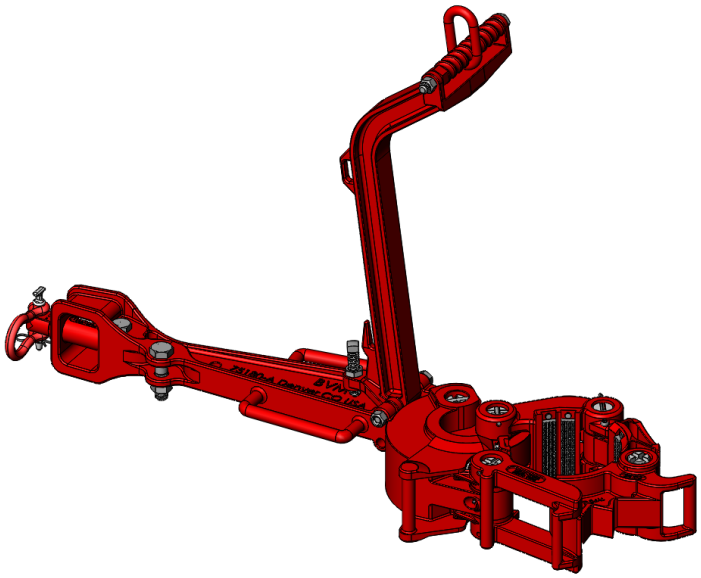
BVM Corporation Maintenance Manual
MANUAL TONGS

Part number: _____ **Serial Number: _____**



Safety

CAUTION: Practice safety in the operation and maintenance and use only approved safety methods, materials and tools. Keep hands away from any pinch point or undesignated areas; use only the provided handles for operating the tongs.

WARNING: Tongs which have experienced wear beyond established wear criteria set by OEM, or are found to have cracks must be replaced or repaired by a BVM authorized repair facility.

WARNING: Only original BVM parts may be used. Tongs are produced from cast alloy heat treated steel and must not be welded in the field. Improper welding can cause cracks and brittleness in heat-affected areas which can result in dramatic weakening of the part and possible failure. Repairs involving welding and/or machining should be performed only by a BVM authorized repair facility. Using a Tong that has been improperly welded or repaired is dangerous.

NOTE: The owner and user together with the manufacturer should jointly develop and update inspection, maintenance, repair and remanufacture procedures consistent with equipment application, loading, work environment, usage and other operational conditions. These factors may change from time to time as a result of new technology, equipment history, product improvements, new maintenance techniques and changes in service conditions.

Load test

WARNING: BVM tongs are load tested after manufacture or repair to 1.5x load rating. Load testing is mandatory on tongs which have not been load tested before. Load testing to 1x rating is recommended annually for recertification. In addition, after the load test, an annual inspection should be performed.

Confidentiality Statement

Note: Original Instructions are published in English; in the event the end-user may wish to obtain a translation of these in the official language of the country in which the machinery is to be used please contact your local BVM representative or BVM directly. Please note that this service may not be free of charge. Original Instruction can be downloaded from www.bvmcorp.com

