

L2677 Rev. A 05/06

Index:

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Português:	N/A
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Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES



Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.



WARNING: Maintain firm hand control of torque wrench or input handle when releasing multiplier, since recoil (wind-up) will be experienced.



WARNING: Prevent accidental torque release; set the neutral positioning set screw (Fig. 3, Item 2) flush with the top of the housing whenever the torque multiplier is operated MANUALLY. The selector pawl (Fig. 3, Item 3) must also operate freely in the CW and CCW positions. Personal injury could result if not set properly.



WARNING: Do not hold torque multiplier reaction bar or reaction plate (Fig. 1, Item 1) while applying torque. Normal multiplier deflection could create pinch a point.



WARNING: Prior to EACH use, check reaction plate/bar holding screws to insure they are tight (Fig. 1, Item 2).



WARNING: Prior to EACH use, inspect output square drive (Fig. 1, Item 4) for visible sign of fatigue or fracture. Replace if necessary.



WARNING: Failure of the output square drive, could result in an immediate torque release; the torque multiplier could fall from the fastener, and result in personal injury.



WARNING: When using an output drive extension (Reaction Plate models only), a double-ended reaction plate is required. Failure to use a double-ended reaction plate could cause the torque multiplier to be forced sideways on the application resulting in multiplier and/or socket breakage.



WARNING: Do not use output drive extensions on Reaction Bar models. Personal injury could result.



WARNING: Select an anchor point sufficient to withstand torque reaction forces. Reaction torque equals OUTPUT torque.



WARNING: Wear proper personal protective gear when operating hydraulic equipment.



WARNING: Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.



WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load.



WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

3.0 INSTRUCTIONS



Read and understand these operating instructions before using the Torque Multiplier.

NOTE: DO NOT USE AN IMPACT WRENCH ON THE TORQUE MULTIPLIER. DAMAGE TO TOOL WILL OCCUR.

1. When using a POWER driven input, lock selector pawl in neutral position using the neutral positioning set screw (Fig. 3 Item 2).
2. When positioning the torque multiplier, be sure socket attached to the output is positioned so that the reaction plate is at a right angle to the fastener. Torque reaction creates a rotational force in the **opposite direction** from which input force is applied. See Application Information section 10.0 for additional torque multiplier reaction information.

3. DO NOT apply more torque than the application can withstand. Breakout torque can be greater than input torque. Allow a minimum of **50% additional tool capacity** for breakout torque. Damaged and corroded fasteners can require even greater breakout torque capacity.
4. Monitor input torque using a torque wrench. If torque multiplier is used without a torque wrench, remember that **output torque** is significantly greater than the **input torque**.
5. **Increase Torque Multiplier life.** Maintain the shortest possible couple distance between the Torque Multiplier Output (Fig. 6) and the fastener being addressed. Maintain the longest distance possible between the Torque Multiplier and reaction point as possible (Fig. 5).
6. Protect your warranty, use Enerpac approved output square drives and replacement parts only.

4.0 SPECIFICATION TABLES

Model Numbers:		290+	291	391	392	393
Output Capacity, Ft-Lb (Nm)		750 (1,020)	1,000 (1,358)	1,200 (1,627)	2,200 (2,983)	3,200 (4,340)
Input Capacity, Ft-Lb (Nm)		227 (309)	303 (411)	200 (271)	162 (220)	173 (234)
Torque Ratio		3.3:1	3.3:1	6:1	13.6:1	18.5:1
Accuracy		±5% of reading from 20% to 100% of full-scale rating				
Output Drive Male Square Size - Inch (mm)		.75 (19)	.75 (19)	.75 (19)	1 (25.4)	1 (25.4)
Input Drive Female Square Size - Inch (mm)		.5 (13)	.5 (13)	.5 (13)	.5 (13)	.5 (13)
Overall Dimensions Inch (mm) (see Fig. 2)	Length A	8.53 (217)	17.06 (443)	19.56 (497)	19.6 (498)	19.6 (498)
	Gearbox Ø B	2.81 (71)	2.81 (71)	3.94 (100)	4.06 (103)	4.06 (103)
	Height C	3.25 (83)	3.25 (83)	4.00 (102)	5.75 (146)	6.5 (165)
Net Weight Lb. (kg)		4 (1.8)	5.5 (2.5)	9.1 (4.1)	15.2 (6.9)	18.3 (8.3)
Planetary Gearing Stages		One	One	One	Two	Two
Needle Bearings		-	-	Yes	Yes	Yes
Angle-of-turn Protractor		No	No	Yes 5° incr	Yes 5° incr	Yes 5° incr
Torque Conversion Chart		No	No	Yes	Yes	Yes
Shearable Replaceable Output Drive		No	No	Yes	Yes	Yes

