# MATERIAL PROCESSOR

# INSTRUCTION MANUAL

*MODELS:*

*M35G  M35K  M35S*

*"Use Genuine NPK Parts"*

NPK ...attachments; designed, built and backed by NPK.

7550 Independence Drive
Walton Hills, OH 44146-5541
Phone (440) 232-7900
Toll-free (800) 225-4379
Fax (440) 232-6294

# CONTENTS


SAFETY ..... 4
OPERATION ..... 5
MAINTENANCE ..... 6
INTRODUCTION ..... 8
EXCAVATOR COMPATIBILITY ..... 8
M-SERIES SPECIFICATIONS ..... 9
M35G MATERIAL PROCESSOR ..... 9
M35K MATERIAL PROCESSOR ..... 10
M35S MATERIAL PROCESSOR ..... 11
K JAW CUTTING CAPACITY ..... 12
SERIAL NUMBER LOCATION ..... 13
JAW SET IDENTIFICATION ..... 14
PROCESSOR BOOSTER & CYLINDER ..... 17
INTRODUCTION ..... 17
STRUCTURE OF THE BOOSTED CYLINDER ..... 18
OPERATING PRINCIPLE ..... 19
HYDRAULIC INSTALLATION ..... 26
HYDRAULIC KITS ..... 26
FLOW DIRECTION ..... 26
SHUT-OFF VALVES ..... 26
TEST PORT LOCATIONS ..... 27
PREVENTION OF CONTAMINATION ..... 28
HYDRAULIC QUICK DISCONNECTS ..... 29
MOUNTING INSTALLATION ..... 31
M35 SERIES TOP BRACKET ..... 31
MOUNTING TO THE CARRIER ..... 32
REMOVAL FROM THE CARRIER ..... 32
STORAGE OF THE M35 MATERIAL PROCESSOR ..... 33
HOSE INSTALLATION ..... 34
WHIP HOSE INSTALLATION TIPS ..... 34
OPERATING INSTRUCTIONS ..... 36
OPERATING TECHNIQUES AND PRECAUTIONS ..... 40
GENERAL MAINTENANCE ..... 42
DAILY INSPECTION AND MAINTENANCE ..... 42
LUBRICATION POINTS ..... 43
HOSE INSTALLATION TIPS ..... 44
CUTTER BLADE MAINTENANCE ..... 46
G and S JAWS ..... 46
M35K JAW MAINTENANCE ..... 48
DAILY MAINTENANCE ..... 48
CUTTER BLADE MAINTENANCE ..... 49
K JAWS ..... 49
K JAW BLADE SET UP PROCEDURE ..... 50
M35K ..... 50
COMPONENT DESCRIPTION ..... 51
M35K ..... 51
K JAW BLADE MAINTENANCE AND ADJUSTMENT ..... 52
PIERCING TIP MAINTENANCE AND REPLACEMENT ..... 59
MAINTENANCE ..... 59
JAW INSPECTION AND MAINTENANCE ..... 60
JAW INSPECTION: G and S JAWS ..... 60
WEEKLY INSPECTION ..... 60
JAW PROFILES: G and S JAWS ..... 60
JAW BUILD-UP AND HARDFACING (M35S) ..... 60
TEETH BUILD-UP AND HARDFACING (M35G) ..... 61
REPLACEABLE TOOTH PLATES – G JAWS ..... 62
JAW AND TOOTH REBUILD PROCEDURE: S and G JAWS ..... 62

# CONTENTS


JAW CONTACT AREAS ..... 65
S and G JAW CONTACT AREAS ..... 65
FRAME MAINTENANCE ..... 66
REPAIR OF MAIN FRAME ..... 66
ROUTINE WELD REPAIR ..... 66
INSPECTION AND MAINTENANCE ..... 68
BOOSTER CYLINDER ..... 68
DISASSEMBLY ..... 68
INSPECTING AND CLEANING CYLINDER COMPONENTS ..... 71
SUGGESTED REPAIR TOOLS AND EQUIPMENT ..... 73
JAW SET INTERCHANGE ..... 78
TOOLS AND SUPPLIES ..... 78
JAW SET INTERCHANGE ..... 79
PROCEDURE FOR JAW SET INTERCHANGE ..... 79
UNIT POSITIONING ..... 79
DETACHMENT OF THE EYE AND FORKED JAWS FROM THE CYLINDER SUB-ASSEMBLIES ..... 79
REMOVAL OF THE JAW SET ASSEMBLY FROM THE MAIN FRAME ..... 80
JAW SET STORAGE ..... 81
JAW SET INSTALLATION INTO THE MAIN FRAME ..... 82
SLEWING RING INSPECTION AND MAINTENANCE ..... 83
MEASURING MAXIMUM AXIAL MOVEMENT ..... 83
SWIVEL MANIFOLD MAINTENANCE ..... 84
SWIVEL MANIFOLD ASSEMBLY ..... 84
LEAKAGE OF THE SEALS ..... 84
TESTING THE SWIVEL SEALS FOR INTERNAL LEAKAGE ..... 85
TEST PROCEDURE ..... 85
REPLACEMENT OF THE SEALS IN THE SWIVEL ..... 86
FASTENER TORQUE SPECIFICATIONS ..... 90
HOSE TORQUE SPECIFICATIONS ..... 92
TROUBLESHOOTING ..... 93
DETERMINE THE TYPE OF PROBLEM ..... 93
DETERMINE THE CAUSE OF THE PROBLEM ..... 93
LOSS OF POWER ..... 93
TROUBLESHOOTING GUIDE FOR LOW POWER ..... 94
RELIEF VALVE CHECKS ..... 94
MEASURING OPERATING PRESSURES ..... 96
RELIEF VALVE CHECKING AND SETTING PROCEDURE ..... 96
PRESSURE INTENSIFIER SEQUENCE VALVE AND RELIEF VALVE ACTUATION ..... 98
M35 MATERIAL PROCESSOR RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS ..... 99
RELIEF VALVE LOCATION ..... 99
PRESSURE INTENSIFIER OPERATION ..... 102
PRESSURE INTENSIFIER (BOOSTER) ..... 102
RAPID CONTINUOUS CLICKING IS HEARD AND THE MATERIAL IS NOT BEING CRUSHED/SHEARED AS EXPECTED ..... 102
CHECKING BOOSTED PRESSURE ..... 103
SLOW CYCLE SPEED ..... 104
TEST PROCEDURE ..... 104
CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE ..... 106
JAW DRIFT ..... 108
TO DETERMINE IF THE JAW DRIFT IS WITH THE M35 MATERIAL PROCESSOR OR THE CARRIER ROTATION ..... 108
KEYWORDS FOR COMMON M35 PROCESSOR COMPONENTS ..... 112
KEYWORDS FOR COMMON M35 PROCESSOR “K” JAW COMPONENTS ..... 113
KEYWORDS FOR COMMON M35 PROCESSOR CYLINDER COMPONENTS ..... 114
WARRANTY STATEMENTS ..... 115
NOTES ..... 117
SERVICE RECORD ..... 117

# SAFETY

Safety notices in NPK Instruction Manuals follow ISO and ANSI standards for safety warnings:

DANGER (red) notices indicate an imminently hazardous situation which, if not avoided, **will result in death or serious injury**.

WARNING (orange) notices indicate a potentially hazardous situation which, if not avoided, **could result in death or serious injury.**

CAUTION (yellow) notices indicate a potentially hazardous situation, which, if not avoided, **may result in minor or moderate injury.**

ATTENTION (blue) notices in NPK Instruction Manuals are an NPK standard to alert the reader to situations which, if not avoided, **could result in equipment damage.**


WARNING – FALLING OR FLYING DEBRIS decals are included with each NPK MATERIAL PROCESSOR. The decal (***part number H100-7210***) must be installed in the cab, visible to the operator.


WARNING – STAY CLEAR decal (***part number H100-7200***) is installed on all NPK Crushers, Shears, and MATERIAL PROCESSORS. Keep them clean and visible. NPK will provide decals free of charge as needed.

# SAFETY

## OPERATION

**⚠ WARNING**

1. Operator personnel must read and understand the ***NPK INSTRUCTION MANUAL*** to prevent serious or fatal injury.
2. ***FLYING OR FALLING DEBRIS CAN CAUSE SERIOUS OR FATAL INJURY.*** Keep personnel and bystanders clear of the MATERIAL PROCESSOR while in operation.
3. Do not operate MATERIAL PROCESSOR without an impact resistant shield between the MATERIAL PROCESSOR and operator. Operate with extreme caution near walls or columns that may collapse and near concrete debris that may fall.
4. Operate the MATERIAL PROCESSOR from the operator's seat only.
5. Use two people whenever operator visibility is limited, one to operate the MATERIAL PROCESSOR, the other to guide operations.
6. ***Do not*** leave a load suspended in air.
7. ***Do not*** pass a load over people, vehicles, etc.
8. ***Do not*** operate the MATERIAL PROCESSOR within reach of power lines.
9. ***Do not*** climb, sit, or ride on the MATERIAL PROCESSOR.

Warning Decal for Cab Installation

**⚠ CAUTION**

10. Match the MATERIAL PROCESSOR size to excavator according to NPK recommendations, see page 8. The excavator must be stable during MATERIAL PROCESSOR operation and during transport.
11. ***Do not*** operate without inspection (access) covers in place.
12. Be especially cautious around hydraulic lines. Hydraulic oil can be extremely **HOT!** ***Avoid skin contact with hydraulic oil. It can cause severe burns!***
13. **Protect hands and body from hydraulic** fluids under pressure. Escaping high pressure fluid can penetrate the skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting any lines. Search for leaks with a piece of cardboard or other object. ***If an accident occurs, see a doctor immediately! Hydraulic fluid injected into the skin must be surgically removed immediately or gangrene may result!***
14. The pressure generated by the power intensifier on the MATERIAL PROCESSOR exceeds 10,000 psi *(690 bar)*, which is higher than commonly encountered on hydraulic equipment. To avoid bodily harm and/or injury when conducting inspection checks, use gauges, hoses and fittings rated at 15,000 psi *(1035 bar)*. For parts replacement, use only genuine NPK replacement parts. Contact NPK Service Department at 1-800-225-4379.
15. When removing or installing mounting pins, beware of flying metal chips.

# SAFETY

## MAINTENANCE

**⚠ CAUTION**

1. Use only NPK supplied replacement parts. NPK specifically disclaims any responsibility for bodily injury or MATERIAL PROCESSOR damage that results from the use of parts not sold or approved by NPK.

2. Use extreme caution in handling. A fully assembled MATERIAL PROCESSOR can weigh up to 5 tons. Sub-assemblies range in weight from hundreds to thousands of pounds. To avoid bodily harm, use lifting and securing mechanisms of adequate capacity to support loads. Seek the aid of an assistant as much as possible, and always when handling heavier sub-assemblies.

3. Use extreme caution when changing jaw sets, particularly in the field. Employ lifting and securing mechanisms of adequate capacity to support the jaw sets. *At least two people are required to change a jaw set safely in the field.*

4. Wear safety glasses and protective clothing when working on the MATERIAL PROCESSOR. Wear thermal-protective gloves when handling heated parts.

5. Prevent exposure to hazardous fumes. Remove all paint, grease, and oil before heating, cutting or welding on the MATERIAL PROCESSOR.

6. Be especially cautious around hydraulic lines. Hydraulic oil can be extremely **HOT**! ***Avoid skin contact with hydraulic oil. It can cause severe burns!***

7. **Protect hands and body from hydraulic fluids under pressure.** Escaping fluid under pressure can penetrate the skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting any lines. Search for leaks with a piece of cardboard or other object. ***If an accident occurs, see a doctor immediately! Hydraulic fluid injected into the skin must be surgically removed within a few hours or gangrene may result.***

8. The pressure generated by the power intensifier on the MATERIAL PROCESSOR exceeds 10,000 psi *(690 bar)*, which is higher than commonly encountered on hydraulic equipment. To avoid bodily harm and/or injury when conducting inspection checks, use gauges, hoses and fittings rated at 15,000 psi *(1035 bar)*. For parts replacement, use only genuine NPK replacement parts. Contact NPK Service Department at 1-800-225-4379.

9. When removing or installing mounting pins, beware of flying metal chips.

# SAFETY

## MAINTENANCE

### STANDARD PRACTICES

**ATTENTION**

Maintenance of and repairs to the MATERIAL PROCESSOR should be performed by an experienced service technician, thoroughly familiar with all standard practices and procedures, and most importantly, all safety precautions. The following is a review of common standard practices to be followed when working with hydraulic equipment, and is not meant to be all-inclusive. Rather, this review is presented as a reminder as to some of the unique characteristics of hydraulic equipment.

- The prevention of foreign contaminant damage is critical when working with hydraulic equipment. Protect exposed holes and parts to guard against entry of contaminants. Install metal or plastic plugs/caps where applicable to prevent entry of debris into the hydraulic system.

- Mark the location and position of mating parts as an aid to re-assembly. Mark corresponding parts uniquely to reflect their relationship, including proper location, position, orientation, and/or alignment.

***DO:***

- During assembly, observe all markings made during disassembly, and all corresponding features of mating parts to ensure proper location, position, orientation, and alignment.

- During disassembly of a sub-assembly, place removed components on a clean, dry surface, in proper relative position as an aid in re-assembly.

- Always inspect threaded areas on components. Repair or replace as required. Never apply uncured thread adhesive to a fastener that has cured adhesive on it. Clean the fastener and the threaded bore. A tap and die may be helpful for this task. Be sure to remove loose debris from the threaded bore.

- Use care to avoid scratches, nicks, dents, or other damage to machined surfaces of mating components.

- When securing a component, always tighten cap screws gradually in an opposing pattern, applying the specified torque.

- Grease can be used to temporarily hold a part in place while the abutting part is placed into position.

- Always use common sense and exercise standard safety precautions when working with all tools and equipment required to maintain, repair or troubleshoot the MATERIAL PROCESSOR.

# INTRODUCTION

Thank you for your purchase of an NPK attachment. NPK prides itself in the design and manufacture of high quality attachments. The quality workmanship and materials, which go into all of our attachments, will provide maximum service life. With proper care and use, your NPK attachment should provide you with many years of productive service.

The purpose of this manual is to provide you with information and instructions required to properly operate and maintain the M35 MATERIAL PROCESSOR. This will result in maximum ATTACHMENT reliability and productivity.

**Read this manual thoroughly** before attempting to operate, remove, disassemble, repair, or troubleshoot the MATERIAL PROCESSOR or any of its components. For additional information or help with any problem encountered, please contact your authorized NPK dealer.

**Follow all the safety precautions** contained in this manual. **Failure to follow safety precautions can result in death, personal injury, injury to others and property damage.**

Use replacement parts sold by NPK only. NPK is not responsible for failures resulting from alterations not approved by NPK or substitution of parts not sold by NPK.

# EXCAVATOR COMPATIBILITY

These carrier weight ranges are intended as a guideline only. Other factors, such as stick length, counterweights, undercarriage, etc., must be taken into consideration.

**⚠ CAUTION**

Mounting a MATERIAL PROCESSOR that is too heavy for the carrier can be dangerous and damage the carrier. Verify carrier stability with the MATERIAL PROCESSOR before transport or operation.

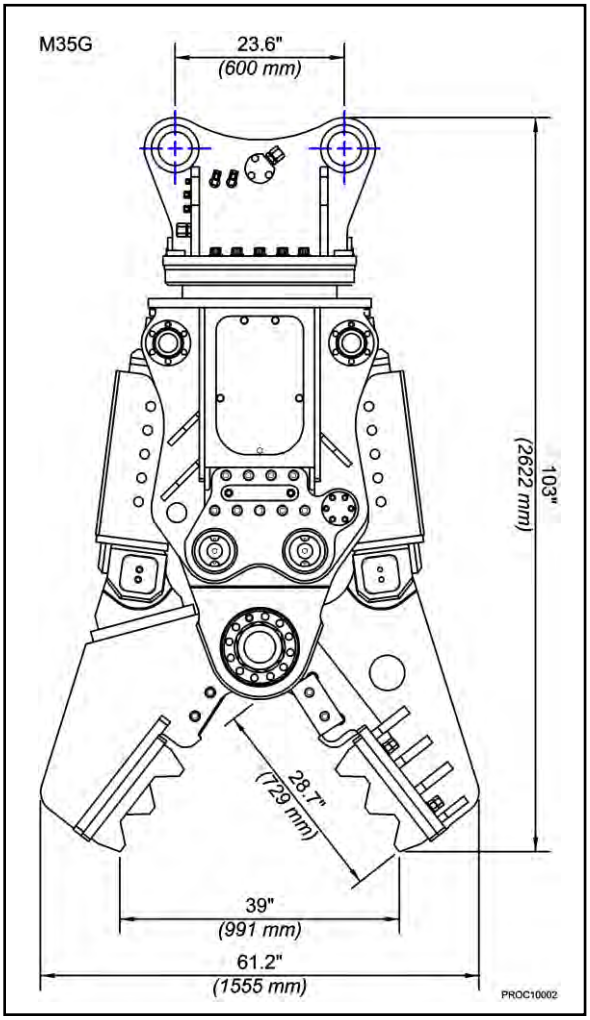
Mounting a MATERIAL PROCESSOR that is too small for the carrier can damage the MATERIAL PROCESSOR and void Warranties. Please consult NPK Service or Engineering for specific detailed information.

| **PROCESSOR MODEL** | **RECOMMENDED CARRIER WEIGHT RANGE 3rd member mounting** | |
|---|---|---|
| | **US ton** | **(*Metric ton*)** |
| **M35** | 30 - 40 | (*27 - 36*) |

*Specifications subject to change without notice.*

# M-SERIES SPECIFICATIONS

## M35G MATERIAL PROCESSOR



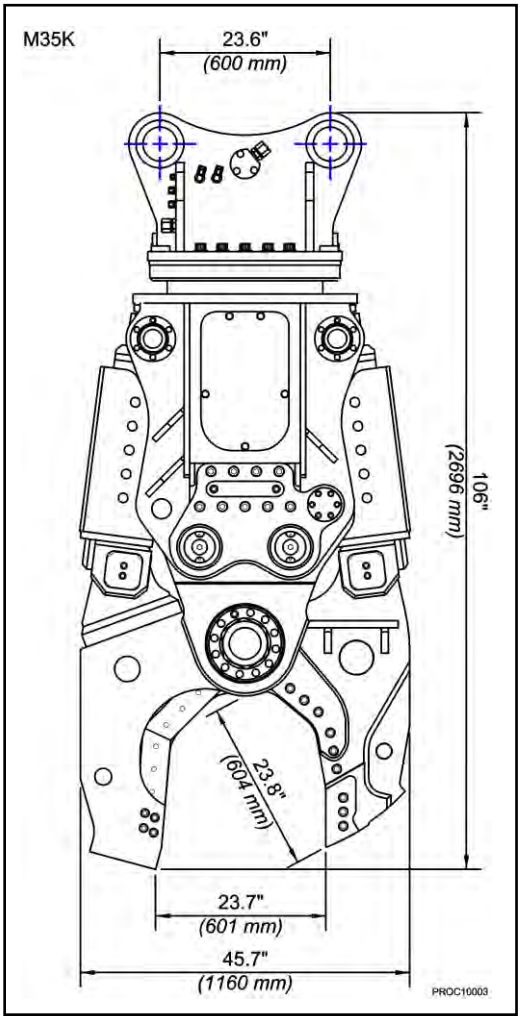

| MODEL | Weight | | Maximum Jaw Opening | | Oil Flow | | Cycle Time seconds | |
|---|---|---|---|---|---|---|---|---|
| | lb. | (*kg*) | in. | (*mm*) | gpm | (*lpm*) | open | close |
| **M35G** | 7,590 | (*3,450*) | 38.6 | (*981*) | 50-80 | (*190-300*) | 1.6 | 3.1 |

| MODEL | Maximum Operating Pressure | | Crushing Force at Tip | |
|---|---|---|---|---|
| | psi | (*bar*) | US Ton | (*Metric Ton*) |
| **M35G** | 3,700 | (*255*) | 127 | (*115*) |

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi *(69 bar)*.
*Maximum operating pressure is determined by reliefs in the crusher.

# M-SERIES SPECIFICATIONS

## M35K MATERIAL PROCESSOR



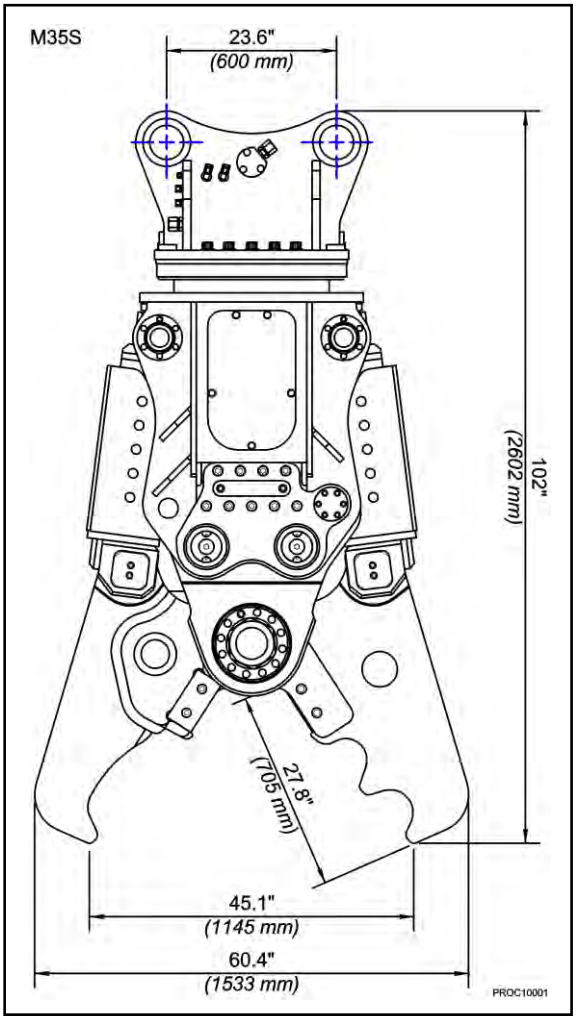

| MODEL | Weight | | Maximum Jaw Opening | | Oil Flow | | Cycle Time seconds | |
|---|---|---|---|---|---|---|---|---|
| | lb. | (*kg*) | in. | (*mm*) | gpm | (*lpm*) | open | close |
| **M35K** | 7,370 | (*3,350*) | 22 | (*559*) | 50-80 | (*190-300*) | 1.6 | 3.1 |

| MODEL | Maximum Operating Pressure | | Crushing Force at Tip | |
|---|---|---|---|---|
| | psi | (*bar*) | US Ton | (*Metric Ton*) |
| **M35K** | 3,700 | (*255*) | 125 | (*113*) |

Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi *(69 bar)*.
*Maximum operating pressure is determined by reliefs in the crusher.

# M-SERIES SPECIFICATIONS

## M35S MATERIAL PROCESSOR

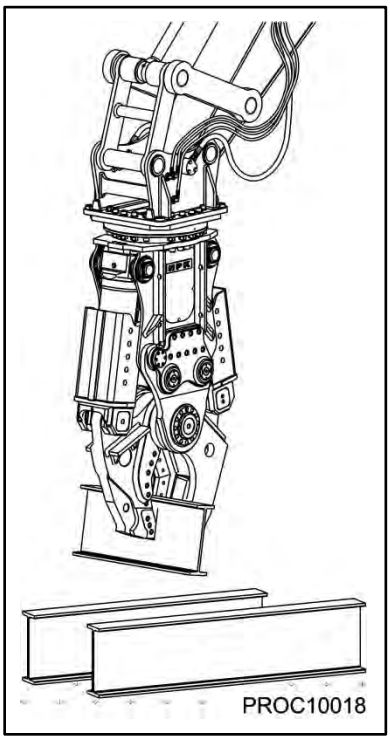



| MODEL | Weight | | Maximum Jaw Opening | | Oil Flow | | Cycle Time seconds | |
|---|---|---|---|---|---|---|---|---|
| | lb. | (*kg*) | in. | (*mm*) | gpm | (*lpm*) | open | close |
| **M35S** | 7,535 | (*3,425*) | 43 | (*1,092*) | 50-80 | (*190-300*) | 1.6 | 3.1 |

| MODEL | Maximum Operating Pressure | | Crushing Force at Tip | |
|---|---|---|---|---|
| | psi | (*bar*) | US Ton | (*Metric Ton*) |
| **M35S** | 3,700 | (*255*) | 110 | (*100*) |

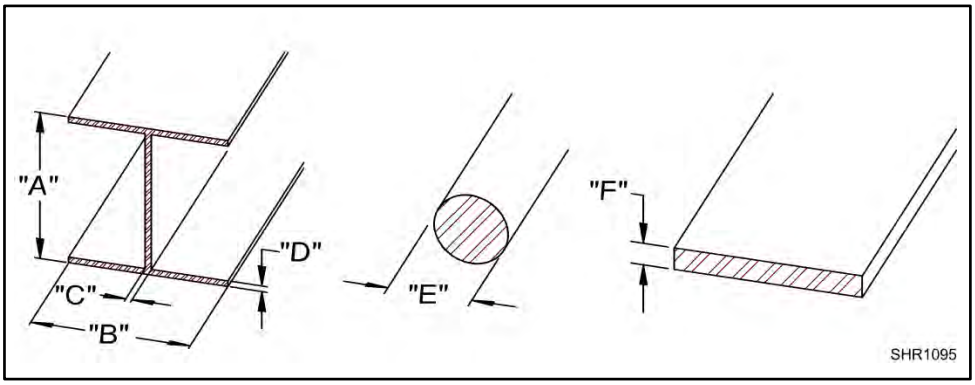
Specifications subject to change without notice.
Cycle time is full stroke at maximum flow.
Carrier flow is set at minimal operating pressure of 1000 psi *(69 bar)*.
*Maximum operating pressure is determined by reliefs in the crusher.