Contents

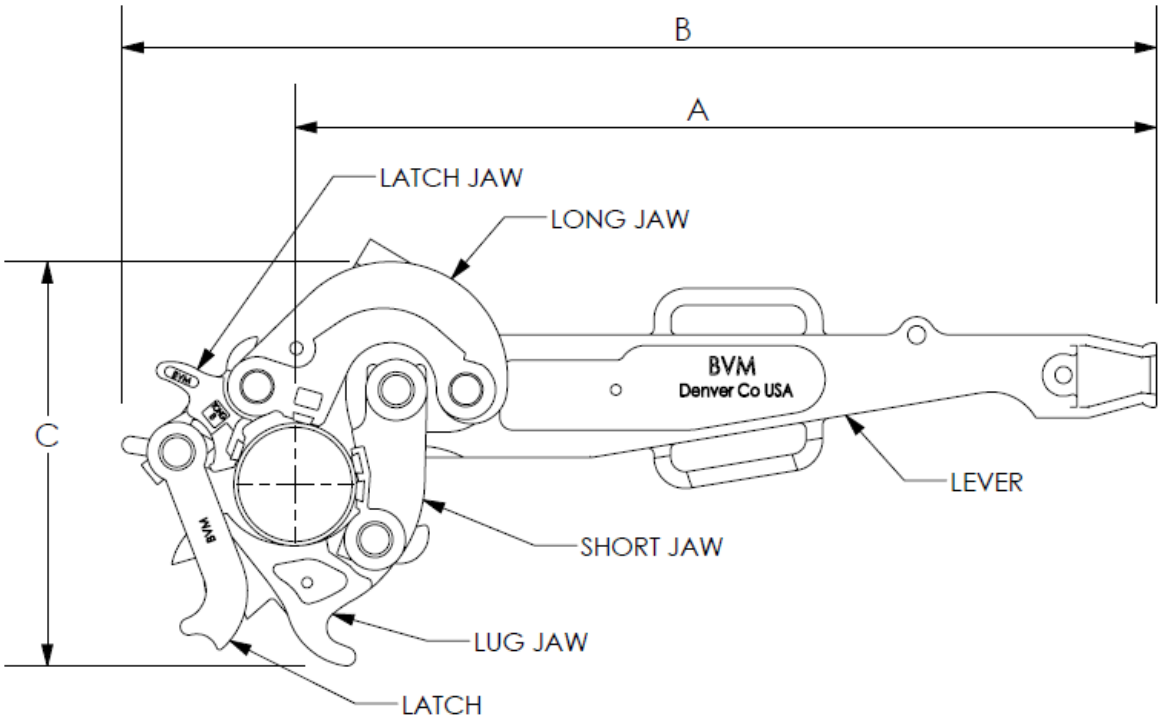
Purpose

This manual contains operation and service instructions for manual tongs, including types: AAX, B, C, DB, H, LF, MS, & SDD. This manual provides a guide for assembly, disassembly, inspection, and repair.

Description

BVM offers multiple types of Manual Tongs which have a torque rating between 6,500 and 100,000 ft-lbs and depending on the Jaws used can accommodate a size range from 1.900” to 31-5/8”. Tongs are made from alloy steel; load tested and are magnetic particle inspected.

Specifications



TONG TYPE	SIZE (in)	LEVER LENGTH	TORQUE* (FT-LBS)	A		B		C
				MIN	MAX	MIN	MAX	MAX
SDD	4 - 17	52 3/4"	100,000	53 7/8	60	64 5/8	78	34 1/8
H	3 1/2 - 13 3/8	50"	80,000	45 1/4	51 1/2	58	68	30
DB	3 1/2 – 21 1/2	43 1/8"	65,000	50 15/16	59 9/16	59 13/16	72 9/16	35 3/4
B	3 1/2 - 13 3/8	48"	55,000	52 1/16	55 3/16	59 9/16	66 7/16	23 1/4
B	3 1/2 - 13 3/8	36"	42,000	40 1/16	43 3/16	47 9/16	54 7/16	23 1/4
B Casing	13 3/8 - 30 1/2	36 or 48"	25,000	-	-	-	-	-
AAX	2 7/8 - 13 3/8	48"	55,000	47 7/8	55 1/2	58 1/4	67 1/2	25
AAX	2 7/8 - 13 3/8	42"	55,000	40 7/8	48 1/2	51 1/4	60 1/2	25
AAX	2 7/8 - 13 3/8	36"	55,000	35 3/8	43	45 3/4	55	25
AAX Casing	9 5/8 - 31 5/8	36, 42, or 48"	25,000	-	-	-	-	-
C	2 3/8 - 10 3/4	40 1/2"	35,000	44 5/8	47 1/8	54 5/8	57 1/8	18
C	2 3/8 - 10 3/4	30 7/8"	35,000	33 11/16	36 3/16	43 11/16	46 3/16	18
LF	2 3/8 - 8 5/8	21 7/8"	16,000	24 1/8	27 1/4	32 1/8	36 3/8	14
MS	1.900 - 6 1/8	24 3/4"	6,500	26	28 3/4	31 7/8	33 3/4	8

*Torque rating depends on size lug jaw used, see below table

TONG TYPE	LUG JAW #	SIZE	RATING (ft-lb)
AAX	1370	2.875-3.75	40,000
AAX	1371	3.5-4.25	40,000
AAX	1372	4-5.5	55,000
AAX	1373	5-7.25	55,000
AAX	1374	6.875-8.625	55,000
AAX	1375	9-10-7.5	30,000
AAX	1376	10.75-11.75	30,000
AAX	1377	13.375	30,000
B	67765	3-5	35,000
B	67927	4-5.5	55,000
B	67196	4.25-6.75	55,000
B	67622	5-6.75	55,000
B	67195	6.625-9	55,000
B	67297	9-10.75	40,000
B	67285	11.75	30,000
B	67569	12.75	30,000
B	67592	13.375	30,000
C	75727	2.875-4.25	15,000
C	75728	3.375-3.668	15,000
C	75939	3.5-5.25	25,000
C	75943	4.5-6.5	25,000
C	75940	5.25-7	33,500
C	75941	7-8.625	25,000
C	75799	9.625-10.75	32,000
DB	45718	3.5-8.25	65,000
DB	45719	8-11.75	65,000
DB	45720	11.75-14.375	40,000

