World Leader in Modular Torque Limiters

Brunel Corporation

Morbark Tub Torque Limiter Instruction Manual
1. TORQUE ADJUSTMENT & INITIAL STARTUP
   a. These torque limiters were preset at the factory, no further adjustment is required at this time. If it is desired to adjust the torque at a later date, proceed as follows.

   **CAUTION:** If you exceed the factory setting possible catastrophic failures could occur.

   — CAUTION —
   This machine is equipped with an internally adjustable break away torque limiter. The limiter was preset to match your engine H.P. DO NOT exceed this setting. This information has been recorded and limiter marked at the factory.

2. RESETTNG
   On overload, the safety element ball is displaced and the Module Carrier Plate disengages from the Detent Pocket Plate, allowing the Module Carrier Hub (1-1) to rotate freely. **PTO clutch should be disengaged immediately after the Torque Limiter has disengaged.** Refer to Morbark operator safety manual. Then align the two reset arrows on the Detent Pocket Plate and the Module Carrier Plate by rotating the Torque Limiter by hand. After aligning the match marks strike the safety element plungers with a soft mallet and the plunger will move back into the safety element signifying that the unit is engaged.

3. GENERAL MAINTENANCE
   **— CAUTION —**
   The torque limiter must be greased once a month or after it has disengaged. If the torque limiter has not disengaged in 1 month, the safety element modules should be removed for proper maintenance, Ref: Fig 1-6. If this procedure is not followed, you will void any warranty on the torque limiter. Brunel’s standard warranty terms apply.

   a. Disengaged safety elements, Ref: Fig 1-6 should be greased once a month with Mobil XTC. Pump 5-7 pumps from a grease gun into grease fitting, Ref: 4-7 and 2A-13. Engaged or non tripped safety elements that have been removed for maintenance will be greased once a month by hand on the ball and detent pocket, Ref: 2A-9 & 10.

   b. The bearings must have 5 to 7 pumps of Mobil SHC 220 grease applied once a month through grease fitting, Ref: Fig 4-8. The driving half of the torque limiter, Ref: Fig 4-1 and driven half of the torque limiter, Ref: Fig 4-2 of the torque limiter should be spun independently of each other for 10 revolutions.

   c. Safety elements should be stripped, inspected and reassembled at least once every three years, more frequently where frequent tripping occurs. Bearings should be inspected every three years.

   Figure “Ref:” may vary depending on the torque limiter style that is installed on your Morbark Grinder.

4. TROUBLE SHOOTING
   a. Continual releasing.

   1) Detent Pocket (2A-10) worn. Remove Safety Element (1-6) to remove detent pocket, extract detent pocket using a slide hammer with heat treated threaded rod, & Rotate Detent 90º & reinstall. If badly worn replace with new detent pocket (2A-10).

   2) If additional torque capacity is required. Consult Morbark Service Department.
Installation and Maintenance Instructions

1. TORQUE ADJUSTMENT & INITIAL STARTUP
   a. These safety elements were preset at the factory, no further adjustment is required at this time.
   b. If it is desired to adjust the release torque at a later date, refer to #3 “Torque Adjustment”.

2. RESETTING
   On overload, the safety element ball is displaced and the Module Carrier Plate disengages from the Detent Pocket Plate. With the drive at rest (the power off) and the overload cleared, align the two reset arrows (or grooves) on the Detent Pocket Plate and Module Carrier Plate by turning the mill shaft by hand. After aligning the match marks strike the safety element plungers with a soft mallet and the plunger will move back into the safety element signifying that the unit is engaged.

3. TORQUE ADJUSTMENT
   a. To adjust torque at the job site: Prior to setting Safety Elements which are new or which have been re-assembled, the desired release torque for the torque limiter must be known.
   b. From this desired Release Torque, the required tangential force (Ft) must be calculated. Perform the following calculation and proceed with setting each Safety Element to the same tangential force from the graph supplied.

   \[
   Ft = \frac{T}{(N) \times (R)}
   \]

   where:
   \( F_t \) = Tangential force (pounds)
   \( T \) = Required release torque of drive (lb-in)
   \( N \) = Total quantity of Safety Elements on Torque Limiter.
   \( R \) = Mounting radius of Safety Elements on Torque Limiter (in.)