# K JAW CUTTING CAPACITY




**NOTE:** *Cutting capacities listed below are based on a single pass cut. Larger material can be cut using multiple pass cuts.*

**APPETITE GUIDE: MILD STEEL**

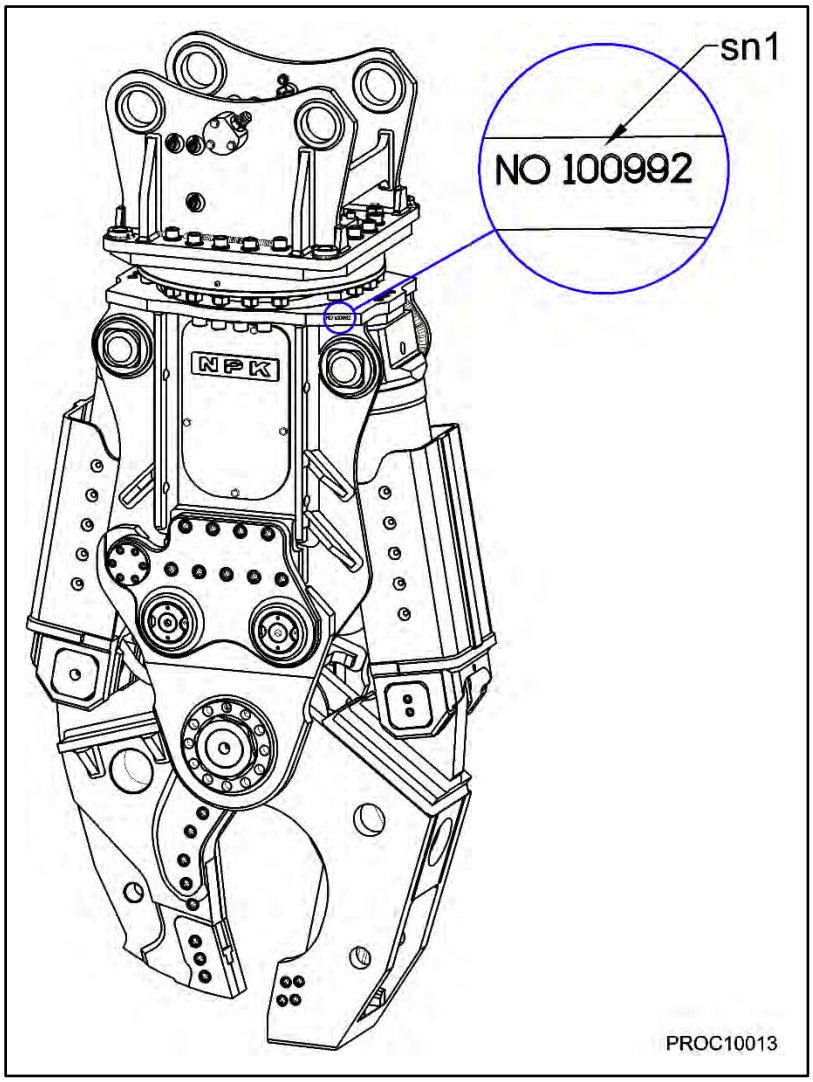



| MODEL | A | | B | | C | | D | |
|---|---|---|---|---|---|---|---|---|
| | in | *(mm)* | in | *(mm)* | in | *(mm)* | in | *(mm)* |
| **M35K** | 16 | *(406)* | 16 | *(406)* | 5/8 | *(15.9)* | 5/8 | *(15.9)* |

| MODEL | E | | F | |
|---|---|---|---|---|
| | in | *(mm)* | in | *(mm)* |
| **M35K** | 2-1/2 | *(63.5)* | 3/4 | *(19.1)* |

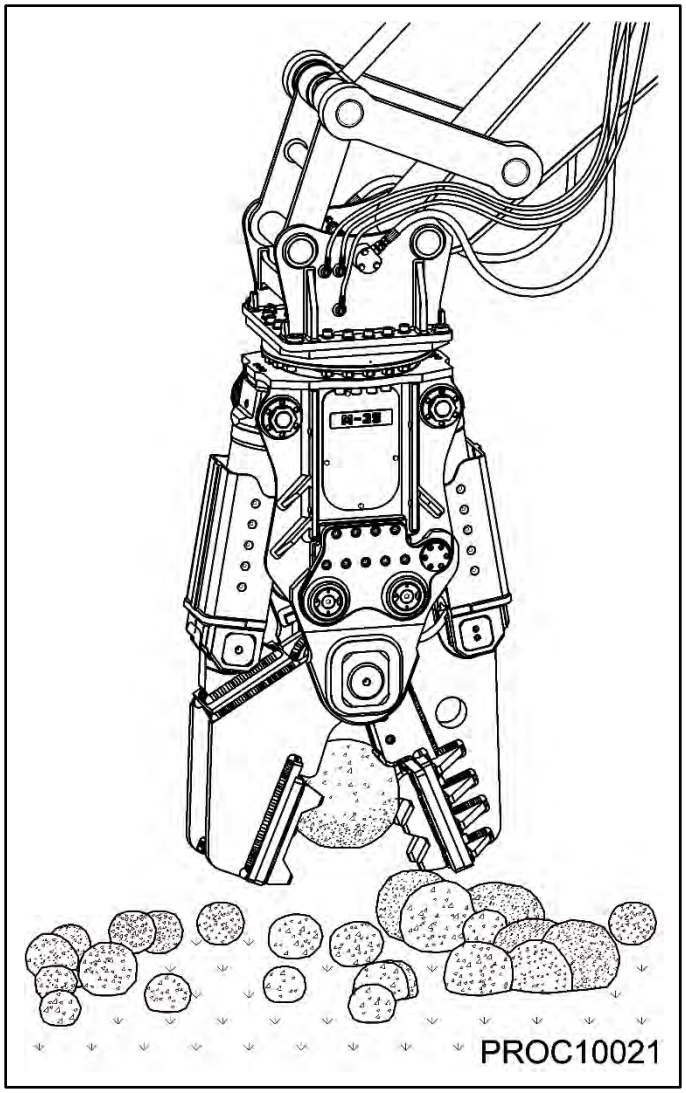
# SERIAL NUMBER LOCATION

## *M35*



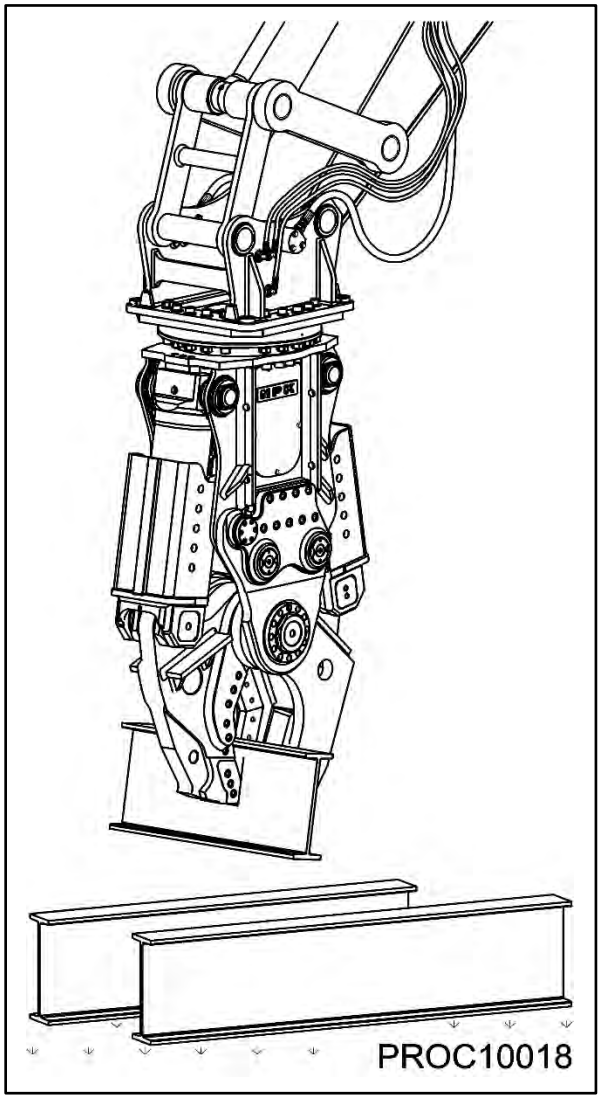
# JAW SET IDENTIFICATION

- G Jaw Set (Pulverizer/Secondary Concrete Crusher) for the downsizing of concrete and the separation of concrete and rebar.



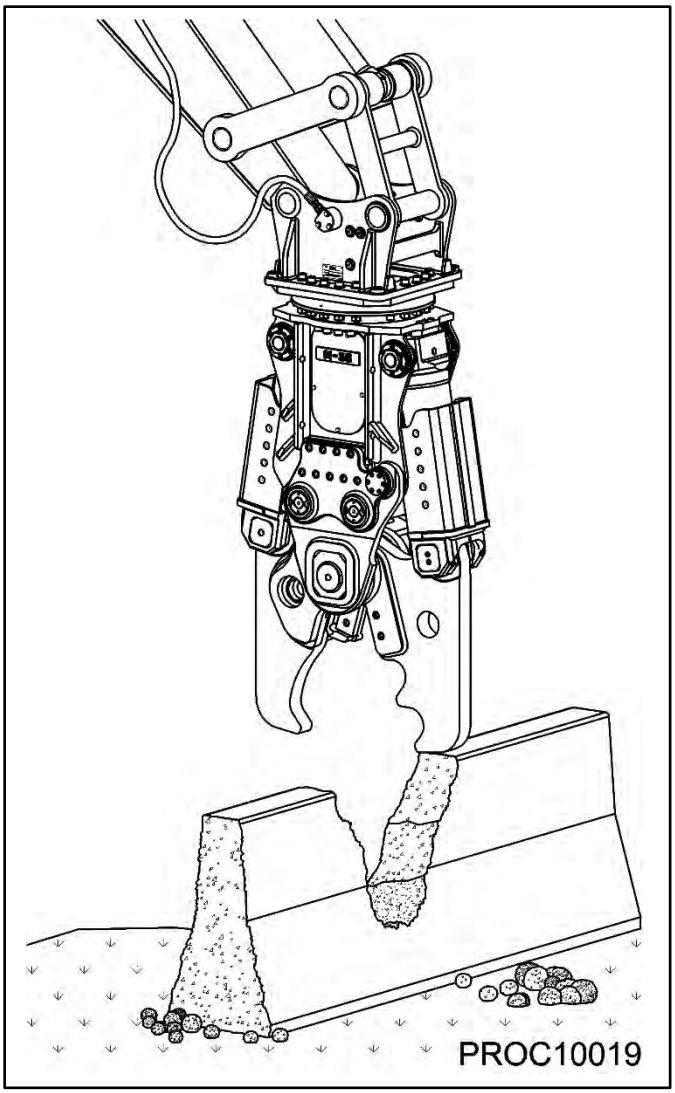
# JAW SET IDENTIFICATION

- K Jaw Set (Shear) for the demolition of steel structures, such as buildings and bridges, as well as for processing of scrap, including steel, wood, rubber and plastics.



# JAW SET IDENTIFICATION

- S Jaw Set (Primary Breaker) for the demolition of concrete pillars, buildings, retaining walls, bridges, and highway barriers.



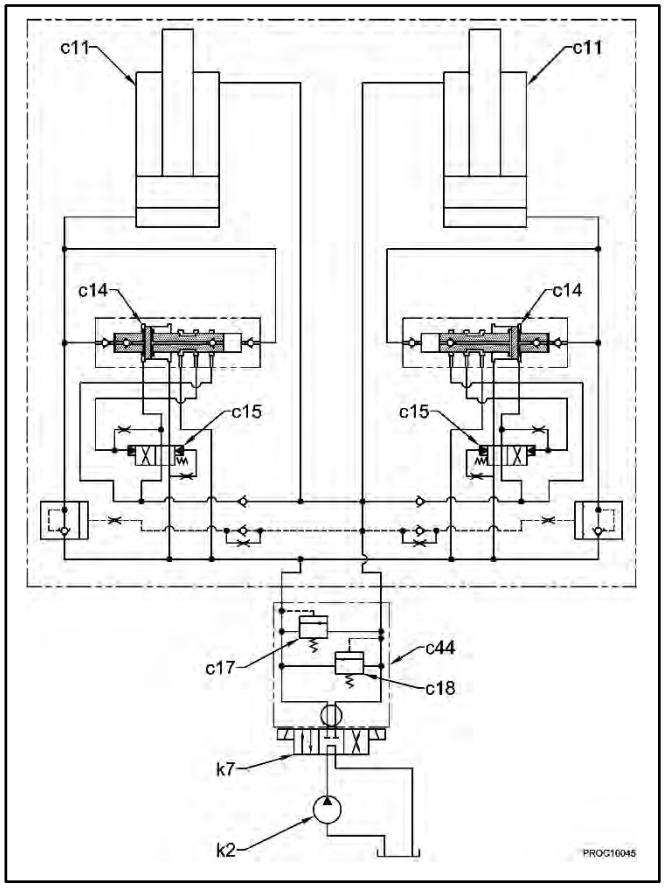

Jaw sets can easily be removed from and installed onto the Material Processor at the job site, see the **"JAW SET INTERCHANGE"** section, page 78, of this manual.

# PROCESSOR BOOSTER & CYLINDER

## INTRODUCTION

The hydraulic cylinders used on the NPK Material Processor are equipped with hydraulic boosters. To close the jaws of the processor, hydraulic oil from the carrier is directed to the base end of the cylinders, which extends the cylinder rods. Under no load, no boost is applied and this results in a rapid cycle time as compared to large, non-boosted cylinders.

When a load *(material to be crushed or sheared)* is encountered, the oil is directed into the booster sections of the cylinders, which intensifies the pressure well beyond the system operating pressure of the excavator. The compact NPK Boosted Cylinder System provides a working force equal to a far larger non-boosted cylinder, which is working at excavator system pressure. Because the NPK boosted cylinder is smaller, it requires less oil for full stroke as compared to a large diameter cylinder. This reduces cycle time for the NPK Material Processor. To open the jaws of the NPK Material Processor, oil is directed to the rod end of the cylinder. This retracts the rod and pulls the jaw open. No boost is provided in the jaw opening mode.




| | |
|---|---|
| **c11** | Jaw Cylinder |
| **c14** | Booster Piston |
| **c15** | Main Valve Assembly |
| **c17** | Relief Valve (close) |
| **c18** | Relief Valve (open) |
| **c44** | Swivel Manifold |
| **k2** | Carrier Hydraulic Pump |
| **k7** | Carrier Control Valve |

# PROCESSOR BOOSTER & CYLINDER

## STRUCTURE OF THE BOOSTED CYLINDER

As shown in **Fig. 1**, the booster cylinder consists of:

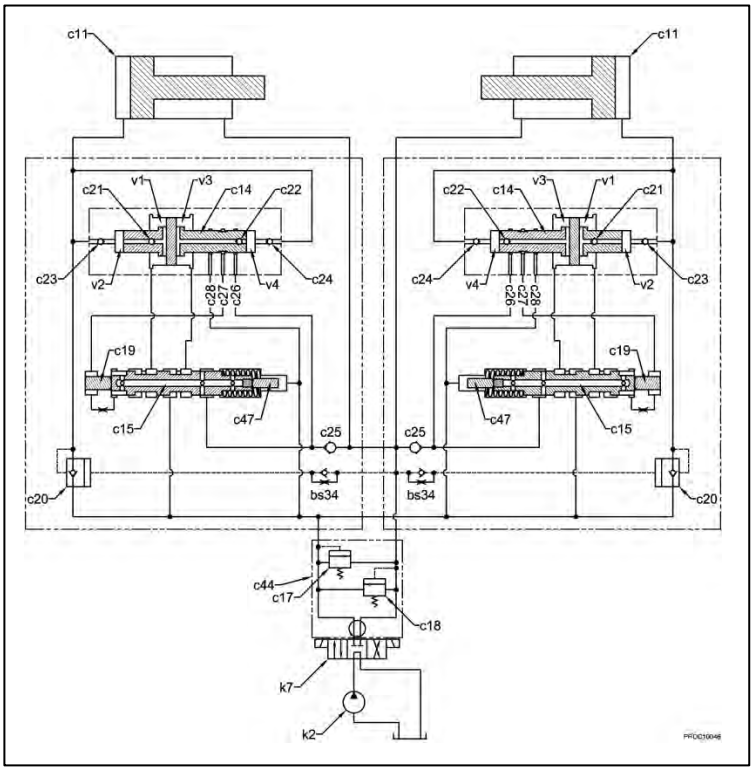



**Fig. 1**

For a complete breakdown of parts in the booster cylinder assembly, see the parts manual for each unit by serial number.

| | |
|---|---|
| **bs34** | Inlet Check Valve |
| **c11** | Jaw Cylinder |
| **c14** | Booster Piston |
| **c15** | Main Valve Assembly |
| **c17** | Relief Valve (close) |
| **c18** | Relief Valve (open) |
| **c19** | Plunger |
| **c20** | Pilot Check Valve Assembly |
| **c21** | Check Valve 1 - booster piston inner "B" |
| **c22** | Check Valve 2 - booster piston inner "A" |
| **c23** | Check Valve 3 - booster sleeve "B" |
| **c24** | Check Valve 4 - booster sleeve "A" |
| **c25** | Check Valve 5 - Return |
| **c26** | Port C1 Piston |
| **c27** | Port C2 Piston |
| **c28** | Port C3 Piston |
| **c44** | Swivel Manifold |
| **c47** | Small Plunger |
| **k2** | Carrier Hydraulic Pump |
| **k7** | Carrier Control Valve |
| **v1** | Oil Chamber - 1 |
| **v2** | Oil Chamber - 2 |
| **v3** | Oil Chamber - 3 |
| **v4** | Oil Chamber - 4 |

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE

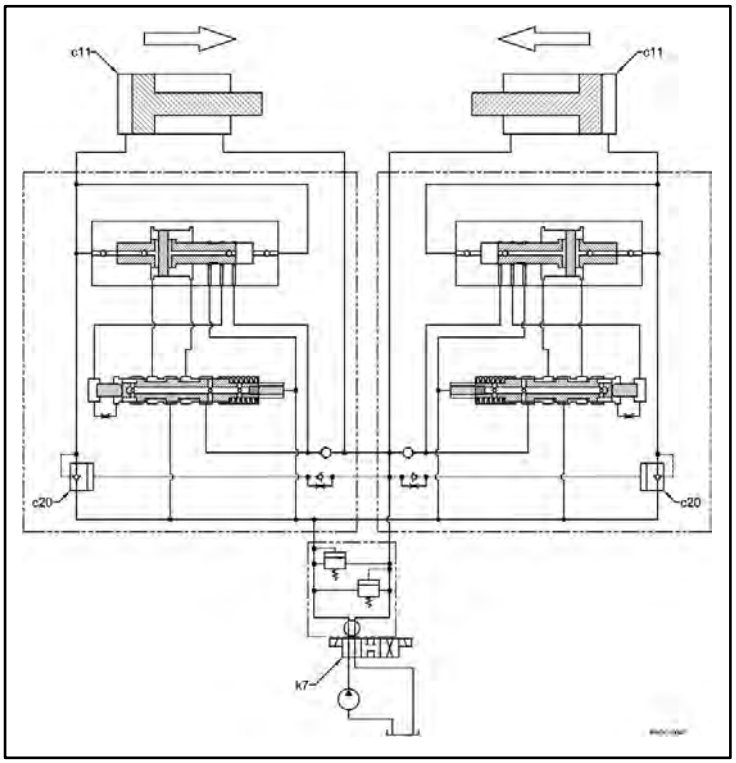



**Fig. 2 CYLINDER EXTEND (NO LOAD)**

| | |
|---|---|
| **c11** | Jaw Cylinder |
| **c20** | Pilot Check Valve Assembly |
| **k7** | Carrier Control Valve |

When the cylinders (c11) are extended *(jaw close)* and no load *(material to be crushed or sheared)* is encountered, oil is directed from the carrier control valve (k7) to the base end of the cylinders by way of the pilot check valves (c20) in the booster assemblies. When there is no load condition, hydraulic pressure is low and no boosted pressure is required.

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE

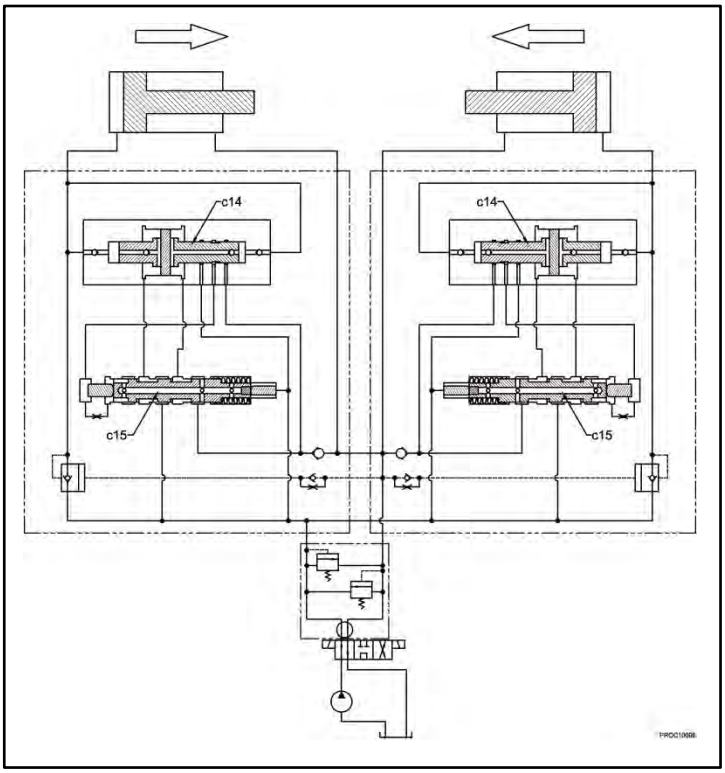



**Fig. 3 BOOSTER ACTUATION**

| | |
|---|---|
| **c14** | Booster Piston |
| **c15** | Main valve Assembly |

When a load *(material to be crushed or sheared)* is encountered on jaw close, the hydraulic pressure in the booster unit starts to rise, which redirects the hydraulic oil through the control valve (c15) of the booster, then to the booster piston (c14). This starts the boosting process. The booster piston is double ended and provides boost in each direction of booster piston travel.

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE

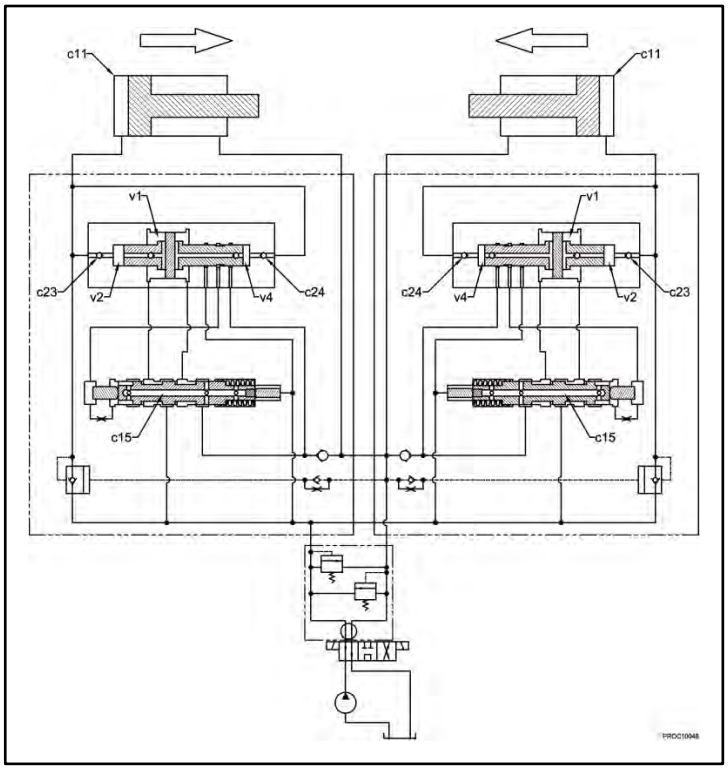



**Fig. 4 FORWARD PISTON STROKE**

| | |
|---|---|
| **c11** | Jaw Cylinder |
| **c14** | Booster Piston |
| **c15** | Main Valve Assembly |
| **c23** | Check Valve 3 - booster sleeve "B" |
| **c24** | Check Valve 4 - booster sleeve "A" |
| **v1** | Oil Chamber - 1 |
| **v2** | Oil Chamber - 2 |
| **v4** | Oil Chamber - 4 |

The hydraulic oil that has passed through the booster valves (c15), flows into rear oil chambers v1 and v2 of the booster pistons (c14) and strokes it toward oil chambers v4. Because the area of the booster pistons in oil chambers v1 is greater than the area in chambers v4, the pressure in oil chambers v4 is intensified. The higher pressure oil is pushed through check valves (c24) to the base end of the cylinders (c11) and closes check valves (c23).

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE

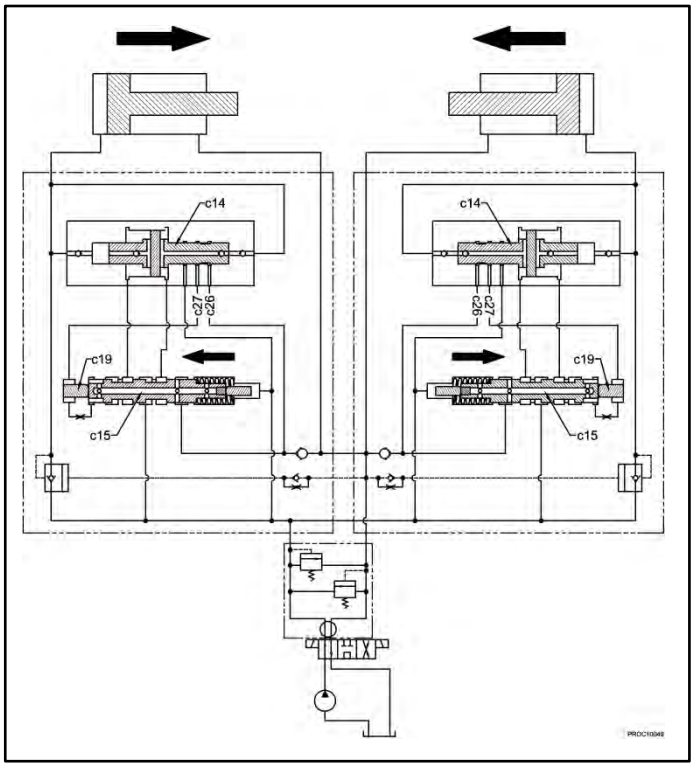



**Fig. 5 MAIN VALVE REVERSE SHIFT**

| | |
|---|---|
| **c14** | Booster Piston |
| **c15** | Main Valve Assembly |
| **c19** | Plunger |
| **c26** | Port C1 Piston |
| **c27** | Port C2 Piston |

When the booster pistons (c14) reaches their full stroke, oil entering port “C1” (c26) transfers to port “C2” (c27) of the pistons. Oil is also sent to the plunger (c19) end of the main valve assemblies (c15). This shifts the valve as shown in **Fig. 5**.

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE

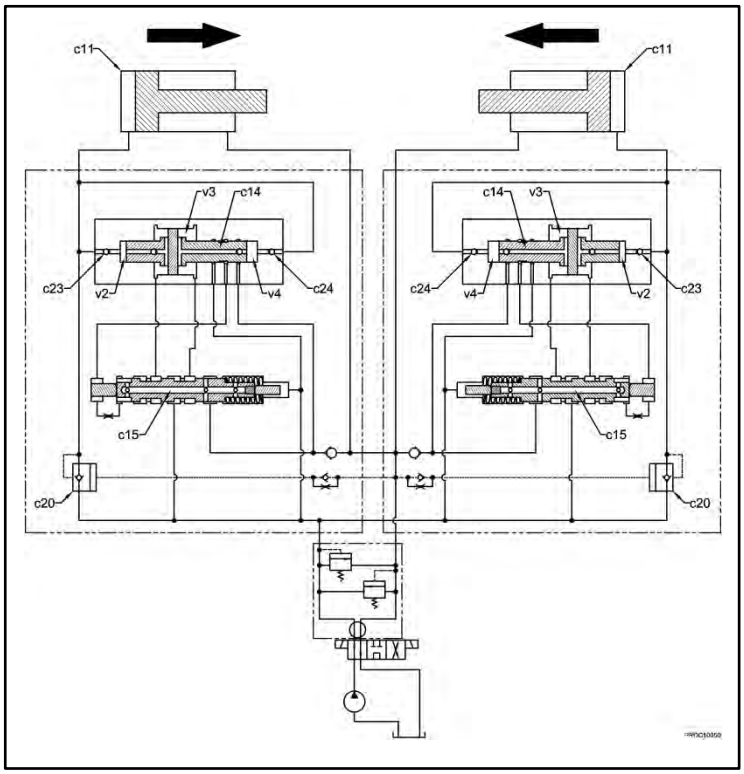



**Fig. 6 REVERSE PISTON STROKE**

| | |
|---|---|
| **c11** | Jaw Cylinder |
| **c14** | Booster Piston |
| **c15** | Main Valve Assembly |
| **c20** | Pilot Check Valve Assembly |
| **c23** | Check Valve 3 - booster sleeve "B" |
| **c24** | Check Valve 4 - booster sleeve "A" |
| **v2** | Oil Chamber - 2 |
| **v3** | Oil Chamber - 3 |
| **v4** | Oil Chamber - 4 |

When the main valve assemblies (c15) have been shifted, oil is directed through the main valve assemblies to oil chambers (v3) and (v4) of the booster pistons (c14). This strokes the booster pistons toward oil chambers (v2). The oil in chambers (v2) is intensified and sent through check valves 3 (c23) to the base end of the cylinders (c11). Pilot check valves (c20) and check valves 4 (c24) are also closed at this time.

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE

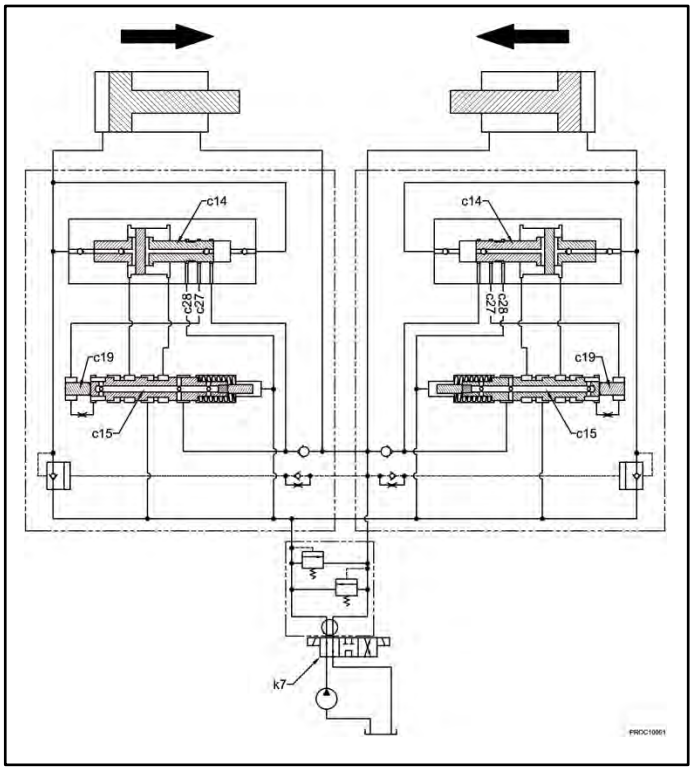


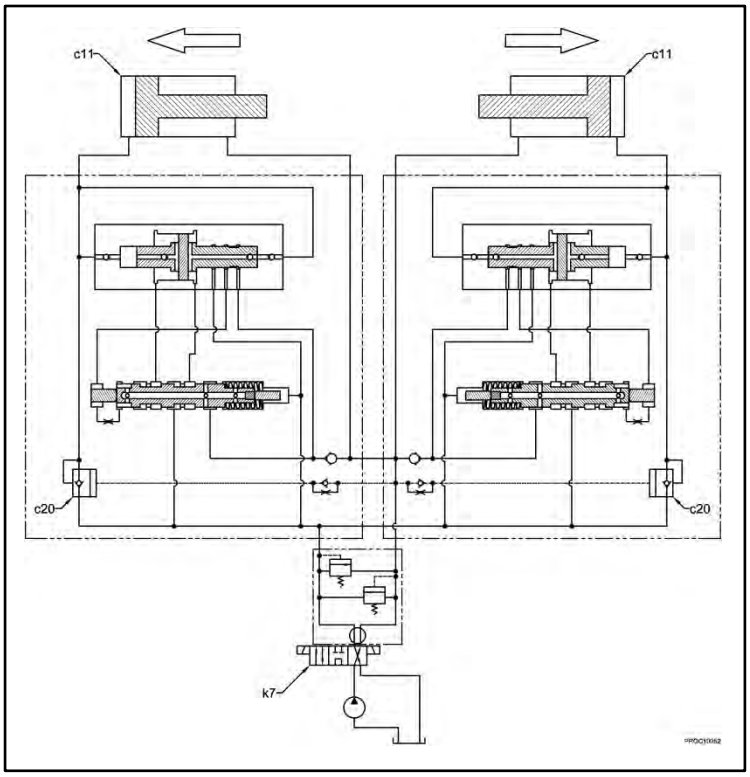

**Fig. 7 VALVE SHIFT TO FORWARD STROKE**

| | |
|---|---|
| **c14** | Booster Piston |
| **c15** | Main Valve Assembly |
| **c19** | Plunger |
| **c27** | Port C2 Piston |
| **c28** | Port C3 Piston |
| **k7** | Carrier Control Valve |

When the booster pistons (c14) reach full reverse stroke, oil drains out of the plunger (c19) ends of the main control valves (c15) through ports C2 (c27) and C3 (c28) of the booster pistons. The main control valve springs move the main control valve spools toward the plungers. This places the main control valves in position to direct oil to the booster pistons to start the next forward piston stroke. These forward and reverse piston strokes will continue as long as the excavator's control valve (k7) is shifted to send hydraulic flow to the boosters and cylinders and that there is sufficient resistance *(load)* to keep the booster active.

