# PETOL™ SURGRIP™ Friction Tongs

# Operating Manual



**PETOL™ GEARENCH**
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**4450 Highway 6**
**Clifton, Texas 76634**
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**Fax: (254) 675-6100**

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# PETOL™ SURGRIP™ Friction Tong Description

The PETOL™ SURGRIP™ Friction Tongs were designed for making up and breaking out downhole pump and other precision components where marking is prohibited.

The tongs utilize multiple jaws that latch into the handle. The jaws are match-bored to a specific diameter. Additional diameters will require additional tongs.

The tongs use a high strength, heat treated alloy steel for rugged, dependable service and high-quality materials throughout for long life with the toughest jobs.

The ZT1 Friction Tong uses a 17-7/8-inch-long alloy steel handle. It has a jaw width of 2.25 inches. The ZT1 will work diameters from 0.625 to 1.250 inches and up to 500 foot-pounds of torque.

The ZT2 Friction Tong uses a 24-1/8-inch-long alloy steel handle. It has a jaw width of 2.50 inches. The ZT2 will work diameters from 1.245 to 1.800 inches and up to 1200 foot-pounds of torque.

The ZT3 Friction Tong uses a 23-inch-long alloy steel handle. It has a jaw width of 2.50 inches. The ZT3 will work diameters from 1.625 to 2.375 inches and up to 2300 foot-pounds of torque.

The ZT4 Friction Tong uses a 31-inch-long alloy steel handle. It has a jaw width of 3.00 inches. The ZT4 will work diameters from 2.327 to 3.062 inches and up to 3000 foot-pounds of torque.

The ZT5 Friction Tong uses a 36-inch-long alloy steel handle. It has a jaw width of 3.50 inches. The ZT5 will work diameters from 2.875 to 4.077 inches and up to 4500 foot-pounds of torque.

# PETOL<sup>TM</sup> GEARENCH Limited Warranty

**What Is Covered**
PETOL™ GEARENCH tools are expressly warranted to you, the purchaser, to be free of defects in material and workmanship.

**How Long Coverage Lasts**
This express warranty lasts for the lifetime of the PETOL GEARENCH tool. Warranty coverage ends when the tool becomes unusable for reasons other than defects in workmanship or material.

**How Can You Get Warranty Service**
To obtain the benefit of this warranty, contact a PETOL GEARENCH sales representative in Clifton, Texas.
PETOL GEARENCH · 4450 S. Highway 6 · P.O. Box 192 · Clifton, TX 76634

**What Will We Do To Correct Problems**
Warranted products will be repaired or replaced, at PETOL GEARENCH's option, and returned at no charge to you, the original purchaser; or, if after three attempts at repair or replacement during the warranty period, the product defect in material or workmanship persists, you can elect to receive a full refund of your original purchase price for the product.

**What Is Not Covered**
Defects, failures or conditions that are due to normal wear and tear, abuse or misuse, are not covered by this limited warranty. In addition, this limited warranty is in lieu of all other warranties, express or implied, verbal or written. To the maximum extent allowed by law PETOL GEARENCH disclaims all implied warranties, including implied warranties of merchantability and/or fitness for a particular purpose. PETOL GEARENCH also specifically denies any liability for any incidental damages and/or consequential damages, including but not limited to property damage to property other than the product itself, loss of sales profits, down time, costs or any other damages measurable in money, whether or not included in the foregoing enumeration.

Please be advised that some states do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific rights, and you may also have other rights, which vary from state to state, province to province, or country to country.

**Are Personal Injuries Covered**
In the event you, someone working for you, or any other person sustain a personal injury as a result of using the PETOL GEARENCH tool, PETOL GEARENCH limits its potential liability for such a claim or injury to the fullest extent allowed by law, and disclaims and denies any liability for such personal injury.

Please be advised that some states do not allow the exclusion or limitation of liability for personal injuries, so the above limitation or exclusion may not apply to you, or the individual claiming injury.

