

— THE —  
**TORQUE GUN™**  
— COMPANY —



**FLASH**

**ELECTRIC** 

**OPERATIONAL MANUAL**

**WITH THE PURCHASE OF TORQUE GUN CO. TORQUE MACHINES (PAST, PRESENT, FUTURE) YOU HAVE OBTAINED THE LATEST TECHNOLOGY AND LIFETIME, WORLDWIDE LOCAL SERVICE.**

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- ◆ **FREE** User Safety Training upon Receipt of Merchandise
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- ◆ **FREE** Loaner Tools in case of Product Failure within 24 Hours
- ◆ **FREE** Torque/Tension Consultation/Seminar
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- ◆ **FREE** Annual Product Inspection on Request
- ◆ **FREE** Product Demonstrations
- ◆ **FREE** 12 Month No-Questions-Asked Warranty
- ◆ **FREE** Upgrades during the Lifetime of the Tool to Enhance Safety, Durability, and Function  
*(Above services are NOT subject to travel expense charges)*

## REPAIRS

- All Repairs are Guaranteed for 6 Months
- Repairs are Subject to Labor and Part Cost, as Outlined in the Official TORQUE GUN CO. Price List
- All Warranty Repairs are FREE of All Charges Including Return-Freight
- All Repairs Will be Tested and Calibrated to Ensure the Highest Quality Repairs

## TOOL RENTALS

- 50% of All Paid Rentals will be Applied as a Discount Toward Any Purchase for One Year from the date of the Rental Invoice
- 100% of all Rental Fees will be Applied if Rental is Paid in 30 days
- User Training for First Time Rentals is FREE of All Cost
- Return Freight Charges are FREE
- Rental Tools are Guaranteed to Perform and are Subject to the FREE Loaner Tool Policy of TORQUE GUN CO.

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**TOTAL SATISFACTION GUARANTEED 1-888-GUN-2-GUN**



**HELP:** If you require any further assistance, please call your local Torque Gun Co. Representative or 1-888-GUN-2-GUN (1-888-486-2486), on the web at [torcgun.com](https://torcgun.com) - 24/7! **It's live!**

# FLASH™ Electric Gun

## OPERATIONAL MANUAL

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Version 2.0, September 2013

# WARRANTY

The FLASH GUN has a one year limited warranty. Every TORQUE GUN tool is tested before leaving the factory and is warranted to be free from defects in workmanship and materials. TORQUE GUN will repair or replace, without charge, any tool which upon examination proves to be defective in workmanship or materials for one (1) year after the date of purchase. This warranty does not cover damage from repairs made or attempted by other than TORQUE GUN authorized repair facilities.

The repair and replacement remedies described herein are exclusive. In no event shall TORQUE GUN be liable for any incidental, special, or consequential damages, including loss of profits. This warranty is exclusive and in lieu of all other warranties or conditions, written or oral, expressed or implied for merchantability or fitness for particular use or purpose.

This warranty gives you specific legal rights. You may also have other rights that vary from state to state and province to province. In those states that do not allow the exclusion of implied warranties or limitation of incidental or consequential damages, the above limitations or exclusions may not apply to you.

**If you have questions about the TORQUE GUN warranty, contact our customer service center at 201-828-5270.**



## THE TORQUE GUN COMPANY

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# STATEMENT OF USE

This FLASH GUN along with its accessories shall only be used for bolting and torquing purposes, up to the maximum specified torque value of the FLASH GUN. It is NOT recommended for any other purpose or use and in doing so may result in tool or property damage and personal injury.

# IMPORTANT SAFETY INFORMATION



Read and understand this material before operating or servicing this equipment. Failure to understand how to safely operate this tool could result in an accident causing serious injury or death. Do not discard these safety instructions or this manual. Instructions in this manual are for bolting professionals. Non professional users, please contact TGC before use.

- Inspect all FLASH GUN components as they are removed from the shipping container. If damage is found to any component, contact your shipper immediately. Do not use the tool.
- Failure to follow correct tool usage could result in personal injury, co-worker injury, and/or damaged tools and equipment.
- Ensure your working area is clean and unobstructed before beginning work.
- The FLASH GUN plug must match the power outlet. Do not modify this plug in any way.
- FLASH GUN maintenance and repair must be performed by a qualified technician.
- Modifying a FLASH GUN or FLASH GUN accessory is dangerous and invalidates the warranty.
- Inspect the tool before each use. Replace any obviously worn or damaged parts.
- When not in use, store the FLASH and FLASH accessories in the plastic storage case supplied with the tool. Do not expose the gun to high humidity or large temperature variations.
- Never carry the electric torque gun by its cord nor use the cord for pulling or unplugging the torque gun.
- The FLASH GUN shall NOT be used under water or extremely humid conditions nor in an extremely cold or hot environment.
- The FLASH Gun is not recommended for use in rain or wet conditions.

## Personal Protective Equipment

- Always wear the appropriate personal protective equipment when operating a FLASH GUN including gloves, safety goggles, hearing protection, hard hat, and safety shoes.
- Wear warm clothing when working in cold conditions and keep hands warm and dry.



## Reaction Arm or HYTORC Washer

Use the appropriate size reaction arm or HYTORC Washer based on your application. The FLASH GUN is usually supplied with a reaction arm in standard length. However, a custom reaction arm may have been delivered for special applications for your FLASH GUN.



Figure 1: Reaction Arm

The HYTORC Washer system can be used for all applications instead of reaction arm.



Figure 2: HYTORC Washer and Drive



**WARNING!**

Never modify a reaction arm! Changes in the reaction arm may lead to personal injury or damage to the tool.

**NOTE:**

Reaction arm modifications result in loss of warranty for the reaction arm and the Flash Gun. If you need a custom reaction arm, please consult with your local FLASH Gun dealer.

## Reaction Assembly and drive

- Use the appropriate size reaction arm or HYTORC Washer based on your application. The FLASH GUN is usually supplied with a reaction arm in standard length.
- If you want to use the HYTORC Washer system, please follow the installation and assembly instructions in the “HYTORC Washer Overview” section.
- Please clean the contact surfaces of FLASH GUN and Reaction Arm, before mounting the reaction arm to FLASH GUN.
- Slide the reaction arm on the appropriate gear teeth so that the extension of the reaction arm is facing outward.