# PROCESSOR BOOSTER & CYLINDER

## OPERATING PRINCIPLE




| | |
|---|---|
| **c11** | Jaw Cylinder |
| **c20** | Pilot check valve assembly |
| **k7** | Carrier Control Valve |

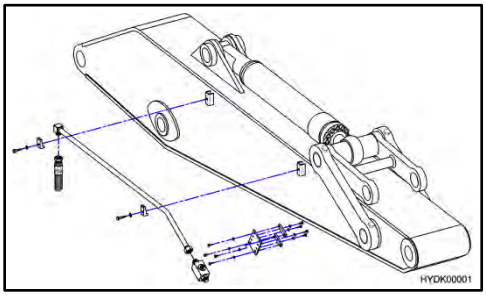
**Fig. 8 CYLINDER RETRACT (JAW OPEN)**

When the crusher jaws are opened, oil from the excavator's control valve (k7) is directed through the boosters to the rod ends of the cylinders (c11). A pilot signal from this flow is sent to open the pilot check valve assemblies (c20) which allows oil to be pushed out of the base end of the cylinders as the cylinder rods retract. There is no boost actuation on the jaw open cycle.

# HYDRAULIC INSTALLATION

## HYDRAULIC KITS

NPK Hydraulic Installation kits are available for virtually all compatible backhoe loaders, excavators and skid steers. Complete parts and instructions for the hydraulic installation of the NPK Material Processor, including valves, electrical or manual controls, hoses and fittings, boom and stick piping and clamps are provided.



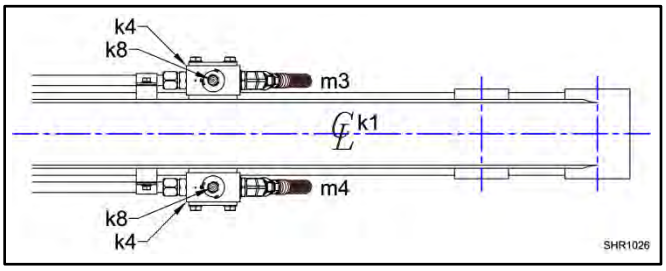

Combination kits that can be used for hydraulic hammer or compactor/driver operation are available.

See your NPK dealer for details or call NPK direct at 1-800-225-4379.

## FLOW DIRECTION

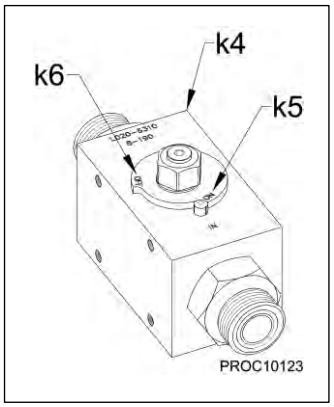
*(All NPK Hydraulic Kits)*

The hydraulic flow to close (m3) the Material Processor jaws is on the left side of the carrier (looking from the operator's seat) and to open (m4) the jaws is on the right.




## SHUT-OFF VALVES

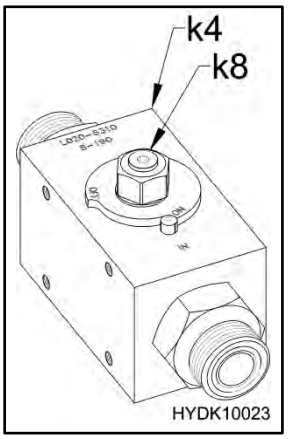
Most NPK Hydraulic Installation Kits use two shut-off valves (k4) on the stick (k1) of the carrier. Each shut-off valve has an **"ON"** (k5) and an **"OFF"** (k6) position. Make sure both shut-off valves are in the **"ON"** position before operating your attachment.



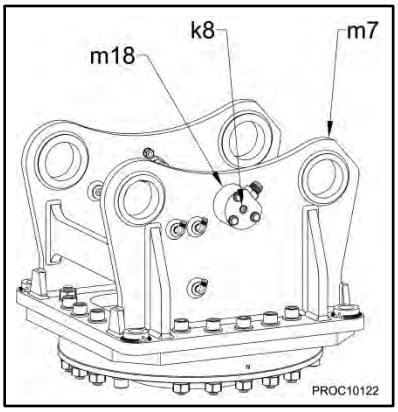
# HYDRAULIC INSTALLATION

## TEST PORT LOCATIONS

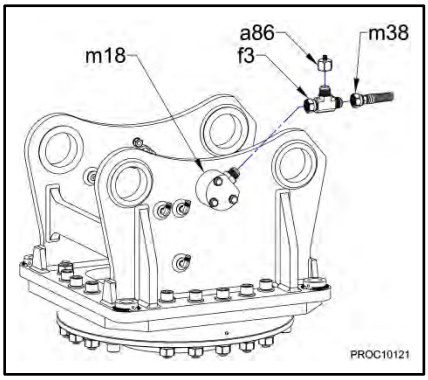
A. NPK Hydraulic Installation kits have pressure test (gauge) ports (k8) in both shut-off valves (k4).




B. NPK also provides pressure test (gauge) ports (k8) in both the pressure and return joint fittings (m18) located on the attachment top bracket (m7).




C. For older units without pressure test ports in the top bracket or for units mounted on a carrier without an NPK Hydraulic Installation kit, it is suggested that you use a correctly sized JIC swivel run tee (f3) and a reducer fitting (a86) between the whip hose (m38) and the joint fitting (m18).



# HYDRAULIC INSTALLATION

**ATTENTION**

## PREVENTION OF CONTAMINATION

1. Neglect of the hydraulic oil will cause many problems in all of the hydraulic components, including the attachment. Care should be taken to check for contamination of the oil and to change the oil if contamination is found. ***Routine oil sampling is recommended once per month.***

- ❖ When the hydraulic oil shows low viscosity and bubbles, this indicates that the oil is deteriorated. If the oil is dark brown and gives off an offensive odor, it is severely deteriorated. ***Change the oil immediately!***
- ❖ When the oil is clouded, or the oil filter becomes clogged, it indicates that the oil is contaminated. ***Change the oil immediately!***
- ❖ To change the contaminated hydraulic oil, drain the hydraulic system as completely as possible. Try to minimize the amount of old oil that will be mixed with the new oil. **NOTE:** *It is suggested to change the oil in the system with all of the cylinders retracted.*

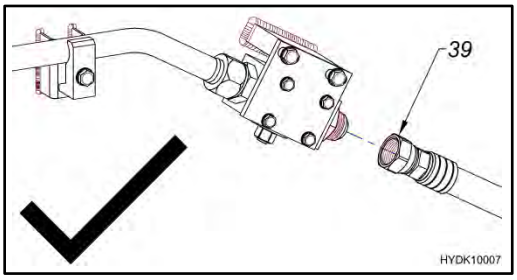
**NOTE:** *If a catastrophic failure has occurred and the system is found to have metal mixed with the hydraulic oil, a complete disassembly and clean out must be done to* ***ALL*** *hydraulic components and attachments.* ***ALL*** *of the hydraulic lines must be flushed.*

2. Do not allow any contaminants to mix with the hydraulic oil. Take special care in preventing contamination from entering the hydraulic system through the hose or tube connection when installing or removing the attachment. Always have caps and plugs ready.
3. Low oil level will cause heat buildup, resulting in deterioration of the hydraulic oil. Also, it may cause pump cavitation due to air mixing with the oil, leading to damage to the attachment or the carrier components. Keep the oil at the proper level at all times.
4. Do not use the hammer at an operating temperature higher than 180°F *(80°C)*. The proper operating oil temperature range is between 120°F *(50°C)* and 180°F *(80°C)*. Since contaminated cooler fins cause reduced efficiency of the cooler, keep them clean at all times. The use of a heat gun is the best way to evaluate if the cooler is working properly.
5. Water in the hydraulic oil will lead to damage of the attachment and the carrier. Drain off water and foreign matter from the hydraulic tank at specified intervals. When out of service, the attachment should be stored indoors.

# HYDRAULIC INSTALLATION

## HYDRAULIC QUICK DISCONNECTS

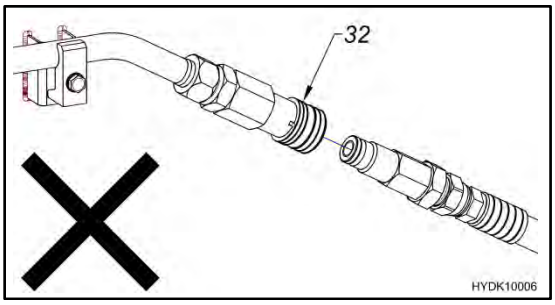
NPK prefers the use of a straight JIC connection *(39)* when installing its Material Processor onto a carrier.




**NOTE:** *Care should be given when removing the Material Processor to make sure that the hoses are plugged and the tube ends are capped to prevent contamination from entering the hydraulic system.*

NPK recommends against the use of non-NPK hydraulic quick disconnects on fluid circuits operating NPK Products, including Material Processors, for the following reasons:

1. The hydraulic pulsations caused by the Material Processor can cause internal pieces of the non-NPK quick disconnect *(32)* to disintegrate. These pieces can migrate into the Material Processor, causing damage to the unit. That damage is not covered by NPK's warranty.

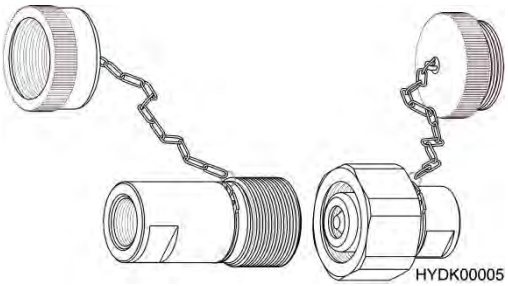



2. Contamination can enter the hydraulic system if the quick disconnect ends are not kept clean. The quick disconnects should be capped to keep them clean. If this is not done, contamination in the quick disconnect will be flushed into the hydraulic system, causing internal damage to the Material Processor.
3. Most quick disconnects create a restriction in the hydraulic circuit. NPK Material Processors are not pressure sensitive, but the restrictions cause unnecessary heating of the oil. Also, the pressure required to operate the Material Processor, plus the restriction of the quick disconnects may push an older, lower pressure carrier to the limit of its hydraulic system. This would interfere with the proper operation of the Material Processor. However, the NPK approved quick disconnects are properly sized so that the Material Processor operation is not affected.

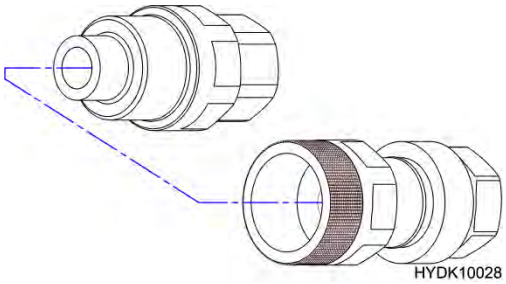
# HYDRAULIC INSTALLATION

## HYDRAULIC QUICK DISCONNECTS

NPK has approved quick disconnects. Contact your NPK dealer or NPK direct at 1-800-225-4379 for proper sizing of approved NPK quick disconnects for your unit.



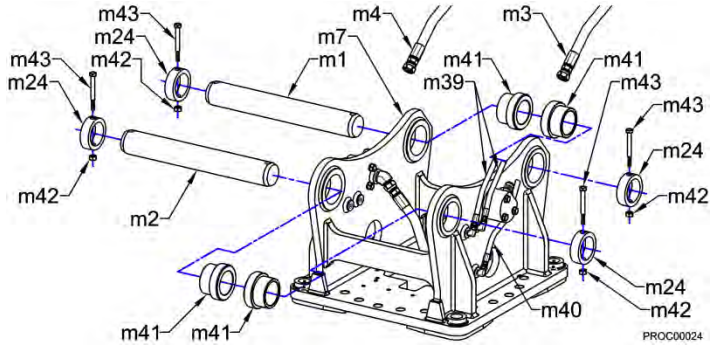

ROFLEX COUPLING




STUCCI COUPLING

# MOUNTING INSTALLATION

NPK Mounting Installation Kits include the parts required to adapt the NPK M35 Material Processor to the stick of an excavator. The kits include all necessary boom pins, bushings, spacers, etc.

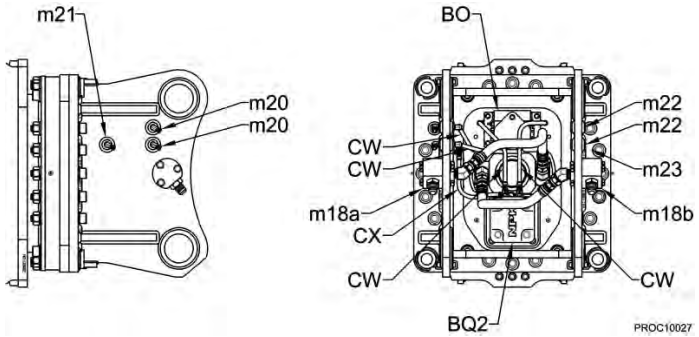



| | |
|---|---|
| **m1** | Stick Pin |
| **m2** | Link Pin |
| **m3** | Main Whip Hose (jaw close) |
| **m4** | Main Whip Hose (jaw open) |
| **m7** | Top Bracket |
| **m24** | Boom Pin Collar |
| **m39** | Rotation Whip Hose |
| **m40** | Motor Drain Whip hose |
| **m41** | Boom Pin Bushing |
| **m42** | Stover Nut |
| **m43** | Hex head Cap Screw |

**NOTE:** *NPK Mounting Kits using loose fit bushings to adapt the pins to the top bracket are not compatible for use with quick attaches or pin grabbers.*

## M35 SERIES TOP BRACKET

The M35 Series top bracket is ported for right or left side hose access for rotation and motor case drain line connections.

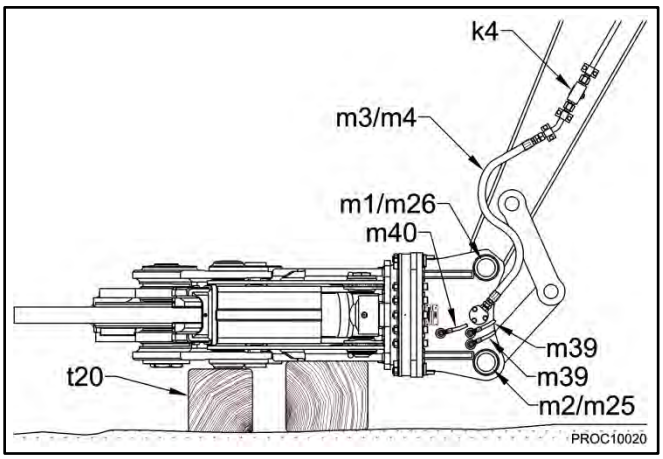



| ITEM | DESCRIPTION |
|---|---|
| **BO** | Holding Valve |
| **BQ2** | Rotation Motor |
| **CW** | Rotation Hose |
| **CX** | Motor Drain Line |
| **m18a** | Main Connection (*close*) - #20 JIC male |
| **m18b** | Main Connection (*open*) - #20 JIC male |
| **m20** | Rotation Connections - #8 JIC male |
| **m21** | Motor Drain Connection - #6 JIC male |
| **m22** | Optional Rotation Ports |
| **m23** | Optional Drain Port |

# MOUNTING INSTALLATION

## MOUNTING TO THE CARRIER

1. Position the M35 Material Processor horizontal on wood blocks (t20) as shown.
2. Align the stick pin bore (m26). Install stick pin (m1).
3. Align the link pin bore (m25). Install the link pin (m2).
4. Clean away any dirt found on the hose connections then connect the whip hoses (m3 and m4).
5. Connect the rotation whip hoses (m39) and hydraulic motor case drain whip hose (m40).
6. Open the shut-off valves (k4).




**ATTENTION**

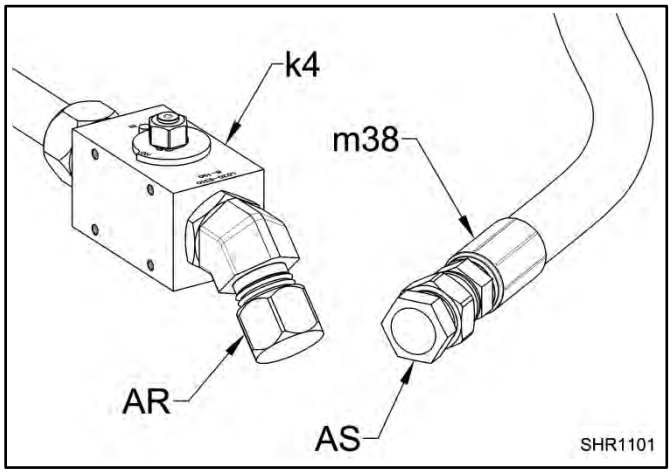
The hydraulic lines must be handled carefully to prevent contamination from entering the M35 Material Processor or the carrier hydraulic system.

## REMOVAL FROM THE CARRIER

1. Retract the cylinders to open the jaws fully.
2. Shut off the carrier's engine and relieve all hydraulic pressure.
3. Close the shut-off valves.
4. Disconnect the hydraulic hoses before laying the M35 Material Processor down. Install metal plugs in the hydraulic hoses and metal caps on the stick tubes to keep out contamination.
5. Position the M35 Material Processor horizontal on wood blocks (t20), as shown in **"MOUNTING TO THE CARRIER"**.

# STORAGE OF THE M35 MATERIAL PROCESSOR

1. Make sure all whip hoses (m38) that connect the M35 Material Processor to the carrier are plugged (AS) and all hose connections are capped (AR), and turn shut-off valves (k4) to the **"OFF"** position.



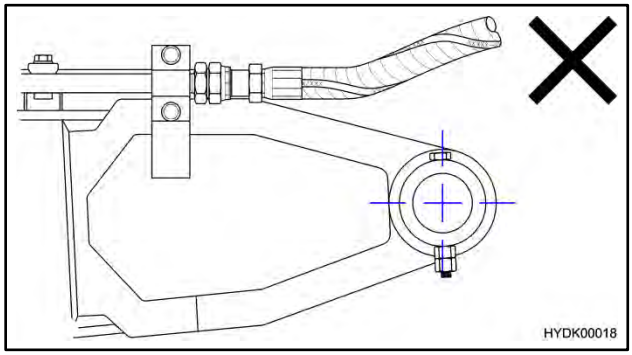

2. Grease all lubrication points; see the **"GENERAL MAINTENANCE"** section under **"LUBRICATION POINTS"**.

3. If the unit is stored outdoors, retract the cylinder and cover with a waterproof tarp.

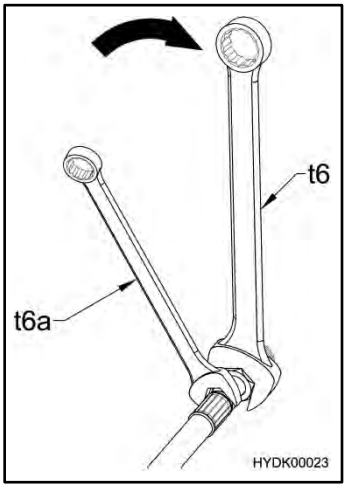
# HOSE INSTALLATION

## WHIP HOSE INSTALLATION TIPS

1. Connect larger diameter hoses first. Larger hoses are more difficult to bend and maneuver, while the smaller lines are usually more flexible and easier to install.
2. Do not twist the hose during installation. Pressure applied to a twisted hose can result in premature hose failure or loose connections.




3. Attach both ends of the hose to their connection points. Let the hose find its natural position, then tighten both ends of the hose, using a wrench (t6) and backup wrench (t6a).



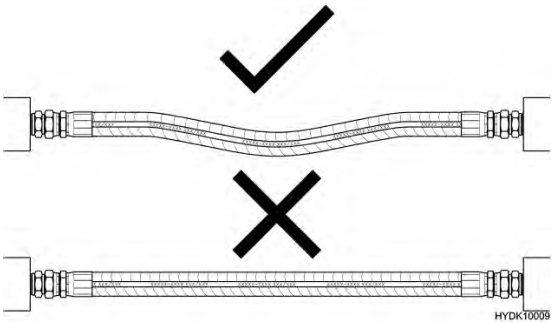

4. Torque hose to specifications.

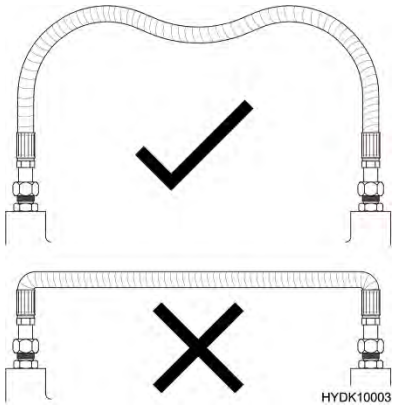
| NOMINAL HOSE SIZE | THREAD SIZE | TORQUE | |
|---|---|---|---|
| | | ft. lbs. | *(Nm)* |
| **1/2"** | 3/4 - 10 | 39 | *(52)* |
| **3/4"** | 1-1/16 - 12 | 88 | *(119)* |
| **1"** | 1-5/16 - 12 | 113 | *(153)* |
| **1-1/4"** | 1-5/8 - 12 | 133 | *(180)* |

# HOSE INSTALLATION

## WHIP HOSE INSTALLATION TIPS

5. All hoses change in length slightly when pressure is applied. Hoses must have enough slack to relieve stressing the connections.




6. Make sure the hose being installed is routed with the proper bend radius to prevent kinking, flow restrictions or hose failures at the hose connection.

| HOSE SIZE | MINIMUM BEND RADIUS | |
|---|---|---|
| | in | *(mm)* |
| **1/2"** | 7 | *(177.8)* |
| **3/4"** | 9.5 | *(241.3)* |
| **1"** | 12 | *(304.8)* |
| **1-1/4"** | 16.5 | *(419.1)* |

7. Hoses should be used within the following ranges of temperature.

| | TEMPERATURE RANGE | |
|---|---|---|
| | °F | *(°C)* |
| **HYDRAULIC FLUID** | 14 to 176 | *(-10 to +80)* |
| **ATMOSPHERIC** | 14 to 122 | *(-10 to +50)* |

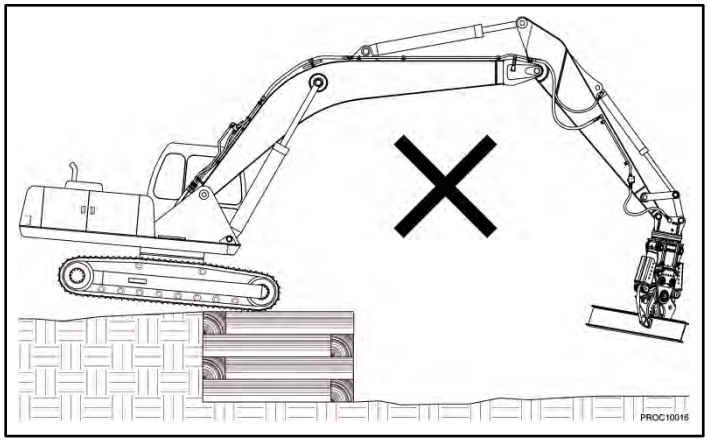
# OPERATING INSTRUCTIONS

Before operating the NPK M35 Material Processor, be sure to read the safety information and perform the daily and weekly maintenance as specified in this manual.

**⚠ WARNING**


**DO NOT OPERATE THE M35 MATERIAL PROCESSOR WITHOUT DEMOLITION GUARDS IN PLACE!**

**⚠ CAUTION**

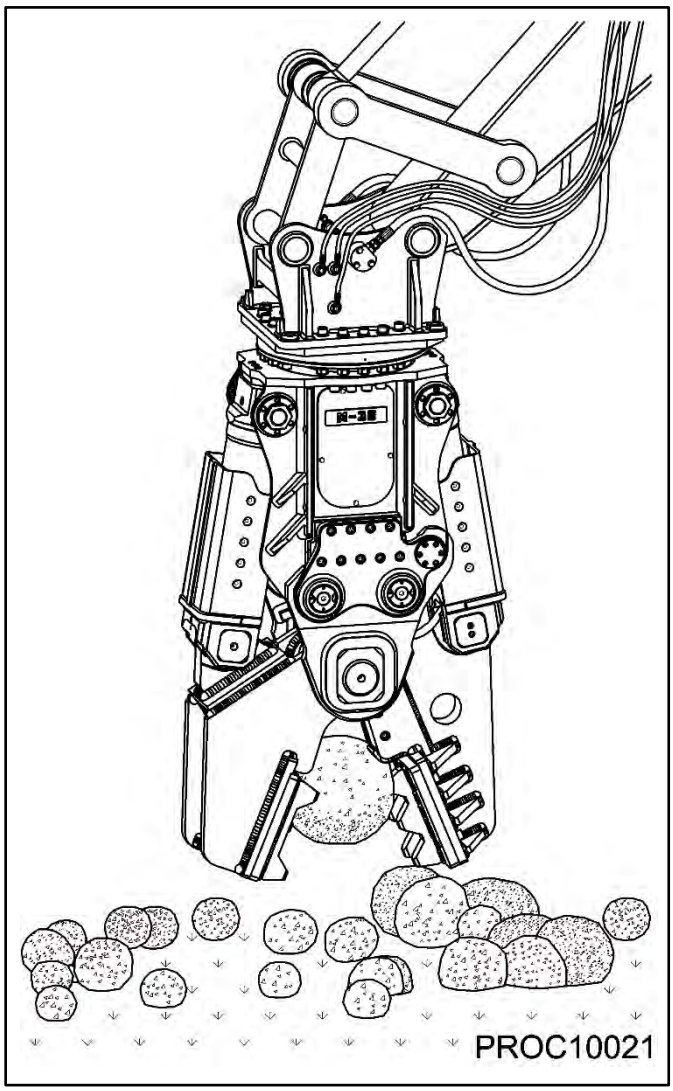



**DO NOT LIFT OR LOAD BEYOND THE CAPACITY OF THE M35 MATERIAL PROCESSOR OR THE CARRIER.**

# OPERATING INSTRUCTIONS

## USE THE M35 MATERIAL PROCESSOR ONLY FOR THE APPLICATION FOR WHICH IT IS INTENDED:

- NPK M35 Material Processors equipped with “G” style jaws are designed for the downsizing of concrete, the separation of concrete and rebar and some primary demolition.

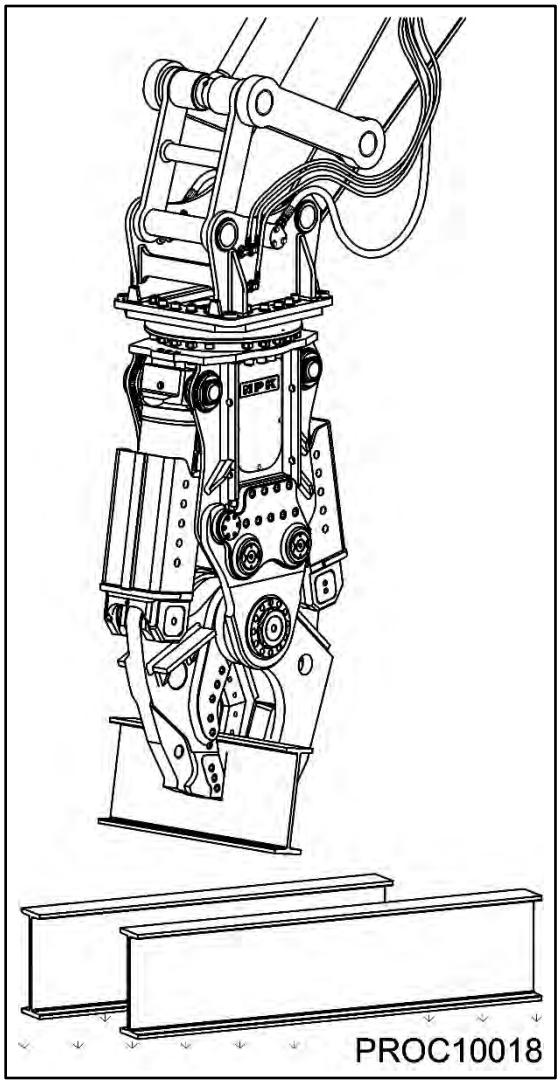



**“G” JAW APPLICATION**

# OPERATING INSTRUCTIONS

## USE THE NPK M35 MATERIAL PROCESSOR ONLY FOR THE APPLICATION FOR WHICH IT IS INTENDED:

- NPK M35 Material Processors equipped with “K” style jaws are designed for the demolition of steel structures and for processing of steel, wood, rubber and plastic scrap. It is not intended for processing concrete.