**No Other Express Warranty Applies**
This PETOL GEARENCH LIMITED WARRANTY is the sole and exclusive warranty, express or implied for PETOL GEARENCH products. No employee, agent, dealer or other person is authorized to alter, modify, expand or reduce the terms of this warranty or to make any other warranty on behalf of PETOL GEARENCH.

**Law Applicable**
All matters related to the sale and/or use of the PETOL GEARENCH tool that is the subject of this limited warranty, along with the construction and enforcement of the terms of this limited warranty itself, shall be subject to the substantive and procedural laws of the state of Texas, not the conflicts of laws provisions of Texas, but rather the laws of Texas themselves.

**Forum Selection Clause**
Any dispute arising out of the sale and/or use of the PETOL GEARENCH tool that is the subject of this limited warranty shall be presented in the form of a claim or lawsuit to the offices of PETOL GEARENCH in Clifton, Bosque County, Texas. No claim or suit may be brought against PETOL GEARENCH, arising out of the sale and/or use of the tool, or arising out of the terms of this warranty, except in such forum. Purchase and/or use of the PETOL GEARENCH tool makes you subject to the benefits and limitations of this limited warranty. Accordingly, any writ, judgment or other enforcement, obtained from a jurisdiction, county, parish, state or federal court or other country, other than from the forum identified above, shall be void and unenforceable against PETOL GEARENCH.

**Arbitration Clause**
In the event of dispute or claim arises out of the sale and/or use of the PETOL GEARENCH tool that is the subject of this limited warranty, or arises out of the interpretation or enforcement of the terms and conditions of this limited warranty, such dispute shall be submitted to binding arbitration pursuant to the rules of the American Arbitration Association. If required to accomplish the purpose of this Arbitration clause, the purchaser hereby expressly waives any right to demand trial by jury.

**Complete Agreement**
This express limited warranty contains the entire agreement regarding express or implied warranties related to the PETOL GEARENCH tool that is the subject of it. No writing or language contained in the purchase order or any other document of the purchaser, or invoice of PETOL GEARENCH or any intermediate seller, shall be construed as modifying, in any way, the rights and liabilities contained in this limited warranty. PETOL GEARENCH expressly disclaims any obligations expressed in any customer purchase order or document that are contrary to the terms and limitations of this warranty.

**Severability**
If any term or limitation contained in this limited warranty is deemed unenforceable by law, then the term shall be severed from the remaining portions of the limited warranty which shall remain enforceable.

All communications to PETOL GEARENCH regarding the use of the tool and any aspect of the sale of the tool of this limited warranty should be addressed to PETOL GEARENCH.
PETOL GEARENCH · 4450 S. Highway 6 · P.O. Box 192 · Clifton, TX 76634

# Safe Practices and Procedures

## Responsibility

"It is the responsibility of the employer to train the employee in the proper selection and usage of tools, chains, etc., and to ensure that they are selected and used in that manner. In many instances, injury results because it is assumed that anybody knows how to use common hand tools. Observations and the record show that this is not the case. A part of every job instruction program should therefore be detailed training in the proper use of hand tools (and of all other special tools and equipment needed to accomplish the job)." - (Source: National Safety Council)

"Employers are responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees." - (Source: OSHA 1910.242A)

**Replacement Parts**

PETOL<sup>TM</sup> SURGRIP<sup>TM</sup> Friction Tongs are bored to size in matched jaw sets. There are no replacement parts for these tongs.

**Safety**

While we pride ourselves on the quality and dependability that we build into PETOL GEARENCH tools and products, we caution users that it is only prudent to know and follow the simple rules of safety when using our products, or anyone else's.

Always follow safe practices and procedures in accordance with the recommendations of OSHA, The National Safety Council (NSC), The Hand Tools Institute (HTI), The International Association of Drilling Contractors (IADC), Etc. All applicable Governmental rules, regulations or restrictions, now in effect or which may be promulgated, take precedence over the suggestions in this publication. The information in this publication is designed to supplement standard safe practices and procedures, not in lieu of, or replacement thereof.