TONG TYPE	LUG JAW #	SIZE	RATING (ft-lb)
DB	45721	16-17	40,000
DB	45731-1	18.625-20	50,000
DB	45732-1	20-21.5	50,000
H	1871	3.5-4.25	80,000
H	1872	4-5.5	80,000
H	1873	5-6	80,000
H	1874	6-7	80,000
H	1875	7-9	80,000
H	1876	9-10.75	80,000
H	1877	10.75-11.75	60,000
H	1878-1	12.75	40,000
H	1878	13.375	40,000
LF	80911	2.375-3.5	10,000
LF	80912	3.5-5.375	10,000
LF	80913	4.75-6.25	14,000
LF	80930	5.75-7.25	12,000
LF	80931	7.25-8.625	10,000
MS	40436	1.9-2.062	6,500
MS	40437	2.375-3.668	6,500
MS	40438	3.5-4.5	6,500
MS	40439	4.5-5.25	6,500
MS	40441	5.2-6.125	6,500
SDD	55702	4-8.5	100,000
SDD	55703	8.5-12	100,000
SDD	55704	12-15	75,000
SDD	55705	15.75	60,000
SDD	55706	16-17	60,000

CE Marking (if applicable):

CE

Operation

General Procedure

1) To install the tong, the tong support line should be connected to the hanger eye / suspension ring.
2) Ensure that the tong is capable of handling the torque required. See table in the "Specifications" section.
3) For easy tong operation, freely suspend tong up by the tong support line as close to the center of the rotary table as is conveniently possible. This reduces the arc of swing and the distance that the tong must travel to the table.
4) With jaws open and free from pipe, balance the tong. Carry this out from lever to latch and from side to side by adjusting the hanger adjustment bolt / screw, and/or the balancing screw. For best operation the long jaw should be about 1" lower than the short jaw.

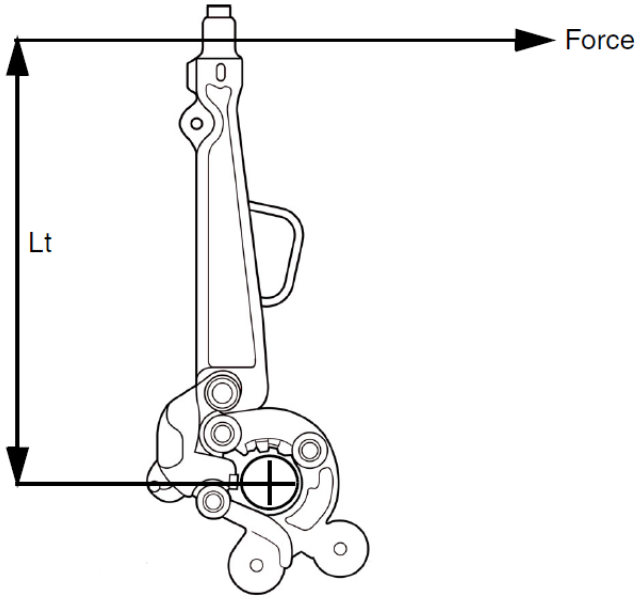
5) The pull line must then be connected to the end of the lever. A backup line, sized to safely withstand the tong torque rating, should in all cases be connected to secure safe operation.