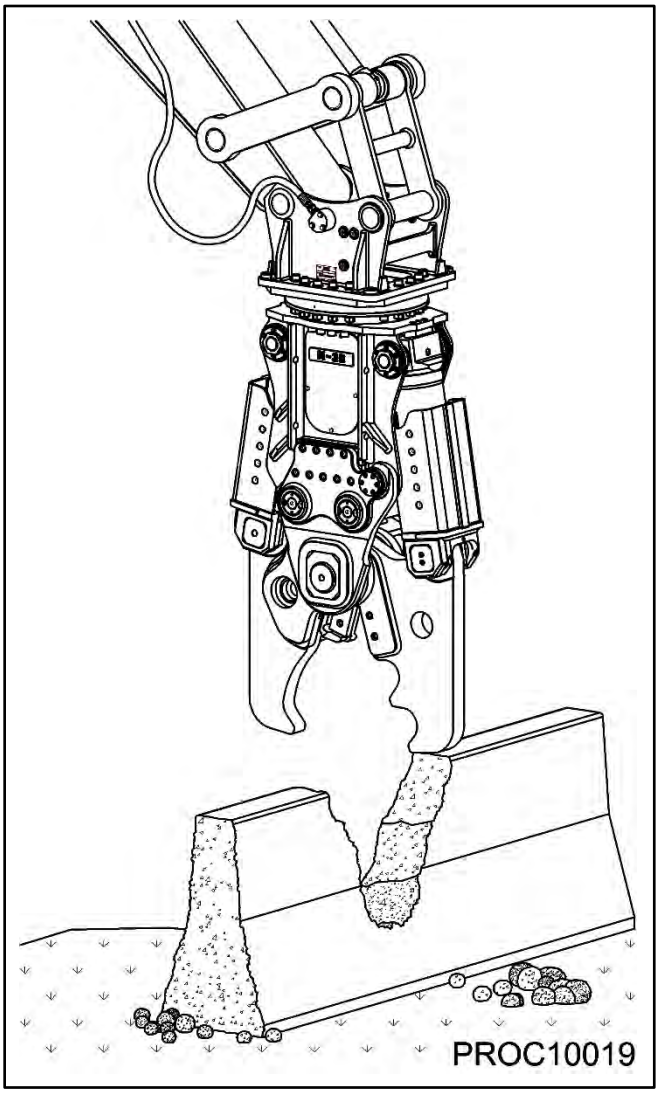



**“K” JAW APPLICATION**

# OPERATING INSTRUCTIONS

## USE THE M35 MATERIAL PROCESSOR ONLY FOR THE APPLICATION FOR WHICH IT IS INTENDED:

- NPK M35 Material Processors equipped with “S” style jaws are designed for the primary breakup of concrete, such as pillars, buildings, retaining walls, bridges and highway barriers.

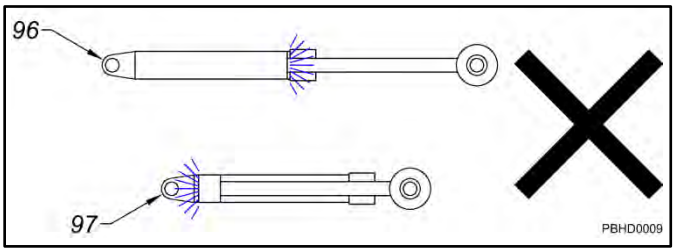



**“S” JAW APPLICATION**

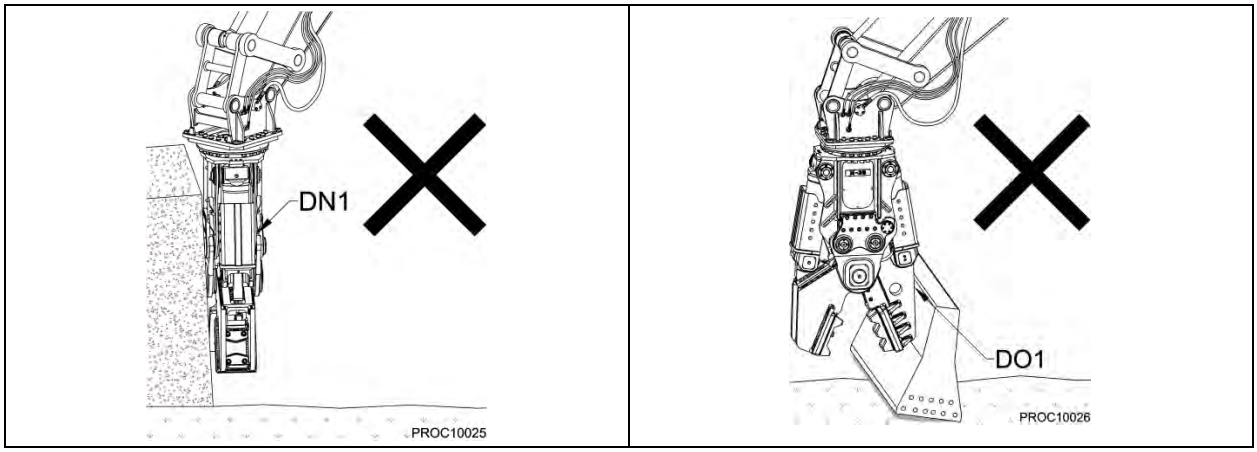
# OPERATING TECHNIQUES AND PRECAUTIONS

## ATTENTION

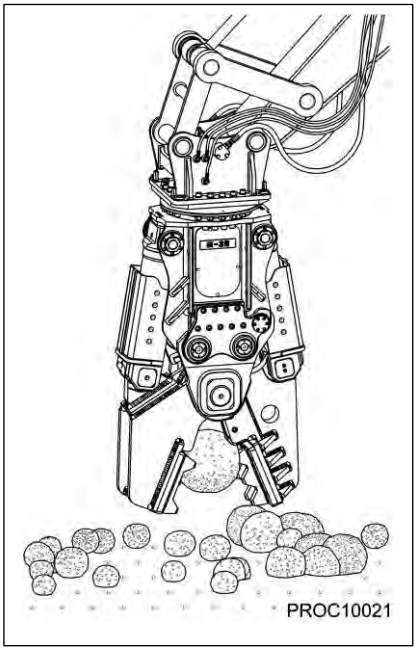
1. **Do not** use the Material Processor with the excavator cylinders fully extended or retracted.




2. **Do not** strike the material with the M35 Material Processor main body (DN1) or outer surface of the jaw set (DO1). **Do not** push, pull or scrape material with the M35 Material Processor.



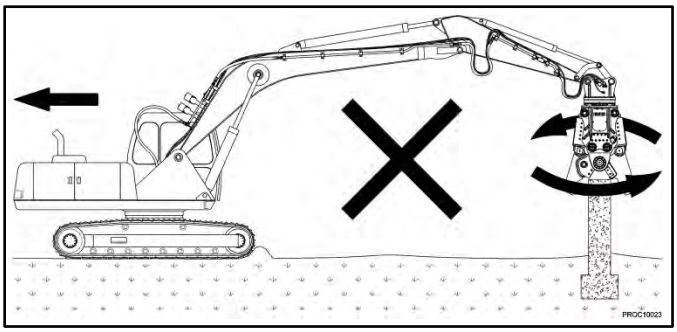

3. For the most efficient operation, open the jaw only wide enough to grasp the material. Grasp the material to be crushed as deep into the throat of the M35 Material Processor as possible. **Do not** force the material into the jaw.



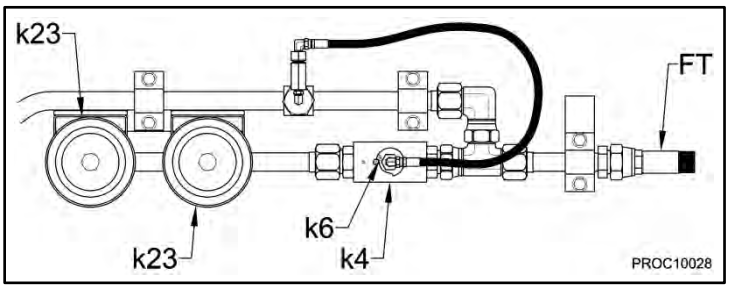

If you have any questions on operating the M35 Material Processor, please contact your local NPK dealer or call the NPK Service Department at 1-800-225-4379.

## ATTENTION

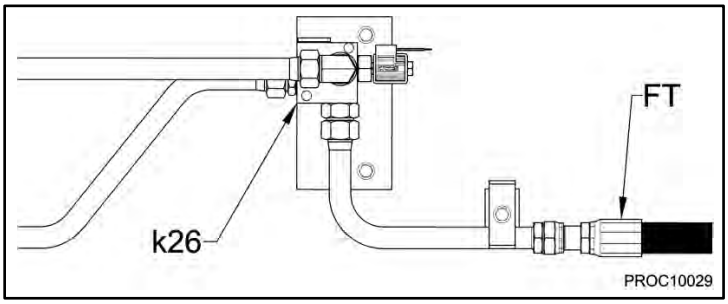
4. **Do not** pry, twist, or pull with the excavator. Allow the hydraulic crushing forces of the M35 Material Processor jaw to do the work. If the material does not crush completely at first, open the jaws and close again in a chewing action. The excavator is used as a way of positioning the processor and supplying hydraulic power to the processor.




5. **Do not** use the rebar cutters on the “S” and “G” jaw sets to cut rod over 1-1/4” in diameter.
6. **Do not** operate the M35 Material Processor on an excavator with an NPK combination Hydraulic Hammer/Crusher hydraulic installation kit without first isolating the line mounted accumulators (k23).




   a. The shut-off valve (k4) in the return line (FT) must be in the **“OFF”** (k6) position for use with the processor.
   b. On some later NPK Hydraulic Installation Kits, the isolation feature is done automatically through the use of an accumulator isolation valve (k26). Consult with NPK at 1-800-225-4379 if you are unsure of what your carrier is equipped with.



# GENERAL MAINTENANCE

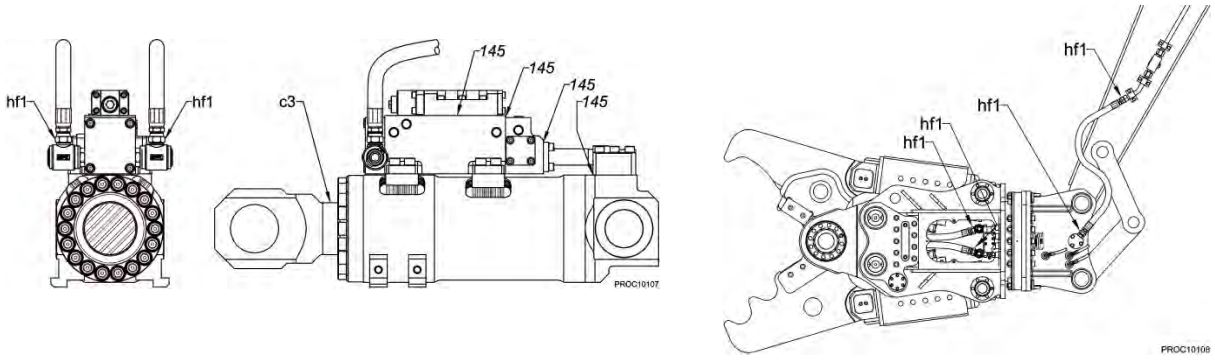
***REFER TO IMPORTANT SAFETY INFORMATION SECTION***

## DAILY INSPECTION AND MAINTENANCE

The functions the M35 Material Processor performs are demanding and in tough environments. Therefore, it is extremely important that the following maintenance and inspection procedures be performed daily:

- Grease all lubrication points! Use moly EP2 or equivalent grease. For lubrication points, see **"GENERAL MAINTENANCE"**, **"LUBRICATION POINTS"**.

- Check for oil leaks at the cylinder piston rod (c3), the machined surfaces (*145*), and at all of the M35 Material Processor's hose and fitting connections (hf1).




- Inspect the hydraulic hoses for wear, damage or oil leakage.

- Inspect for loose, broken, and missing fasteners. Replace and/or retighten to torque specifications as required. See the **"FASTENER TORQUE"** section of this manual. Call the **NPK** Service Department at 1-800-225-4379 if there are any questions regarding torque.

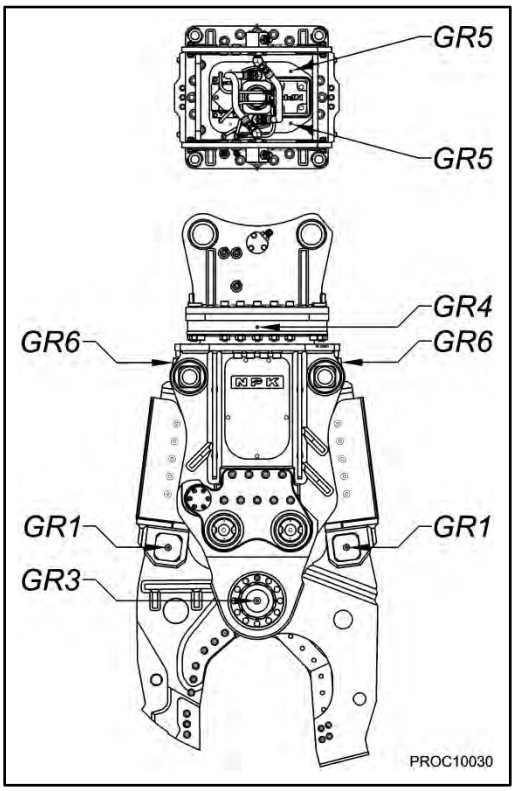
- Check the moveable jaws and main frame for cracks. See the **"FRAME CRACK AND JAW REPAIR"** section of this manual or contact **NPK** at 1-800-225-4379 for repair procedure.

- Check the condition of the cutting blades; see **"CUTTER BLADE MAINTENANCE"**.

# GENERAL MAINTENANCE

## LUBRICATION POINTS

### M35

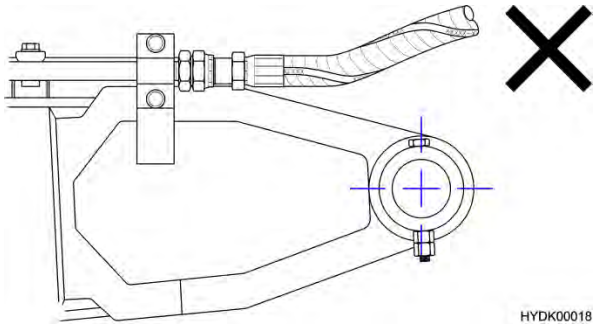


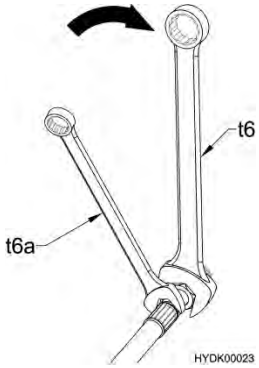

| | | | |
|---|---|---|---|
| ***GR1*** | CYLINDER ROD PINS | One lubrication point per cylinder located at the jaw attachment end. | 10 strokes from a grease gun every 4 hours. |
| ***GR3*** | JAW PIVOT PIN | One lubrication point on each end of pin *("S", early "K" and "G" jaws)*. Two lubrication points on one end, one lubrication point on the other end *(later "K" jaws)*. | 15 strokes from a grease gun per fitting every 4 hours. |
| ***GR4*** | SLEWING RING/PINION TEETH | Two lubrication points 180° apart. | 5 strokes from a grease gun per fitting per shift. |
| ***GR5*** | MOTOR PINION | One lubrication point on each side of the hydraulic motor located on the top bracket. | 5 strokes from a grease gun per fitting once per shift. |
| ***GR6*** | CYLINDER BASE END PINS | One lubrication point located at the main frame attachment end. | 10 strokes from a grease gun every 4 hours. |

# GENERAL MAINTENANCE

## HOSE INSTALLATION TIPS

1. Connect larger diameter hoses first. Larger hoses are more difficult to bend and maneuver, while smaller lines are usually more flexible and easier to install.
2. **Do not** twist the hose during installation. Pressure applied to a twisted hose can result in premature hose failure or loose connections. Attach both ends of the hose to their connection points. Let the hose find its natural position, then tighten both ends using a wrench and backup wrench.

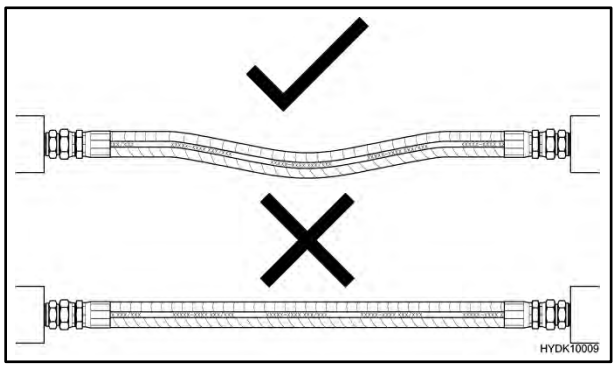



3. Torque hose to specifications, see **"HOSE TORQUE SPECIFICATIONS"**.

| NOMINAL HOSE SIZE | THREAD SIZE | TORQUE | |
|---|---|---|---|
| | | ft. lbs. | *(Nm)* |
| **1/2"** | 3/4-16 | 109 | *(80)* |
| **3/4"** | 1-1/16-12 | 245 | *(180)* |
| **1"** | 1-5/16-12 | 272 | *(200)* |
| **1-1/4"** | 1-5/8-12 | 250 | *(250)* |

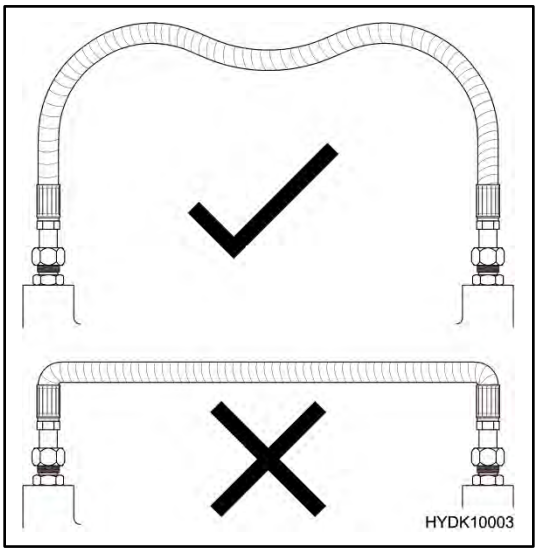
4. All hoses change in length slightly when pressure is applied. Hoses must have enough slack to relieve stressing the connections.



# GENERAL MAINTENANCE

## HOSE INSTALLATION TIPS

5. Make sure the hose being installed is routed with the proper bend radius to prevent kinking, flow restrictions, or hose failures at the hose connection.




6. Hoses should be used within the following ranges of temperature.

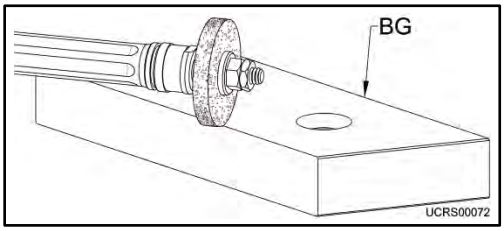
| | TEMPERATURE RANGE | |
|---|---|---|
| | **ºF** | ***ºC*** |
| **HYDRAULIC FLUID** | 14 to 176 | *(-10 to +80)* |
| **ATMOSPHERIC** | 14 to 122 | *(-10 to +50)* |

# GENERAL MAINTENANCE

## CUTTER BLADE MAINTENANCE

### G and S JAWS

When cutter blades become damaged or rounded due to abrasion, grind the rounded areas of the blades (BG) to a sharp 90° edge.



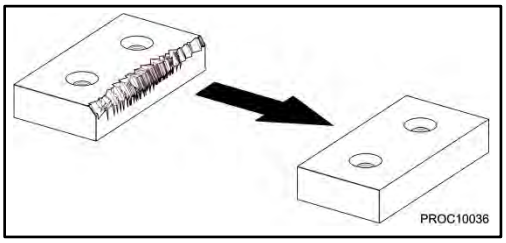

**⚠WARNING**

*Use care in handling to avoid bodily harm.*

**⚠ CAUTION**

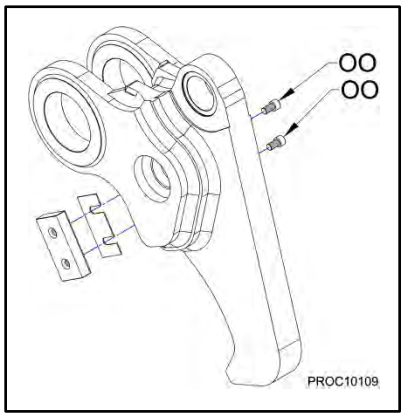
***Do not** over grind the blades to the point that the surface becomes blue or discolored. This will make the blades brittle.*

Cutter blades can be flipped four times to increase service life. Replace the cutter blade if it is cracked, chipped, or worn beyond repair.




**DO NOT WELD CUTTER BLADES!**

Torque the cutter blade bolts (OO) to specification; see the **"FASTENER TORQUE"** section of this manual.



# GENERAL MAINTENANCE

## CUTTER BLADE MAINTENANCE

### G and S JAWS

### BLADE-TO-BLADE CLEARANCE

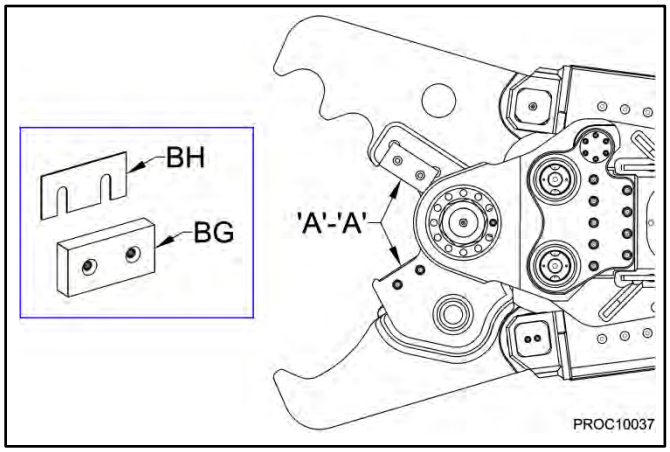



**Fig. 1**

A blade-to-blade ('A'-'A') clearance of .010" to .040" *(0.25 to 1.00 mm)* should be maintained for optimum performance. Install shims (BH) under blade (BG) as necessary, see fig. 1.

### SHIM KITS

| MODEL/ JAW TYPE | NPK SHIM KIT PART NUMBER |
|---|---|
| **M35, S & G** | 1618210 |

# GENERAL MAINTENANCE

## M35K JAW MAINTENANCE

The following information is to be used as a general guide for maintaining the jaws and cutter blades on the NPK M35 Series Processor. Failure to maintain the jaws and cutter blades will result in poor performance, and eventual failure to the jaws and cutter blades. These failures are not covered under the standard NPK warranty.

**⚠WARNING**

*Use care when handling the blades.*

**⚠ CAUTION**

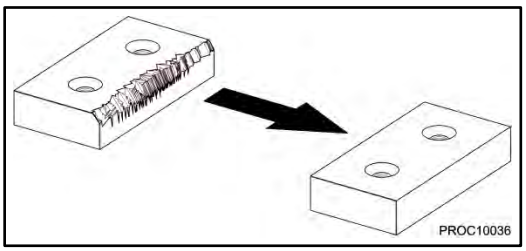
***Do not** over grind the cutter blades.*

***Do not** weld on the cutter blades.*

During normal use of a processor, the jaws and cutter blades will become worn. Regular maintenance must be performed to ensure that the maximum efficiency is realized.

### DAILY MAINTENANCE

- Grease the two arm pins and center pivot area two times per shift using an EP #2 grease *(15 pumps of grease)*.
- Check the jaw weldment for cracks. Contact NPK at 1-800-225-4379 for repair procedure, if a crack is found.
- Inspect for loose, broken and missing fasteners. Replace and re-torque as required. See **"FASTENER TORQUES"**.
- Check the condition of the cutting blades. If the edge is rounded and dull, grind the edges back to 90°. Rotate the blades if extreme wear or chipping on the cutting edge is noted. If the blades are replaced or rotated, they must be shimmed. Blades should be shimmed from .005" *(0.127 mm)* to a maximum of .010" *(0.254 mm)*. Replace the blades if they are cracked.




- See **"BLADE MAINTENANCE AND ADJUSTMENT"** for piercing tip and blade maintenance.

# GENERAL MAINTENANCE

## CUTTER BLADE MAINTENANCE

### K JAWS

#### BLADE-TO-BLADE CLEARANCE

M35K

A blade to blade clearance of .000” to .010” *(.00 to 0.25 mm)* should be maintained for optimum performance.

See Fig. 2 for cutting blade and shim arrangement. Refer to the NPK Parts Manual for part numbers.

#### PIERCING TIP TO TUNNEL BLADE GAP

M35K

The piercing tip to tunnel blade gap can be increased by removing the tunnel spacer, which can be helpful in some piercing operations.

Removal of the spacer on the M35K increases the gap by .20 inch *(5 mm)*.

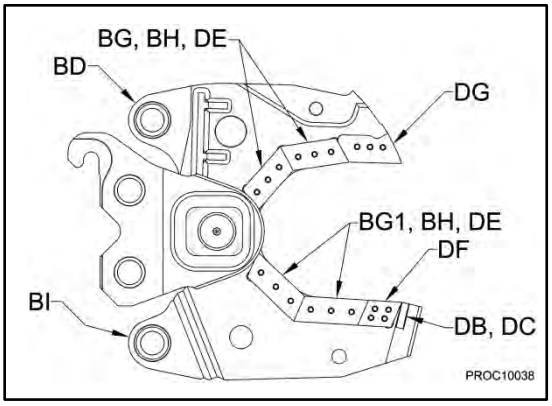



**Fig. 2**
**(With bolt-on piercing tip)**

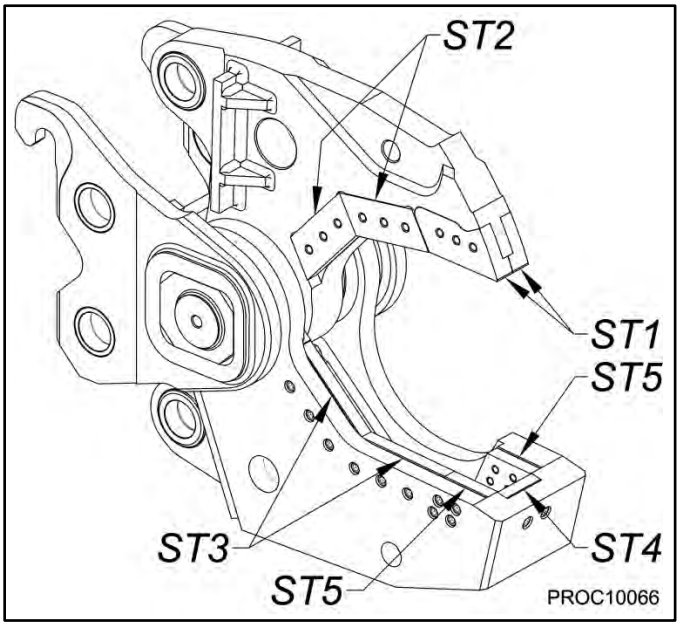
| | |
|---|---|
| **BD** | ARM |
| **BG** | PRIMARY CUTTING BLADE |
| **BG1** | SECONDARY CUTTING BLADE |
| **BH** | SHIM PACK *(drive arm only)* |
| **BI** | DRIVE ARM |
| **DB** | TUNNEL BLADE |
| **DC** | SPACER |
| **DE** | SPACER PLATE |
| **DF** | GUIDE BLADE *(not shown)* |
| **DG** | PIERCING TIP *(bolt-on)* |

# GENERAL MAINTENANCE

## K JAW BLADE SET UP PROCEDURE

**M35K**

| | |
|---|---|
| ***ST1.*** | Install the piercing tip on the arm (if needed) first. Check to ensure that the piercing tip blades are parallel.<br>See **"COMPONENT DESCRIPTION"**, **"PIERCING TIP MAINTENANCE AND REPLACEMENT"** and **"BLADE MAINTENANCE AND ADJUSTMENT"**, Steps 1 and 2. |
| ***ST2.*** | Install the primary blades in the arm second. Check to ensure that the primary blade faces are parallel.<br>See **"COMPONENT DESCRIPTION"** and **"BLADE MAINTENANCE AND ADJUSTMENT"**, Steps 1 and 2. |
| ***ST3.*** | Install the secondary blades in the drive arm. Shim to the primary blades. Check to ensure that the secondary blade faces are parallel. See **"COMPONENT DESCRIPTION"** and **"BLADE MAINTENANCE AND ADJUSTMENT"**, Step 3. |
| ***ST4.*** | Install the tunnel blade in the drive arm.<br>See **"COMPONENT DESCRIPTION"** and **"BLADE MAINTENANCE AND ADJUSTMENT"**, Step 4. |
| ***ST5.*** | Install the guide blade and shim to the side of the piercing tip.<br>See **"COMPONENT DESCRIPTION"** and **"BLADE MAINTENANCE AND ADJUSTMENT"**, Step 5. |

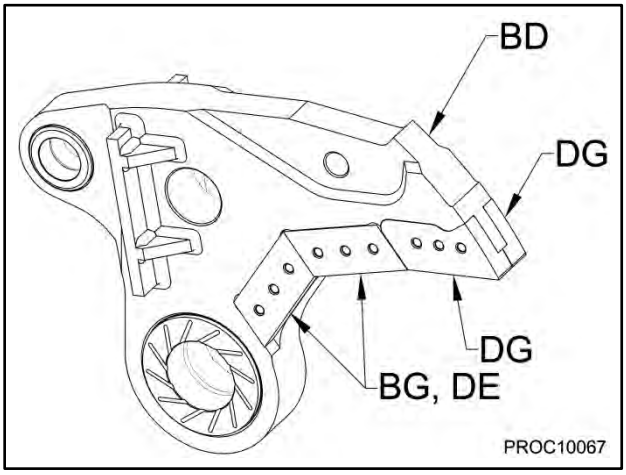


# GENERAL MAINTENANCE

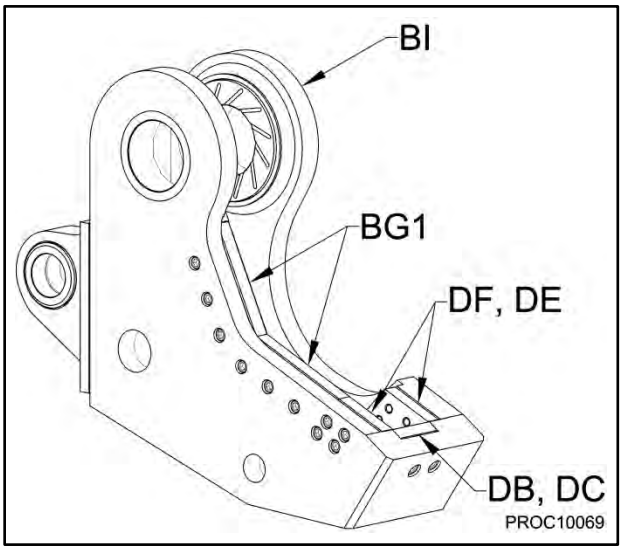
## COMPONENT DESCRIPTION

### M35K

The arm (BD) contains the primary cutting blades (BG), spacer plates (DE) and a two piece bolt-on piercing tip (DA).