**Safe Practices**

**(Source: The National Safety Council)**

Failure to observe one or more of the following five safe practices accounts for most hand and powered tool accidents:

1. ALWAYS WEAR SAFETY GOGGLES TO PROTECT EYES
2. SELECT THE RIGHT TOOL FOR THE JOB
3. KEEP TOOLS IN GOOD CONDITION
4. USE TOOLS CORRECTLY
5. KEEP TOOLS IN A SAFE PLACE

Safety Goggles must always be worn by persons in any area where hand and powered tools are being used.

Never apply excess leverage to a wrench or tool by means of a "Cheater Bar". Never strike wrenches and tools with hammers or other objects.

All tools should be kept clean, inspected on a regular basis, and replaced when they show signs of wear.

Be especially careful not to place yourself in a position that could result in bodily injury in the event of a failure. Brace yourself firmly and pull rather than push when wrenching. (If necessary, to push, do so with the flat of the hand rather than gripping around the wrench.)

Never stand under or near loads being hoisted off the ground.

READ SAFE PRACTICES AND PROCEDURES MANUAL, CATALOG INFORMATION AND PRODUCT LABELING PRIOR TO OPERATION.

**Safety Sources and Publications**

In the interest of Safety the following sources of Safety information is furnished:

 The Hand Tools Institute (HTI)
 25 North Broadway
 Tarrytown, New York 10591
 (914) 332-0040
 www.hti.org

 The National Safety Council (NSC)
 1121 Spring Lake Drive
 Itasca, Illinois 60143-3201
 (630) 285-1121
 www.nsc.org

 International Safety Council
 1121 Spring Lake Drive
 Itasca, Illinois 60143-3201
 (630) 285-1121

**Responsibility of Distributors**

IT IS THE RESPONSIBILITY OF THE PURCHASERS OF PETOL$^{TM}$ GEARENCH PRODUCTS TO CONVEY THE INFORMATION IN THIS PUBLICATION AND ANY OTHER INFORMATION RELATING TO THE INDIVIDUAL PRODUCT, THROUGH THE CHANNELS OF DISTRIBUTION, DOWN TO AND INCLUDING THE INDIVIDUAL USING THE PRODUCT

**NOTE:**
**In view of the fact that the actual use determines whether safety requirements have been met, the ultimate responsibility to comply rests with the end user.**

The service life of leaf chains can be altered by a variety of adverse operating conditions. The following information discusses the most important of these conditions for consideration when operating or scheduling replacement of leaf chain systems.

**Overloading / Shock Loads / Side Loading**

Attempting to "inch loads which are beyond the rated capacity of the tool.

Striking the tool with a hammer or other object while force is being exerted in an attempt to loosen a "frozen" joint.

Side pull can be caused by pulling or pushing on the tong in a direction that is not along a perpendicular plane, unleveled mounting of the tong or vise, inadequate support of the part being broken out, and improper seating of the part being broken out in the tong or vise. Improper seating will occur when the diameter of the part is not consistent within the width of the tong or vise jaw.

**Environmental Conditions**

Wrenches operate in widely varying environments, from wet outdoor conditions to mildly or highly corrosive industrial atmospheres. They can also be exposed to abrasives such as sand or grit.

The possible effects include:

Moisture - Corrosion and rust reduce strength by causing pitting and cracking.

Temperature - Very cold temperatures reduce strength by embrittlement.

Chemical Solutions or Vapors - Corrosive attack of the components' grain structure and/or the mechanical connections between the components (crevice corrosion) may occur. Cracking often is microscopic. Propagation to complete failure can be eventual or sudden.

Abrasives - Accelerated wearing and scoring of the articulating members (pins and jaws) may occur, with a corresponding reduction in strength. Due to inaccessibility of the bearing surfaces, wear and scoring are not readily noticeable.

These conditions, when coupled with normal wear and inherent residual stress, can result in environmentally assisted failure. It is impossible to predict tong life under complex conditions, as the degree of hostility and its effects are dependent on many variables such as temperature, time of exposure, concentration of corrosive atmosphere or medium, degree of abrasive wear, etc. Establishing the degree and frequency of unpredictable dynamic loading is also difficult.