Model Numbers:		492	493	494	495
Output Capacity, Ft-Lb (Nm)		2,200 (2,983)	3,200 (4,339)	5,000 (6,779)	8,000 (10,846)
Input Capacity, Ft-Lb (Nm)		162 (220)	173 (235)	189 (256)	154 (209)
Torque Ratio		13.6:1	18.5:1	26.5:1	52:1
Accuracy		±5% of reading from 20% to 100% of full-scale rating			
Output Drive Male Square Size - Inch (mm)		1 (25.4)	1 (25.4)	1.5 (38)	1.5 (38)
Input Drive Female Square Size - Inch (mm)		1/2 (13)	1/2 (13)	1/2 (13)	1/2 (13)
Overall Dimensions Inch (mm) (see Fig. 2)	Length A	14.0 (356)	14.0 (356)	14.88 (378)	15.2 (387)
	Gearbox Ø B	4.88 (124)	4.88 (124)	5.63 (143)	5.81 (148)
	Height C	5.5 (140)	6.41 (163)	8.75 (222)	10.75 (273)
Net Weight Lb. (kg)		17.2 (7.8)	19.5 (8.9)	34 (15.4)	50.3 (22.8)
Planetary Gearing Stages		Two	Two	Two	Three
Needle Bearings		Yes	Yes	Yes	Yes
Angle-of-turn Protractor		No	No	No	No
Torque Conversion Chart		Yes	Yes	Yes	Yes
Shearable Replaceable Output Drive		Yes	Yes	Yes	Yes

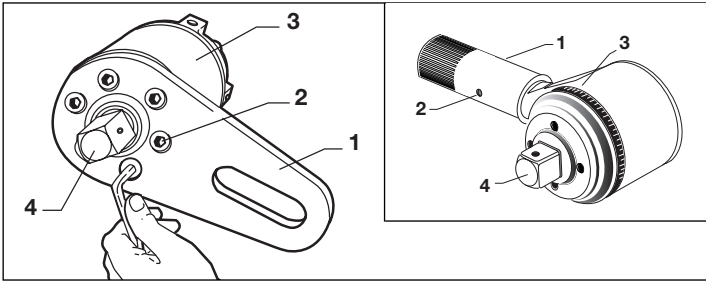


Fig. 1 – Changing the Reaction Plate

1. Reaction Plate / Reaction Bar
2. Socket Head Cap Screws
3. Torque Multiplier
4. Controlled-Shear Output Square Drive

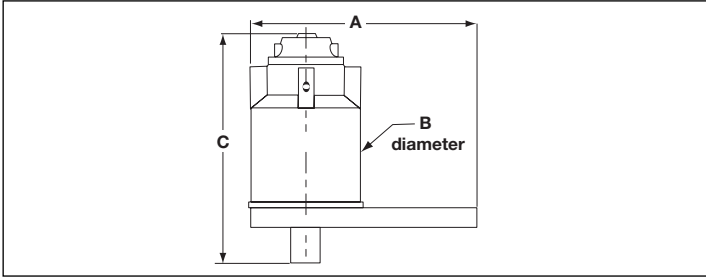


Fig. 2 – Torque Multiplier Dimensions

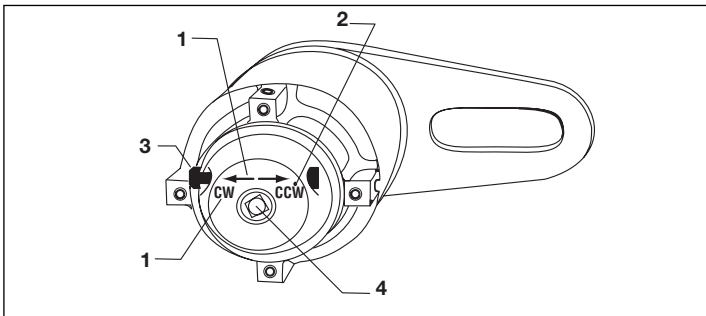


Fig. 3 – Input End Detail (shown set for CW rotation)

1. Rotational direction indicators
2. Neutral positioning set screw
3. Selector pawl
4. 1/2-inch female input square drive