The drive arm (BI) contains the secondary blades (BG1), tunnel blade (DB), spacer (DC), guide blade (DF) and spacer plate (DE).



# GENERAL MAINTENANCE

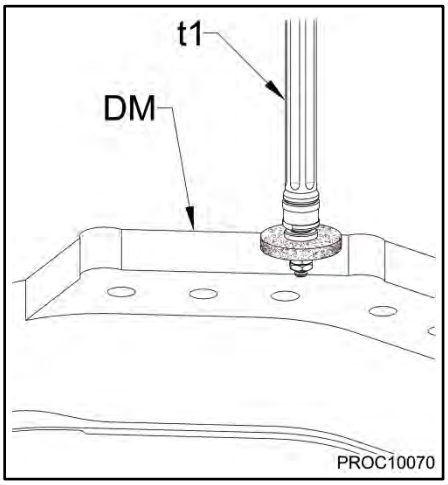
## K JAW BLADE MAINTENANCE AND ADJUSTMENT

Each cutting blade and the tunnel blade can be turned four times. The guide blade can only be turned twice. The piercing tip is a bolt in style and cannot be turned. The piercing tip also cannot be built up via a weld procedure. Excessive tip wear will require replacing the tip.

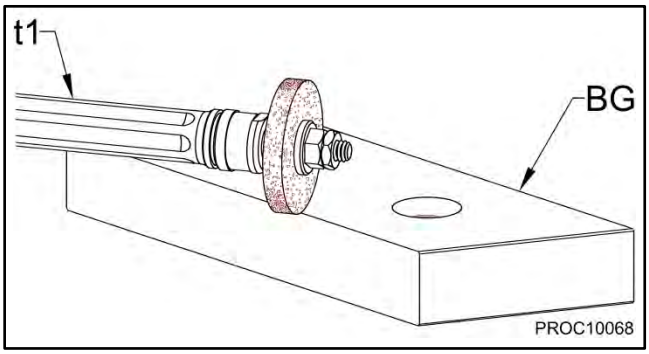
When replacing or turning cutting blades, the following steps must be followed to achieve accurate blade shimming and final blade clearance.

**STEP 1:**

Start with the male jaw (BD) which contains the piercing tip and primary blades. These blades should be installed first. Prior to installing, the male jaw blade pocket and piercing tip pockets (DM) need to be free from debris and raised edges. Clean pockets and remove any raised edges from the pockets using a grinder (t1).



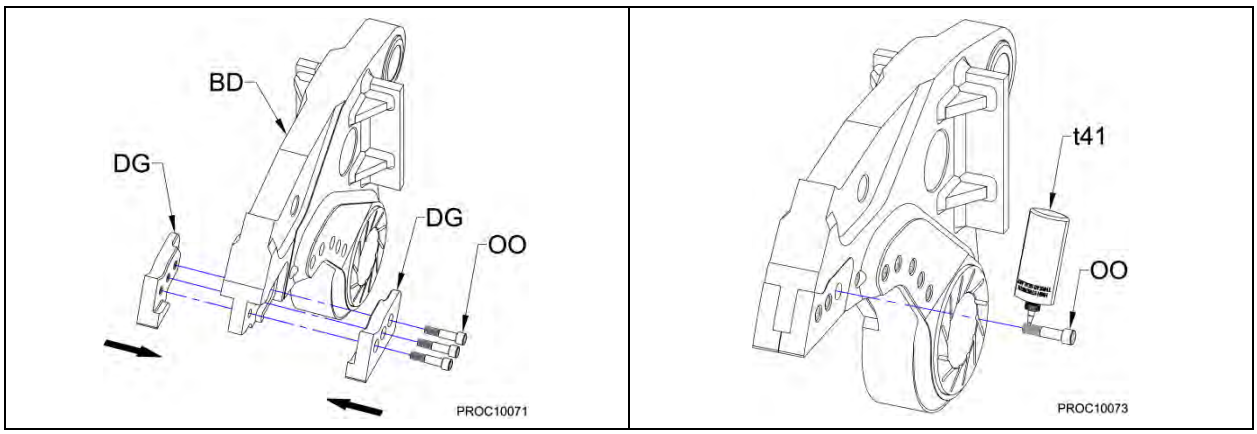

If existing blades (BG) are being turned, the face must also be free of scars. Remove the scars using a grinder (t1).



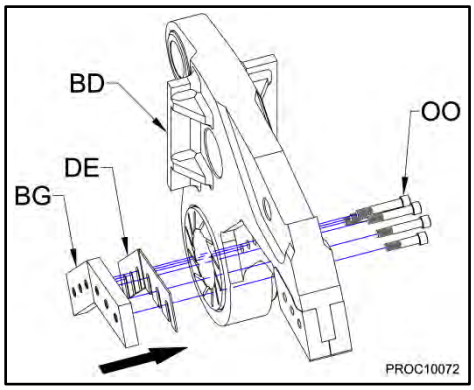
# GENERAL MAINTENANCE

## K JAW BLADE MAINTENANCE AND ADJUSTMENT

Install and tighten the piercing tip blades (DG) into the male jaw (BD) first using the three socket head cap screws (OO) provided. Use thread adhesive (t41) when installing the cap screws.

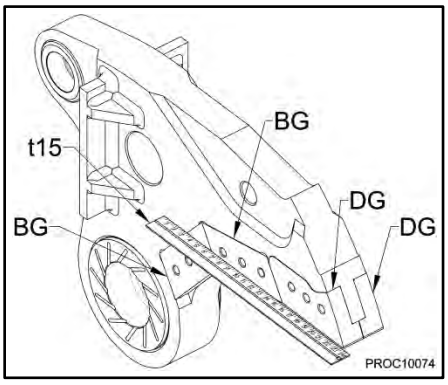



Each primary blade (BG) will have a spacer plate (DE) placed between the blade and blade pocket. Install the blades, spacers, and socket head cap screws (OO) into the male jaw and tighten.




**STEP 2:**

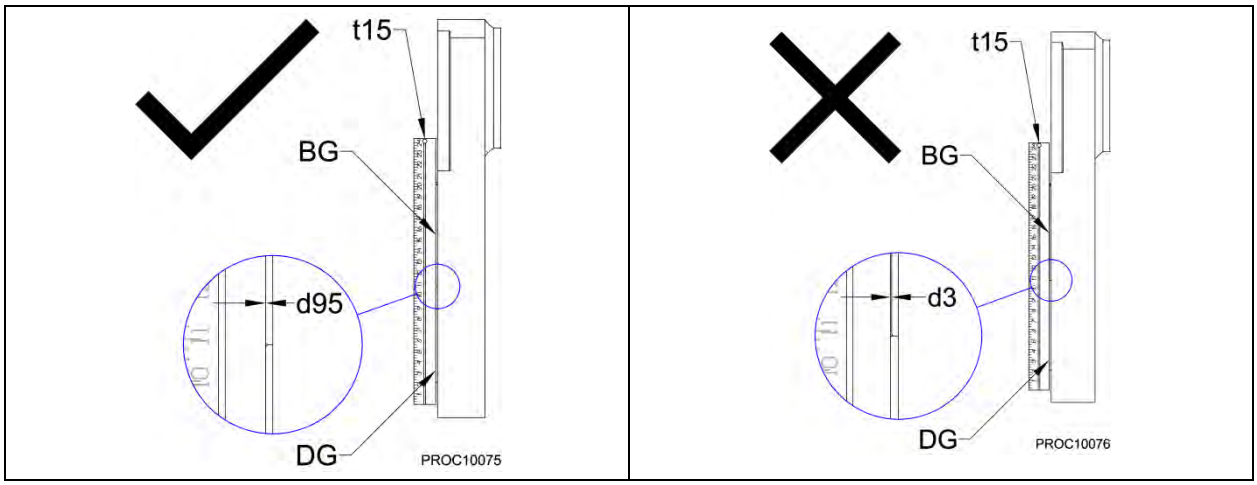
Using a steel straight edge (t15) place the edge across the face of the piercing tip (DG) and the primary blades (BG).



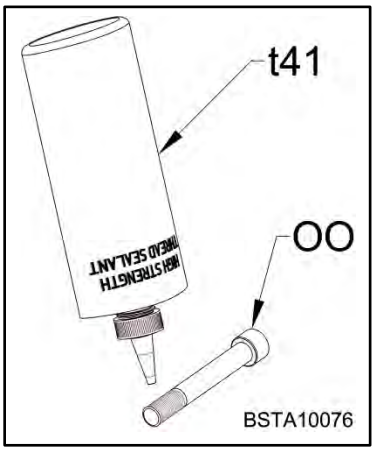
# GENERAL MAINTENANCE

## K JAW BLADE MAINTENANCE AND ADJUSTMENT

There should be no gap (d95) between primary blades, the piercing tip, and the straight edge. If the blades are being turned and a gap (d3) is found between either of the blades and the straight edge, measure the gap using feeler gauges and add shims as required. If the gap is found at the piercing tip, the primary blade or blades may require surface grinding at a machine shop. If the gap between the primary blades and the piercing tip is excessive, install new primary blades.




It is imperative that the primary blade faces are parallel/even in order to achieve correct blade clearance between the primary and secondary blades. Once the primary blades are in place, use thread adhesive (t41) on the socket head cap screws (OO). Then torque to NPK specifications (see the **"FASTENER TORQUE CHART"**).

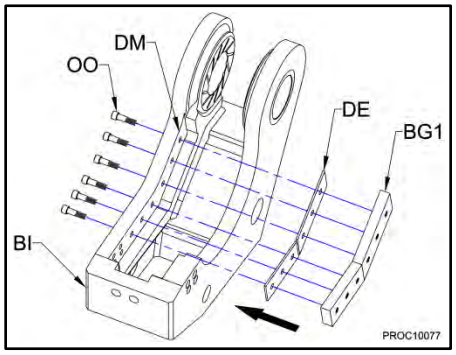


# GENERAL MAINTENANCE

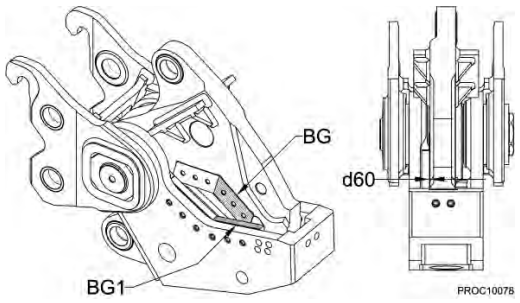
## K JAW BLADE MAINTENANCE AND ADJUSTMENT

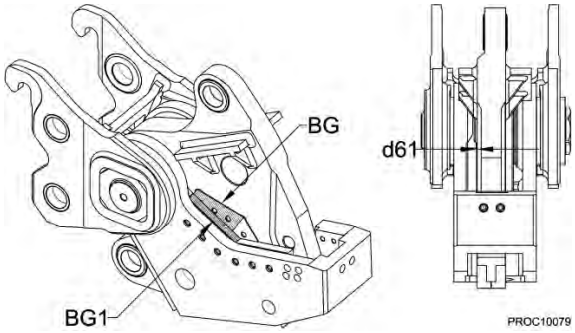
**STEP 3:**

Install either reconditioned (used) or new secondary blades (BG1) and blade spacers (DE) into female jaw (BI) blade pockets (DM). Install socket head cap screws (OO) and tighten.

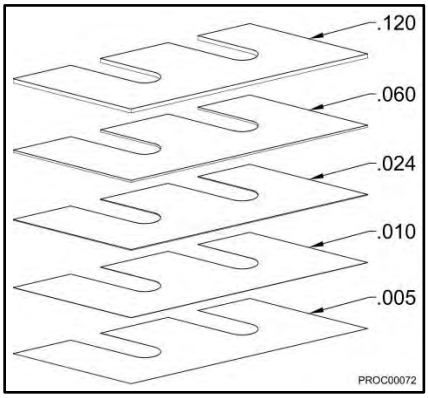



Begin closing the processor jaws until the first primary blade (BG) begins passing the first secondary blade (BG1), stop closing the jaws and measure the clearance (d60) between the two blades. Record the clearance, (example: .015" or *.381 mm*). Continue closing the jaws stopping to record the clearance (d61) at the second secondary blade.



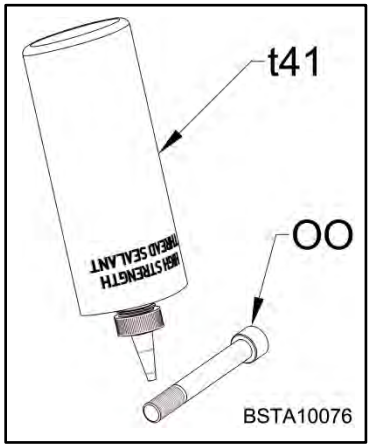

NPK shim packs have a variety of shims (i.e., .005, .010, .024, .060, and .120). Install the required amount of shims behind each secondary blade until a clearance of .005" *(.127 mm)* is achieved between all primary and secondary blades. (One shim pack for each blade is recommended.)



## K JAW BLADE MAINTENANCE AND ADJUSTMENT

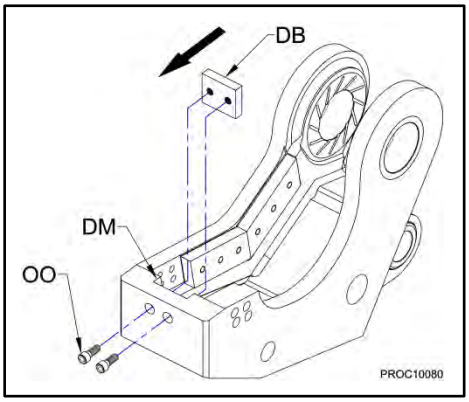
**STEP 3:**

After blade shimming is complete, remove the socket head cap screws (OO) for each secondary blade and apply thread adhesive. Then torque to NPK specifications (see the **"FASTENER TORQUE CHART"**).

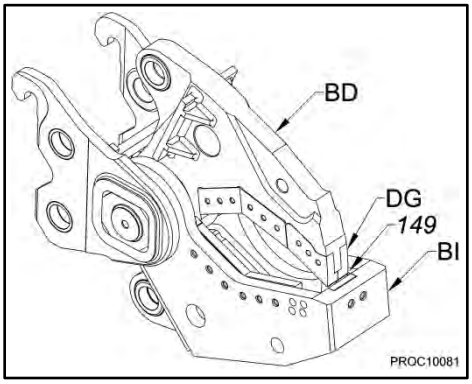



**STEP 4:**

Install either a reconditioned (used) or new tunnel blade (DB) into the female jaw tunnel blade pocket (DM). Then tighten the socket head cap screws (OO).




Slowly close the male (BD) and female (BI) jaws until the piercing tip (DG) enters the tunnel blade pocket *(149)*.

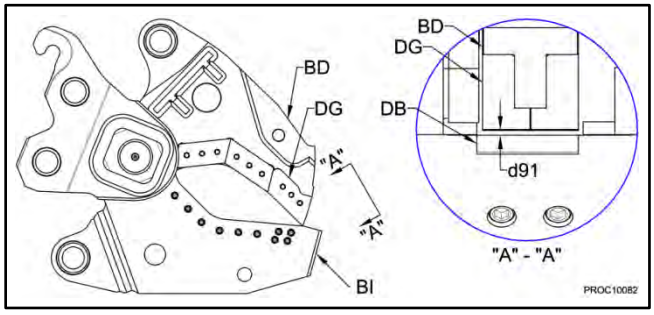


# GENERAL MAINTENANCE

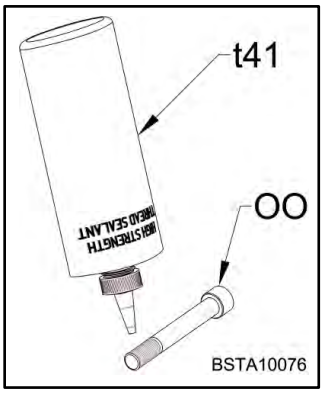
## K JAW BLADE MAINTENANCE AND ADJUSTMENT

**STEP 4:**

Verify the clearance (d66) between the lead edge of the piercing tip (DG) and tunnel blade (DB). This clearance should be approximately .15" *(3.81 mm)* to .19" *(4.83 mm)*. Install tunnel blade shims if necessary to achieve the above clearances.

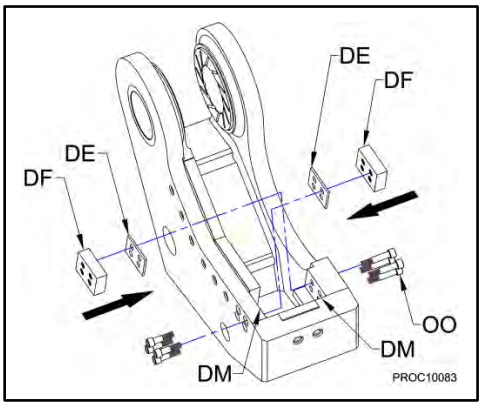



After blade shimming is complete, remove the socket head cap screws (OO) for the tunnel blade and apply thread adhesive. Then torque to NPK specifications (see the **"FASTENER TORQUE CHART"**).




**STEP 5:**

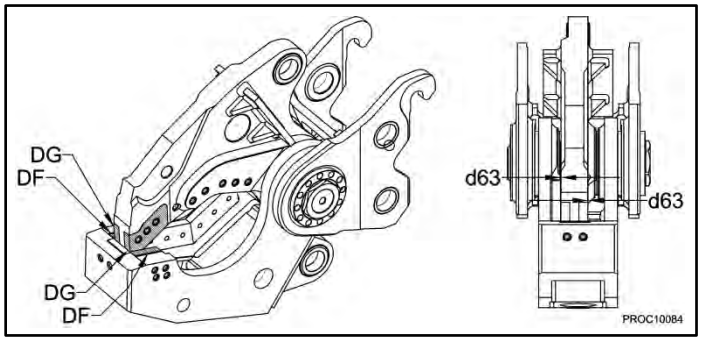
The female jaw (BI) also has two guide blades (DF) and two spacer plates (DE). The blades are located directly across from each other. Install either reconditioned (used) or new guide blades into the guide blade pockets (DM) then tighten the socket head cap screws (OO).



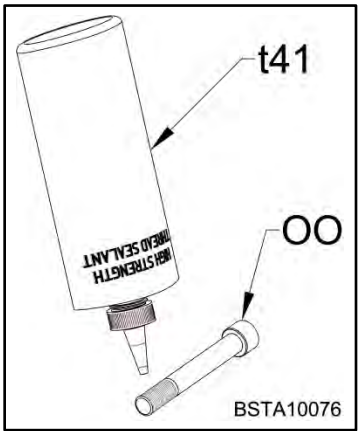
# GENERAL MAINTENANCE

## K JAW BLADE MAINTENANCE AND ADJUSTMENT

The guide blades (DF) must also be shimmed as close as possible to both sides of the piercing tip (DG). Begin closing the jaws until the piercing tip just enters the tunnel. Stop and measure the clearance (d63) between the guide blades and the sides of the piercing tip. Install the required amount of shims to reduce these gaps to .005" *(.127 mm)*.




After blade shimming is complete, remove the socket head cap screws (OO) for the guide blades and apply thread adhesive. Then torque to NPK specifications (see the **"FASTENER TORQUE CHART"**).



# GENERAL MAINTENANCE

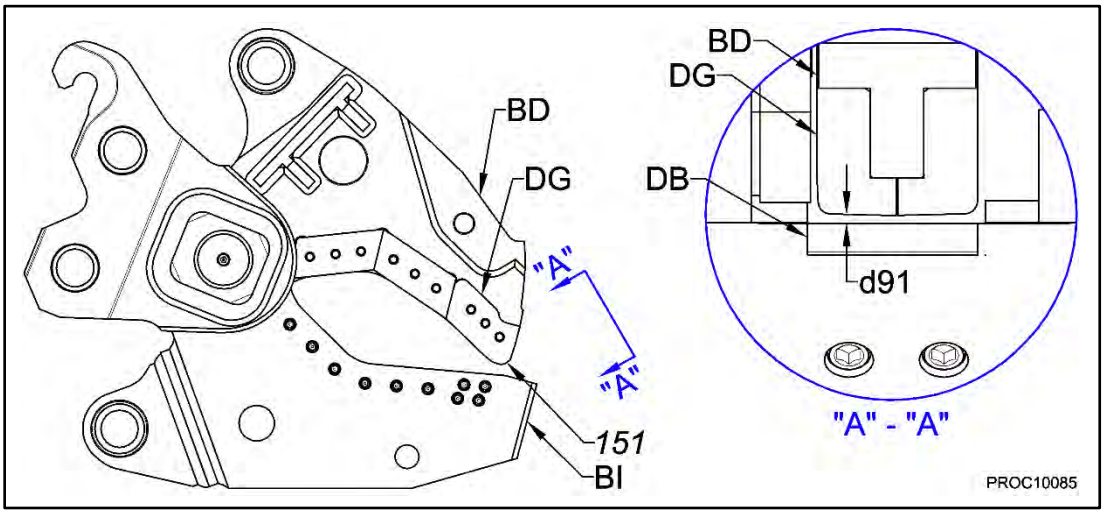
## PIERCING TIP MAINTENANCE AND REPLACEMENT

Before maintenance is performed on the piercing tip, it is recommended that the drive arm (tunnel) be repaired first.

### MAINTENANCE

To maintain maximum piercing efficiency, the piercing tip (DG) should be checked daily for wear. The rate of wear that will occur is going to be influenced greatly due to the types of material being processed and the amount of piercing being done.

To check the jaw and tip for wear, close the arm (BD) until the piercing tip is beginning to enter the drive arm (BI) tunnel. If a large gap (d91) is noted and the tip is rounded *(151)*, this is an indication that the piercing tip requires attention. It is also an indication that the tip is in need of attention if it is noted that material is being drug through the tunnel and not efficiently pierced by the tip.



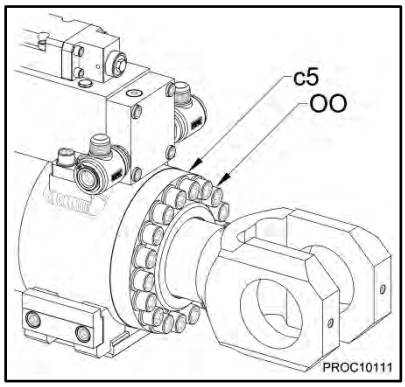
# JAW INSPECTION AND MAINTENANCE

## JAW INSPECTION: G and S JAWS

**WEEKLY INSPECTION**

**ATTENTION**

With new G or S jaw sets, the teeth will contact before the cylinders reach full stroke. As the teeth continue to wear, the cylinders will reach full stroke and a gap will be apparent between the opposing jaws. If wear continues to this point or beyond, the crushing efficiency may decrease and the full cylinder force will be transferred to the cylinder end cap (c5) and retaining cap screws (OO).




This situation should be avoided. The jaws or teeth should be inspected and maintained to avoid this gap.

## JAW PROFILES: G and S JAWS

**G and S JAWS:** Profiles can be checked against NPK original profile templates. Contact the NPK Service Department for assistance at 1-800-225-4379.

**S JAWS:** These jaws are hard faced. The best time to rebuild them is as soon as the hard face pattern is worn off. If the hard face pattern is gone and wear is in to the jaws itself, the profile should be rebuilt to that of the template. Do not allow tip wear to exceed .75” *(19 mm)* compared to the template or the cylinder will bottom out.

## JAW BUILD-UP AND HARDFACING (M35S)

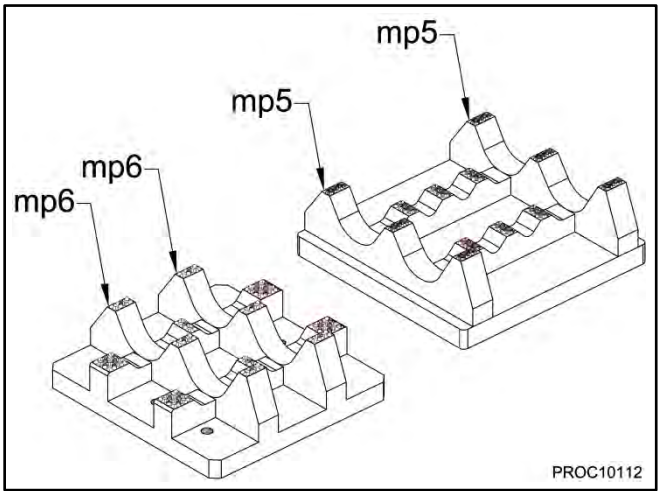
For build-up and hardfacing of jaw, use the NPK template to check jaws so that they are to the original profile. Contact NPK for the correct templates, drawing no. M3500-9501 and M3500-9502. Then, refer to **“JAW and TOOTH REBUILD PROCEDURE”**.

# JAW INSPECTION AND MAINTENANCE

## JAW INSPECTION: G and S JAWS

### WEEKLY INSPECTION

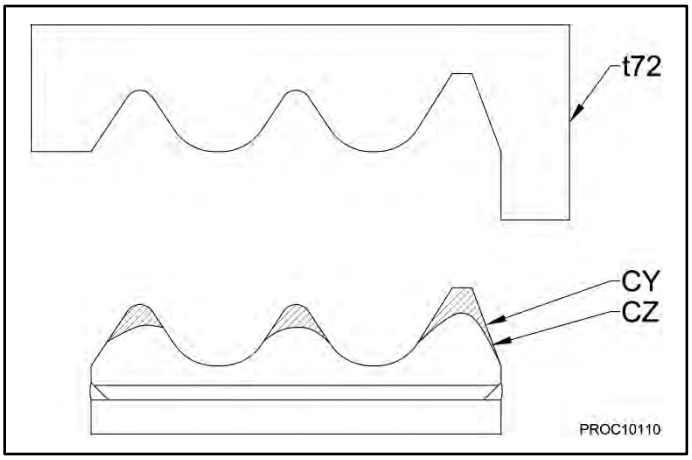
**G JAWS:** Wear on the small outside side teeth (mp5) determines when the cylinders are approaching full extension. The large center teeth (mp6) are for crushing purposes only. New small teeth are .97" *(25 mm)* high for the M35.




Tip wear of the two large teeth may affect crushing efficiency. This profile can be rebuilt to that of a template.

## TEETH BUILD-UP AND HARDFACING (M35G)

For build-up and hardfacing of teeth, use the NPK template (t72) to check teeth so that they are to the original profile (CY). Contact NPK for the correct template, drawing no. M3500-9500. Then, refer to **JAW and TOOTH REBUILD PROCEDURE**.




**CY – ORIGINAL PROFILE**

**CZ – WORN PROFILE**

# JAW INSPECTION AND MAINTENANCE

## JAW INSPECTION: G and S JAWS

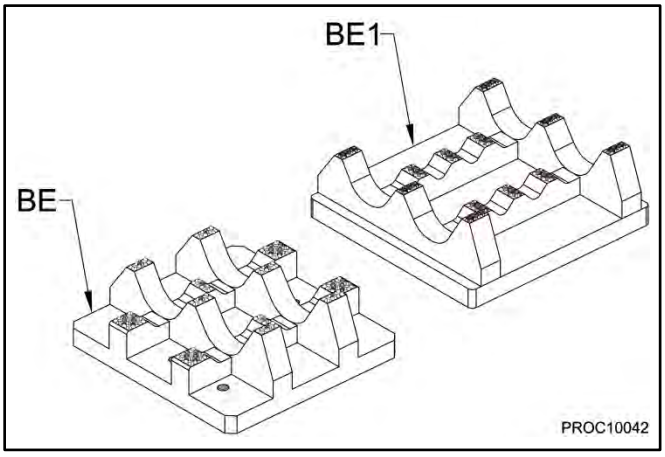
**WEEKLY INSPECTION**

## REPLACEABLE TOOTH PLATES – G JAWS

Another alternative is to replace the entire bolt on plates.

The male jaw tooth plate (BE) is part number M3500-2002.

The female jaw tooth plate (BE1) is part number M3500-2003.




## JAW AND TOOTH REBUILD PROCEDURE: S and G JAWS

Due to the abrasive nature of the material being crushed, jaw wear will occur on the M35S and M35G Processors. The jaws must be built up with hard face weld when the clearance between the tip of the jaws in the closed position is worn to the extent that the material can no longer be crushed efficiently.

To ensure maximum crushing performance of the M35S or M35G, this rebuild procedure, comprised of three steps, should be followed.

1. Surface Preparation
2. Underlayment Weld
3. Hard Face Weld

### 1. SURFACE PREPARATION

Grind the entire worn area until it is smooth and clean. Remove all paint, grease, oil, dirt, and old hardfacing material before welding.