**Safety Precautions**

1. Always wear safety goggles to protect eyes.

2. Select the right tool for the job.

3. Keep tools in good condition.

4. Use tools correctly.

5. Keep tools in a safe place.

6. Wear protective clothing, gloves and safety shoes as appropriate.

# Operation

The typical application of one PETOL$^{TM}$ SURGRIP$^{TM}$ Friction Tong is shown in the figure below.  Normally backup will be provided by an additional tong or by a vise.  The backup tong or vise is not shown for clarity.  The tong will exert torque when the handle is pulled down. The tong will ratchet when the handle is lifted up.  Ratcheting is used when the tong must be pulled more than once to completely makeup or breakout the connection.

## ZT1 PETOL™ SURGRIP™ Friction Tong
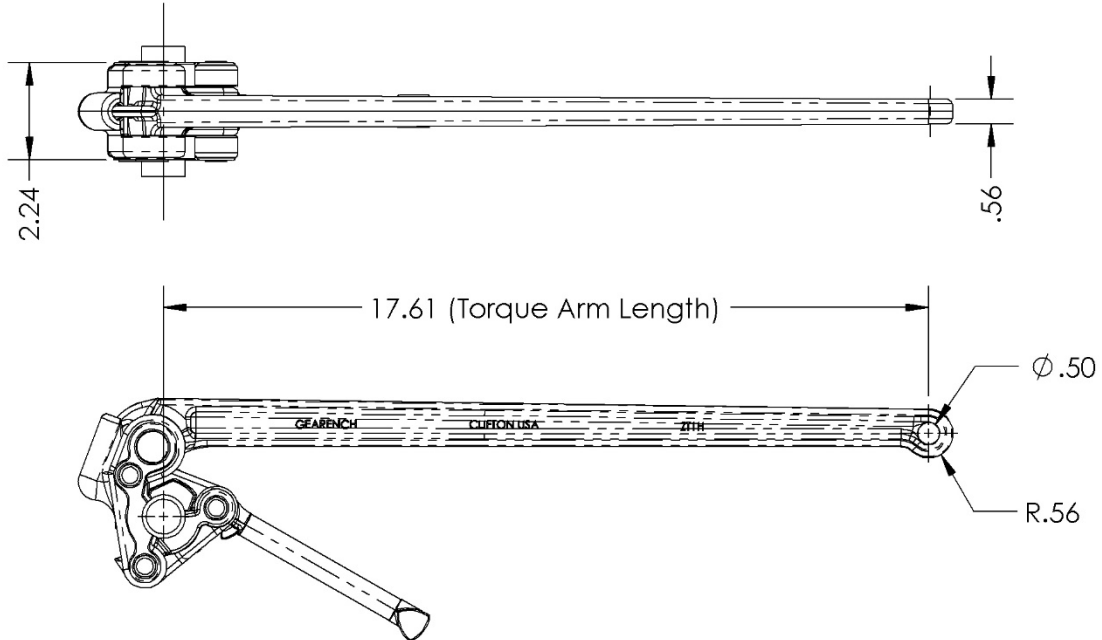
**Dimensions**



**Torque and Diameter Capacity**

The following table lists the maximum working torques and the corresponding handle loads for the diameter range of the tong.

| Diameter (inches) | Torque Arm Length (inches) | Maximum Torque (foot-pounds) | Maximum Handle Load (pounds) |
|---|---|---|---|
| 0.625 – 1.250 | 17.61 | 500 | 340 |

**WARNING:  Under no circumstances should the maximum working load be exceeded.  Overloading may result in injury or death.  Always use a load cell or other calibrated indicating device to monitor the line pull on the tong to avoid an overload.**