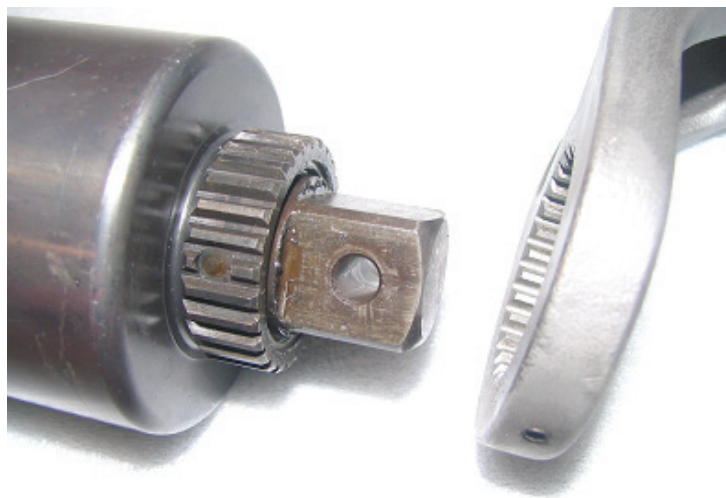


Figure 3: Reaction Arm Assembly



**WARNING!**

Always attach the Reaction so that it points away from the handle with the extension of the FLASH GUN. Incorrect installation of the reaction arm can cause the reaction arm come into contact with your hand or other body parts causing injury.

The reaction arm will start to rotate as soon as the FLASH GUN trigger is pulled. Please keep all body parts and other objects away from the bolting area when operating the FLASH GUN. Exposure to vibration with prolonged and repeated use may cause disabling damage to the nerves and alter blood flow to the hands and arms.





Figure 4: Reaction Arm Attachment

Attach the reaction arm to the FLASH GUN so that the attachment screw with the recess corresponds to the teeth, tighten and then loosen it a 1/4th turn.

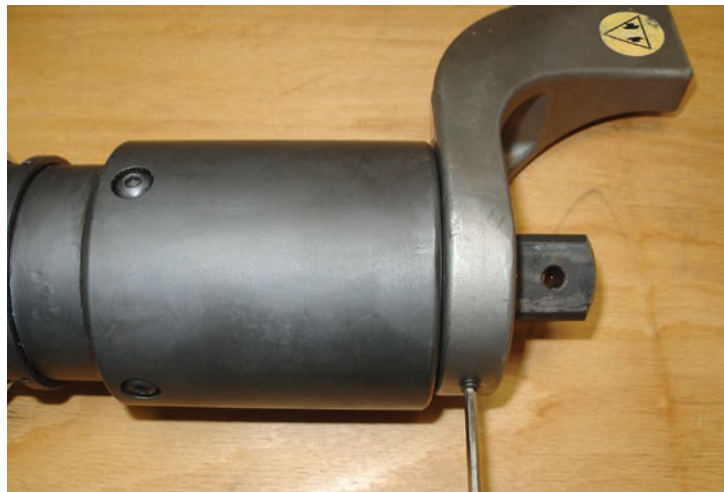


Figure 5: Reaction Arm Fastening

Place an appropriate size socket on the square drive.



Figure 6: Socket Drive

Secure the socket by means of locking pin on the square drive.



Figure 7: Socket Drive Attachment

Store the reaction arm and FLASH GUN in the tool box supplied after use and during work breaks.

## Basic safety instructions for handling

Make sure the reaction arm sits directly in contact with a suitable immovable object before you start to tighten the nut.



Figure 8: Reaction Arm Positioning

The use of HYTORC Washer eliminates the need for external reaction arms and thereby contributes to an increase in the safety of the user. (see also section “HYTORC Washer Overview”)

- Keep all body parts away from the reaction arm and reaction point.
- Make sure the operator is safe and secure in place before starting.
- Make sure the square drive is seated correctly and completely onto the socket



**SAFETY WARNING!**

TO ENSURE HAND and BODY PROTECTION and PREVENT INJURIES:

BEFORE START OF FASTENING PROCESS ENSURE

- Reaction Arm is in firm direct contact with a suitable immovable object.
- Hands and all body parts are never in between the reaction arm and reaction point.
- Hands are away from the sockets.
- Power cord, Gloves, loose clothing, neck ware, jewelry etc. are not entangled with the rotating parts.

# OPERATION

## General

Each electric torque gun is supplied completely assembled and ready for use. A side handle is supplied for better hold and grip during operation.