# JAW INSPECTION AND MAINTENANCE

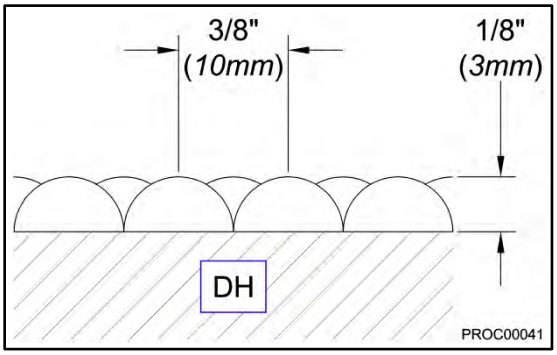
## JAW INSPECTION: G and S JAWS

### WEEKLY INSPECTION

## JAW AND TOOTH REBUILD PROCEDURE: S and G JAWS

### 2. UNDERLAYMENT

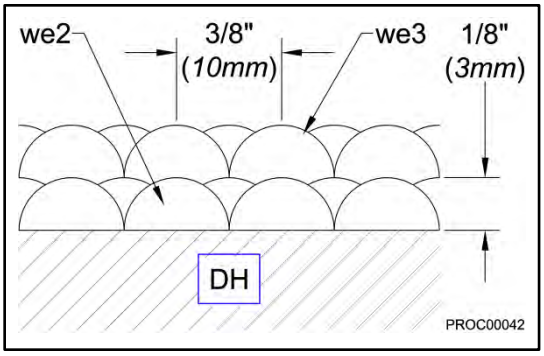
Underlayment weld is necessary to build-up the base material (DH) to match the original jaw or tooth profile before hardfacing. You cannot hard face over old hardfacing.




- Welding rod: Airco Austex 361, Cronatron 7770, Eutectic 3205, Postalloy 205, Stoody 2110 or equal. In Canada: NCH Canada Inc. Hi-Pact #194 or equal.
- Dry welding rod at 300°F+ *(150°C+)*.
- Pre-heat the jaw area to 300° - 400°F *(150° - 200°C)* and maintain this temperature during the welding operation. It is very important to maintain this temperature in cold environments.
- Adjust weld current to rod manufacturer's specifications.
- Peen each layer.
- Cool slowly. Cover weld in cold environments.

### 3. HARD FACE

Hard face (we3) can only be applied over base material (DH) or underlayment weld (we2). **NEVER HARD FACE OVER EXISTING HARD FACE!**



# JAW INSPECTION AND MAINTENANCE

## JAW INSPECTION: G and S JAWS

**WEEKLY INSPECTION**

## JAW AND TOOTH REBUILD PROCEDURE: S and G JAWS

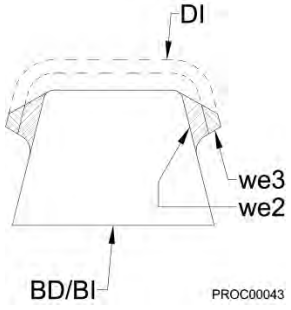
Welding Rod: Airco Tubecraft 1A, Cronatron 7355, Eutectic N6006, Postalloy 214, Stoody 31 or equal. In Canada: NCH Canada Inc. Wear-X #176 or equal.

- Dry welding rod at 300°F+ *(150°C+)*.
- Pre-heat the jaw area to 350°F *(177°C)* and maintain this temperature during the welding operation. It is very important to maintain this temperature in cold environments.
- Adjust weld current to rod manufacturer's specifications.
- Peen each layer. Do not exceed 2 – 3 layers of hard face.
- Cool slowly. Cover weld in cold environments.

**DO NOT WELD OVER OLD HARDFACING!**

*Remove all old hardfacing before applying new underlay weld.*

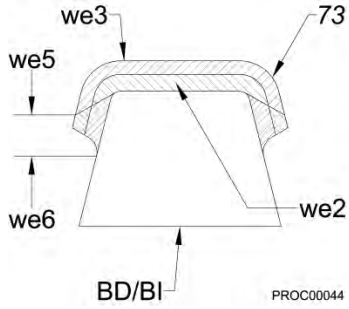
**1. BEFORE WELD**




**CORRECT**

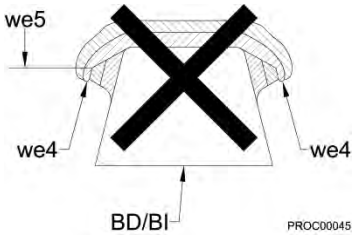
| | |
|---|---|
| **BD/BI** | MALE OR FEMALE CRUSHER JAW |
| **DI** | WORN AREA |
| **we2** | UNDERLAYMENT |
| **we3** | HARD FACE |

**2. AFTER WELD**




**CORRECT**

| | |
|---|---|
| **BD/BI** | MALE OR FEMALE CRUSHER JAW |
| **we2** | UNDERLAYMENT |
| **we3** | HARD FACE |
| **we5** | END OF NEW WELD |
| **we6** | OLD WELD |
| ***73*** | FINISH GRIND TO BLEND |




**INCORRECT**

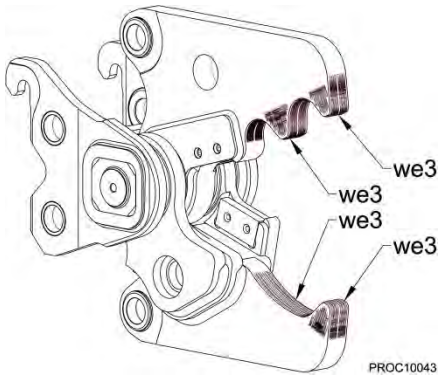
| | |
|---|---|
| **BD/BI** | MALE OR FEMALE CRUSHER JAW |
| **we4** | OVERFLOW |
| **we5** | END OF NEW WELD |

# JAW INSPECTION AND MAINTENANCE

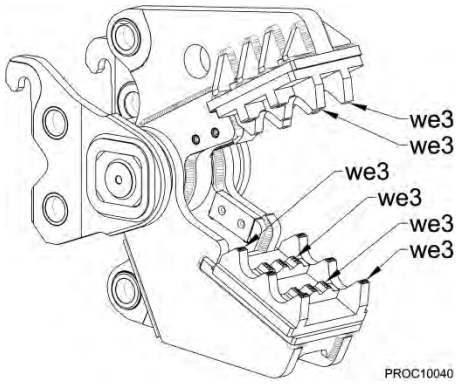
## JAW CONTACT AREAS

### S and G JAW CONTACT AREAS

In contact areas of jaws, hardfacing (we3) may be added to increase the wear life of these surfaces for hardfacing instructions, see the **JAW and TOOTH REBUILD PROCEDURE.**

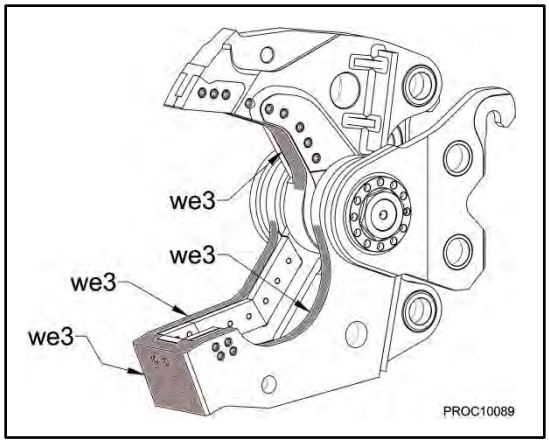



**S JAW**




**G JAW**

**K JAWS:** Several surfaces of the K jaws have been hard faced in contact areas. Hardfacing (we3) may be added to increase the wear life of these surfaces. The best time to rebuild them is as soon as the hard face pattern is worn off. If the hard face pattern is completely worn, the surfaces should be rebuilt and hard faced such that they are even with or slightly above the adjoining blades. See **HARDFACING K JAWS**.




### HARDFACING: K JAWS

If hardfacing is to be performed, the jaw must be preheated to 300° - 400°F *(150° - 200°C)* before hardfacing is applied. Failure to preheat the tip area will cause the hardfacing to crack and chip off prematurely. Using a suitable hard face rod, apply the material in stringer beads vertically on the front and sides of the piercing tip and parallel to the moveable jaw on the lower face of the piercing tip. This pattern will allow for the most efficient piercing and the least amount of interference. Peen after each pass and maintain inner pass temperature. **DO NOT APPLY MORE THAN TWO (2) LAYERS OF HARD FACE MATERIAL!**

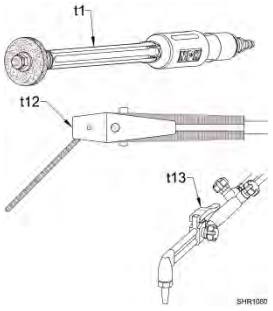
# FRAME MAINTENANCE

## REPAIR OF MAIN FRAME

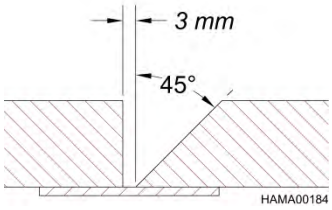
Inspect frame for cracks periodically. Crushing or shearing is an abusive operation and eventually frame cracking may occur. If the attachment has been overstressed due to improper operation or has been used for many hours of operation, the steel components may develop fatigue cracks. If cracking is found in any of the steel components of the processor, photos of the crack or cracks must be emailed to NPK immediately so that the crack can be evaluated and a repair option recommended.

**ROUTINE WELD REPAIR**

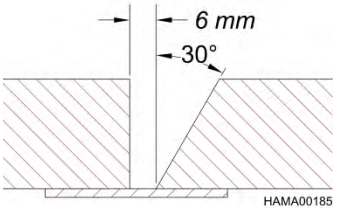
1. Gouge any cracks 100% using an air or electric hand held grinder (t1), carbon arc (t12) or torch (t13).




2a. Grind gouged area to a 30° angle on each side to the full depth of the gouged area for plate sizes up to 3/4" *(19 mm)* thick.




2b. Grind gouged area to a 45° angle on each side to the full depth of the gouged area for plate sizes over 3/4" *(19 mm)* thick.

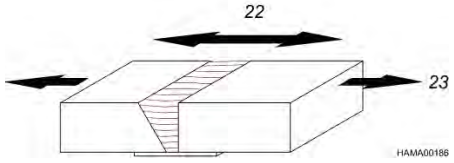



3. If the crack is completely through the plate, grind the bevel in halfway from both sides. Remove all slag and grinding residue.

4. Consult the **"JAW and TOOTH REBUILD PROCEDURE"**, **"HARD FACE"** section for pre-heat and welding instructions.

5. Peen or stress relieve after each pass. Maintain pre-heat.

6. After welding, grind area flush.




***22*** DIRECTION OF GRINDING

***23*** DIRECTION OF PRINCIPLE STRESS

# FRAME MAINTENANCE

## REPAIR OF MAIN FRAME

### ROUTINE WELD REPAIR

7. Allow area to cool slowly *(eight hours minimum)*. Cover with a heat blanket or other suitable insulation. **FAILURE TO DO SO MAY CAUSE CRYSTALLIZATION OF THE WELD AND SUBSEQUENT BREAKAGE**.

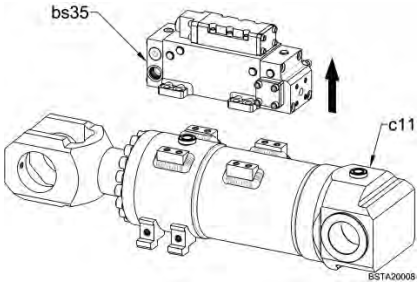
***NOTE:*** *NPK Construction Equipment has developed this repair procedure based on known information about structure and material. This, however, does not imply that repairs made using this procedure are guaranteed to be successful. NPK, therefore, cannot warranty this procedure. There is* ***NO*** *warranty regarding this repair either expressed or implied.*

# INSPECTION AND MAINTENANCE

## BOOSTER CYLINDER

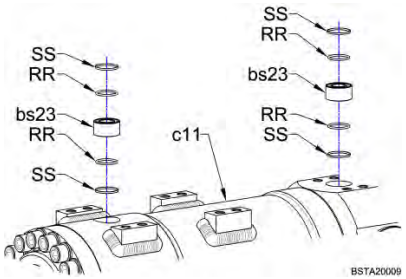
### DISASSEMBLY

1. Remove the booster assembly (bs35) from the cylinder assembly (c11).

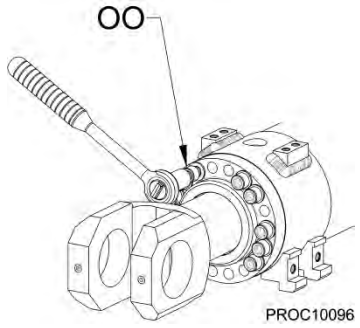



**NOTE:** *See the Booster Manual (B000-9601 for Booster maintenance.*

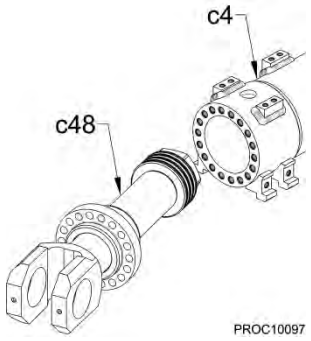
2. Remove the spacers (bs23), o-rings (RR) and backup rings (SS) from the cylinder assembly (c11).




3. Remove the cylinder end cap socket head cap screws (OO).




4. Remove the cylinder rod assembly (c48) from the cylinder housing (c4).

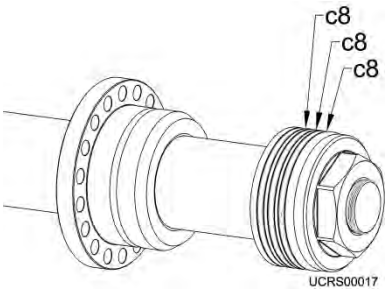


# INSPECTION AND MAINTENANCE

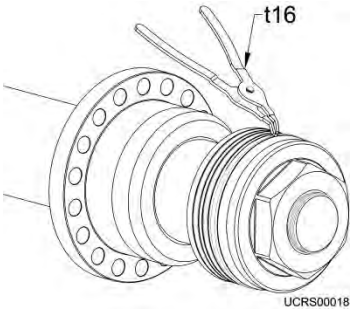
## BOOSTER CYLINDER

### DISASSEMBLY

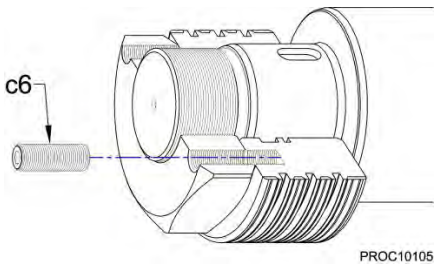
5. Check the piston rings (c8). The rings should be free in their grooves. If the rings are found to be stuck in their grooves, use a die grinder with a soft polishing stone (preferably NPK polishing wheel p/n 25026030) and polish the rings until they spring out of their grooves. If a ring is broken it must be replaced.



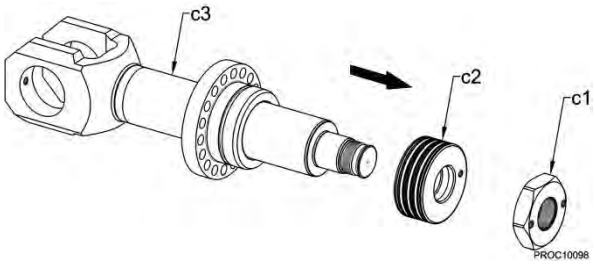

6. Using a ring expander (t16), remove all of the piston rings.

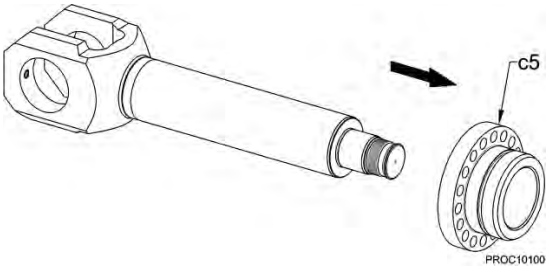



7. Lightly heat the rod nut set screw (c6) to loosen any thread adhesive that is present. Remove the rod nut set screw.




8. Unscrew the rod nut (c1) and remove the piston (c2) from the cylinder rod (c3). Remove the cylinder end cap (c5).



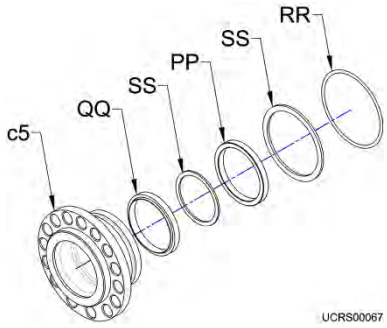



# INSPECTION AND MAINTENANCE

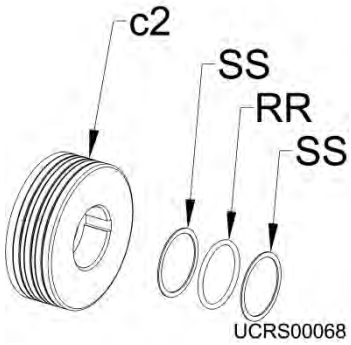
## BOOSTER CYLINDER

### DISASSEMBLY

9. Remove the dirt seal (QQ), rod seal (PP), o-ring (RR) and backup rings (SS) from the cylinder end cap (c5) and discard.




10. Remove the o-ring (RR) and backup rings (SS) from the inside of the piston and discard.



# INSPECTION AND MAINTENANCE

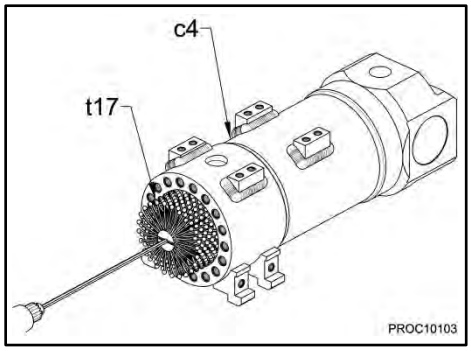
## INSPECTING AND CLEANING CYLINDER COMPONENTS

**⚠ CAUTION**

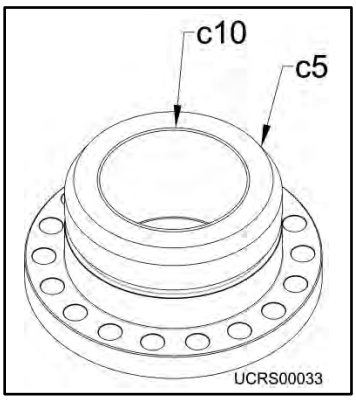
The prevention of foreign contaminant damage is critical when working with hydraulic equipment. Keep the work area clean. Using masking tape, cover all exposed holes and parts which may allow entry of foreign contaminants. Habitually clean the work area by wiping with a lint-free dry cloth.

Mating surfaces are machined to a smooth surface. Use care to avoid scratches, nicks, dents or other damage to machined surfaces. If damaged, the component must be repaired or replaced as required.

1. Inspect the heads and threads of all fasteners and plugs and corresponding threaded bores for damage. Repair or replace as required.
2. Inspect all components, particularly machined surfaces, including all hydraulic ports, for evidence of scratches, scoring, nicks, dents, wear, deformity, or other damage. Particularly close attention should be given to o-ring grooves and counter bores. Repair or replace as required.
3. Inspect drained and residual hydraulic fluid for evidence of contamination. If contaminated, inspect all components, seal, etc., to determine the cause.
4. Inspect the cylinder housing (c4) bore. Lightly hone using a ball hone (t17). If there is heavy scoring, the cylinder housing will need to be replaced.




5. Inspect the bronze guide (c10) found in the cylinder end cap (c5) for damage or excessive wear.

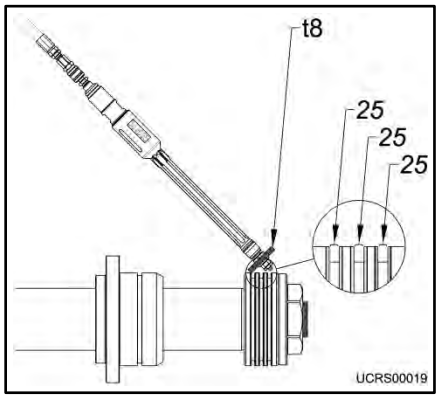


# INSPECTION AND MAINTENANCE

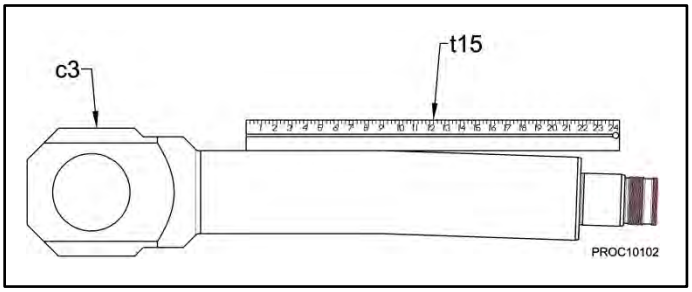
## INSPECTING AND CLEANING CYLINDER COMPONENTS

**⚠ CAUTION**

6. Using a die grinder with a soft polishing stone (t8), preferably NPK polishing wheel p/n 25026030, polish the leading edges of the piston ring grooves *(25)* to remove damage to the piston and allow free movement of the piston rings.




7. Using a straight edge (t15), check the cylinder rod (c3) for straightness.




**NOTE:** *The cylinder rod is a forged, high strength part. It is not possible to repair the rod. If the rod is bent or damaged, it must be replaced.*

8. Clean all parts with a degreaser solvent using a Scotchbrite® or equivalent cleaning pad.

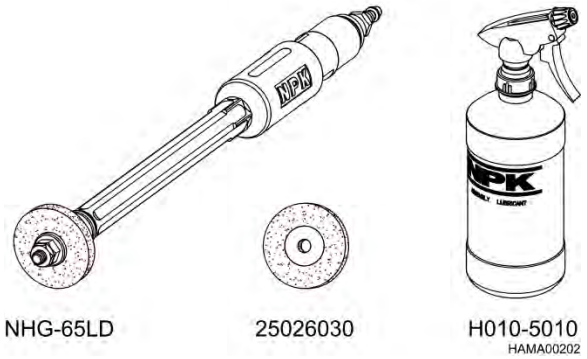
**⚠ WARNING**

Compressed air can cause injury or death! Limit air pressure to a maximum of 30 psi *(2 bars)*. Protect your eyes with safety glasses. Do not direct compressed air current at exposed skin. Do not direct compressed air current at other people within the work area.

9. Remove all thread sealant from threads using an appropriate thread sealant solvent. Remove old thread sealant residue with a maximum of 30 psi *(2 bars)* of compressed air.

# INSPECTION AND MAINTENANCE

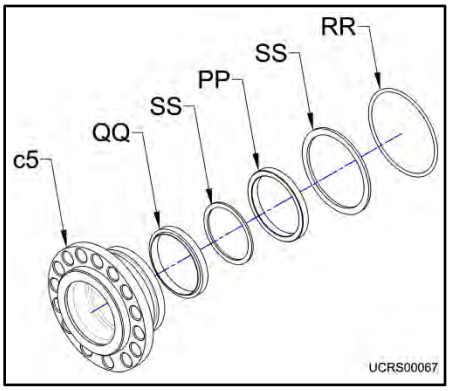
## SUGGESTED REPAIR TOOLS AND EQUIPMENT



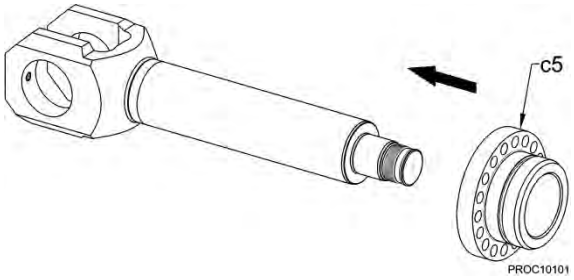

Air or electric handheld grinder
(NPK model NHG-65LD recommended)
Polishing wheel for grinder
(NPK p/n 25026030)
NPK Assembly Lube
(NPK p/n H010-5010)
Emery cloth (200 grit)
Cleaning solvent

### ASSEMBLY

1. Install dirt seal (QQ), backup ring (SS) and piston seal (PP) into the seal grooves on the inner side of the cylinder end cap (c5). Install the o-ring and backup ring into the outer groove.



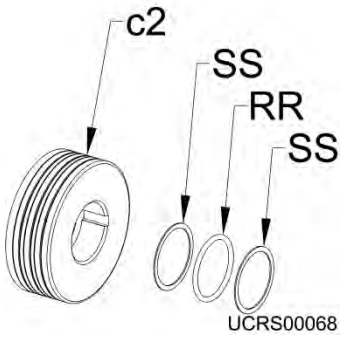

2. Apply hydraulic oil or NPK Assembly Lube to the inner surface coating the previously installed dirt seal, backup ring and piston seal. Install the cylinder end cap onto the cylinder rod.

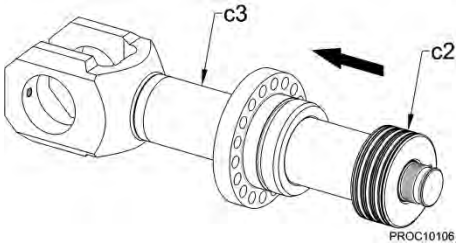
# INSPECTION AND MAINTENANCE

## SUGGESTED REPAIR TOOLS AND EQUIPMENT

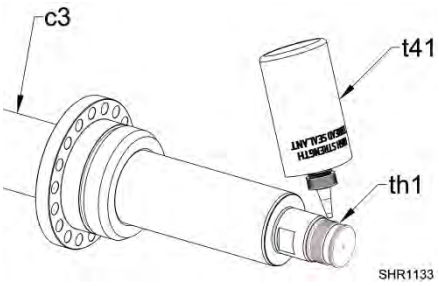
3. Install the o-ring (RR) and backup rings (SS) into the piston (c2). Apply a light coat of hydraulic oil or NPK Assembly Lube to the o-ring and backup ring after installation.



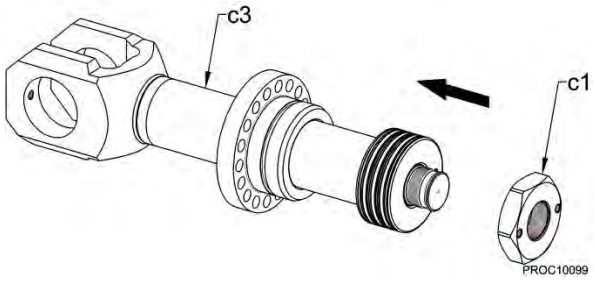

4. Install the piston (c2) onto the cylinder rod (c3).




5. Apply high strength thread adhesive to the clean dry threads of the cylinder rod.



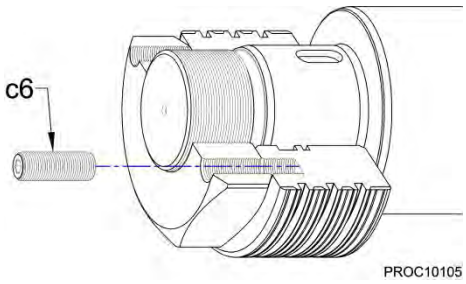

6. Install cylinder rod nut (c1) onto cylinder rod (c3) and torque to the listed value below.



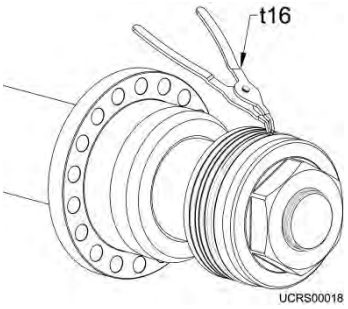

| MODEL | THREAD SIZE | TORQUE | | SOCKET SIZE | PART NUMBER |
|---|---|---|---|---|---|
| | | ft. lb. | (*Nm*) | | |
| **M35** | M70 x 3.0 | 3,200 | (*4,300*) | 100 mm | 16087553 |

## SUGGESTED REPAIR TOOLS AND EQUIPMENT

7. Install the set screw (c6).

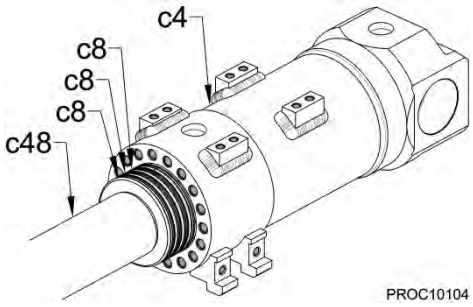



8. Using a ring expander (t16), install the piston rings with the splits in the piston rings opposing each other.

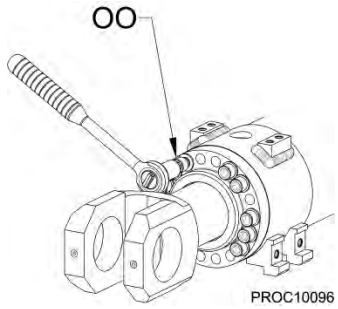



9. Apply hydraulic oil or NPK Assembly Lube to the inner surface of the cylinder housing and to the outside diameter of the piston and piston rings.


10. Install the cylinder rod assembly (c48) slowly into the cylinder housing (c4) taking care not to damage the piston rings (c8).

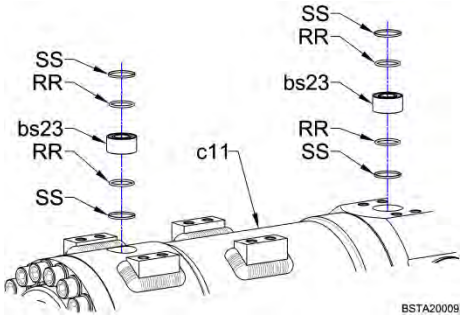


11. Install the cylinder end cap socket head cap screws (OO) and torque to the value listed below.



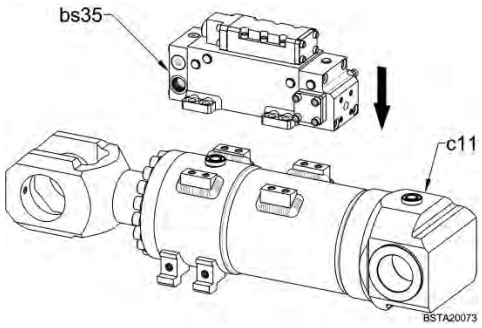

| MODEL | BOLT SIZE | TORQUE | |
|---|---|---|---|
| | | ft. lb. | (*Nm*) |
| **M35** | M20 x 2.5 | 430 | (*580*) |

12. Apply a light coat of oil or NPK Assembly Lube to four new backup rings (SS), four new o-rings (RR) and the two spacers (bs23), then install in the corresponding counter bores of the main cylinder (c11).

