

PETOL™ Bull Tong

LA116H

Operating Manual

GEARENCH™
P.O. Box 192
4450 South Highway 6
Clifton, Texas 76634
Phone: (254) 675-8651
Fax: (254) 675-6100

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LA116H PETOL™ Bull Tong Description

The PETOL™ Bull Tongs were designed for making up and breaking out casing, drill pipe, and tubular products requiring substantial torque. The LA116H will work diameters from 16 inches to 40 inches and up to 81,900 foot pound of torque.

The tong is adjusted by exchanging chain sections and chain hooks to work the various diameters.

The Bull Tongs have the following features:

- A high strength, heat treated alloy chain for rugged, dependable service.

- High strength alloy steels used throughout for long life with the toughest jobs.

- A hanger attached to the tong handle to suspend the tong during operation when used on vertical pipe applications.

Warranty

What Is Covered

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 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 GEARENCH sales representative in Clifton, Texas.
GEARENCH · 4450 South Highway 6 · P.O. Box 192 · Clifton, TX 76634

What Will We Do To Correct Problems

Warranted products will be repaired or replaced, at 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 GEARENCH disclaims all implied warranties, including implied warranties of merchantability and/or fitness for a particular purpose. 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 GEARENCH tool, 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 GEARENCH LIMITED WARRANTY is the sole and exclusive warranty, express or implied for 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 GEARENCH.

Law Applicable

All matters related to the sale and/or use of the 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 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 GEARENCH in Clifton, Bosque County, Texas. No claim or suit may be brought against 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 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 that from the forum identified above, shall be void and unenforceable against GEARENCH.

Arbitration Clause

In the event of dispute or claim arises out of the sale and/or use of the 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 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 GEARENCH or any intermediate seller, shall be construed as modifying, in any way, the rights and liabilities contained in this limited warranty. 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 GEARENCH regarding the use of the tool and any aspect of the sale of the tool of this limited warranty should be addressed to GEARENCH.

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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

Use only PETOL™ replacement parts - no other parts are of comparable strength, quality and interchangeability.

Safety

While we pride ourselves on the quality and dependability we build into 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 National Association of Chain Manufacturers (NACM), 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.

Spinning and drill pipe chain, cathead chain, and the PETOL™ Connecting Link attachment are designed for the specific purpose for which the name indicates. Chains and attachments that are to be used for any other purpose should be selected in accordance with the recommendations of ASTM, NACM, Rigger's Handbook, and the commercial chain manufacturer's technical manuals.

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 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, unlevelled 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

Wrench chains 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 chain strength by causing pitting and cracking.

Temperature - Very cold temperatures reduce chain strength by embrittlement.

Chemical Solutions or Vapors - Corrosive attack of the chain components' grain structure and/or the mechanical connections between the chain 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 chain members (pins and plates) may occur, with a corresponding reduction in chain strength. Due to inaccessibility of the bearing surfaces (pin surfaces and plate apertures), wear and scoring are not readily noticeable.

These conditions, when coupled with normal chain wear and inherent residual stress (normally in the chain as constructed), can result in environmentally assisted failure. It is impossible to predict chain 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.

Normal Life Expectancy

A leaf chain's normal life expectancy can be expressed as a maximum percent of elongation. This is generally between 2% and 3% of pitch. As the chain flexes back and forth, the bearing joints (pins and inside link plates) gradually wear from articulation. As with all steel bearing surfaces, the precision hardened steel joints of leaf chain require a constant film of oil between mating parts to prevent wear and to resist corrosion.

Lubrication

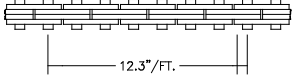
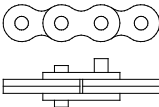






One of the most important but often-overlooked factors is adequate lubrication. In addition to reducing internal friction, maintaining a film of oil on all chain surfaces will inhibit rusting and corrosion. This is important as corrosion of highly stressed, hardened steel chain components can cause a major reduction in the load capacity of leaf chain and result in link plate cracking.

Protection from corrosion is important in storage as well as in service. The factory lubricant applied to PETOL™ Chain is a “Fingerprint Neutralizing Water-Displacing Corrosion Preventative”. This is an excellent rust and corrosion inhibitor for chains in storage. When installing these chains new, do not attempt to steam clean or degrease this lubricant. A grade of SAE 30 or 40 weight, non-detergent motor oil should be used as supplemental lubricant and a film of this oil should be maintained on all surfaces and internal bearing joints. Also, do not attempt to paint new chains. Though painting may help inhibit corrosion, it will seal off critical clearances and restricts oil from reaching the pin surfaces where it is needed for good joint lubrication.