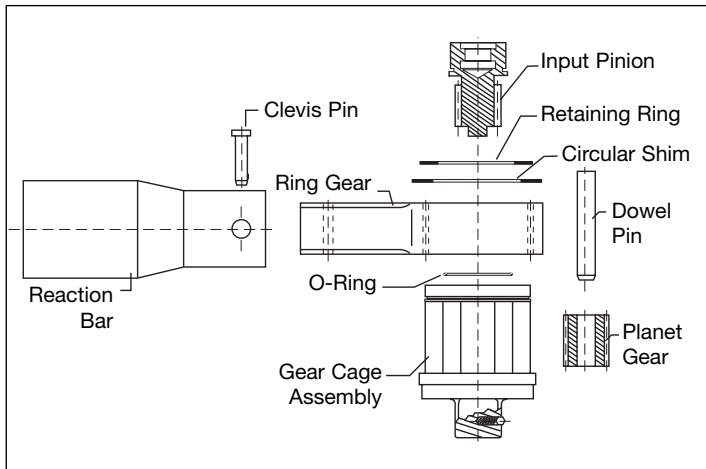


Fig. 4

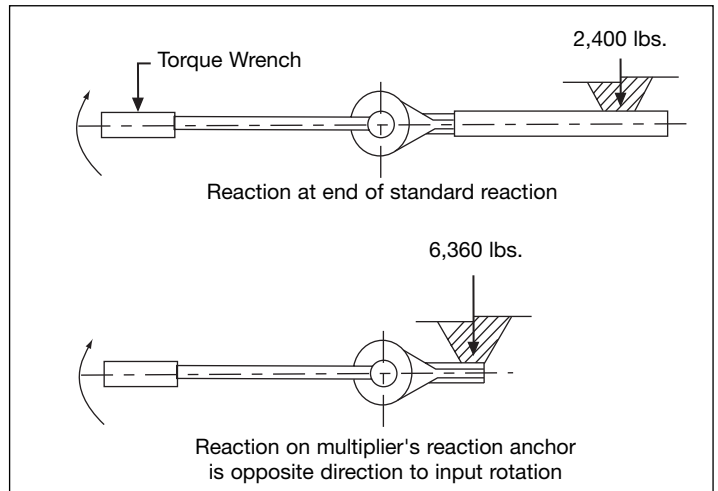


Fig. 5 – Reaction forces increase closer to the multiplier

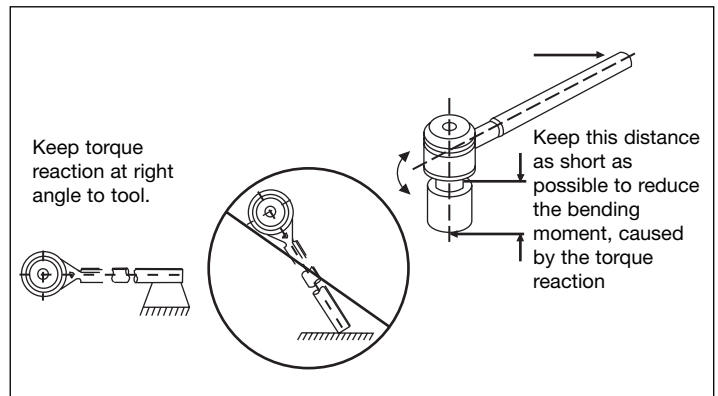


Fig. 6 – Minimize bending moments created by the torque multiplier's reaction

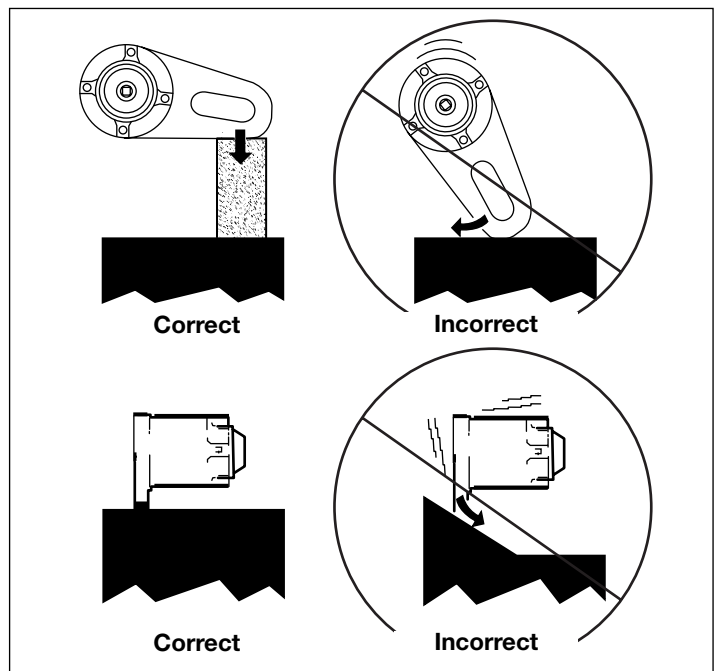


Fig. 7 – Keep reaction anchor perpendicular to the reaction point.

5.0 DESCRIPTION AND DESIGN FEATURES

Input and Output rotation directions are the same. (EXAMPLE: Clockwise input rotation creates clockwise output rotation). Torque multipliers use planetary gear action to tighten/loosen with a continuous 360° rotation in either clockwise or counterclockwise direction. An internal, bi-directional anti-backlash device inhibits accidental torque wind-up release (not available on E290+, E291, E391).

NOTE: Reaction force is equal to output force and is in the opposite direction of input/output rotation force.

Reaction bars are held in place using a detent pin or socket head cap screw, depending on model. Reaction plates are attached with socket head cap screws.

A controlled-shear output square drive (Fig. 1 Item 4) protects internal components in the event maximum output capacity is exceeded. This overload-protection feature causes the drive to fracture when output exceeds from 103% to 110% of rated output capacity. One replacement drive is included with the torque multiplier (E391, E392, E393, E492, E493, E494, E495). (Order additional replacements from your Enerpac distributor.)

Selector pawl (Fig. 3, Item 3) must be set in neutral position and the neutral position set screw (Fig. 3, Item 3) must be tightened to lock the selector pawl for power drive unit operation. It controls the torque multiplier's rotational direction for manually-applied input. (Not available on E290+, E291, E391 models). Do not use impact wrench for power driving, damage to multiplier power train will result.

6.0 TORQUE CONVERSIONS

A data plate attached to the torque multiplier displays input torque required to obtain listed output torque values. To calculate a specific input value not listed on the data plate, divide the desired output torque by the multiplier's torque ratio. See Specification Tables.

7.0 MANUAL OPERATION