   — continued on page 3

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**Figure 2A**
Section View of Part No. JSE1-0014 Safety Element
Parts referred to by (Figure # - Part #)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty.</th>
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<tbody>
<tr>
<td>1</td>
<td>JSE1-0014-1</td>
<td>Plunger</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>JSE1-0014-2</td>
<td>Outer Thrust Race</td>
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<td>3</td>
<td>JSE1-0014-3</td>
<td>1/4&quot; Ball</td>
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<td>4</td>
<td>JSE1-0014-4</td>
<td>Inner Thrust Race</td>
<td>1</td>
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<td>5</td>
<td>JSE1-0014-5</td>
<td>Disc Springs 31.5x16.3x1.5mm</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>JSE1-0014-6</td>
<td>1/4&quot;-28 x 1 1/2&quot; SHCS</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>JSE1-0014-7</td>
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<tr>
<td>14</td>
<td>JSE1-0014-14-19/14</td>
<td>“O” Ring Housing - H2mm x 16mm</td>
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<td>Shims 4/Pack</td>
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<td>17</td>
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<td>M6-1.0 x 8mm SSS</td>
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<td>18</td>
<td>JSE1-0014-18</td>
<td>Locking Pellet</td>
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<td>19</td>
<td>JSE1-0014-14-19/14</td>
<td>“O” Ring Bushing- H2mm x 16mm</td>
<td>1</td>
</tr>
</tbody>
</table>
### 4. METHOD OF PRELOADING EACH SAFETY ELEMENT (BLIND HOLE DETENT)


b. Grease the bushing (2A-8) complete with “O” ring (2A-19) and install over the greased plunger (2A-1). Install the greased ball (2A-9) in the hole in the Module Carrier Plate (1-1).

c. Insert the Safety Element assembly (1-6) firmly into the Module Carrier Plate (1-1).

d. Using feeler gauges, measure the gap between the base of the Safety Element (1-6) and the Module Carrier Plate (1-1).

e. Accumulate pealable shims to a thickness of 0.003-0.008" less than the gap measured in d. above.

f. Remove Safety Element (1-6) from Module Carrier Plate (1-1) and remount over shims.

g. Insert Qty. 4 3/8"-24 x 2" SHCS or 12pt bolt (2A-6) and torque tighten to 40 lb.-ft.

### 5. TROUBLE SHOOTING

**a. Continual releasing, further adjustment making no difference.**

1. Detent Pocket (2A-10) worn. Remove Safety Element and remove Detent Pocket. Rotate Detent 90° and reinstall. If badly worn replace with new detent pocket.

2. Additional torque capacity is required.

**b. Unable to reset.**

Reset arrows not aligned. Check reference marks on Module Carrier and Detent Pocket Plate.

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**Figure 2B**

Section View of Part No. JSE2-0014 Safety Element

Parts referred to by (Figure # - Part #)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty.</th>
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<td>JSE2-0014-1</td>
<td>Plunger</td>
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<td>2</td>
<td>JSE2-0014-2</td>
<td>Outer Thrust Race</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>JSE2-0014-3</td>
<td>10mm Ball</td>
<td>12</td>
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<td>4</td>
<td>JSE2-0014-4</td>
<td>Inner Thrust Race</td>
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<td>5</td>
<td>JSE2-0014-5</td>
<td>Disc Springs 50x25.4x2.5mm</td>
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<td>8</td>
<td>JSE2-0014-8</td>
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</table>
JSE1-0014/JSE2-0014 Setting
Instructions

1. Ensure Set Screw (3-15) is not locking the Adjusting Nut (3-7).
2. Hold safety element in soft jaws in a bench vice, as shown in drawing below.
3. Tighten Adjusting Nut (3-7) by turning clockwise with adjusting tool, then loosen by turning counterclockwise until all spring load is removed.
4. With adjusting tool, slowly tighten the Adjusting Nut (3-7) until it just touches the disc springs - you will note a large increase in resistance when the nut comes up against the disc springs. At this point the Adjusting Nut is bearing on the Disc Springs with no pre-load.
5. Arrange depth micrometer as shown in drawing (Figure 3). Measure the distance “X” from the safety element Housing (3-16) base, to the face of the Adjusting Nut (3-7). This is equivalent to the ZERO SETTING on the Load / Depth setting graph. Make a scribe mark on the adjusting nut face to note the position of this measurement and make all future measurements to this same position.
6. Refer to Morbark Service Department for depth setting for the required load, and add this to dimension “X”.
7. Using the dial indicator or micrometer depth gauge, measure depth and slowly tighten Nut until the required depth is reached. This safety element is now set to the required load setting.
8. Tighten Set Screw (3-15) to lock Nut (3-7).