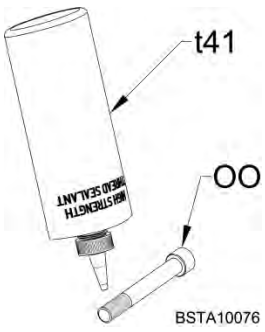



13. Apply a light coat of oil or NPK Assembly Lube to the mating surfaces of the booster main body.

14. With the aid of an assistant, carefully orient and align the eight mounting flange fastening holes of the booster assembly (bs35) with the corresponding eight threaded bores of the cylinder assembly (c11). If necessary, install two eye-bolts in the threaded bores on top of the booster assembly. Lift and move the booster assembly using a hoist.




15. Apply high-strength thread sealant to the clean, dry threads of the eight previously removed cap screws.



## SUGGESTED REPAIR TOOLS AND EQUIPMENT

16. Secure the main booster assembly to the cylinder housing using the eight cap screws and washers. Tighten the cap screws in an opposing pattern. Torque to value listed below.

| MODEL | BOLT SIZE | TORQUE | |
|---|---|---|---|
| | | ft. lb. | (*Nm*) |
| **M35** | M16 x 2 | 220 | (*300*) |

# JAW SET INTERCHANGE

## TOOLS AND SUPPLIES

The following are tools and supplies needed to properly change jaw sets.

- A sturdy pallet (wood or metal).
- Three wood blocks, 4” x 4” x 24” *(100 x 100 x 610 mm)* or larger.
- 12 mm hex key socket.
- 17 mm hex key socket (available as NPK part no. 35004600).
- 12 mm hex key wrench (available as NPK part no. 25004120).
- 17 mm hex key wrench (available as NPK part no. 25004170).
- 1/2" drive breaker bar.
- 3/4" or 1/2" air gun *(if available)*.
- Brass drift pin.
- Dead blow hammer or non-metallic rod or hammer (such as nylon or wood).
- Qty. 2 - #20 JIC steel caps.

***If removed jaw set is to be stored, it is recommended to:***

- Grease.
- Set on a wood pallet.
- Use a protective tarp for outside storage.

# JAW SET INTERCHANGE

## PROCEDURE FOR JAW SET INTERCHANGE

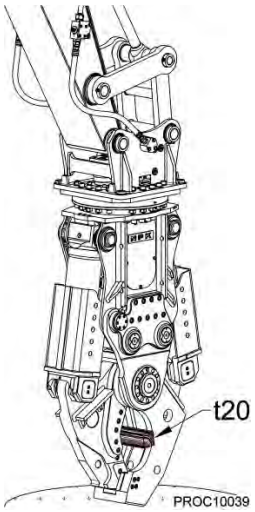
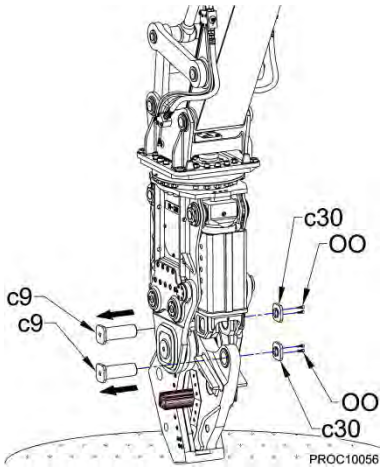
**⚠WARNING**

A. Safe handling procedures must be followed to avoid personal injury.
B. Lifting and securing mechanisms must be of adequate capacity to safely support the particular processor or jaw set.

## UNIT POSITIONING

All processor positioning will be done with the excavator.

## DETACHMENT OF THE EYE AND FORKED JAWS FROM THE CYLINDER SUB-ASSEMBLIES

| | |
|---|---|
| 1. Using the excavator, maneuver the M35 processor into a vertical position. **"K" JAWS ONLY:** *Insert a wood block (t20) between the jaws and close the jaws as shown.* This will prevent the jaws from closing too far. |  |
| 2. Using a hex key socket, remove the four 12 mm socket head cap screws (OO) securing the two cylinder jaw pin lock plates (c30). |  |

# JAW SET INTERCHANGE

## DETACHMENT OF THE EYE AND FORKED JAWS FROM THE CYLINDER SUB-ASSEMBLIES

3. Manually remove the cylinder lock plates.

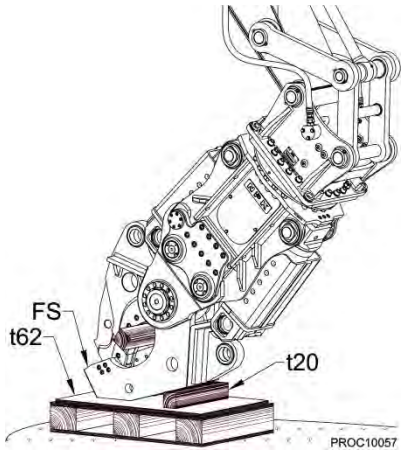
4. Remove the cylinder pins (c9).

**⚠ WARNING**

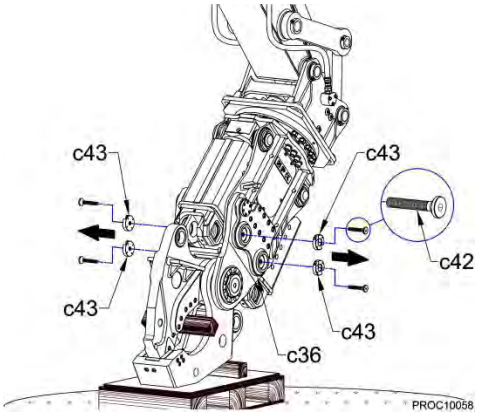
*Once the cylinder jaw pins are removed, the jaws may rock forward.*

## REMOVAL OF THE JAW SET ASSEMBLY FROM THE MAIN FRAME

5. Using the excavator, position the jaw set on a sturdy pallet. The forked jaw (FS) must be resting on the top surface of the pallet. Prop the back of the forked jaw up, using a block of wood (t20) as shown. *(This is to allow for clearance when unhooking the jaw set from the processor frame.)*



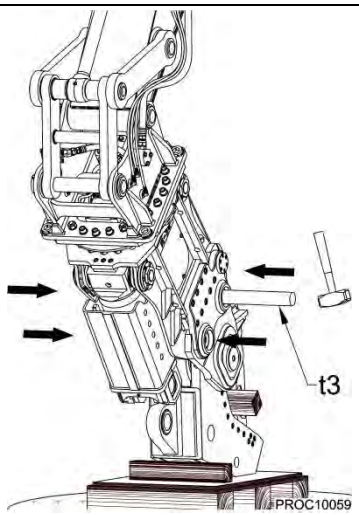

6. Remove the four retaining pin bolts (c42) and the four lock plates (c43) from the cylinder pin cover plates (c36).

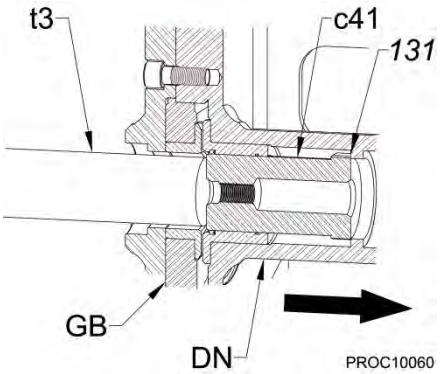


# JAW SET INTERCHANGE

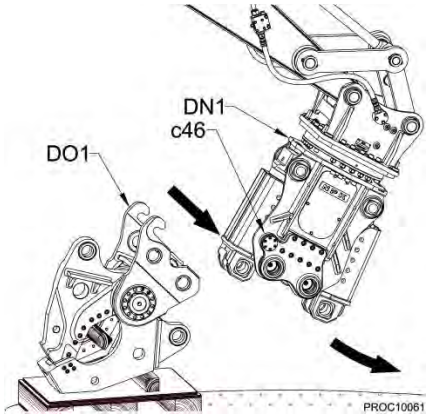
## REMOVAL OF THE JAW SET ASSEMBLY FROM THE MAIN FRAME

7. Using a non-metallic *(e.g., nylon, wood)* rod (t3), drive the four jaw frame pins (c41) in until they hit the pin stop *(131)* or through the jaw frame (GB) and flush with the processor frame.




8. Using the excavator, unhook the processor's main frame assembly (DN1) from the jaw set assembly (DO1) at the hook pin (c46).



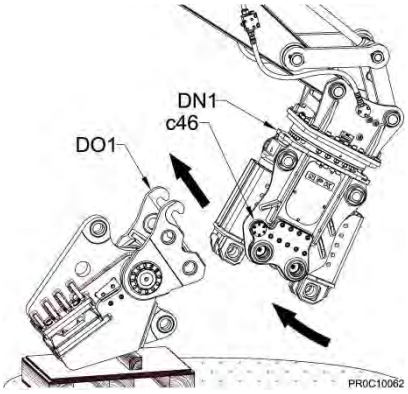

## JAW SET STORAGE

If the removed jaw set is to be stored, pack the bushings with grease, lay the jaw set on a wood or metal pallet and cover with a waterproof tarp *(if storage is outside)*.

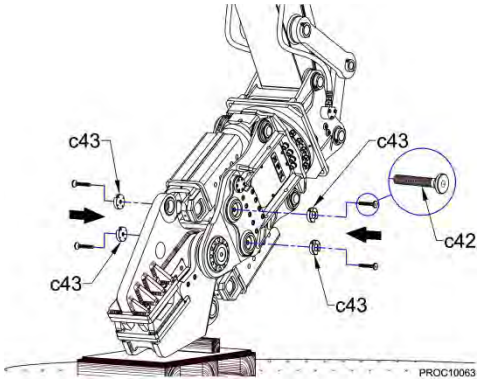
# JAW SET INTERCHANGE

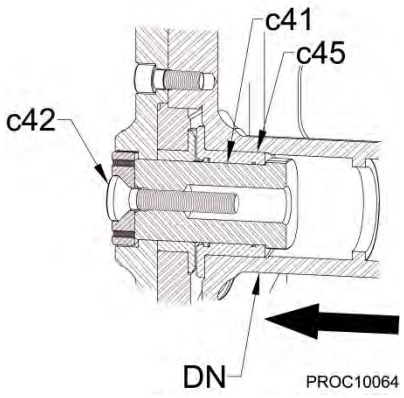
## JAW SET INSTALLATION INTO THE MAIN FRAME

1. Using the excavator, hook the main frame assembly (DN1) at the hook pin (c46) to the jaw set assembly (DO1).



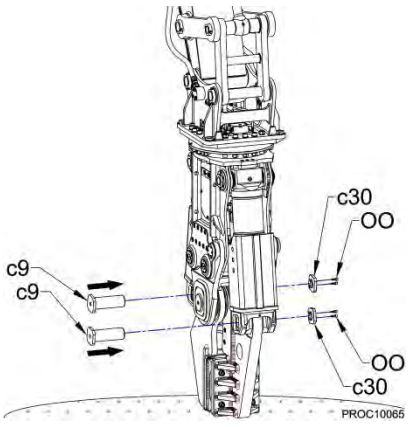

2. Using a 17 mm hex key socket or wrench, install the four retaining pin bolts (c42) to secure the four lock plates (c43) to the four jaw frame pins (c41). **NOTE:** *Keep threading the retaining pin bolts until the jaw frame pin stops against the pivot bushing* (c45) *located in the processor's main frame* (DN).




3. Line up the cylinder pin bores with the jaw pin bores and push the cylinder pins (c9) into place.

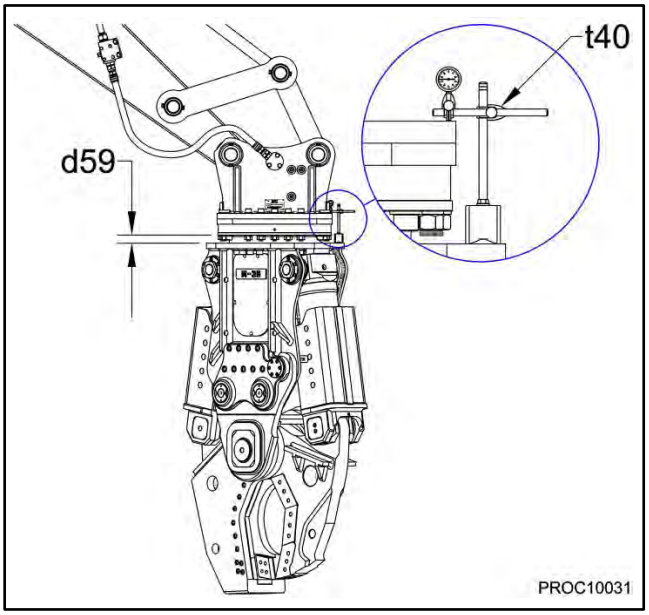
4. Install the cylinder jaw pin lock plates (c30). Using a hex key socket, install the four 14 mm socket head cap screws. See the **"FASTENER TORQUE CHART"** section of this manual for the correct torque.



# SLEWING RING INSPECTION AND MAINTENANCE

## MEASURING MAXIMUM AXIAL MOVEMENT

1. While the unit is attached to the carrier, position the processor in a vertical position as shown.
2. Lock the base of a dial indicator (t40) onto the lower frame of the processor. Indicate the other end of the dial onto the top bracket face as shown. Using the excavator, slightly rock the processor back and forth using slight stick movement. Note the movement shown on the dial. Take this reading (d59) in four places. If your readings are greater than shown, please contact the NPK Service Department at 1-800-225-4379.




| MODEL | NEW MAXIMUM | |
|---|---|---|
| | in | *(mm)* |
| **M35** | <.010 | *(<0.25)* |

| MODEL | MAXIMUM ALLOWABLE WEAR | |
|---|---|---|
| | in | *(mm)* |
| **M35** | 0.138 | *(3.50)* |

# SWIVEL MANIFOLD MAINTENANCE

## SWIVEL MANIFOLD ASSEMBLY

The swivel manifold assembly is located between the top bracket, which is pinned to the carrier, and the M35 processor frame that rotates. Hydraulic oil for both the open and close operations of the M35 processor pass through this manifold. The swivel manifold assembly consists of two main parts, the **"Spindle Case"** (BZ), which contains the oil seals, and the **"Spindle"** (CA), which rotates with the M35 processor frame (see **Fig. 1**).

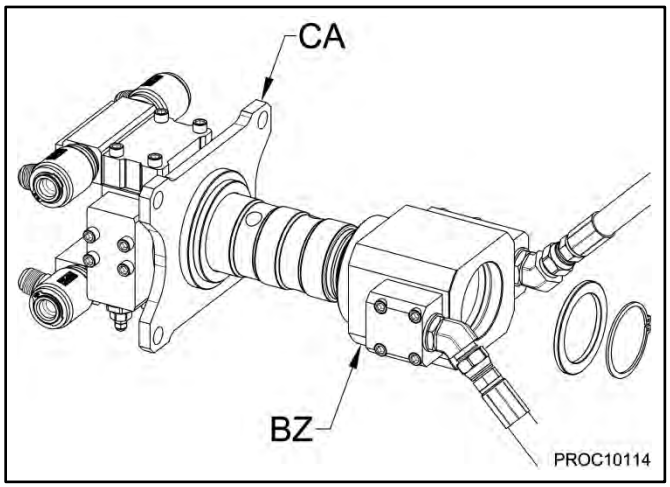



**Fig. 1**

## LEAKAGE OF THE SEALS

External leakage or internal bypassing of hydraulic fluid will require the replacement of the seals in the swivel assembly. For external leakage, please review the seal replacement procedure in the **"REPLACEMENT OF THE SEALS IN THE SWIVEL"** section of this manual. If internal leakage is suspected, please proceed to the **"TESTING THE SWIVEL SEALS FOR INTERNAL LEAKAGE"** in the next section.

# SWIVEL MANIFOLD MAINTENANCE

## TESTING THE SWIVEL SEALS FOR INTERNAL LEAKAGE

If internal leakage is suspected, before disassembling the swivel assembly, the relief valve (c17/c18) pressure settings should be checked. Internal leakage will most likely prevent the unit from reaching its relief settings in both the open and close functions. The relief valve cartridges are located in blocks (bs24) mounted to the swivel manifold assembly near the four hose connections (see Fig. 2). Access to these is through the upper side access plates of the M35 processor main frame (see Fig. 3). The relief valve setting adjustment screws (va1) are located beneath plastic caps. **NOTE:** *Before attempting to adjust the relief setting, check that the relief valve cartridges have not loosened in their blocks.*

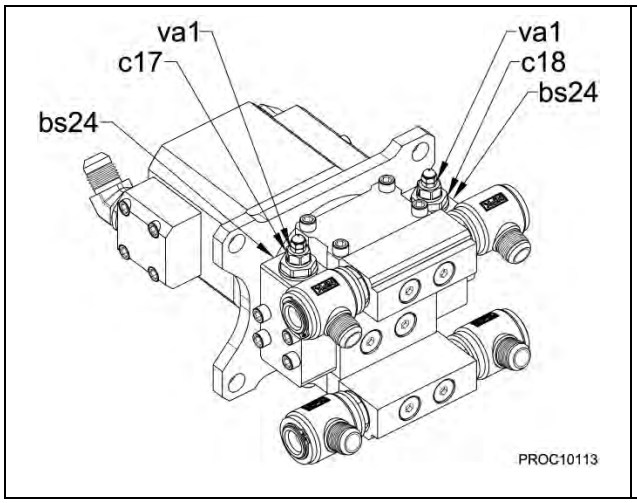



**Fig. 2**

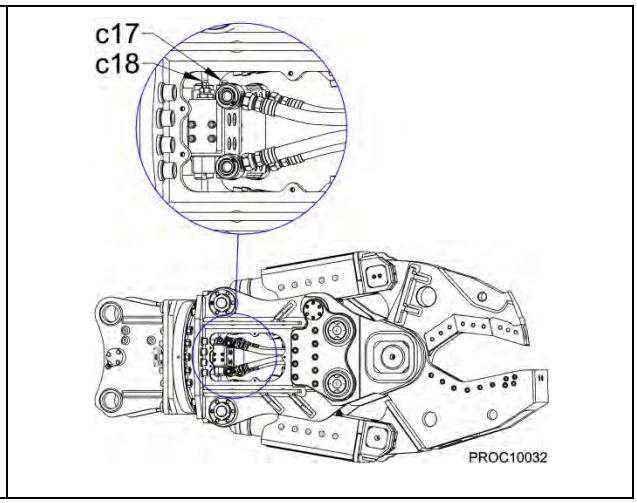



**Fig. 3**

## TEST PROCEDURE

Install 0 to 5,000 psi *(0 to 350 bar)* gauges in the NPK stop valves (located on the stick of the carrier) or in gauge ports in the open and close circuits located near the end of the stick *(for carriers without an NPK hydraulic kit)*. Close the jaw and keep the function activated, then read the pressure indicated on the gauge. Compare the pressure reached with the specifications for your M35 processor. Repeat the check while opening the jaws and read the pressure indicated. If the proper relief pressure cannot be reached and the booster slows or stops, disassemble the swivel to check for failed seals. **NOTE:** *If the relief pressure cannot be reached with the jaw closed and the intensifier booster is clicking rapidly, the relief valves are not the problem and the intensifier booster should be checked.*

# SWIVEL MANIFOLD MAINTENANCE

## REPLACEMENT OF THE SEALS IN THE SWIVEL

**Tools needed:**

19 and 22 mm open end wrenches

41 and 46 mm open end wrenches

External snap ring pliers

**⚠ CAUTION**

The jaws of the M35 material processor should be closed and the frame supported or the shipping pins (t80), as shown in **Fig. 4**, installed to prevent rotation during repair.

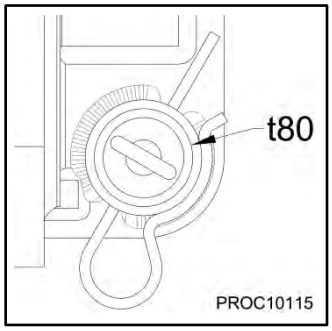



**Fig. 4**

**STEP 1 (Fig. 5)**

Disconnect the rotation motor hoses (m39) at the hydraulic motor. It is not necessary to remove the hoses from the counterbalance valve. Remove the counterbalance valve and its mounting plate as a unit from the M35 processor frame. Remove the case drain (not shown) and port fittings (f1) from the hydraulic motor. Disconnect the cylinder hoses (AO) at the side plates of the top bracket. Do not remove the cylinder hoses and fittings from the **"Spindle Case"** (BZ); they will be used to help lift it off the **"Spindle"** (CA). Do not remove the stop plate (not shown) from the "Spindle Case"; it can be used for correct alignment during assembly.

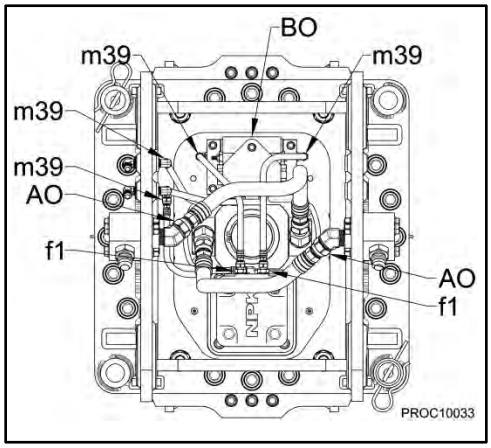



**Fig. 5**

# SWIVEL MANIFOLD MAINTENANCE

## REPLACEMENT OF THE SEALS IN THE SWIVEL

**STEP 2 (Fig. 6)**

Remove the snap ring (AJ) and washer (U) from the top of the swivel assembly. Pull the **"Spindle Case"** off of the **"Spindle"** *(the cylinder hoses can be used for this)*.

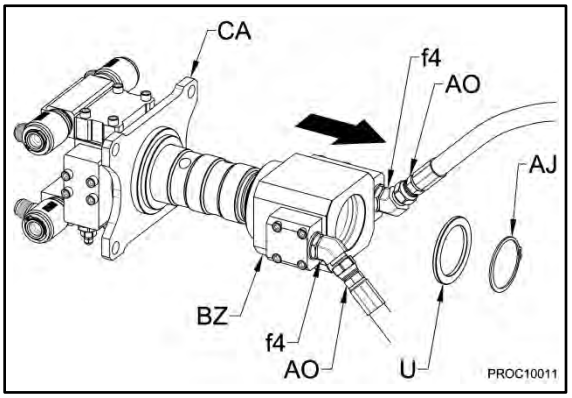



**Fig. 6**

**STEP 3 (Fig. 7)**

Inspection:

Visually inspect the sealing surfaces (120) of the **"Spindle"** (CA) for damage, which may hamper the ability of the o-rings to seal. Polishing the surface may clean up light scratching. Heavy scratching or galling may indicate rotator bearing play.

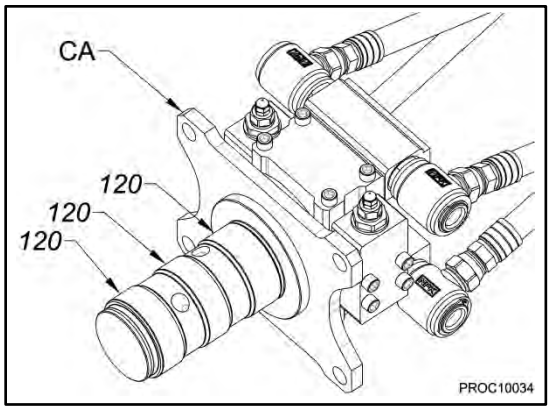



**Fig. 7**

# SWIVEL MANIFOLD MAINTENANCE

## REPLACEMENT OF THE SEALS IN THE SWIVEL

**STEP 4 (Fig. 8)**

**Seal removal and replacement:**

Sealing is accomplished with a combination of o-rings and back-up rings, which ride against the **"Spindle"**. Remove the o-rings and back-up rings with a seal pick (note the order of placement). Check the grooves *(118)* in the **"Spindle Case"** (BZ) for burrs or scoring damage. Light grinding or polishing may be required.

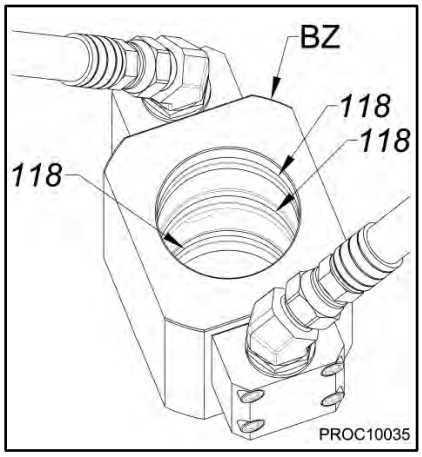



**Fig. 8**

**STEP 5 (Fig. 9)**

Lubricate the o-rings (RR) and back-up rings (SS) with grease. Install the back-up rings first, taking care not to crimp or fold them. Install the o-rings. Refer to the illustration for o-ring and back-up ring placement.

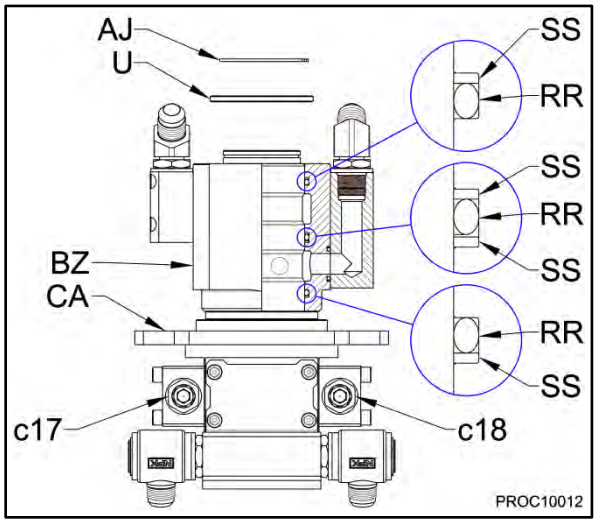



**Fig. 9**

# SWIVEL MANIFOLD MAINTENANCE

## REPLACEMENT OF THE SEALS IN THE SWIVEL

Spray the **"Spindle"** (CA) with NPK assembly lube (P/N H010-5010). Install the hoses onto the **"Spindle Case"** (BZ). Slide the **"Spindle Case"** over the **"Spindle"**, which includes the relief valve cartridges (c17/c18). Install the washer (U) and snap ring (AJ). Reconnect the cylinder hoses to the top bracket, install the counterbalance valve, install the fittings into the hydraulic motor and install the hydraulic motor hoses.

# FASTENER TORQUE SPECIFICATIONS

These torque charts are to be used with the specific “M35” Series processor parts manual for the unit being repaired.

All fasteners will be used with lube or medium strength adhesive. Bolts must have their threads wire brushed or cleaned with a thread die, then cleaned with solvent and finally cleaned with compressed air. Threaded holes must be cleaned with a thread tap, solvent and also with compressed air.

Use a common chassis or wheel bearing grease on fasteners listed as lubed. Grease the threads of the bolt and the contact surface under the bolt head. Grease the contact surface of nuts.

Use a few drops of medium strength thread adhesive on the threads of fasteners listed as torqued with adhesive.

Do not use anti-seize compound on any fasteners, unless otherwise noted.