When operating in dusty environments, lubricated chains will accumulate a paste-like buildup of grime. At periodic intervals, this buildup should be removed by cleaning and the chain should be immediately re-lubricated. Do not use caustic or acid type cleaners; use a stiff brush and a certified safe petroleum base solvent.

Periodic Inspection List for PETOL™ Special Chain

1. PRIOR TO EACH USE, LEAF CHAIN AND TOOLS SHOULD BE INSPECTED FOR SERVICEABILITY AND LUBRICATION.
2. USE ONLY PETOL™ AND TITAN™ REPLACEMENT PARTS - NO OTHER PARTS ARE OF COMPARABLE STRENGTH, QUALITY, AND INTERCHANGEABILITY.

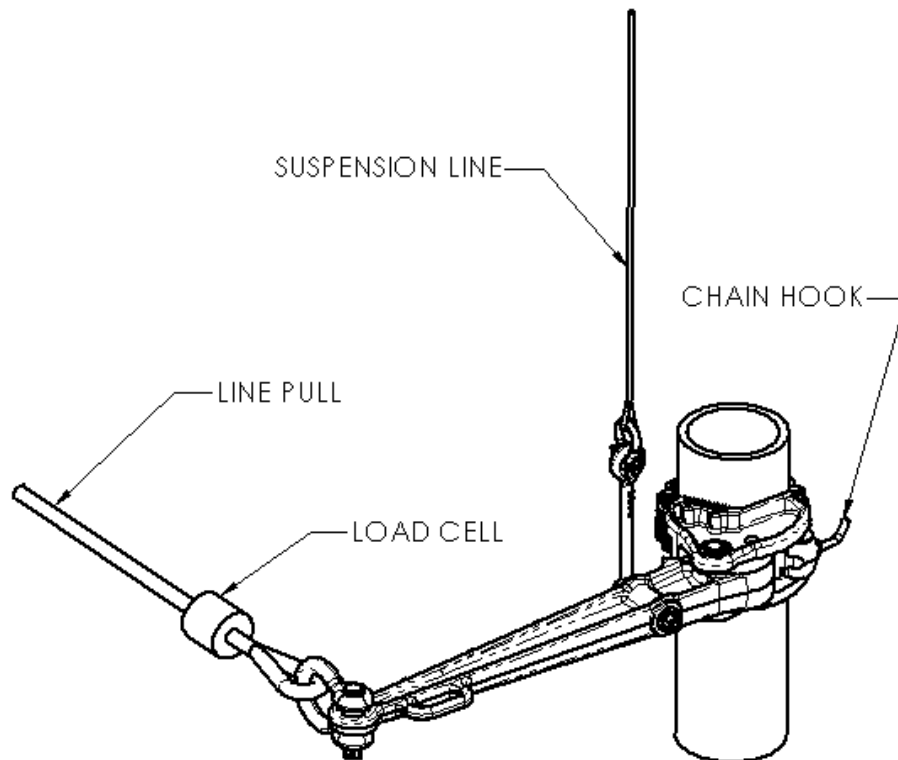
APPEARANCE AND/OR SYMPTOM	PROBABLE CAUSE	CORRECTION
<p>Excessive Length (Elongation)</p> 	<p>Normal wear</p> <p>Permanent deformation (stretch) from overload</p>	<p>Replace chain</p> <p>Replace chain and correct cause of overload</p>
<p>Abnormal Protrusion of Pins</p> 	<p>Overloading</p> <p>Inadequate lubrication</p> <p>Side loading</p>	<p>Replace chain and correct cause of overload</p> <p>Replace chain and improve lubrication</p> <p>Replace chain and correct cause of side load</p>
<p>Cracked Plates (Fatigue)</p> 	<p>Overloading</p> <p>Side loading</p>	<p>Replace chain and correct cause of overload</p> <p>Replace chain and correct cause of side load</p>
<p>Arc-Like Cracked Plates (Stress Corrosion)</p> 	<p>Severe rusting or exposure to acidic or caustic medium, plus static stress at press fit between pin and plate</p>	<p>Replace chain and protect from hostile environment</p>
<p>Enlarged Holes</p> 	<p>Overloading</p>	<p>Replace chain and correct cause of overload</p>
<p>Cracked Plates (Corrosion Fatigue) Perpendicular to Pitch Line, plus rust or other evidence of chemical corrosion</p> 	<p>Corrosive environment</p>	<p>Replace chain and protect from hostile environment</p>
<p>Fractured Plates (Tension Mode)</p> 	<p>Overloading</p>	<p>Replace chain and correct cause of overload</p>
<p>Tight Joints</p> 	<p>Dirt or foreign substance packed in joints</p> <p>Corrosion and rust</p> <p>Bent pins</p>	<p>Clean and relube</p> <p>Replace chain and protect from hostile environment</p> <p>Replace chain</p>