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ITEM NO. PART NUMBER DESCRIPTION QTY.
1 JSE1-0014-1 PLUNGER 1
2 JSE1-0014-2 OUTER THRUST RACE 1
3 JSE1-0014-3 1/4" BALL 11
4 JSE1-0014-4 INNER THRUST RACE 1
5 JSE1-0014-5 DISC SPRINGS 31.5 x 16.3 x 1.5 mm 6
6 JSE1-0014-6 1/4-28 x 1 1/2" SHCS 4
7 JSE1-0014-7 ADJUSTING NUT 1
8 JSE1-0014-8 BUSHING 1
9 JSE1-0014-9 5/8" BALL 1
10 JSE1-0014-10A DETENT POCKET (BH) 1
11 JSE1-0014-11 HOUSING 1
12 JSE1-0014-12 SHROUD 1
13 1/4-28 GREASE ZERK 1
14 JSE1-0014-14/19 O-RING HOUSING -H2mm x 16mm 1
15 JSE1-0014-15 5/16"-24 x 5/8" SHCS 1
16 JSE1-0014-16 SHIMS 4/PACK 1
17 JSE1-0014-17 M6-1.0x 8mm SSS 1
18 JSE1-0014-18 LOCKING PELLET 1
19 JSE1-0014-19/14 O-RING BUSHING -H2mm x 16mm 1
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<th>Part Number</th>
<th>Description</th>
<th>Qty.</th>
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<td>JSE2-0014-13</td>
<td>Shim Pack (4/SET)</td>
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<td>18</td>
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**Material:** Steel

**Finish:** Black Oxide

**Geometric Tolerancing:** Per ASME Y14.5M-1994

**Scale:** 1:1
Setting Charts

SETTING CHART BRUNEL JSE2-0014

DEPTH FROM ZERO SPRING COMPRESSION (INCHES)

TANGENTIAL FORCE lb

SETTING CHART BRUNEL JSE1-0014, JSE1-0016, JSE1-0017

DEPTH FROM ZERO SPRING COMPRESSION (INCHES)
ITEM  DESCRIPTIO N  QTY  PART NUMBER
1  MODULE CARRIER HUB  1  JSE-1-0310-1
2  DETENT POCKET PLATE  1  JSE-1-0310-2
3  INNER HUB  1  JSE-1-0310-3
4  SAFETY MODULE  4  JSE1-0014
5  ROLLER BEARING  2  JSE-1-0310-6
6  SNAP RING  1  JSE-1-0310-7
7  SAFETY ELEMENT GREASE ZERK  4  ---------------
8  BEARING GREASE ZERK  1  ---------------

MATERIAL  1045 OR EQUIVALENT
FINISH  125 MAX UNLESS NOTED

ALL MACHINED SURFACES TO BE DATUM WITHIN 0.003 T.I.R.
UNLESS OTHERWISE SPECIFIED:
SQUARE AND CONCENTRIC TO PROPER AND CONFIDENTIAL

DIMENSIONS: INCHES [MILLIMETERS]
TOLERANCES:
FRACTIONAL 1/32
ANGLES 0'30"
TWO PLACE DECIMAL .01
THREE PLACE DECIMAL .005
FOUR PLACE DECIMAL .0005
BREAK ALL SHARP EDGES

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DO NOT SCALE IF IN DOUBT ASK

ASSEMBLY

1) ITEM 3 (BEARING WASHERS) TO BE ADJUSTED ON ASSEMBLY, INNER TO GIVE CORRECT DETENT POCKET ALIGNMENT & OUTER TO GIVE CORRECT BEARING FIT.

2) SAFETY ELEMENT MODULE COMPONENTS & DETENT POCKET TO BE COATED WITH KLUBER Q NB 5G GREASE & FREET SPACE FILLED WITH KLUBER STABURAGS NBU12 GREASE.