Operation Procedure:
With the Tong positioned and balanced properly, follow the steps outlined below:

1) Ensure that the correct rated tongs with the correct jaws/heads are used for the required tubular torque.
2) Never torque tubular or collars with insufficiently rated tongs.
3) The line between cathead and tong should form a 90° angle when connections are being torqued.
4) It is advised to attach a torque-measuring device to the snub line when using multiple lines.
5) Counterweight bucket should be balanced for easy up and down motion.
6) Never hang additional weight outside of tong counterweight bucket. When circumstances require additional weight to be added to tongs, do not tie weight to tong hanger assembly.
7) Before attempting to put tongs on tubular, the tubular should always be stopped and set in the slips.
8) Tongs should be placed in the correct position on the tool joints and not on the hard band or tube.
9) When placing tongs on the tool joint, do not get any part of arm or hand in between the tong and the tool joint.
10) Back up tongs (stationary) should be put on first using handles on tongs only.
11) The man working the bottom tongs should always take care that his hands and fingers are not on the top of the tong handles.
12) Top tongs should then be put on using handles only.
13) Keep your thumb off of the top of the tong handles.
14) When making the tongs bite on the tool joint, hands should be placed in tong handles only.
15) Never stand directly in the path of the rotating tongs during make up or breakout procedures.
16) All personnel should clear the rotary area during make-up and breakout of high torque connections such as drill collars or over torqued connections.
17) After breaking or making connection, bottom tongs should be pushed at tong lever arm to break open and unlatch same.
18) When unlatching tongs, unlatch the bottom tong first to avoid contact with the above tong hanger arm. Always be vigilant with hand placement.
19) Always be aware of snub lines.
20) Keep out of the Driller's line of sight to the rotary table at all times while making and breaking connections.
21) Do not stand on tongs when working above rig floor.
22) Tongs should be tied back out of the way when not in use.
23) The Tongs can be assembled for either making-up or breaking-out by removing the hanger and turning the complete tong over.

Applying Make-up Torque

Torque is the measurement of the amount of twist applied to two tubulars as they are screwed together. The product of the tong arm length (Lt) and the line Force is the measurement of torque when the tong-arm and the pulling line are perpendicular (90° angle).



Warning:

- Be sure to use the handles provided for opening and closing the tongs. Keep hands away from all other areas when the tongs are in use.
- Tongs are made from cast alloy steel and should not be welded in the field. Improper welding can cause cracks and brittleness in repaired area and can result in drastic weakening of the Parts and possible Failure.
- Repairs which involve welding and or machining by others that is not authorized by BVM will void the warranty.
- Using Tongs which has been improperly welded can result in serious bodily harm and property damage.
- Never use the tongs other than what it is intended for: size and torque, which is clearly marked on lever. Double check the lug jaw is torque rating, as some lug jaws have a lower rating than the tong assembly.
- Only use the tongs within the specified temperature rating, which is -4°F to 150°F unless otherwise specified.

Note: If tongs are used despite the above warnings, BVM voids all warranties.

Maintenance

Safety should be practiced at all times when servicing the equipment always use BVM Corporation, approved safety methods, material and tools. Always wear protective gear for eyes, head and hands.

Caution:

- Use only parts manufactured and sold by BVM Corporation
- Re-machining of parts should be performed only at BVM Corporation. Improper machining could result in increased stress (Decreased Load carrying capability) or improper alignment of component parts. Either condition could be hazardous to personnel and equipment.
- Always wear gloves and eye protection when grinding, striking or handling parts.

Lubrication

Lubricate the Elevator regularly during usage and storage to prevent corrosion. Use an extreme pressure, multipurpose, lithium-based grease of No. 1 or No 2 consistency and multi-weight motor oil.

Inspection (PER API-RP8B)

Daily Inspection (Category II – tong in use)

1. Check for proper latch engagement on lugs of the lug jaw. The latch must not contact any part of the tong when latched and under torque except the lug on the lug jaw.
2. Check for worn hinge pins and hinge pin bores by trying to vertically move the jaws from the lever.
3. Check for any worn and damaged parts.
4. Check for loose and missing parts.
5. Check all pins are properly locked
6. Brush dies clean and check for wear
7. Check the proper locking of:
    a. Bolts and nuts
    b. Slotted nuts and cotter pins
    c. Lock tabs and lock bars
    d. Roll pins and dowel pins
    e. Snap rings
    f. Cotter pins
8. Check state of lubrication
9. Check for any visible cracks
10. Check for any corrosion

Semi-annual inspection (Category III)

1. Conduct Category II inspection
2. Disassemble the following parts of the tong for dimensional check according to max allowable wear (see “Wear data” section):
    a. Hinge pins

b. Hinge pin holes
c. Jaws/Latches

Annual Inspection (Category IV)

1. Conduct Category III inspection.
2. MPI inspect the following parts (See "Critical areas drawings" for cast parts):
    a. Latch lug jaw
    b. Latch jaw
    c. Short jaw
    d. Lever
    e. Long jaw
    f. Hinge jaw
    g. Latch
    h. Hanger

Magnetic Particle Inspection (MPI)

Carry out MPI according to ASTM E709 or ASME BPVC sub section A, article 7 and subsection B, article 25; determine the type of defects and the degree by comparing defects to ASTM E125 reference photographs to the acceptance criteria.