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.
7. Use lengths of assembled chain. Do not build lengths from individual components.
8. Do not attempt to rework damaged chain by replacing only the components obviously faulty. The entire chain may be compromised and should be discarded.
9. Never electroplate assembled leaf chains or components. Plating will result in failure from hydrogen embrittlement.
10. Do not weld any chain or component. Welding spatter should never be allowed to come into contact with chain or components.
11. Leaf chains are manufactured exclusively from heat-treated steels and therefore must not be annealed. If heating a chain with a cutting torch is absolutely necessary for removal, the chain should not be reused.
12. Inspect chains frequently and regularly for link plate cracking, pin turning, pin protrusion and corrosion.
13. Use only PETOL™ & TITAN™ replacement parts to ensure proper strength.

Operation

The typical application of one Bull Tong is shown in the figure below. Normally an additional tong is used as a backup. The backup tong is not shown for clarity. The tong will exert torque in the direction shown. The tong will ratchet when moved in a direction opposite to the line pull. Ratcheting is used when the tong must be pulled more than once to completely makeup or breakout the connection.

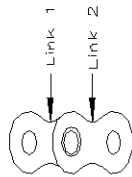


Suspension

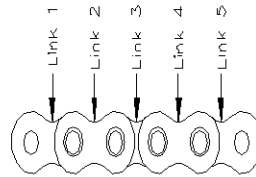
When working vertical pipe, the tong should be suspended by the attached hanger. Adjust the hanger to obtain the best possible balance of the tong. Always use a suspension line of adequate capacity to safely hold up the tong during operation.