3) DRY GREASE PRIOR TO LUBRICATION, BEARING LUBRICATE VIA ITEM 10 (SH14UNF90) GREASE NIPPLE PLUG GREASE HOLE WITH ITEM 11 TO PREVENT SEEPAGE.

TORQUE TIGHTEN TO 90 lb ins

6 HOLES 7/16"-20 UNF x 3/4" DEEP

TORQUE TIGHTEN TO 45 lb ins

BREAK-OUT TORQUE 12854 lb ins

MAX OPERATING SPEED 2500 RPM

ALL DIMENSIONS IN INCHES
DO NOT SCALE IF IN DOUBT ASK

ITEMS 1 & 6 TO BE ADJUSTED ON ASSEMBLY TO GIVE NO PLAY & NO PRELOAD ACROSS BEARINGS

LUBRICATION
1) SAFETY ELEMENT MODULE PARTS ARE FIRST SMEARED WITH KLUBER ALTEMP Q NB50, BEFORE FILLING THE FREE SPACE WITH MOBIL XTC.
2) BEARING FREE SPACE TO BE 100% FILLED WITH DELTA PLEX EP2

MAXIMUM BREAK-OUT TORQUE = 12225 Nm [9015 lbf-ft]
MINIMUM BREAK-OUT TORQUE = 3650 Nm [2720 lbf-ft]
MAXIMUM PRESET TORQUE = 80% MAX = 9780 Nm [7210 lbf-ft]
PRESET TORQUE = REFER TO ORDER

BRUNEL PART No JS20-0202A-1
PART No PL857M01

SE20 SAFETY ELEMENT FOR ROCKWELL 92N UJ

03-S120NA0223-A
DO NOT SCALE IF IN DOUBT ASK

ITEMS 1 & 6 TO BE ADJUSTED ON ASSEMBLY TO GIVE NO PLAY & NO PRELOAD ACROSS BEARINGS

LUBRICATION
1) SAFETY ELEMENT MODULE PARTS ARE FIRST Smeared WITH KLUBER ALTEMP O & NLGI, BEFORE FILLING THE FREE SPACE WITH MOBIL XTC.
2) BEARING FREE SPACE TO BE 100% FILLED WITH DELTAPLEX EP2.

MAXIMUM BREAK-OUT TORQUE = 20450 Nm (18034 lbf-ft)
MINIMUM BREAK-OUT TORQUE = 6710 Nm (5698 lbf-ft)
MAXIMUM PRESET TORQUE = 80% MAX = 19560 Nm (17427 lbf-ft)
PRESET TORQUE = REFER TO ORDER

6 - 3/16"-18 UNCH HOLES SPACED AS SHOWN ON A 1/8" 15.1750" PCD

TORQUE TIGHTEN TO 58 Nm (43 lbf-ft) SECURE WITH LOC-TITE 270

1/2" x 13 UNC x 19 (3/4") LIFTING HOLE

NOTES
ADJUST TO GIVE 0.1520/0.203 [0.0360/0.051]
PRELOAD ON ASSEMBLY
1. **TORQUE ADJUSTMENT & INITIAL STARTUP**
   a. These torque limiters were preset at the factory, no further adjustment is required at this time. If it is desired to adjust the torque at a later date, proceed as follows.
   b. **Externally Adjustable**
      Procedure for setting the externally adjustable element:
      How to find zero Spring Compression
      1. Release Socket Head Set Screw (6-15).
      2. Turn housing nut counter-clockwise using 2-1/2” socket until spring force is removed and the housing nut is free to turn by hand. Now turn the housing by hand clockwise and determine the point at which resistance is first felt as the springs become engaged. This is the “zero point”. The number of setting marks required from the Setting Chart must be counted from this “zero point”.
      3. Using 2-1/2” socket turn housing nut until the required number of setting marks from “zero” are obtained.
      4. Turn Socket Head Set Screw until tight (6-15).
      5. Repeat steps 1 through 6 for each safety element. How to adjust element to specified setting.

   **CAUTION:** If you exceed the factory setting possible catastrophic failures could occur.

   — **CAUTION** —
   This machine is equipped with an externally adjustable break away torque limiter. The limiter was preset to match your engine H.P. **DO NOT** exceed this setting. This information has been recorded and limiter marked at the factory.