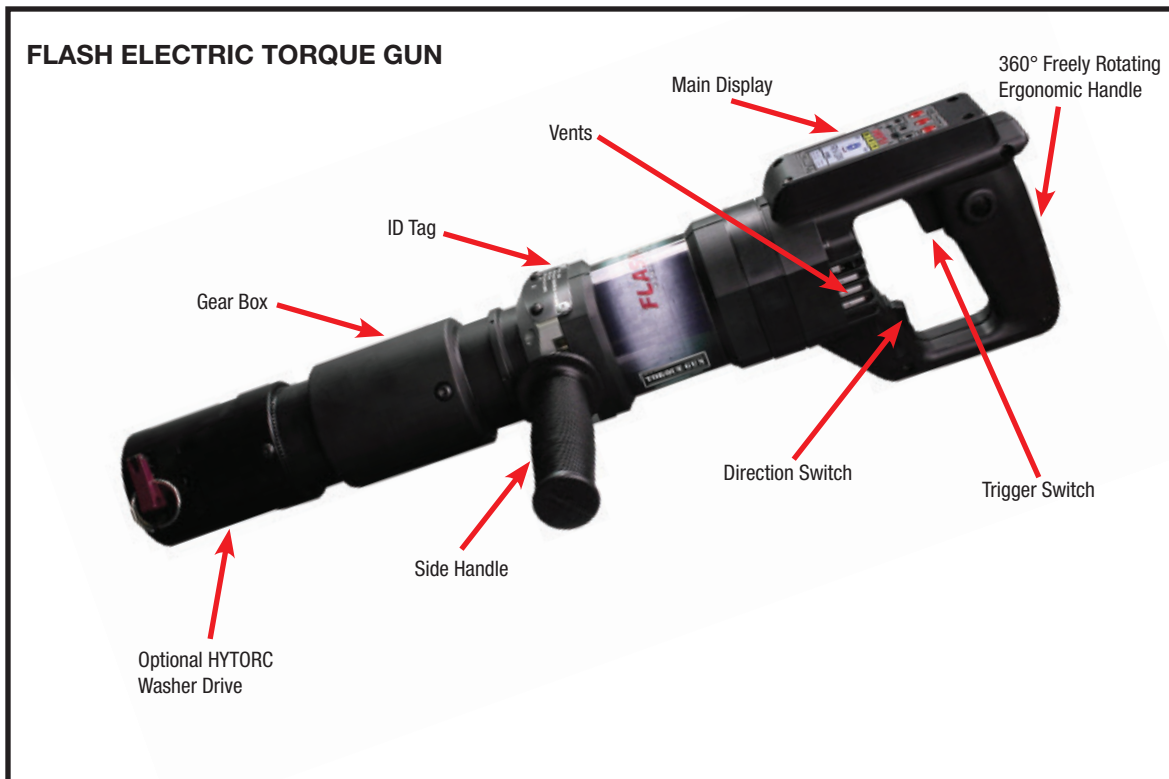


Figure 9: FLASH Gun Overview

## Setup

### Reaction Arm

Each electric torque gun is equipped with a universal reaction arm. The reaction arm is used to absorb and counteract any opposing forces created by the operation of the torque gun. Use the appropriate size reaction arm or HYTORC Washer based on your application.

### Power

The FLASH GUN can operate at 110V or 220V AC based on the Model configuration. Ensure proper voltage is present at the power outlet and insert the power chord into the nearest 110V (black cord) or 220V (yellow cord) outlet. Upon power up, the FLASH GUN will initialize and show the main display screen as shown in Figure 10.

## Basic Operation

At Start up the FLASH GUN is ready to operate at the initial or the last Torque, Angle and Release angle settings. If these settings are correct and when ready to tighten a fastener, place the gun on the application and press the trigger until the reaction arm firmly makes contact with the reaction point. Press and hold the trigger until the gun comes to a complete stop.

While torquing, the YELLOW LED will light up showing BUSY. When done, the torque gun will beep once and the GREEN LED will turn ON. In case of error, the torque gun will beep 4 times and the RED LED will be ON. If failed, an error message will be shown on the display screen. If Release angle is set, the gun will automatically run backwards the specified angle to release windup from reaction torque.

To change or set torque, angle and release angle see “Setting Torque and Angle” section.

To loosen, set the direction switch to ‘L’.

See figure 11 for direction switch operation. The torque setting will be automatically set to the maximum allowed torque for the particular type of gun, i.e. for FG3 Series FLASH-3 GUNS, the MAX Torque is 3150 ft. lbs. Press and hold the power trigger switch while the socket turns and loosens the nut. In reverse direction, the torque gun is set to maximum torque in order to loosen the nut. Use extreme caution when running in this mode.

The FLASH GUN can operate on both Left Hand and Right Hand threads. See “Additional Options” sections for changing to/from Left Hand or Right Hand thread modes.

## Basic Function Descriptions

**Torque:** Allows the operator to enter the target torque that the gun will seek when the trigger is pulled and held.

**Angle:** If an angle setting is above “0” the gun will add this angle of rotation to a completed torque operation using the maximum output of the unit. If the FLASH GUN reaches its MAXIMUM torque before completing the angle then it will stop with an error: “Angle Failure: Out of Torque Range”

**Release Angle:** After completing an operation, the gun will automatically run backwards the specified angle to release windup from reaction torque.

