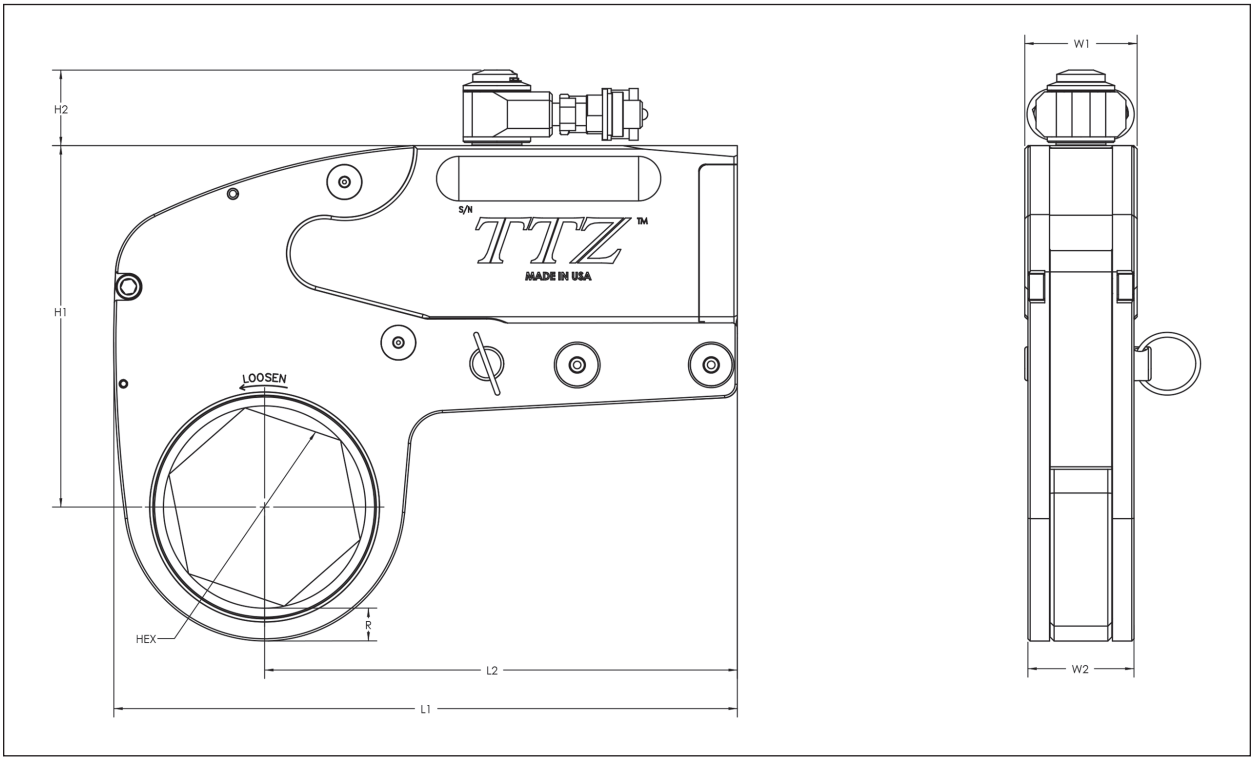
APPENDIX D

TTZ DIMENSIONAL DATA

METRIC



MODEL	HEX	TORQUE RANGE*	RADIUS (R)	OVERALL LENGTH (L1)	LINK HEIGHT (H1)	SWIVEL HEIGHT (H2)	TOOL WIDTH (W1)	LINK WIDTH (W2)
TTZ- 2	24-60 mm	365-2,542 Nm	97 mm	177.0 mm	94.7 mm	27.7 mm	31.8 mm	28.7mm
TTZ-4	36-80 mm	888-6,152 Nm	12.9 mm	233.7 mm	140.0 mm	42.7 mm	42.4 mm	38.1mm
TTZ-8	50-100 mm	1,629-11,264 Nm	18.3 mm	295.1 mm	165.9 mm	42.7 mm	53.3 mm	48.0mm
TTZ-14	70-120 mm	2,795-19,762 Nm	18.5 mm	352.6 mm	204.2 mm	42.7 mm	63.5 mm	59.9mm

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