**Torque – Handle Load Formulas**

The following formula is used to determine the handle force required to produce a known torque:
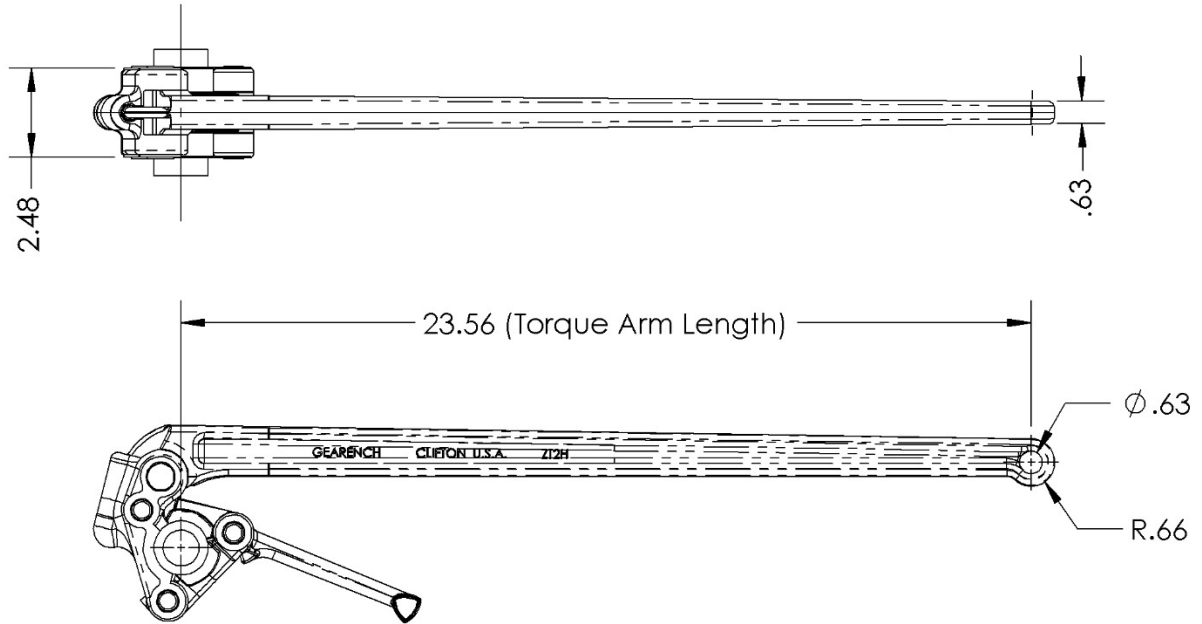
$$F = T / 1.468$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.  To find the torque produced from an observed handle force, use the following formula:

$$T = F * 1.468$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.

## ZT2 PETOL™ SURGRIP™ Friction Tong

**Dimensions**



**Torque and Diameter Capacity**

The following table lists the maximum working torques and the corresponding handle loads for the diameter range of the tong.

| Diameter (inches) | Torque Arm Length (inches) | Maximum Torque (foot-pounds) | Maximum Handle Load (pounds) |
|---|---|---|---|
| 1.245 – 1.800 | 23.56 | 1200 | 610 |

**WARNING:  Under no circumstances should the maximum working load be exceeded.  Overloading may result in injury or death.  Always use a load cell or other calibrated indicating device to monitor the line pull on the tong to avoid an overload.**