2. **RESETTING**

   On overload, the safety element ball is displaced and the Module Carrier Plate disengages from the Detent Pocket Plate, allowing the Module Carrier Hub (5-1) to rotate freely. **PTO clutch should be disengaged immediately after the Torque Limiter has disengaged.** Refer to Morbark operator safety manual. Then align the two reset arrows on the Detent Pocket Plate and the Module Carrier Plate by rotating the Torque Limiter by hand. After aligning the match marks strike the safety element plungers with a soft mallet and the plunger will move back into the safety element 5/16 inch signifying that the unit is engaged.

3. **GENERAL MAINTENANCE**

   — **CAUTION** —
   The torque limiter must be greased once a month or after it has disengaged. If the torque limiter has not disengaged in 1 month, a manual reduction to “0” torque setting on all safety elements, **Ref: Fig 7-6** is required and then a trip of the torque limiter is required. If this procedure is not followed, you will void any warranty on the torque limiter. Brunel’s standard warranty terms apply.
   a. Disengaged safety elements, **Ref: Fig 7-6** should be greased once a month with Mobil XTC. Pump 5-7 pumps from a grease gun into grease fitting (6-18).

   — continued on page 16
Installation and Maintenance Instructions
JSE3-0213EAXT series

b. The bearings must have 7-10 pumps of Mobil SHC 220 grease applied once a month through grease fitting. Ref: Fig 7-9 or until grease comes out of the grease vent. Ref: Fig 7-10. The driving half of the torque limiter, Ref: Fig 7-1 and driven half of the torque limiter, Ref: Fig 7-2 should be spun independently of each other for 10 revolutions.

c. Safety elements should be stripped, inspected and reassembled at least once every three years, more frequently where frequent tripping occurs. Bearings should be inspected every three years.

Figure "Ref:" may vary depending on the torque limiter style that is installed on your Morbark Grinder.

4. TROUBLE SHOOTING

a. Continual releasing.
   1) Detent Pocket (6-11) worn. Remove Safety Element (5-6) to remove detent pocket, first remove 3/8-16 SHCS and extract detent pocket using a slide hammer with 12mm x 1.75 pitch heat treated threaded rod, & Rotate Detent 90º & reinstall. If badly worn replace with new detent pocket (6-11).
   2) If additional torque capacity is required. Consult Morbark Service Department.

b. Unable to screw Housing Nut (6-7) in any further.
   1) Loosen Set Screw (6-15) and make sure that the threads on the Housing Nut and Housing are not damaged, if so clean & file burrs until usable or replace defective parts.
   2) You have reached maximum torque capacity.

c. Unable to reset. Align reset marks on Module Carrier Hub (7-1) and Detent Pocket Plate (7-2).
1. TORQUE ADJUSTMENT & INITIAL STARTUP

   a. These safety elements were preset at the factory, no further adjustment is required at this time.
   b. If it is desired to adjust the release torque at a later date, refer to #3 “Torque Adjustment”.

2. RESETTING

On overload, the safety element ball is displaced and the Module Carrier Plate disengages from the Detent Pocket Plate. With the drive at rest (the power off) and the overload cleared, align the two reset arrows (or grooves) on the Detent Pocket Plate and Module Carrier Plate by turning the mill shaft by hand. After aligning the match marks strike the safety element plungers with a soft mallet and the plunger will move back into the safety element signifying that the unit is engaged.

3. TORQUE ADJUSTMENT

   a. To adjust torque at the job site: Prior to setting Safety Elements which are new or which have been re-assembled, the desired release torque for the torque limiter must be known.
   b. From this desired Release Torque, the required tangential force (Ft) must be calculated. Perform the following calculation and proceed with setting each Safety Element to the same tangential force from the graph supplied.

   **CALCULATION:**
   
   \[ \text{Ft} = \frac{T}{N \times R} \]
   
   where:
   
   Ft = Tangential force (pounds)
   T = Required release torque of drive (lb-in)
   N = Total quantity of Safety Elements on Torque Limiter.
   R = Mounting radius of Safety Elements on Torque Limiter (in.)