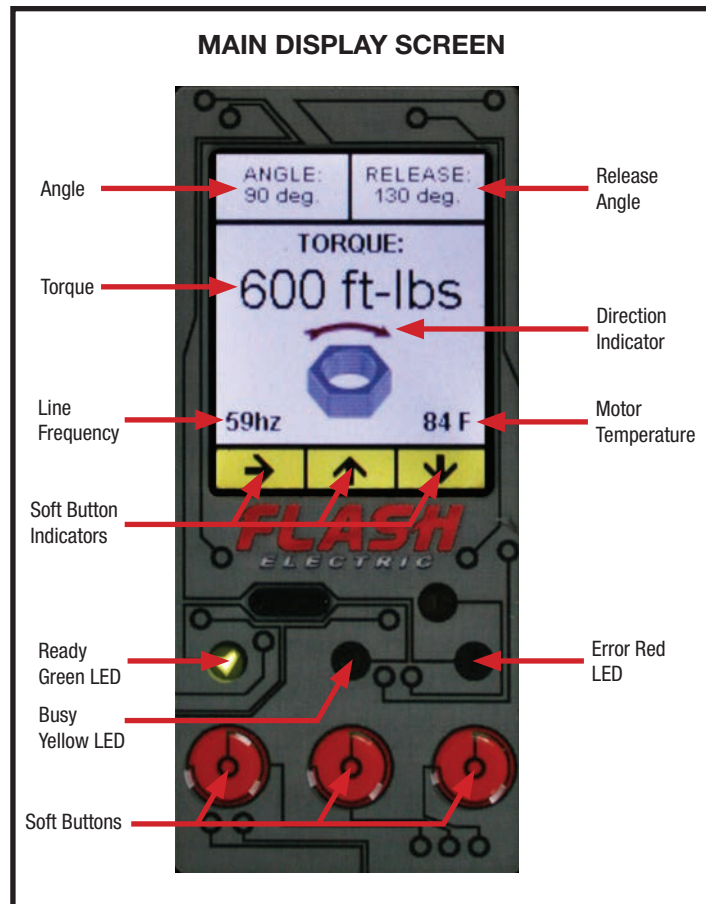


Figure 10: Main Display Screen

## Direction Switch

1. (R) Tighten
2. (L) Loosen

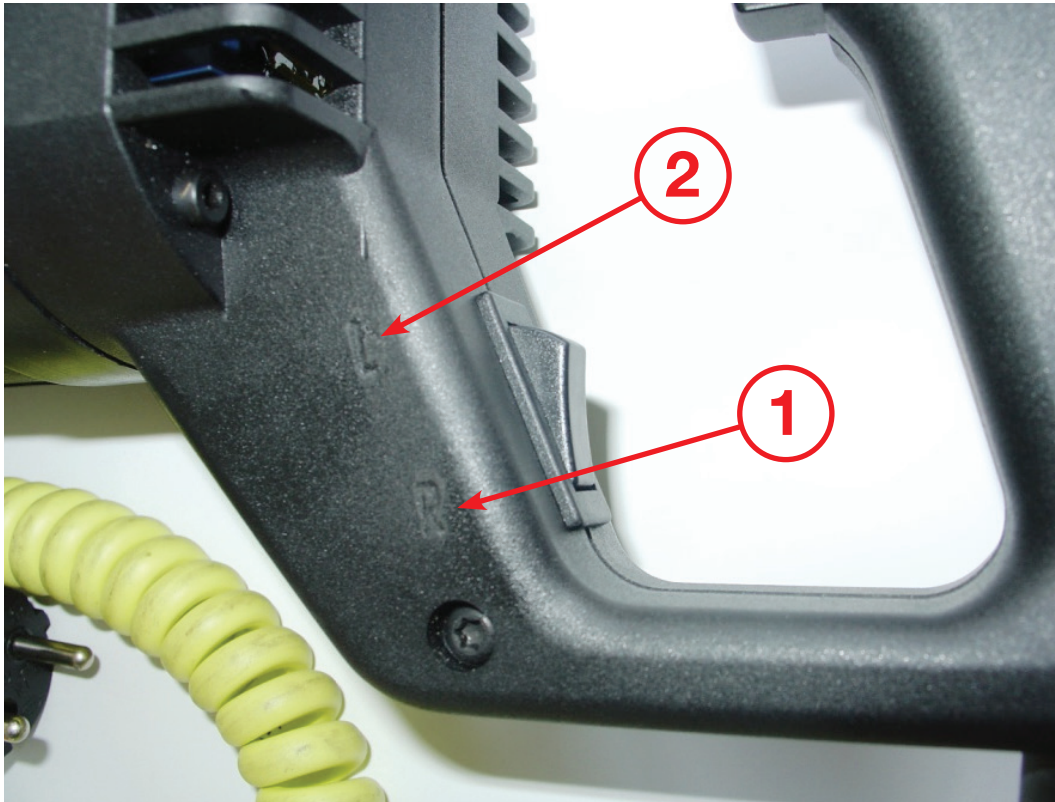


Figure 11: Direction Switch



**CAUTION!**

In reverse direction, the torque gun is set to MAXIMUM torque setting in order to loosen the nut. Use extreme caution when running in this mode. DO NOT toggle the direction switch while the torque gun is in operation.

## Setting Torque and Angle

Figure 12 shows the flow chart for setting desired Torque, Angle and Release Angle.

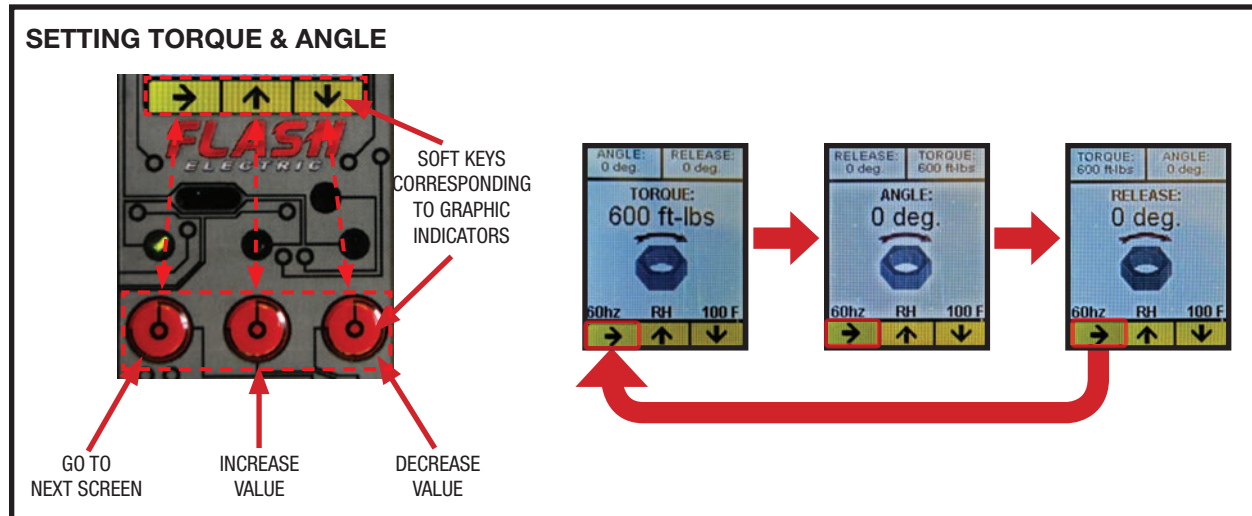


Figure 12: Setting Torque and Angle

The main screen shows three settings for Torque, Angle and Release Angle. The three settings are toggled with the left most soft button. Increase and decrease each value by using the center and rightmost soft buttons.

Follow these steps to set the torque and angle:

1. Set the direction switch to 'R' to tighten. See figure 11 for directional switch.
2. Set the desired torque by pressing the soft push buttons corresponding to the up/down arrow key indicators. When desired torque is displayed, press the leftmost soft button corresponding to the "Right arrow" to go to the next screen for setting the angle.
3. Set the desired angle by pressing the soft buttons corresponding to the up/down arrow key indicators. When desired angle is displayed, press leftmost soft button corresponding to the "Right arrow" to go to the next screen for setting the release angle.
4. Set the desired release angle by pressing the soft buttons corresponding to the up/down arrow key indicators. When desired release angle is displayed, press leftmost soft button corresponding to the "Right arrow" to go back to main screen with Torque setting.

**Note:** Set the Angle to 0, if working only in Torque Mode. The FLASH GUN is ready to operate once the desired Torque setting is entered. There is no need to toggle through Angle and Release angle screens if they are already set to 0.