1. **NOTE:** Reaction force is equal to output force and is in the opposite direction of input/output rotation.
2. Set desired rotation direction by pushing the selector pawl (Fig. 3, Item 3) in the direction indicated by the letters and directional arrows stamped on the input end case (Fig. 3, Item 1). EXAMPLE: "CCW" for counter-clockwise rotation, push pawl to end of travel in the direction shown by the "CCW" arrow. For clockwise rotation, push pawl in the opposite "CW" direction. (Not available on E290+, E291, E391 models).
3. Mount the proper size female square drive socket onto the torque multiplier's output square drive (Fig. 1, Item 4). Position socket and torque multiplier on the fastener to be tightened.
4. **Reaction Plate Models:** Place a proper size socket on the slave square drive and attach it to an adjacent fastener.
Reaction Bar Models: Butt the reaction anchor plate securely against a suitable object. **NOTE:** When socket is properly positioned on fastener, reaction bar must be at right angles to the fastener to which torque is being applied (Fig. 7). See [Application Information](#) section 10.0 for additional torque multiplier reaction information.
5. **Tighten using a torque wrench:** Determine the proper input torque required (refer to torque data plate on tool) or reference section 4.0 Specification Tables. Output torque accuracy requires an accurate torque wrench in series with

the torque multiplier. Apply torque with torque wrench until desired input torque is achieved (Fig. 5).



WARNING: Failure of the output square drive, due to torque overload or fatigue, could result in an immediate torque release, potentially causing the torque multiplier to fall from the fastener, and result in personal injury.

6. **To remove torque multiplier from fastener:**

Anti-backlash models: using a torque wrench, apply enough input torque to release internal anti-backlash device; maintain torque input and push selector pawl (Fig. 3, Item 3) into opposite position (EXAMPLE: Pawl set in "CW" position requires reset to "CCW" position). Slowly relax input torque. (Not available on E290+, E291, or E391 models).

Standard models: apply torque to desired rating, then slowly relax input torque and remove multiplier from application (E290+, E291, or E391 models).