**Torque – Handle Load Formulas**

The following formula is used to determine the handle force required to produce a known torque:
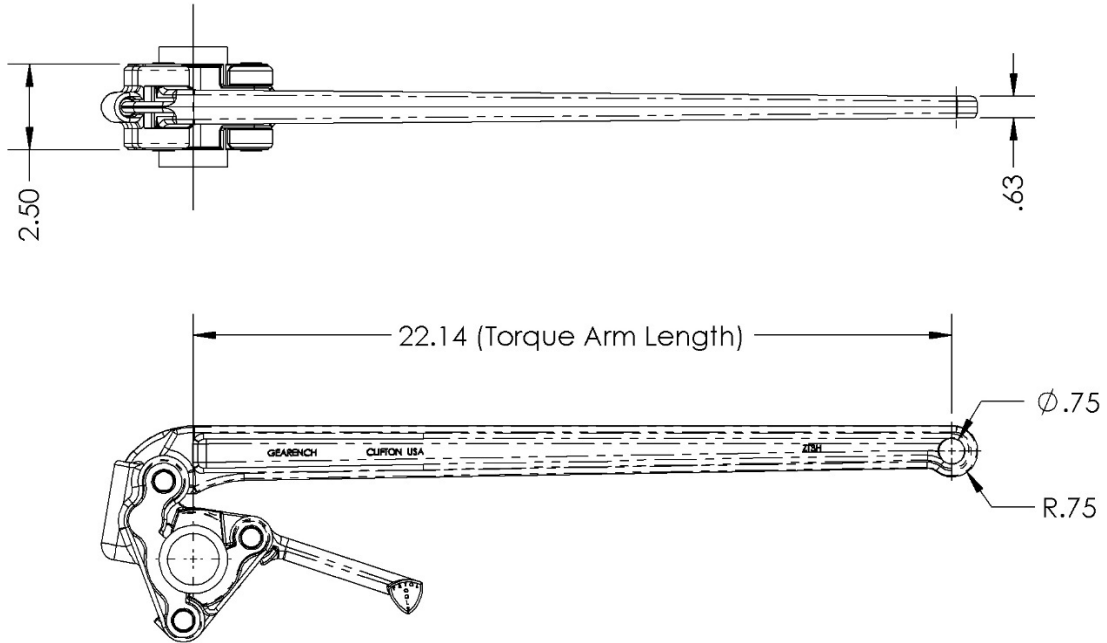
$$F = T / 1.963$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.  To find the torque produced from an observed handle force, use the following formula:

$$T = F * 1.963$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.

## ZT3 PETOL™ SURGRIP™ Friction Tong

**Dimensions**



**Torque and Diameter Capacity**

The following table lists the maximum working torques and the corresponding handle loads for the diameter range of the tong.

| Diameter (inches) | Torque Arm Length (inches) | Maximum Torque (foot-pounds) | Maximum Handle Load (pounds) |
|---|---|---|---|
| 1.625 – 2.375 | 22.14 | 2300 | 1240 |

**WARNING: Under no circumstances should the maximum working load be exceeded. Overloading may result in injury or death. Always use a load cell or other calibrated indicating device to monitor the line pull on the tong to avoid an overload.**

**Torque – Handle Load Formulas**

The following formula is used to determine the handle force required to produce a known torque:
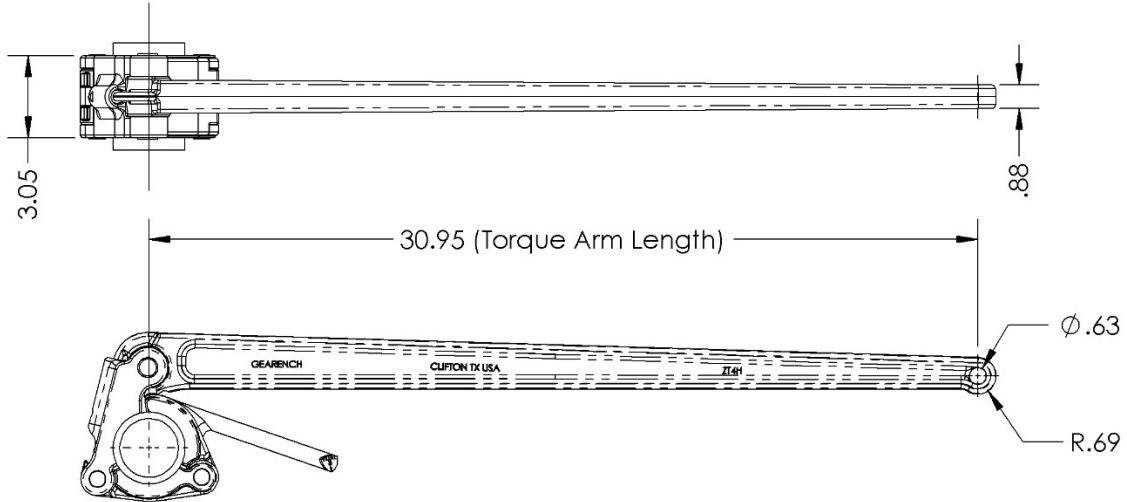
$$F = T / 1.845$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds. To find the torque produced from an observed handle force, use the following formula:

$$T = F * 1.845$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.