# **TORQUE GUN OPERATION**

## **Tightening**

1. Set the direction switch to 'R' to tighten. See figure 11 for directional switch.
2. Set the desired torque value as described in "Setting Torque and Angle" section.
3. Make sure the torque gun and the reaction arm are in position for tightening.
4. Ensure the reaction arm is squarely against a solid reaction point.
5. Press and hold the power trigger switch while the socket turns.
6. When specified torque is reached, the FLASH GUN will stop, BEEP once and the Green LED will turn ON.
7. If Release angle is set, the gun will automatically run backwards the specified angle to release windup from reaction torque.
8. If the FLASH GUN Fails to set the torque properly, it will BEEP 4 times and turn ON the Red LED while also showing the error on the display. In case of error, try again by repeating process from Step 3. If error continues, STOP and check for any abnormalities with the FLASH GUN or the nut/bolt being tightened.
9. Release the power trigger switch.
10. If the trigger is released prematurely, the display will show an error and the Red LED will be ON. In this case, restart tightening process from step 3.
11. The nut is now tight at the current torque setting. Proceed to the next nut.

## **Tightening with Angle**

1. Set the direction switch to 'R' to tighten. See figure 11 for directional switch.
2. Set the desired pre-torque and angle values as described in "Setting Torque and Angle" section.
3. Follow the steps in Tightening above from step 3 to 5.
4. When preset torque is reached, the FLASH GUN will turn the nut in degrees set by the Angle.
5. When the specified angle is set, the gun will stop, BEEP once and the Green LED will turn ON. If the FLASH Gun reaches its maximum torque before completing the angle, then it will stop with an error: "Angle Failure: Out of Torque Range"
6. Proceed and follow steps 7 to 11 in Tightening above.

## **Loosening**

1. Set the direction switch "L" to loosen. See figure 11 for directional switch. The torque setting will be automatically set to the maximum allowed torque for the particular type of gun, i.e. for FG3 Series FLASH GUNS, the MAX Torque is 3150 ft. lbs.
2. Make sure the torque gun and the reaction arm are in position for loosening.
3. Make sure the reaction arm is seated squarely against a solid reaction point.
4. Press and hold the power trigger switch while the socket turns and loosens the nut.
5. Release the power trigger switch when the nut is loose enough to be removed by hand.



## Memory Options

By pressing the leftmost button and holding it, the memory menu will be displayed. Figure 13 shows the memory options menu. On this menu, you can save the current settings, or load previously stored settings.

There are 8 memory locations for saving and loading both torque and angle settings. Use the up and down arrow keys to choose from the highlighted numbered memory locations. Press the leftmost button to select the current memory location. Press the corresponding down arrow key button to save the current settings to the selected memory location. To Load the contents of the memory location, press the corresponding up arrow key button. To return to Main menu without saving/loading, press the leftmost button.

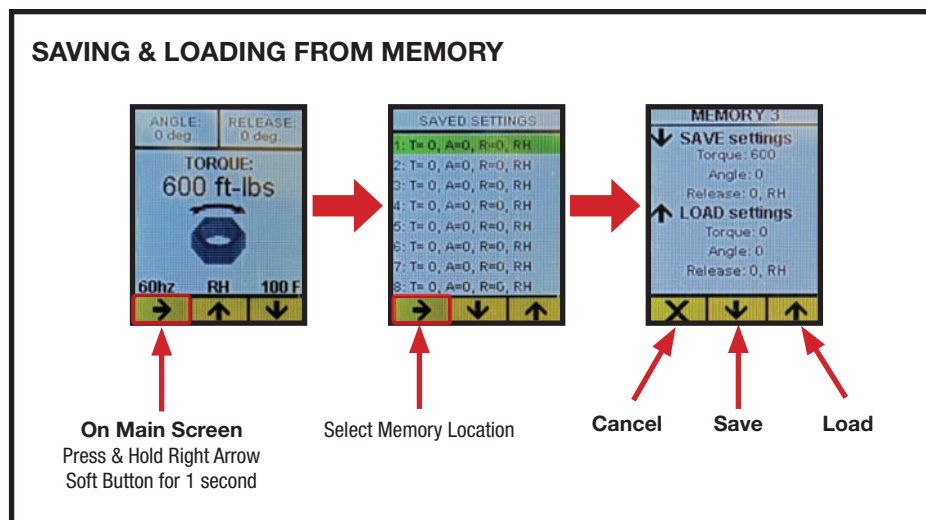


Figure 13: Memory Options

## Additional Options

By simultaneously pressing the leftmost and center buttons and holding them, the Options menu will be displayed. Figure 14 shows the options menu. Press the corresponding up/down arrow keys to highlight the different selection. Press the leftmost button to select the highlighted option.

The options menu gives the following 7 choices:

1. **Beeper:** Turn beeper On/Off. The beeper beeps 4 times to indicate an error. It beeps 1 time for a successful operation.
2. **Output Units:** Change the units to be displayed for the torque setting. It allows the operator to select the preferred units of torque to display.
3. **Display Rotation:** Reserved for adding a future feature to rotate display upside down.
4. **Fastener Type:** Allows setting of left handed or right handed threads and sets functions accordingly. Also offers a setting for “HYTORC Nut” which effectively puts the tool in left handed thread mode.
5. **Change Unlock Code:** Changing some features, such as calibration, requires the use of an unlock code. This function allows you to change the code from the default. The default code is 0.
6. **Firmware Version:** Displays the version of the hardware and firmware for the display (UIC) “User Interface Controller” and (MDC) “Motor Drive Controller” board.
7. **Main Menu:** Returns the user to the main torque setting screen.