Chain Identification Guide

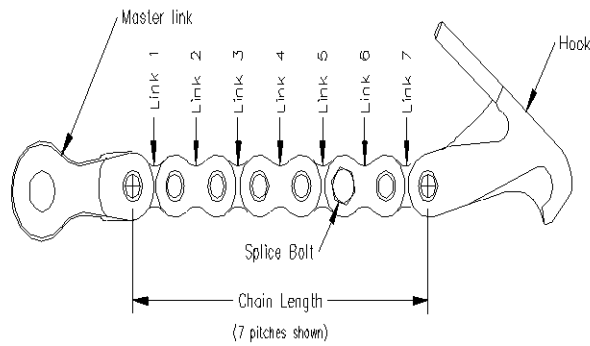
2 LINK SECTION



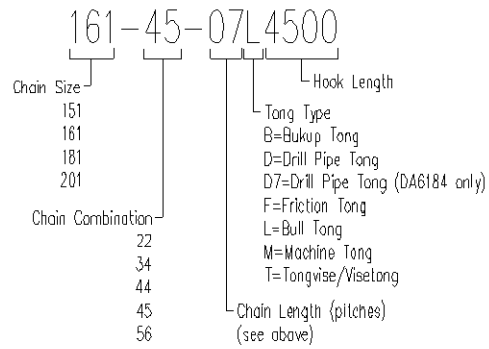
5 LINK SECTION



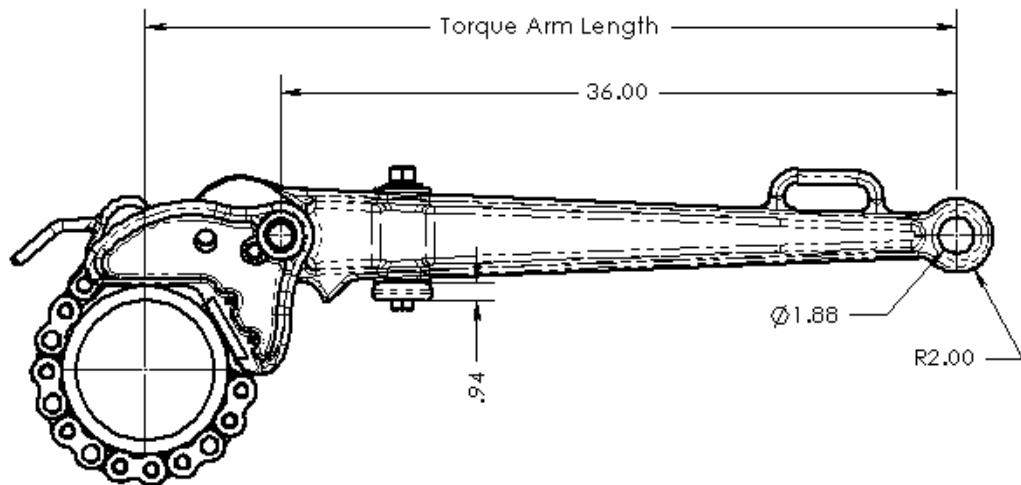
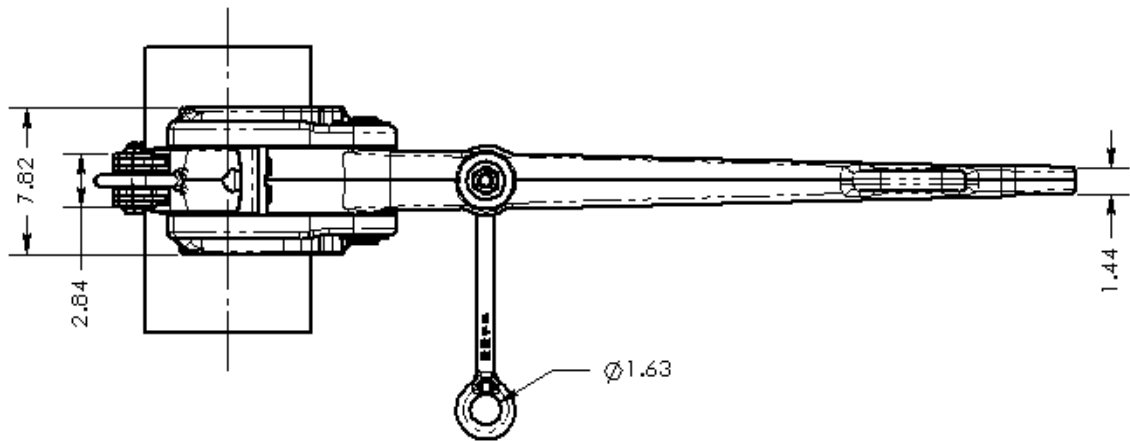
CHAIN ASSEMBLY



THIS IS WHAT A CHAIN PART NUMBER TELLS YOU



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	Torque Arm Length (inches)	Maximum Torque (foot-pounds)	Maximum Line Pull (pounds)
16	44.62	78,600	21,100
17	44.83	78,600	21,100
18	45.03	78,700	21,000
19	45.24	78,800	20,900
20	45.45	78,900	20,800
21	45.65	79,000	20,800
22	45.86	79,100	20,700
23	46.07	79,200	20,600
24	46.28	79,300	20,600
25	46.48	79,400	20,500
26	46.69	79,600	20,400
27	46.90	79,700	20,400
28	47.10	79,800	20,300
29	47.31	80,000	20,300
30	47.52	80,100	20,200
31	47.72	80,300	20,200
32	47.93	80,500	20,100
33	48.14	80,600	20,100
34	48.35	80,800	20,100
35	48.55	81,000	20,000
36	48.76	81,200	20,000
37	48.97	81,300	19,900
38	49.17	81,500	19,900
39	49.38	81,700	19,900
40	49.59	81,900	19,800

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.