   — continued on page 18

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**Figure 6**

Section View of Part No. JSE3-0015XT Safety Element
Parts referred to by (Figure # - Part #)
c. In order to determine “zero” and set each safety element:
   1) Release Socket Head Set Screw (6-15).
   2) Turn housing nut (6-7) counter-clockwise using 2-1/2” socket until spring force is removed and the housing nut is free to turn by hand. Now turn the housing by hand clockwise and determine the point at which resistance is first felt as the springs become engaged. This is the “zero point”.
   3) Using 2-1/2” socket turn housing nut until the required number of setting marks from “zero” are obtained.
   4) Turn Socket Head Set Screw (6-15) until tight.
   5) Repeat steps 1 through 4 for each safety element.

EXAMPLE:
A Torque Limiter has four JSE3-0015XT Safety Elements mounted on a 7.3” radius. We want the drive to release at 363,800 lb-in torque.
1. Determine tangential force, Ft
   \[ Ft = \frac{363,800 \text{ lb-in}}{(4 \text{ elements} \times (5.35” \text{ radius})} \approx 17,000 \text{ pounds.} \]
2. Read from graph for JSE3-0015XT, the required number setting from zero compression and set each safety element accordingly. For this example each safety element would be set to 1.2 (1-2/10 revolution from zero).

4. METHOD OF PRELOADING EACH SAFETY ELEMENT (BLIND HOLE DETENT)
   a. Bolt the Detent Pocket (6-11) into the Detent Pocket Plate (5-2) using 3/8”-16 x 1.25” SHCS (6-10).
   b. Grease the bushing (6-8) complete with “O” ring (6-12) and install over the greased plunger (6-1). Install the greased ball (6-9) in the hole in the Module Carrier Plate (5-1).
   c. Insert the Safety Element assembly (5-6) firmly into the Module Carrier Plate (5-1).
   d. Using feeler guages, measure the gap between the base of the Safety Element (5-6) and the Module Carrier Plate (5-1).
   e. Accumulate pealable shims to a thickness of 0.003- 0.008” less than the gap measured in d. above.
   f. Remove Safety Element (5-6) from Module Carrier Plate (5-1) and remount over shims.
   g. Insert Qty. 4 7/16”-20 x 2.25” SHCS or 12pt bolt (6-6) and torque tighten to 72 lb.-ft.

5. TROUBLE SHOOTING
   a. Continual releasing, further adjustment making no difference.
      1) Detent Pocket (6-11) worn. Remove Safety Element and remove Detent Pocket. Rotate Detent 90° and reinstall. If badly worn replace with new detent pocket.
      2) Additional torque capacity is required.
   b. Unable to screw Housing Nut (6-7) in any further.
      1) Loosen Socket Head Set Screw (6-15) and make sure that the threads on the Housing Nut and Housing are not damaged. If so clean & file burrs until usable or replace defective parts.
      2) You have reached maximum torque capacity.
   c. Unable to reset.
      Reset arrows not aligned. Check reference marks on Module Carrier and Detent Pocket Plate.

6. SAFETY ELEMENT - METHOD OF ASSEMBLY
   a. Clean all components and coat all surfaces with a suitable anti-seize compound.
   b. Grease inside surfaces of the Housing and install Inner Thrust Race (6-4).
   c. Grease Plunger (6-1) and install thru Housing and Inner Thrust Race.
   d. Install 15 mm Balls (6-3), apply grease over balls.
   e. Grease and Install Outer Thrust Race (6-2).
   f. Grease and Install 12 springs (6-5), oriented as shown in cross section.
   g. Grease inner walls of Housing Nut (6-7) and install “O” ring (6-17).
   h. Screw in the Housing Nut (6-7) into the Housing until there is contact with the springs (6-5).
   i. Insert the Locking Pellet (6-14) and Socket Head Set Screw (6-15) into the side of the Housing to facilitate locking the Housing Nut. (Refer to #3 Torque Adjustment)
   j. Grease and insert the “O” Ring (6-12) into the Bushing (6-8). Insert the Detent Ball (6-9) after thoroughly greasing the Bushing ID. Grease the Plunger (6-1) and install the Bushing.
Setting Charts

JSE3-0015XT

Tangential force (lbs) vs. Turns From Zero Spring Compression

JSE3-0213EAXT

Tangential force (in-lbs) vs. Turns From Zero Spring Compression
Figure 7