7. Loosen using a torque wrench: Follow same procedure as for tightening except set the selector pawl in opposite position.

8.0 PNEUMATIC OPERATION

Use an approved **non-impact** power drive with models: (E391, E392, E393, E492, E493, E494 or E495 only). **Lock selector pawl in Neutral** position by centering between the "CW" and "CCW" positions and tightening the set-screw (fig 3, Item 2).

NOTE: Set in the proper position, the selector pawl WILL NOT move in either direction when the neutral position set screw is tightened.

9.0 REPLACING A SQUARE DRIVE ASSEMBLY

9.1 Models E290PLUS, E291

1. Remove Retaining ring and circular shims (figure 4) from input side of torque multiplier housing.
2. Remove gear cage assembly from ring gear (torque multiplier housing).
3. Remove input pinion from gear cage assembly with a pulling and twisting motion. Use an arbor press to remove dowel pins from planet gears (figure 4).
4. Replace gear cage assembly with genuine Enerpac replacement.
5. Reassemble planet gears into cage assembly using arbor press.
6. Lubricate all friction points with high grade molybdenum-disulfide grease.
7. Reassemble input pinion, install assembly into ring gear (torque multiplier housing). Reassemble shims and retaining ring.

9.2 Models E391, E392, E393, E492, E493, E494, E495

1. Remove the screws (Fig. 1, Item 2) holding the reaction plate (Figure 1, Item 1) to the torque multiplier, and remove the reaction plate from the torque multiplier.
2. Remove the pin engaging the gear cage with the output square drive and remove old output square drive.
3. Insert replacement square drive assembly into square drive carrier, aligning the hole in the lower portion of the replacement square drive with the hole in the square drive carrier.
4. Insert pin through hole in square drive carrier and into hole in replacement square drive.
5. Re-attach reaction plate to torque multiplier with the screws previously removed (Fig. 1, Item 2).

10.0 APPLICATION INFORMATION

10.1 Torque Multiplier Reaction

1. Absorbing torque multiplier reaction forces can be accomplished using common practices noted here.
2. First consider the size and type of torque tool required for the application. Survey space limitations as well as the maximum torque needed. Allow a minimum of 50% additional capacity in the tool for breakout torque. NOTE: Damaged and corroded fasteners can require even greater breakout torque capacity. Allow a minimum of 100% over the make-up torque for these conditions. Example: Corroded studs and a 1,500 Ft-Lbs. make-up torque. Choose a tool with a capacity of at least 3,000 Ft-Lbs. for breakout.
3. Select a solid anchor point to minimize deflection. Determine where the reaction anchor forces are going to take place (e.g. against a flange or over an adjacent bolt). NOTE: This point must withstand the torque tool's reaction forces. Example: A 3,200 Ft-Lb. torque multiplier, with reaction near the end of its anchor stub (figure 5) produces a reaction force of 6,400 pounds. Reduce the reaction force to 2,400 pounds by moving the reaction anchor point toward the end of an anchor tube. Keep the reaction point tangent to the rotation of the torque output to prevent increased reaction forces (figures 6 and 7).
4. Keep output torque rotation pure by reducing bending moments. Bending moments decrease torque efficiency and increase stress on the tool and sockets. Keep the distance between the tool's output and the fastener as short as possible (figure 6).
5. Increase tool life and increase working environment safety by taking torque reaction as far out on the reaction anchor as possible (Fig. 5).

10.2 Angle of Turn Protractor

Some torque multipliers include an Angle of Turn Protractor. This allows the operator to accurately measure a specific number of degrees of rotation of the fastener. The torque / angle of turn method of tightening fasteners requires a pre-torque value, and a specific additional rotation of the fastener, that is engineered into the application. This data will be supplied by the original equipment manufacturer's engineering department if angle of turn torquing is applicable.



CERTIFICATION
ENERPAC 
TORQUE MULTIPLIER

MODEL NO.: E _____ 9 _____ C

CODE: _____

This unit is CERTIFIED accurate within the readings listed on the test documentation provided with this shipment.

TEST DOCUMENTS

FINAL PACKAGING

SIGNED: _____

DATE: _____

Certification is an optional service available only on original shipment from the factory. Contact Enerpac for prices and procedures.



INSPECTION REPORT
ENERPAC 
TORQUE MULTIPLIER

This unit is accurate within plus or minus 5% of the input and output readings given on the specification plate and specification tables in this document.

FINAL PACKAGING

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DATE: _____

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