## ZT4 PETOL™ SURGRIP™ Friction Tong

**Dimensions**



**Torque and Diameter Capacity**

The following table lists the maximum working torques and the corresponding handle loads for the diameter range of the tong.

| Diameter (inches) | Torque Arm Length (inches) | Maximum Torque (foot-pounds) | Maximum Handle Load (pounds) |
|---|---|---|---|
| 2.327 – 3.062 | 30.95 | 3000 | 1160 |

**WARNING:  Under no circumstances should the maximum working load be exceeded.  Overloading may result in injury or death.  Always use a load cell or other calibrated indicating device to monitor the line pull on the tong to avoid an overload.**

**Torque – Handle Load Formulas**

The following formula is used to determine the handle force required to produce a known torque:
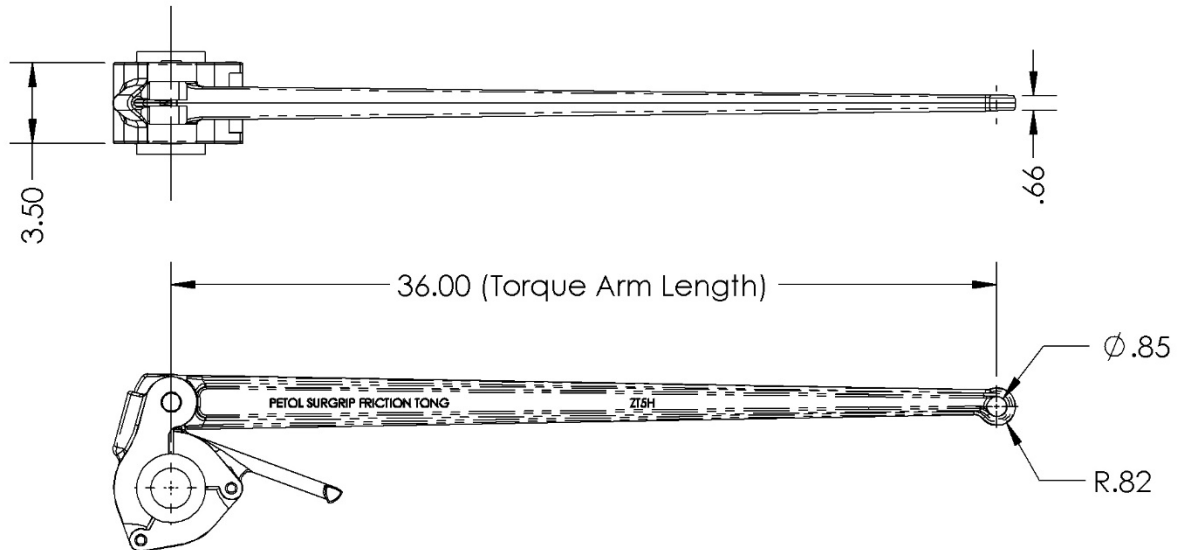
$$F = T / 2.579$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.  To find the torque produced from an observed handle force, use the following formula:

$$T = F * 2.579$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.

## ZT5 PETOL™ SURGRIP™ Friction Tong

**Dimensions**



**Torque and Diameter Capacity**

The following table lists the maximum working torques and the corresponding handle loads for the diameter range of the tong.

| Diameter (inches) | Torque Arm Length (inches) | Maximum Torque (foot-pounds) | Maximum Handle Load (pounds) |
|---|---|---|---|
| 2.875 – 4.077 | 36.00 | 4500 | 1500 |

**WARNING: Under no circumstances should the maximum working load be exceeded. Overloading may result in injury or death. Always use a load cell or other calibrated indicating device to monitor the line pull on the tong to avoid an overload.**

**Torque – Handle Load Formulas**

The following formula is used to determine the handle force required to produce a known torque:

$$F = T / 3$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.  To find the torque produced from an observed handle force, use the following formula:

$$T = F * 3$$

Where F is the handle force in pounds and T is the desired torque in foot-pounds.