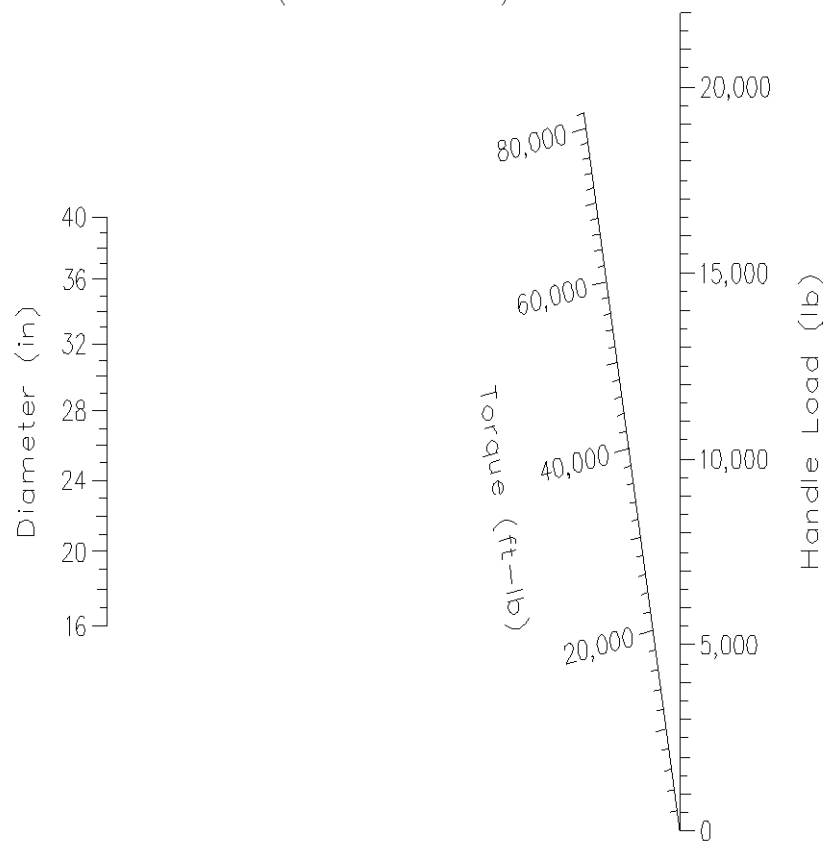
Chain Selection

The following table lists the diameter range of all chain assemblies used with this tong.

Chain	Min Dia. (inches)	Max Dia. (inches)	Chain	Min Dia. (inches)	Max Dia. (inches)
161-45-27L6250	16	16-5/8	161-45-49L6250	28-1/8	28-5/8
161-45-29L4500	16-1/8	17-1/8	161-45-51L4500	28-3/4	29-1/4
161-45-29L5375	16-3/8	17-3/8	161-45-51L5375	29	29-1/2
161-45-29L6250	16-5/8	17-5/8	161-45-51L6250	29-1/4	29-3/4
161-45-31L4500	17-1/8	18-1/8	161-45-53L4500	29-3/4	30-1/4
161-45-31L5375	17-1/2	18-1/2	161-45-53L5375	30	30-1/2
161-45-31L6250	17-3/4	18-3/4	161-45-53L6250	30-3/8	30-7/8
161-45-33L4500	18-1/2	19-3/8	161-45-55L4500	31	31-3/8
161-45-33L5375	18-3/4	19-5/8	161-45-55L5375	31-1/4	31-5/8
161-45-33L6250	19	19-7/8	161-45-55L6250	31-1/2	31-7/8
161-45-35L4500	19-5/8	20-1/2	161-45-57L4500	32	32-1/2
161-45-35L5375	19-7/8	20-3/4	161-45-57L5375	32-1/2	32-3/4
161-45-35L6250	20-1/8	21	161-45-57L6250	32-3/4	33
161-45-37L4500	20-3/4	21-1/2	161-45-59L4500	33-1/8	33-1/2
161-45-37L5375	21-1/8	21-7/8	161-45-59L5375	33-1/2	33-3/4
161-45-37L6250	21-3/8	22-1/8	161-45-59L6250	33-3/4	34-1/8
161-45-39L4500	21-7/8	22-5/8	161-45-61L4500	34-1/4	34-5/8
161-45-39L5375	22-1/4	23	161-45-61L5375	34-5/8	34-7/8
161-45-39L6250	22-1/2	23-1/4	161-45-61L6250	34-7/8	35-1/8
161-45-41L4500	23	23-3/4	161-45-63L4500	35-1/4	35-5/8
161-45-41L5375	23-3/8	24-1/8	161-45-63L5375	35-5/8	36
161-45-41L6250	23-1/2	24-1/4	161-45-63L6250	36	36-1/4
161-45-43L4500	24-1/8	24-7/8	161-45-65L4500	36-3/8	36-3/4
161-45-43L5375	24-3/8	25-1/8	161-45-65L5375	36-3/4	37
161-45-43L6250	24-5/8	25-3/8	161-45-65L6250	37	37-1/4
161-45-45L4500	25-1/4	25-7/8	161-45-67L4500	37-3/8	37-7/8
161-45-45L5375	25-5/8	26-1/4	161-45-67L5375	37-7/8	38-1/8
161-45-45L6250	25-7/8	26-1/2	161-45-67L6250	38-1/8	38-3/8
161-45-47L4500	26-3/8	27	161-45-69L4500	38-1/2	38-7/8
161-45-47L5375	26-5/8	27-1/4	161-45-69L5375	38-7/8	39-1/8
161-45-47L6250	27	27-5/8	161-45-69L6250	39-1/8	39-1/2
161-45-49L4500	27-5/8	28-1/8	161-45-71L4500	39-5/8	40
161-45-49L5375	27-7/8	28-3/8			