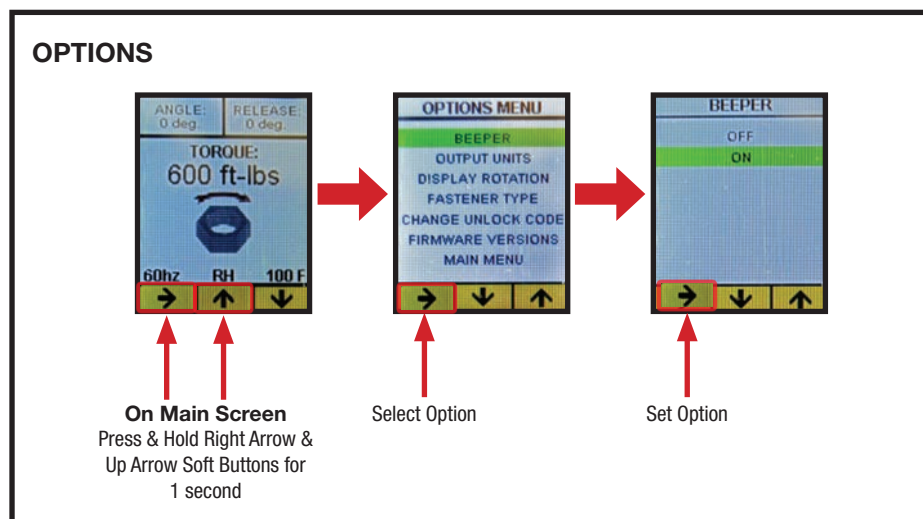


Figure 14: Additional Options

## **HYTORC Washer Overview**

The HYTORC Washer makes the Reaction unnecessary. It is sold and distributed exclusively by HYTORC. The HYTORC Washer is a hex washer that fits under a standard nut and is used in conjunction with the HYTORC Washer drive, a bivalve, concentric sleeve. The nut is driven by the sleeve of the inner HYTORC Washer drive. The reaction of the tool is transmitted to the outer sleeve with the HYTORC Washer drive.



Figure 15: HYTORC Washer and Drive

Safety increases as there are no external moving parts. The system provides a universal HYTORC Washer reaction point for all applications, making custom reaction arms unnecessary. In addition, the thread segment prevents the screw inside the disk to drive, making an otherwise normally required counter pressure unnecessary. The fact that the tightening and the reaction takes place in the same axis, lateral forces are eliminated, the surface friction is balanced, and that the accuracy of the gland is increased.

## **HYTORC Washer Requirements**

- Always use the appropriate size HYTORC Washers for the nuts and bolts you use.
- All specifications of the connection (screw size, material, seal type, etc.) must be coordinated.
- When installing HYTORC Washers, use only original HYTORC accessories. Never use a wrench or other torque drive.

## **HYTORC Washer assembly, use and service (SETUP)**

Correct preparation and use of HYTORC Washer are a prerequisite for good rundown and for safe handling.

## Important Preparation Steps for HYTORC Washer

- Before using the HYTORC Washer the connection and the connection elements must be carefully checked and cleaned.
- Before using the HYTORC Washer the surfaces of the joint, the bolts and the nuts must be thoroughly cleaned and dried.
- The HYTORC Washer discs must be completely dry and free from oil and grease.
- The nut to be mounted above the HYTORC Washer must be lubricated according to the specifications of the torque-biasing force conversion table with MoS<sub>2</sub>.

## Important Installation Steps for HYTORC Washer

- Slide the cleaned and dried bolts through the bolt hole.
- Determine which side of the connection is more suitable for fastening and tightening the bolts. (Working space for bolting, lighting, accessibility)
- Install the clean, dry nut on the opposite side from which you want to tighten.
- Install the disk HYTORC Washer on the side from which you want to tighten by rotating the bolt clockwise until it is hand tight.
- Now install the lubricated nut (on the same side as the HYTORC Washer) by turning it clockwise until it is hand tightened against the HYTORC Washer.



Figure 16: LoaDisc Installed

**NOTE:**

For a correct installation only 3 to 4 threads should be seen beyond the nut to be tightened.

Once all the bolts are prepared following the previous instructions for assembly, tighten the nuts using the HYTORC Washer drive.



Figure 17: Installing Set Screw on HYTORC Washer Drive

## Installing HYTORC Washer Drive

- The set screw for fastening the drive HYTORC Washer is brought in aligned with the milled recess in the ring gear of the tool. See Figure 17 and Figure 18.
- Tighten the set screw and then loosen it again by  $\frac{1}{4}$  turn.



Figure 18: Tighten set screw

## Tightening with HYTORC Washer

- Place the bivalve HYTORC Washer drive of the tool over the nut to be tightened and the HYTORC Washer disc. Set the direction switch to R. (R = clockwise = tighten with right-hand threads)
- Press the trigger of your tool to tighten the nut. (At the beginning of installation, the outer drive will make a short rotation in the opposite direction. Once the rotation of the outer drive stops the response to the HYTORC Washer disc, the inner drive starts pulling the nut.)
- Hold down the trigger until the drive stops the rotation. Then, the desired torque is reached.



Figure 19: HYTORC Washer Drive on Flash

# MAINTENANCE

## Preventative Maintenance

Even though the FLASH can operate virtually maintenance free; good care, proper repairs and predictive maintenance will contribute significantly to longer lasting tool.

- Inspect power cord and fittings before every use.
- Connections must be clean and properly connected before each use.
- Sufficient cooling must always be ensured. The cooling vents must be kept clean, free of adhering dirt and dust, and may not be closed for any reason.
- Keep tools clean and protected from damage.
- Replace worn or damaged fittings or cords.
- When scrapping, the FLASH GUN shall be disposed off according to the local environmental law



**WARNING: TO PREVENT ELECTRICAL SHOCK HAZARD**  
During maintenance, the power supply must be disconnected. Damaged power cables or cords can be hazardous.

## Calibration

Calibration should be performed by a qualified technician. Unlike other electrical and pneumatic torque guns, the FLASH GUN has two steps which involves calibration and verifying calibration.

1. Calibration: Calibrating against a standard and storing the measured torque values into the memory at various calibration points.
2. Calibration Test: Verify calibration by checking the FLASH GUN's torque output against a standard at 5 calibration points with step intervals of 25%. For a quick calibration check, please follow Calibration Test procedure in Figure 20.

Pressing the left and right buttons will make the FLASH GUN display the calibration menu. Next Enter the Unlock code to enter the calibration mode. Follow the steps below to calibrate the gun.

1. Put the FLASH GUN on a calibration stand and plug into an appropriate power outlet.
2. Press leftmost and rightmost buttons simultaneously to put torque gun in Calibration mode.
3. Enter unlock code. (default code is 0)
4. When "Cal Point (#)" is displayed, press and hold the trigger until the torque gun stops turning. Release the trigger. Enter the measured torque value from the calibration stand. Press the Right arrow key to proceed to the next calibration point.
5. The torque gun will now temporarily store the current calibration point and will go to next calibration point.
6. Repeat steps 4 to 6 until about 10 calibration points are stored. If the torque value reaches the maximum torque value of the gun, then the torque gun will stop calibration and ask if you would like to SAVE or discard calibration. If 10 calibration points are done and the torque value does not reach the maximum limit, then the torque gun may ask for few more extra calibration points
7. When all calibration points are completed, the torque gun will ask if you would like to SAVE or CANCEL calibration. Press Down Arrow to SAVE all calibration points or Up Arrow to CANCEL and disregard calibration.
8. Perform Calibration Test on the FLASH GUN as shown in Figure 20 to verify calibration.