Only cracks may develop and as such need to be reviewed. All other indication types have been addressed by the manufacturer during production. As such, the tong has left the factory with indication (if at all) which were deemed acceptable. All cracks which have developed in service are relevant and need to be examined.

Evaluation of indications:

Relevant indications: Only those indications with major dimensions greater than 1/16 Inch (1.6mm) and associated with a surface rupture shall be considered relevant. Relevant indications are indications that results from, discontinuities within the test part. Non relevant indications are indications that results from excessive magnetizing current, structural design or permeability variances within the test parts. Any indication believed to be non-relevant shall be regarded as relevant and shall be re-examined to determine whether an actual defect exists. Linear indications shall be considered as those having a length of more than three times the width. Rounded indications shall be considered as those having a length less than three times the width. A lined indication shall be considered as a group of three more indications which touch an imaginary straight line connecting any two of the group.

Qualification and certification

All personnel performing and interpreting MPI shall be qualified in accordance with the guidelines of ASNT SNT-TC-1A (latest edition) or an equivalent standard and shall be trained in the use of the reference photographs and the interpretation of the MPI with regard to the acceptance criteria and ASTM E125 reference photographs.

Acceptance criteria for API 7K equipment:
Grey area is NOT applicable for MPI for equipment in service.

	Maximum Allowable Degree		
Type	**Discontinuity Descriptions**	**Critical Areas**	**Non-critical Areas**
I	Hot tears, cracks	None	Degree 1
II	Shrinkage	Degree 2	Degree 2
III	Inclusions	Degree 2	Degree 2
IV	Internal chills, chaplets	Degree 1	Degree 1
V	Porosity	Degree 1	Degree 2

Acceptance criteria for welds:

- No relevant liner indications (1/16")
- No rounded indications with a major dimension 1/8" for welds whose depth is 5/8" or less.
- No rounded indications with a major dimension 3/16" for welds whose depth is greater than 5/8".
- No more than 3 relevant indications in a line separated by less than 1/16".

Acceptance criteria for wrought material:

- No relevant indications with a major dimension equal or greater than 3/16".
- No more than ten relevant indications in any continuous 6 in^2.
- No more than 3 relevant indications in a line separated by less than 1/16" edge to edge.
- No relevant indications in pressure sealing areas, in the root area of rotary threads or in stress-relief features of threaded joints.

Note: Only BVM authorized repair facilities are allowed to repair tongs with indications outside the acceptance criteria.

Wear data

The inspection data and maximum wear tolerances are only valid if the equipment is in otherwise good condition and has not been mis-used, does not exibit excessive wear, cracks or other defects. Additionally any weld repairs – not done at a BVM authorized repair facility – shall require examination and re-certification by a BVM authorized repair facility before being used further. These data and tolerances only apply to certain critical components and cannot on their own determine the overall condition of the equipment or its suitability for continued use. These data and tolerances are what is required to retain 100% ratings.

Table 1: Wear table

Tong Family	AAX	B	C	DB	H	LF	MS	SDD
Pin Max Clearance (A)	0.035	0.025	0.030	0.035	0.035	0.030	0.025	0.035
Jaw Max Clearance (B)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035