Torque – Handle Load Diagram

Handle Load – Torque Chart
LA116H Petrol Bull Tong
(161-45 chain)



To use chart:

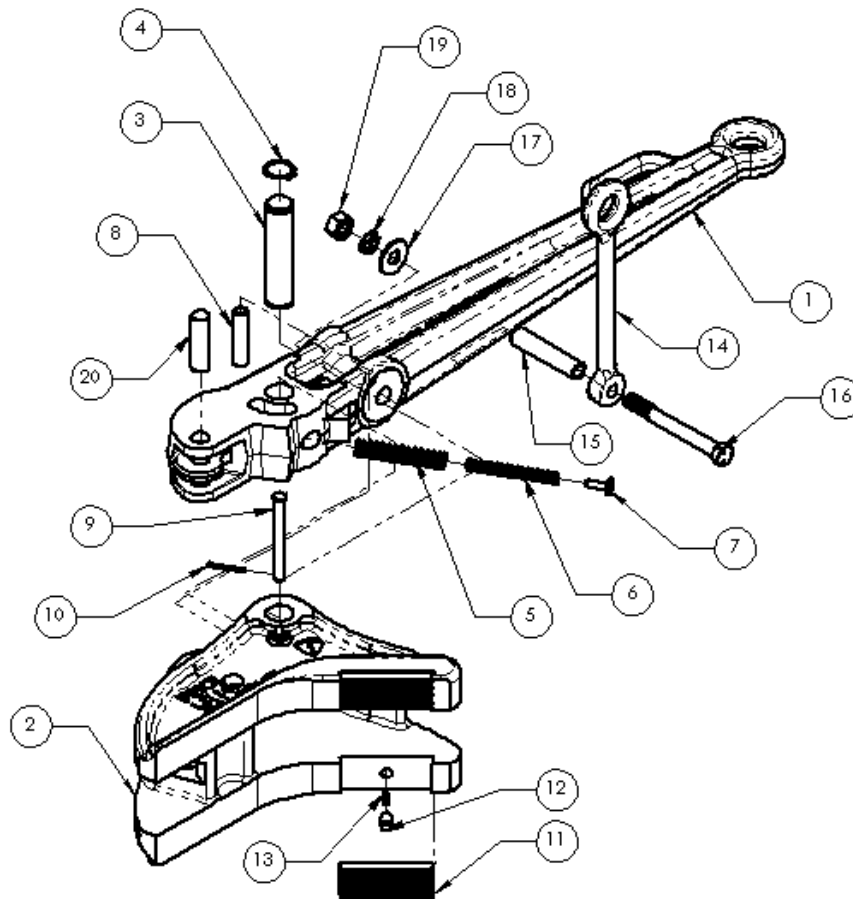
Draw a line from the diameter of the pipe through the desired torque. Read the handle load from the right hand column.

Parts List

The following drawings, diagrams, and parts lists describe all parts, which may be needed as replacement items.

All tong components are manufactured only by GEARENCH™. DO NOT ATTEMPT TO SUBSTITUTE THESE COMPONENTS. The tong will not work properly unless these components are matched to the specific application. Consult our factory as your requirements change. Any non-GEARENCH substitutions of these components void all warranties and subject the user to assumption of liabilities resulting from subsequent use.