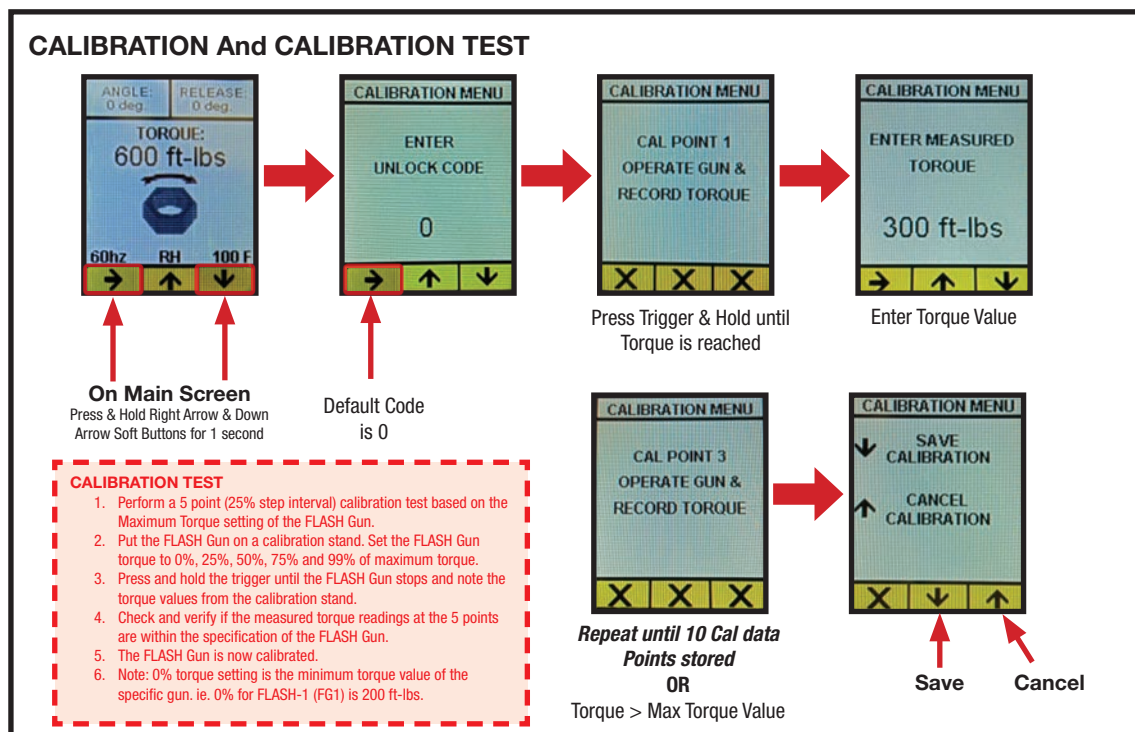


Figure 20: Calibration procedure

# APPENDIX

## FLASH GUN Block Diagram

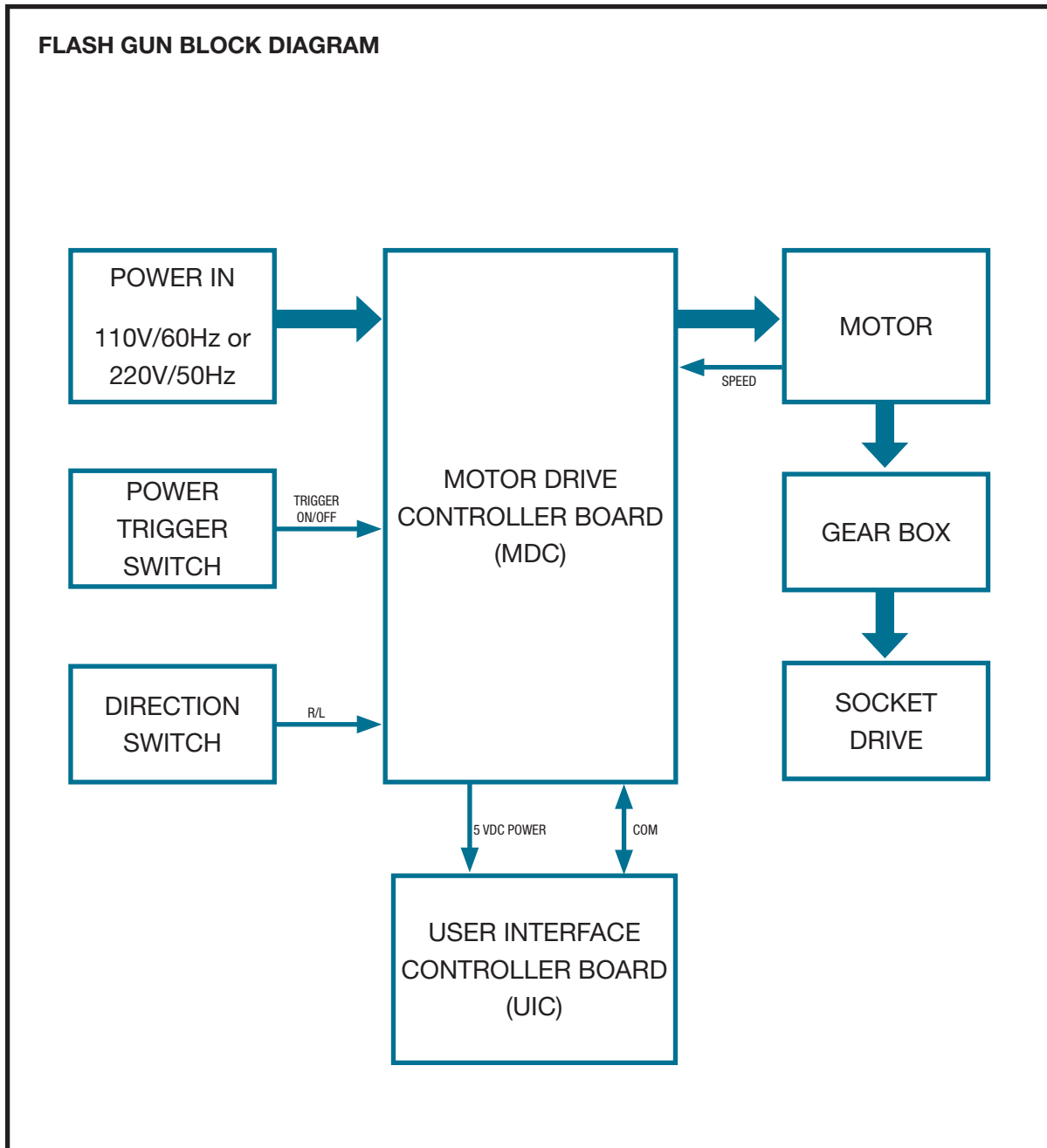


Figure 21: FLASH GUN Block Diagram



## FLASH GUN Screen Navigation

### SETTING TORQUE & ANGLE

SOFT KEYS CORRESPONDING TO GRAPHIC INDICATORS

GO TO NEXT SCREEN    INCREASE VALUE    DECREASE VALUE

### SAVING & LOADING FROM MEMORY

On Main Screen  
Press & Hold Right Arrow Soft Button for 1 second

Select Memory Location

Cancel    Save    Load

Angle    Release Angle

Torque    Direction Indicator

Line Frequency    Motor Temperature

Soft Button Indicators

Ready Green LED    Error Red LED

Busy Yellow LED

Soft Buttons

### OPTIONS

On Main Screen  
Press & Hold Right Arrow & Up Arrow Soft Buttons for 1 second

Select Option

Set Option

### CALIBRATION

On Main Screen  
Press & Hold Right Arrow & Down Arrow Soft Buttons for 1 second

Default Code is 0

Press Trigger & Hold until Torque is

Enter Torque Value

REPEAT UNTIL 10 CAL DATA POINTS STORED

OR  
Torque > Max Torque Value

Save    Cancel

# FLASH GUN SPECIFICATIONS



Table 1 - FLASH GUN Specifications

MODEL	FLASH-5	FLASH-1	FLASH-2	FLASH-3
INPUT VOLTAGE	110VAC 50/60Hz @ 10 AMPS 220VAC 50/60Hz @ 6 AMPS	110VAC 50/60Hz @ 10 AMPS 220VAC 50/60Hz @ 6 AMPS	110VAC 50/60Hz @ 10 AMPS 220VAC 50/60Hz @ 6 AMPS	110VAC 50/60Hz @ 10 AMPS 220VAC 50/60Hz @ 6 AMPS
OUTPUT TORQUE RANGE	185 - 475 FT-LBS 251 - 644 NM	200 - 1250 FT-LBS 271 - 1695 NM	250 - 2200 FT-LBS 271 - 1695 NM	600 - 3150 FT-LBS 813 - 4271 NM
MAX. AMP DRAW	10 AMPS	10 AMPS	10 AMPS	10 AMPS