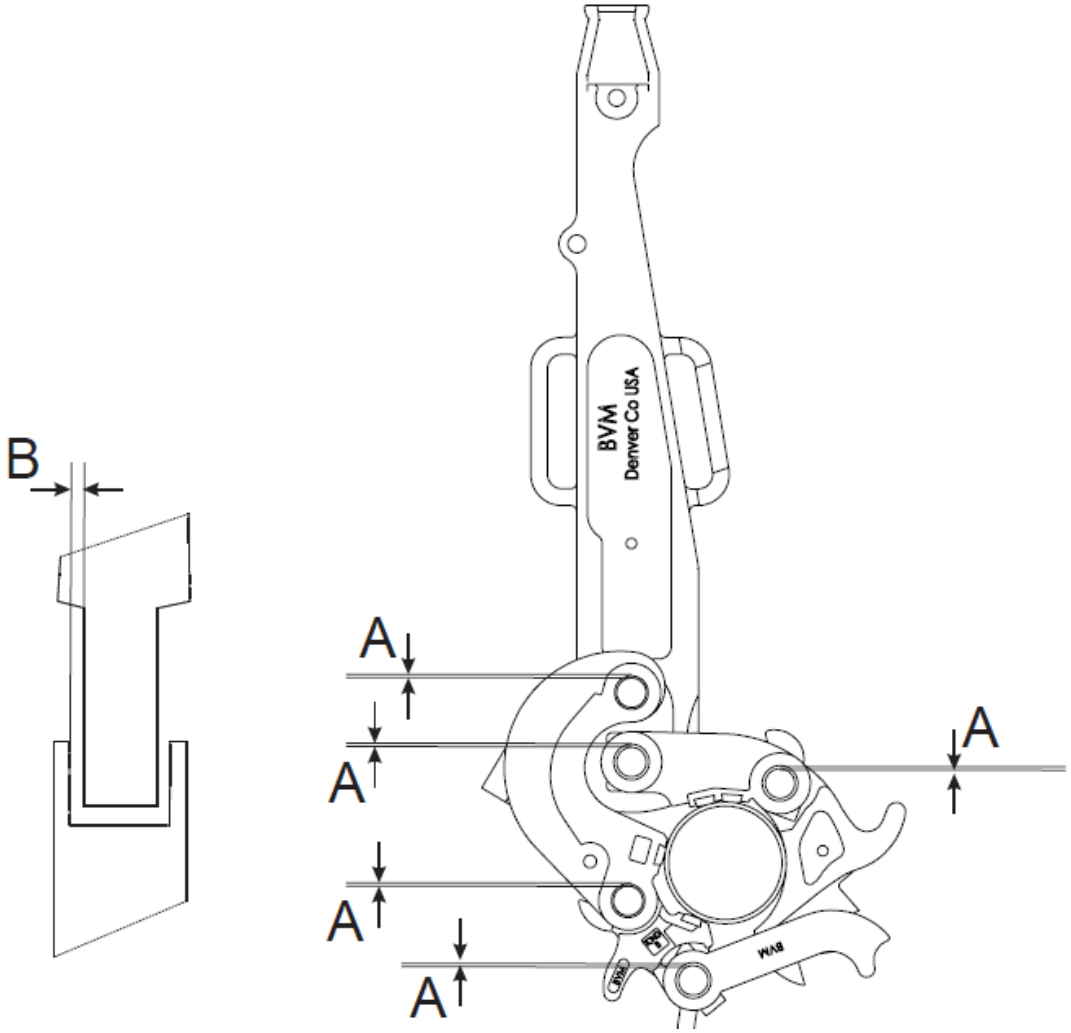


Figure 1: Tong wear variables

Assembly & Disassembly

Assembly/Disassembly Procedure

1. Disconnect the head assembly from the lever by removing the hinge pins and lock.
2. Disconnect the latch by removing the hinge pin. This allows removal of the latch spring and latch spring plunger.
3. For “B” and “C” type tongs, remove the latch jaw by removing the hinge pin. This will allow removal of the adjustable stop assembly and booster plunger assembly.
4. Remove all other lug, hinge, short, and long jaws by taking out the various hinge pins and locks.
5. Complete disassembly of the various jaws can be done by removing all nuts and bolts.
6. Assembly is the same procedure in reverse. See related tong data sheet for exploded view for proper part orientation.

Disassembly of the hanger and lever assembly

1. Disconnect the hanger assembly from the lever by removing the hanger bolt(s) and nut(s) or hanger pin as applicable.
2. Complete disassembly of the hanger and lever can be carried out by removing all nuts and bolts.
3. Assembly is the same procedure in reverse.

Changing dies/inserts

1. Remove the cotter pins followed by the retaining pins

Caution: Wear eye protection when removing or replacing inserts to protect against chip fragments

2. After replacing the inserts, the retaining pins with the cotter pins shall be installed. Always use NEW cotter pins.

Lug Jaw removal for changing sizes

1. Remove the cotter pin from the nut, unscrew the nut and remove the hinge pin.
2. Take out the lug jaw and replace with correct size lug jaw and possible other components needed for the job. Take notice of possible new maximum torque rating.
3. Relock the pin. Use NEW cotter pins.