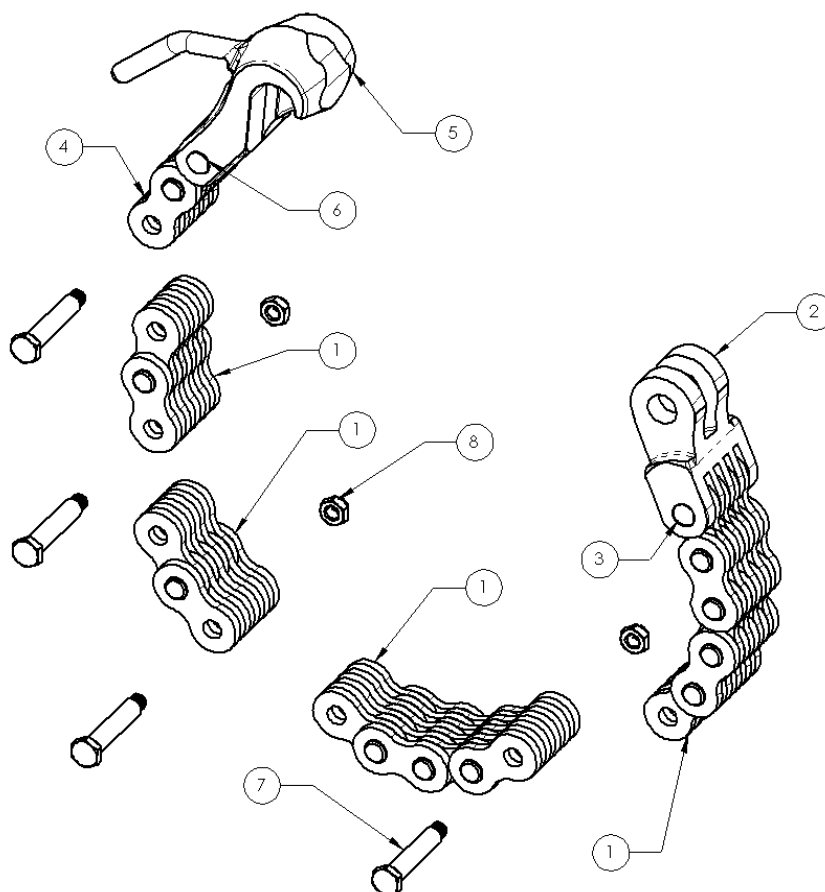
Tong Assembly Parts List



Tong Assembly Parts List

Item	Qty.	Part Number	Description
1	1	LH116H	Handle
2	1	LJ116H	Jaw
3	1	HP249	Jaw-handle pin with kliplings
4	2	HXRR150	Retaining ring only
5	1	HS18	Spring (outside)
6	1	HS09	Spring (inside)
7	1	HG09	Spring guide
8	1	HU36	Spring pin bushing
9	1	HP250	Spring pin with cotter
10	1	HXC003	Spring pin cotter only
11	2	HI06D	Diamond point insert
12	2	HP904	Insert key
13	2	HS21	Insert key spring
14	1	HH16	Bar hanger
15	1	HU49	Hanger bushing
16	1	HB19	Hanger bolt with nut
17	1	HXW001	Hanger flat washer
18	1	HXW002	Hanger lock washer
19	1	HXN023	Hanger nut only
20	1	HP234	Master link – handle pin
21	1	See tables	Chain assembly (not shown)

Chain Assembly Parts List



Item	Part No.	Description
1	161-45-02	Special chain only
1	161-45-04	Special chain only
1	161-45-05	Special chain only
1	161-45-07	Special chain only
2	HM06-45	Master link
3	HP247	Master link – chain rivet
4	161-45-02-4500	Chain hook assembly
4	161-45-02-5375	Chain hook assembly
4	161-45-02-6250	Chain hook assembly
5	HC01-45-4500	Chain hook only
5	HC01-45-5375	Chain hook only
5	HC01-45-6250	Chain hook only
6	HP247	Chain hook rivet
7	HB52	Splice bolt with nut
8	HXN016	Splice bolt nut only