Height (H)	5-1/2" (13.97 cm)	5-1/2" (13.97 cm)	5-1/2" (13.97 cm)	5-1/2" (13.97 cm)
Length (L)	16-1/2" (44.13 cm)	17-3/8" (44.13 cm)	18-7/8" (47.94 cm)	19-3/8" (49.21 cm)
Width (W)	3-5/8" (9.2 cm)	3-5/8" (9.2 cm)	3-5/8" (9.2 cm)	3-5/8" (9.2 cm)
Output Square Drive	3/4" (1.9 cm)	3/4" (1.9 cm)	1" (2.54 cm)	1" (2.54 cm)
Weight	10.1 lbs. (4.6 kg)	11.7 lbs. (5.3 kg)	18.1 lbs. (8.2 kg)	18.6 lbs. (8.4 kg)
RPM	26 RPM	6.9 RPM	3.3 RPM	2.3 RPM
Accuracy	±3%	±3%	±3%	±3%



Table 2 - Bolt Torque Specifications

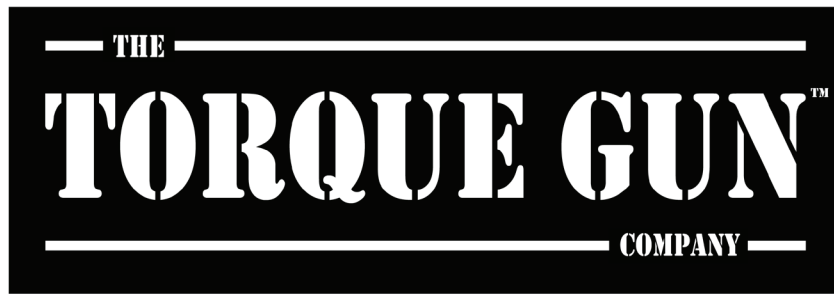
SAE1 SAE2 30,000PSI	ASTM 193 Grade B7 Bolt	Gr. 7 A/F Heavy Hex Nut	Foot Pounds	Estimated Load
1 inch	7/8 inch	1-7/16 inches	300	18,150 lbf
1-1/8 inches	1 inch	1-5/8 inches	425	23,690 lbf
1-1/4 inches			600	29,955 lbf
1-3/8 inches	1-1/8 inches	1-3/16 inches	700	36,990 lbf
	1-1/4 inches	2 inches	800	46,776 lbf
1-1/2 inches			900	44,760 lbf
1-5/8 inches	1-3/8 inches	2-3/16 inches	1,250	53,400 lbf
	1-1/2 inches	2-3/8 inches	1,500	64,617 lbf
1-3/4 inches			1,600	62,400 lbf
1-7/8 inches			1,800	72,300 lbs
	1-5/8 inches	2-9/16 inches	2,000	76,540 lbs
2 inches			2,200	83,100 lbs
	1-3/4 inches	2-3/4 inches	2,600	89,440 lbs
2-1/4 inches			3,000	106,800 lbs
	1-7/8 inches	2-15/16 inches	3,700	110,680 lbs
2-1/2 inches	2 inches	3-1/8 inches	4,000	133,200 lbs
2-3/4 inches			5,100	162,900 lbs



*The Data Above is based on bolts lubricated to manufacturer's specifications. Due to a variation in friction, we recommend in extreme cases to check with the bolt manufacturer, as the chart represents a guideline only.*

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