Critical Area Drawings

- The entire part is critical for the below parts:
  - Jaws
  - Latches
  - Hinge pins

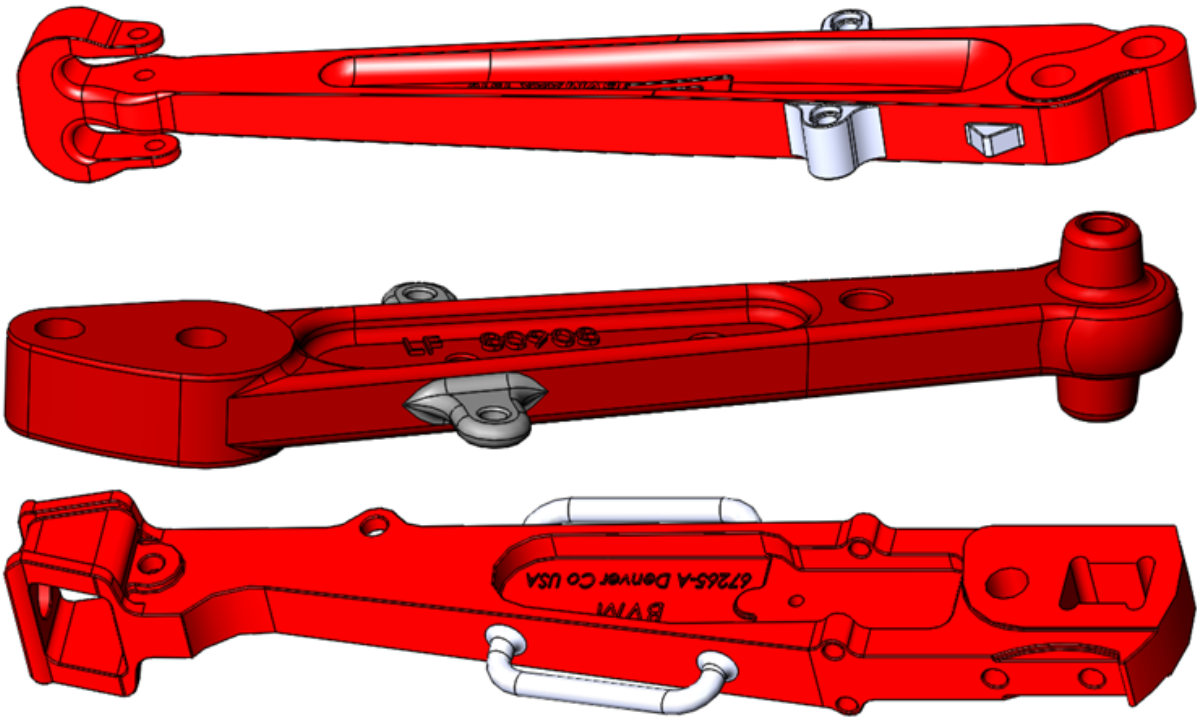


Figure 2: Lever critical areas shown in red

Troubleshooting

When problems cannot be solved, contact an authorized BVM repair facility.

Overview of possible problems:

Problem	Possible cause	Possible solution
Tong does not bite	Worn die	Replace die
	Tong not correctly dressed for size	Check manual for correct dressing size
	Tong assembled wrong	Reassemble tong properly
Tong does not hang level	Balancing bolt (eye) not adjusted properly	Adjust balancing bolt (eye)
	Hanger adjustment not adjusted properly	Adjust hanger adjustment screw
Tong does not open OR parts do not move freely	Yielding due to overloading	Replace tong
Bent pins or sheared pin heads	Tong is overloaded	Replace tong
Elongated holes	Tong is overloaded	Replace tong
	Tong holes worn	Check amount of wear. If within acceptance criteria use as is, when over acceptance criteria, replace tong

Risk Assessment According to EN-ISO 12100:2010

The conclusion of the risk assessment is that in general, the crew must:

- Wear person safety protection like safety glasses, hard hats, etc.
- Follow instructions as stated in the manual.
- Have knowledge of rig procedures.
- Must have been instructed for safe use of the tool.
- Perform maintenance and inspection according to this manual.
- Personnel must stay out of working area of tong.

Applicable standards:

- EN-ISO 12100:2010 Safety of machinery – Basic concepts, general principles for design – Risk assessment and risk reduction
- Machinery Directive: 2006/42/EC
- API 7K

Assembly drawing and List of Parts

See data sheet at www.bvmcorp.com.