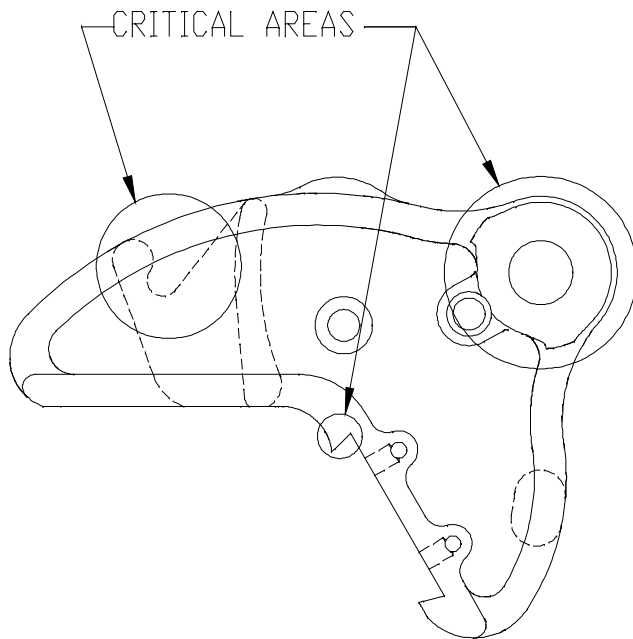
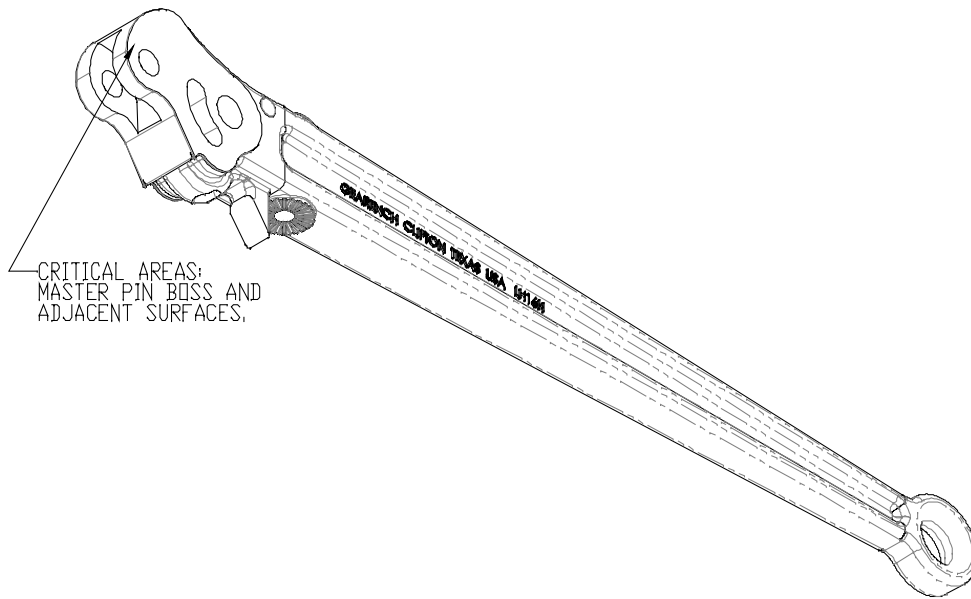
Wear Limits

The following table indicates limiting diameters on the components of the PETOL™ Bull Tong. When localized wear is beyond any one of the limits indicated, the component should be replaced.

Part Number	Description	Location	Limit Dimension
HP249	Jaw – handle pin	Pin body diameter	1.485 (min)
HP234	Chain – handle pin	Pin body diameter	0.985 (min)
HB52	Chain splice bolts	Bolt body diameter	0.615 (min)
161-45-XX	Chain links	Pin hole diameter	0.640 (max)
161-45-XX	Chain links	Pitch center – center	1.738 (max per pitch)
LH116H	Handle	Jaw pin hole diameter	1.525 (max)
LH116H	Handle	Chain pin hole diameter (master link)	1.025 (max)
LH116H	Handle	Load loop diameter	2.125 (max)
LJ116H	Jaw	Jaw pin hole diameter	1.525 (max)

Non-Destructive Evaluation

The figures below indicate the critical areas of the tong handle and jaw. A critical area is defined as an area in which no unrepaired crack indications are permitted and in which no major weld repairs are permitted. There are no critical areas on the bar hanger. Weld repairs are only permitted on the handle, jaw, and bar hanger.



Weld Repairs

Scope:

This procedure is to be followed for minor repairs of crack indications in heat treated alloy steels. A weld repair shall be considered minor when the depth of the cavity does not exceed 30% of the actual wall thickness or 1 inch, whichever is smaller, or when the extent of the cavity does not exceed approximately 10 square inches. Major weld repairs must be performed by GEARENCH™ or an approved repair center using appropriate procedures followed by full heat treatment and load testing.

Application:

This procedure applies to steel castings, forgings and, wrought with carbon content between 0.15% and 0.31%.

Weld preparation:

The crack indication is to be removed by carbon arc gouging, grinding, or machining until all indication is removed. Magnetic particle inspection shall be used to verify that the crack indication has been removed.

Filler material and process:

Repairs made with the FCAW process shall use a filler material of class E120T5-K4 or equivalent with CO₂ shielding gas. Repairs made with the SMAW process shall use a filler material of type E-12018-M. All welding is to be performed by a qualified welder.

Preheat:

Preheat the weld area to 300°F minimum.

Interpass temperature:

The interpass temperature is to be 600°F maximum. All weld slag to be removed prior to application of additional layers by chipping, grinding or wire brushing. Do not peen the weld repair.

Post weld heat treatment:

Do not allow weld to cool below 300°F before stress relief. Post heat immediately after welding to 1010 - 1040°F for 1 hour per inch of thickness, 2 hours minimum at temperature. Water quench after stress relief.

Weld blending and inspection:

The weld is to be ground flush with the adjacent parent material. The weld is to be inspected by magnetic particle to verify that the weld area is free of all crack indications.