## FASTENER TORQUE CHART - M35 MAIN FRAME ASSEMBLY

| BOLT LOCATION | BOLT SIZE | BOLT TORQUE | | ADHESIVE |
|---|---|---|---|---|
| | | ft. lb. | *(Nm)* | OR LUBED |
| **CYLINDER ROD END PIVOT PIN KEEPER** | M14 | 145 | *(200)* | LUBED |
| **CYL. BARREL END PIVOT PIN FLANGE** | M12 | 65 | *(90)* | LUBED |
| **JAW PIVOT PIN NUT** | M16 | 190 | *(255)* | LUBED |
| **CYLINDER PIN COVER PLATE** | M22 | 550 | *(760)* | LUBED |
| **HOOK PIN** | M12 | 65 | *(90)* | LUBED |
| **CUTTING BLADE, G & S JAWS** | M16 | 225 | *(300)* | ADHESIVE |
| **CUTTING BLADE, K JAW** | M20 | 360 | *(490)* | ADHESIVE |
| **TUNNEL FRONT BLADE, K JAW** | M20 | 365 | *(495)* | ADHESIVE |
| **TOOTH PLATE, G JAW** | M24 | 640 | *(870)* | ADHESIVE |
| **ACCESS PLATE** | M12 | 90 | *(125)* | LUBED |
| **JOINT FITTING** | M12 | 65 | *(90)* | LUBED |
| **WEDGE PLATE** | M16 | 225 | *(300)* | ADHESIVE |

# FASTENER TORQUE SPECIFICATIONS

## FASTENER TORQUE CHART - M35 CYLINDER ASSEMBLY

| BOLT LOCATION | BOLT SIZE | BOLT TORQUE | | ADHESIVE OR LUBED |
|---|---|---|---|---|
| | | ft. lb. | *(Nm)* | |
| **CYLINDER END CAP** | M20 | 365 | *(495)* | LUBED |
| **CYLINDER ROD NUT** | M70 | 3200 | *(4300)* | ADHESIVE |
| **GUIDE PLATE** | M16 | 225 | *(300)* | ADHESIVE |
| **BOOSTER ASSEMBLY** | M16 | 220 | *(300)* | ADHESIVE |
| **MANIFOLD BLOCK** | M14 | 145 | *(200)* | ADHESIVE |
| **CONNECTOR PIPE** | M12 | 93 | *(125)* | ADHESIVE |

**NOTE:** *For booster assembly bolt torques see* ***B000-9601*** *booster manual.*

## FASTENER TORQUE CHART - M35 ROTATION COMPONENTS

| BOLT LOCATION | BOLT SIZE | BOLT TORQUE | | ADHESIVE OR LUBED |
|---|---|---|---|---|
| | | ft. lb. | *(Nm)* | |
| **SLEWING RING ASSEMBLY TO FRAME** | M24 | 700 | *(950)* | LUBED |
| **TOP PLATE TO SLEWING RING** | M16 | 260 | *(350)* | ADHESIVE |
| **SLEWING RING COVER** | M12 | 93 | *(125)* | ADHESIVE |
| **ROTATION MOTOR** | M16 | 260 | *(350)* | ADHESIVE |
| **MOTOR PINION GEAR** | M12 | 93 | *(125)* | ADHESIVE |
| **COUNTERBALANCE VALVE** | M12 | 95 | *(130)* | LUBED |
| **COUNTERBALANCE VALVE PLATE** | M12 | 95 | *(130)* | LUBED |
| **SWIVEL MANIFOLD ASSEMBLY** | M20 | 430 | *(580)* | ADHESIVE |
| **SPINDLE BLOCK** | M10 | 50 | *(68)* | LUBED |
| **SWIVEL MANIFOLD** | M12 | 95 | *(130)* | LUBED |
| **FLANGE EXTENSION** | M12 | 93 | *(125)* | LUBED |
| **STOP PLATE** | M12 | 93 | *(125)* | ADHESIVE |

# HOSE TORQUE SPECIFICATIONS

### JIC ENDS

| NOMINAL SIZE | FITTING DASH SIZE | THREAD SIZE | NUMBER OF FLATS FROM FINGER TIGHT | TORQUE | |
|---|---|---|---|---|---|
| | | | | ft. lb. | *(Nm)* |
| **1/2"** | -8 | 3/4-16 | 1 | 36 - 39 | *(49 - 53)* |
| **3/4"** | -12 | 1-1/16-12 | 1 | 79 - 88 | *(107 - 119)* |
| **1"** | -16 | 1-5/16-12 | 1 | 108 - 113 | *(146 - 153)* |
| **1-1/4"** | -20 | 1-5/8-12 | 1 | 127 - 133 | *(172 - 180)* |

### ORFS ENDS

| NOMINAL SIZE | FITTING DASH SIZE | THREAD SIZE | NUMBER OF FLATS FROM FINGER TIGHT | TORQUE | |
|---|---|---|---|---|---|
| | | | | ft. lb. | *(Nm)* |
| **1/2"** | -8 | 13/16-16 | 1.25 - 1.75 | 32 - 35 | *(43 - 48)* |
| **3/4"** | -12 | 1-3/16-12 | 1.25 - 1.75 | 65 - 70 | *(88 - 95)* |
| **1"** | -16 | 1-7/16-12 | 1.25 - 1.75 | 92 - 100 | *(125 - 136)* |
| **1-1/4"** | -20 | 1-11/16-12 | 1.25 - 1.75 | 125 - 140 | *(170 - 190)* |

# TROUBLESHOOTING

## DETERMINE THE TYPE OF PROBLEM

Performance problems are classified as **"LOSS OF POWER"** or **"LOSS OF CYCLE SPEED"** *(assuming the problem is not due to misapplication)*.

1. **LOSS OF POWER**
   NPK M35 Material Processor jaw crushing/cutting forces are determined by the operating pressure setting and NPK pressure intensifier performance.
2. **LOSS OF CYCLE SPEED**
   NPK M35 Material Processor cycle speed is determined by oil flow to the unit. The hydraulic installation circuit for the M35 Material Processor must be set to provide the correct flow.

## DETERMINE THE CAUSE OF THE PROBLEM

Technical problems are caused by either the NPK M35 Material Processor or the carrier's hydraulic system *(hydraulic installation kit for the M35 Material Processor)*. Checking the hydraulic pressure and flow will determine if the problem is in the M35 Material Processor or the carrier. If the pressure and flow to the Processor are correct, the problem is in the M35 Material Processor.

## LOSS OF POWER

Loss of power can be caused by a low carrier relief valve setting or by a low M35 Material Processor relief valve setting. Verify the correct relief valve settings of the carrier and the M35 Material Processor. (See **"M35 PROCESSOR RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS"** on page 99.)

If the relief valve pressures are to specification, proceed to the **"INTENSIFIER CHECKS"** troubleshooting chart on page 100 and the **"PRESSURE INTENSIFIER OPERATION"** section on page 102.

# TROUBLESHOOTING

## TROUBLESHOOTING GUIDE FOR LOW POWER RELIEF VALVE CHECKS

**LOW POWER CHECKS**

| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Operating Pressure is less than 3,700 psi (*255 bar*). | Carrier hydraulic circuit relief valve. | Measure the carrier circuit relief valve with the pressure to close shut-off valve in the **"OFF"** position | Adjust or replace the carrier circuit relief valve. The setting for the relief valve must be 200 psi (*14 bar*), minimum, above the M35 Processor operating pressure. |
| | M35 Processor relief valves | Measure the relief valves with the shut-off valves on the carrier in the **"ON"** position. Check pressure with the jaws fully open and fully closed. | Setting should be 3,700 psi (*255 bar*) |
| | | Check relief cartridges for tightness. | Tighten the relief valve cartridges. |
| | | Check relief cartridges for mis-adjustment. | Reset to 3,700 psi (*255 bar*). If unable to adjust, replace the cartridge. |
| | | Check the o-rings and backup rings of the relief valve cartridges. | Replace the o-rings and backup rings of both relief valve cartridges. |
| | Pilot check valve assemblies. | Inspect the booster inlet pilot check valves for damage. | Replace the inlet pilot check valve assemblies if necessary. |
| | Swivel manifold assembly | Check the seals between the open and close passages in the swivel manifold assembly. | Replace the seals in the swivel manifold assembly. |
| | | Check the land areas for the seals in the swivel manifold assembly. | Repair the land area or replace the spindle. |

# TROUBLESHOOTING

## TROUBLESHOOTING GUIDE FOR LOW POWER RELIEF VALVE CHECKS

**LOW POWER CHECKS**

| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Operating pressure is at 3,700 psi (*255 bar*), *but the intensifier does not click.* | Booster control valve assembly. | Dis-assemble the main valve and inspect the spring, plungers and for free movement of the spool. | Polish or replace as necessary. |
| | Booster assembly | Dis-assemble the main valve and inspect the piston assembly, seals, poppets and seats. | Polish or replace as necessary. |

# TROUBLESHOOTING

## MEASURING OPERATING PRESSURES

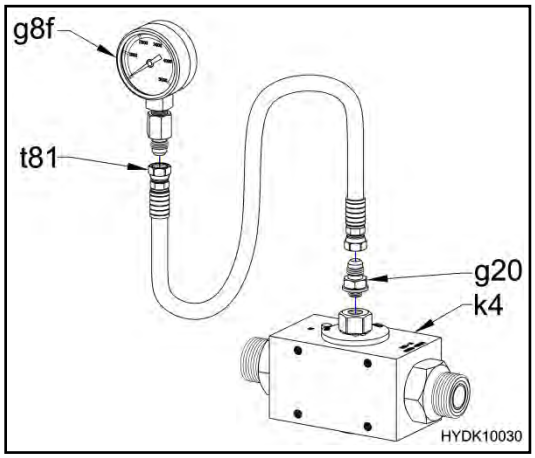
**Tools and equipment required:**

*(For carriers with an NPK hydraulic installation kit installed).*

Pressure gauge (g8f): 5000 psi *(350 bar)*.

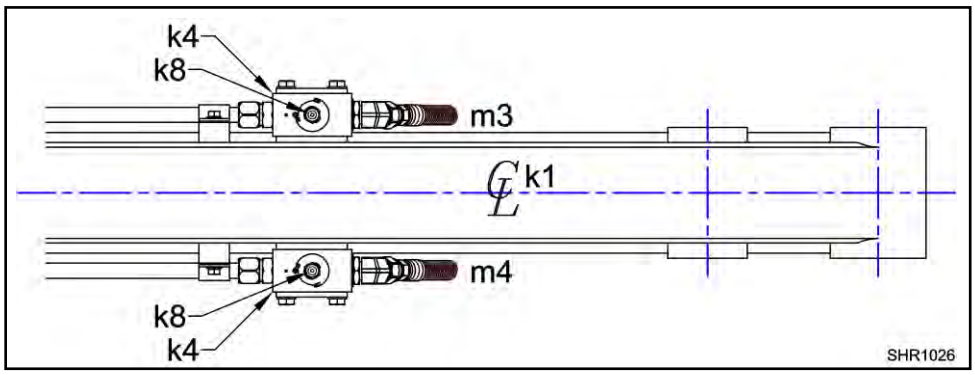
Test port adapter (g20): to fit #4 SAE female port in NPK shut-off valve (k4).

Test hose (t81): 5000 psi *(350 bar)* rated




## RELIEF VALVE CHECKING AND SETTING PROCEDURE

NPK Hydraulic Installation Kits provide shut-off valves (k4) with test ports (k8) in both the jaw open (m4) and close lines (m3). Install pressure test hoses in both test ports.



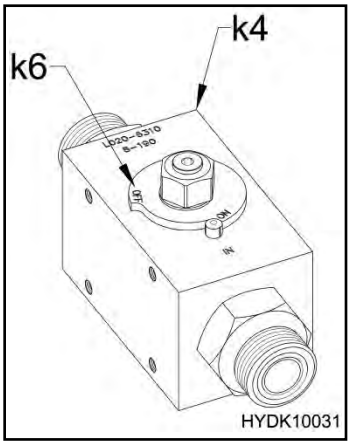
# TROUBLESHOOTING

## 1. CARRIER CIRCUIT RELIEF VALVE CHECK

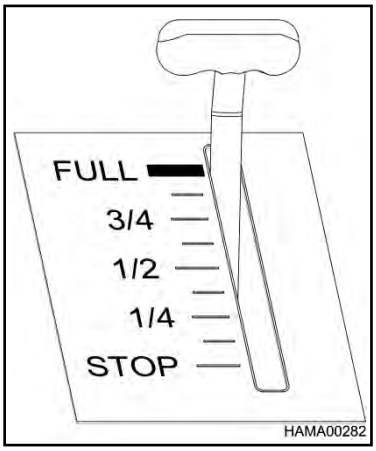
Verify that the hydraulic system of the carrier meets the requirements of the M35 Material Processor.

A. Install a 0 – 5000 psi *(350 bar)* pressure gauge (g8f) in the #4 SAE test ports in each of the shut-off valves at the end of the stick.

B. Turn the shut-off valve (k4) in the close circuit to the **"OFF"** position (k6).




C. Start the carrier. Set the throttle to the **"FULL"** position. Actuate the hydraulic circuit to close the jaws.




D. The pressure reading should be at least 200 psi *(14 bar)* above the M35 Material Processor operating pressure.

**Note:** If the excavator relief setting is less than 200 psi *(14 bar)* above the M35 Material Processor operating pressure, reset the excavator accordingly. (See specifications).

**2. M35 MATERIAL PROCESSOR RELIEF VALVE**

After the M35 Material Processor hydraulic circuit has been verified, check the M35 Material Processor relief valve settings for both open and close.

A. With a 0 – 5000 psi *(350 bar)* gauge installed in both the open and close side of the stick, open the shut-off valves.

B. Start the carrier. Set the throttle at full RPM and close the jaws completely and hold for 10 seconds. Check the psi *(bar)* reading on the gauge and compare to the specified M35 Material Processor relief valve setting. If it is not the same, reset the M35 Material Processor relief valve accordingly.

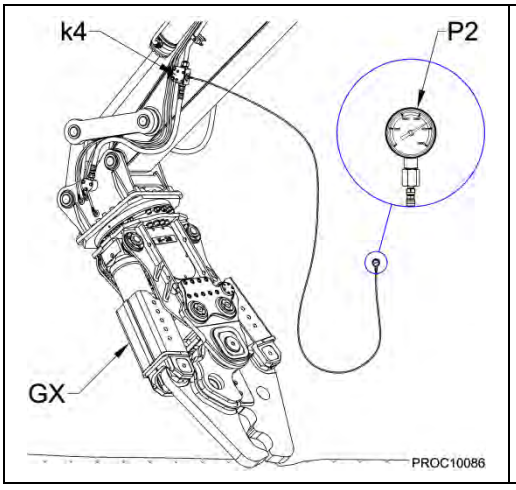
C. The booster will start to click. Depending on oil temperature, the booster will continue to click slowly compensating internal leaking in the main cylinder. This is normal.

D. If the intensifier is clicking rapidly, pressure may not reach the relief valve setting due to severe intensifier or cylinder leakage.

E. Open the M35 Material Processor jaws to the fully open position and hold for 10 seconds. Check the pressure reading on the gauge and compare to the specified M35 Material Processor relief valve setting. If it is not the same, reset the M35 Material Processor relief valve accordingly.

## PRESSURE INTENSIFIER SEQUENCE VALVE AND RELIEF VALVE ACTUATION

Close the jaws without material in them. When the M35 Material Processor's cylinders are fully stroked, the load pressure rises until it reaches the M35 Material Processor's (GX) relief valve setting (P2). The excavator relief valve acts only as a safety relief and must be set a minimum of 200 psi *(14 bar)* above the M35 Material Processor relief valve setting shown below.



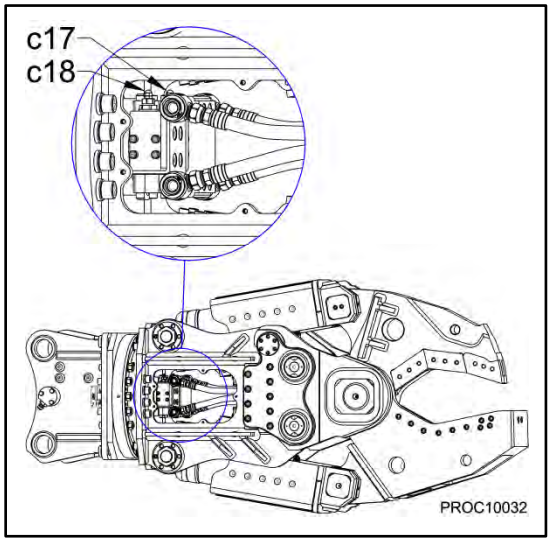

| MODEL | SERIAL NO. | P2 M35 PROCESSOR RELIEF VALVE SETTING | | P3 MINIMUM CARRIER RELIEF VALVE SETTING | |
|---|---|---|---|---|---|
| | | psi | *(bar)* | psi | *(bar)* |
| **M35** | ALL | 3,700 | *(255)* | 3,900 | *(270)* |

# TROUBLESHOOTING

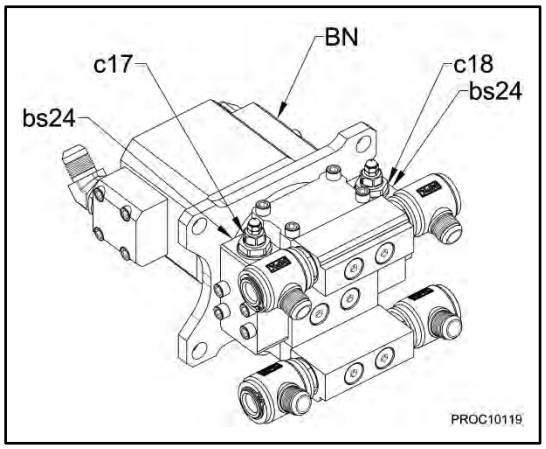
## M35 MATERIAL PROCESSOR RELIEF VALVE AND CARRIER RELIEF VALVE SETTINGS

| MODEL | SERIAL NO. | P2 M35 PROCESSOR RELIEF VALVE SETTING | | P3 MINIMUM CARRIER RELIEF VALVE SETTING | |
|---|---|---|---|---|---|
| | | psi | *(bar)* | psi | *(bar)* |
| **M35** | ALL | 3,700 | *(255)* | 3,900 | *(270)* |

## RELIEF VALVE LOCATION




The M35 Material Processor relief valve cartridges, close (c17) and open (c18) are located in the relief blocks (bs24) that are bolted to the rotary joint assembly (BN).



# TROUBLESHOOTING

**INTENSIFIER CHECKS** *(unit does not click)*

**INTENSIFIER CHECKS**

| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Intensifier does not click | M35 Processor relief valves | Check relief cartridges for tightness. | Tighten the relief valve cartridges. |
| | | Check relief cartridges for mis-adjustment. | Reset to 3,700 psi (*255 bar*). If unable to adjust, replace the cartridge. |
| | | Check the o-rings and backup rings of the relief valve cartridges. | Replace the o-rings and backup rings of both relief valve cartridges. |
| | Booster control valve assembly. | Dis-assemble the main valve and inspect the spring, plungers and for free movement of the spool. | Polish or replace as necessary. |
| | Booster assembly | Check poppets and seats. | Replace poppets and seats as necessary. |
| | | Check all o-rings and backup rings. | Replace all o-rings and backup rings. |

# TROUBLESHOOTING

**INTENSIFIER CHECKS** *(unit clicks – does not slow down)*

**INTENSIFIER CHECKS**

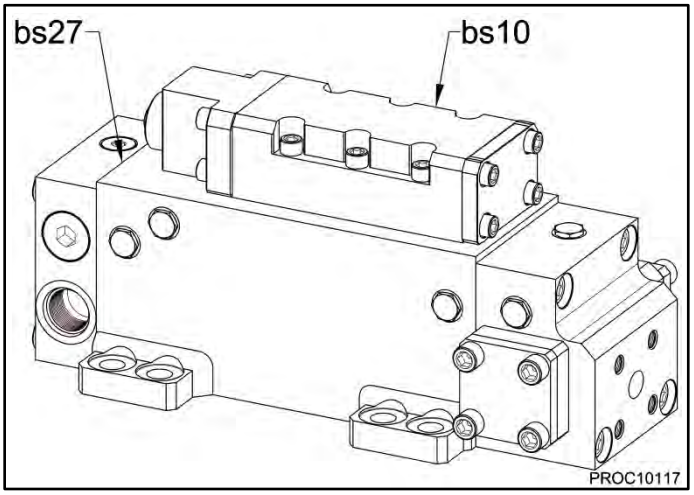
| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Intensifier clicks but does not slow down | M35 Processor relief valves | Check relief cartridges for tightness. | Tighten the relief valve cartridges. |
| | Pilot check valve assemblies. | Inspect the booster inlet pilot check valve assemblies for damaged seats. | Replace the inlet pilot check valve assemblies. |
| | Booster assembly | Check poppets and seats. | Replace poppets and seats as necessary. |
| | | Check all o-rings and backup rings. | Replace all o-rings and backup rings. |
| | Main cylinder assemblies | Check main cylinder piston rings for by-passing oil. | Replace piston rings. |
| | | Check for damaged seals. | Reseal cylinders |

# TROUBLESHOOTING

## PRESSURE INTENSIFIER OPERATION

NPK's exclusive pressure intensifier system is used in NPK M35 Material Processors to boost cylinder pressure to increase the jaw closing forces. When the intensifier is working properly, a rapid clicking sound will be heard, indicating that the pressure intensifier is being actuated as the jaws begin to close against resistance. As the jaws grasp tighter onto the material, the clicking will begin to slow down. This slowing will continue until the material is either cut/crushed or the M35 Material Processor meets full resistance. At full resistance, the clicking will slow dramatically or sometimes stop completely.

## PRESSURE INTENSIFIER (BOOSTER)




The control valve (bs10) and booster assembly (bs27) make up the pressure intensifier assembly.

## RAPID CONTINUOUS CLICKING IS HEARD AND THE MATERIAL IS NOT BEING CRUSHED/SHEARED AS EXPECTED

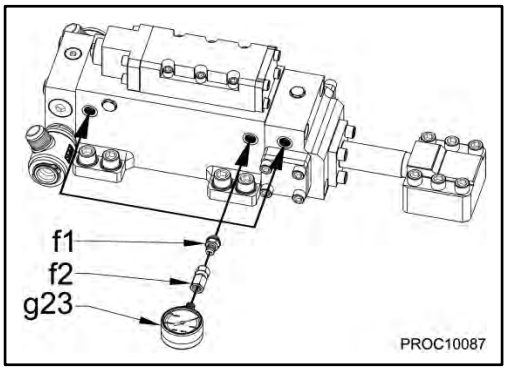
This indicates that the problem is not a relief setting, but it is in the intensifier or the cylinder of the M35 Material Processor. This requires further investigation by a mechanic/technician, see **"INTENSIFIER CHECKS"** *(clicks – does not slow down)* section on page 101.

# TROUBLESHOOTING

## CHECKING BOOSTED PRESSURE

**⚠WARNING** ***EXTREMELY HIGH PRESSURE OIL!***

NPK gauge assembly, **P/N L017-8000** is available to directly check the boosted pressure on all M35 Material Processors. The pressure intensifier's have three test ports as shown.




| L017-8000 GAUGE ASSEMBLY | | |
|---|---|---|
| **g23** | L017-4020 | gauge: 0 - 15,000 psi (*0 - 1000 bar*) |
| **f1** | L007-6630 | female swivel adapter |
| **f2** | K023-6690 | male adapter |

**PROCEDURE:**

1. Remove a plug from one of the test ports and install the male adapter (f2). Choose the port that will give you the best gauge clearance and viewing.
2. Install the gauge (g23) into the swivel adapter (f1). *(Use thread sealant)*.
3. Install the gauge and swivel adapter onto the male adapter. *(No thread sealant required.)*
4. Close the jaws all the way. Pressure will rise to the the full boosted pressure of approximately 10,870 psi (750 bar) which is a ratio of 2.938:1. When the clicking of the booster slows, it is at full intensification, click…click…click…etc., is normal. If the clicking continues rapidly and will not slow down, there may be a problem with the intensifier or the M35 Material Processor cylinder assemblies.
5. Open the jaws all the way. You will now read the relief setting of the jaw open circuit. Note that the intensifier only works on jaw close. Jaw open sees the M35 Material Processor's or the carrier's relief valve pressure setting, whichever is lower.

**NOTE:** *IF ADDITIONAL ASSISTANCE IS REQUIRED, CALL THE NPK SERVICE DEPARTMENT AT 1-800-225-4379.*

# TROUBLESHOOTING

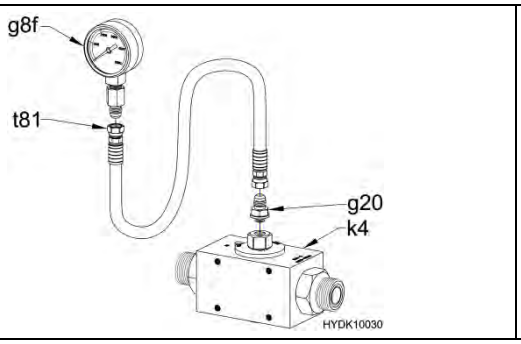
## SLOW CYCLE SPEED

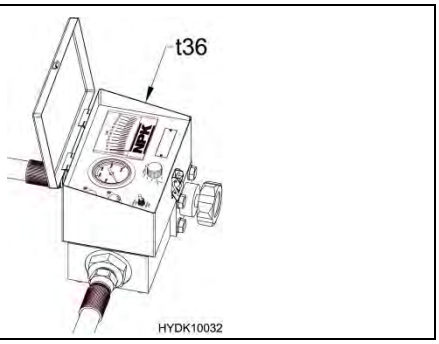
The specified cycle times of the M35 Material Processor are controlled by the flow provided by the hydraulic circuit of the carrier. The published cycle times of the M35 Material Processor are a direct result of the maximum published oil flow; see the **"MODEL SPECIFICATIONS"** section of this instruction manual.

**NOTE:** *If the jaws will not open or close, be sure the open and close shut-off valves are in the* **"ON"** *position.*

**Tools and equipment required:**

*(For carriers with an NPK hydraulic installation kit installed.)*




Pressure gauge (g8f): 5000 psi *(350 bar)*.

Test port adapter (g20): to fit #4 SAE female port in NPK shut-off valve (k4).

Test hose (t81): 5000 psi *(350 bar)* rated.

Loading type hydraulic flow meter (t36): 100 gpm *(380 l/m)* hydraulic flow capacity.

## TEST PROCEDURE

Install a pressure gauge in the test port of the jaw close circuit *(left shut-off valve as seen from the operator's position)*. Fully stroke the M35 Material Processor cylinders. Measure the attachment operating pressure.

**SLOW CYLINDER SPEED**

| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Slow cylinder speed. Operating pressure is at 3,700 psi (*255 bar*), but the intensifier does not click. | Carrier flow setting is set too low. | Check flow output of M35 Material Processor hydraulic circuit at 1000 psi (*69 bar*). | Adjust carrier flow output to meet NPK specifications.<br><br>Repair or replace the carrier's pump. |
| | M35 Material Processor cylinders. | Check piston rings in M35 Material Processor cylinders. | Replace if damaged or worn. |

# TROUBLESHOOTING

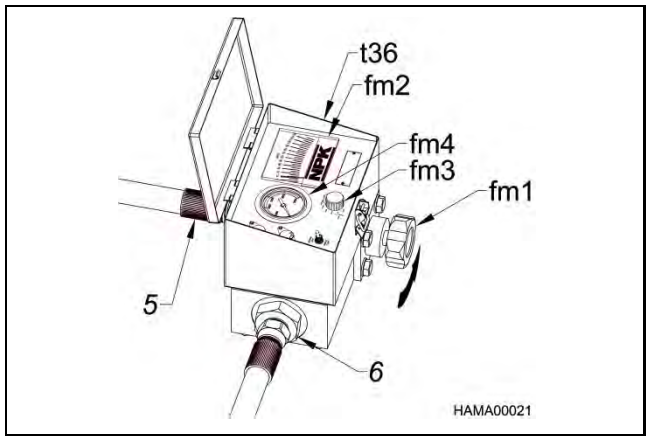
## TEST PROCEDURE

**SLOW CYLINDER SPEED**

| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Operating Pressure is less than 3,700 psi (*255 bar*).) | Carrier hydraulic circuit relief valve. | Measure the carrier circuit relief valve with the pressure to close shut-off valve in the **"OFF"** position | Adjust or replace the carrier circuit relief valve. The setting for the relief valve must be 200 psi (*14 bar*), minimum, above the M35 Processor operating pressure. |
| | M35 Processor relief valves | Measure the relief valves with the shut-off valves on the carrier in the **"ON"** position. Check pressure with the jaws fully open and fully closed. | Setting should be 3,700 psi (*255 bar*). |
| | | Check relief cartridges for tightness. | Tighten the relief valve cartridges. |
| | | Check relief cartridges for mis-adjustment. | Reset to 3,700 psi *(255 bar*). If unable to adjust, replace the cartridge. |
| | | Check the o-rings and backup rings of the relief valve cartridges. | Replace the o-rings and backup rings of both relief valve cartridges. |

# TROUBLESHOOTING

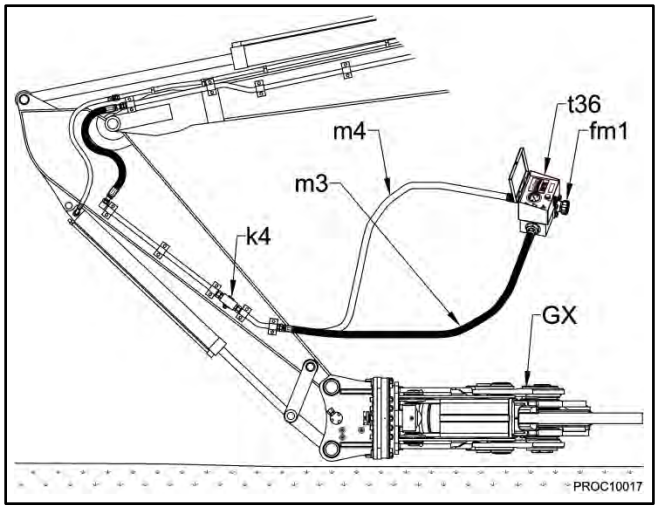
## CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE




*(Typical loading type flow meter)*

| | |
|---|---|
| ***5*** | out port |
| ***6*** | in port |
| **fm1** | load valve |
| **fm2** | flow/temperature display |
| **fm3** | flow/temperature switch |
| **fm4** | pressure gauge |

1. **Installation of the loading type flow meter.**
   Install the flow meter (t36) between the M35 Material Processor close (m3) and open lines (m4) as shown. Typically, the jaw close line is on the left and the jaw open is on the right of the M35 Material Processor *(looking from the operator's seat)*.



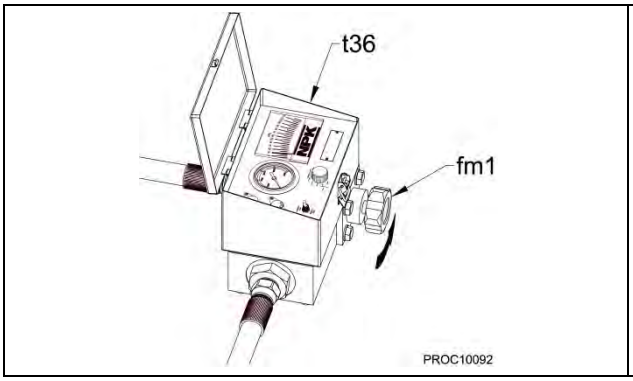

2. **Determine the return line pressure** *(pressure drop)*.
   Open both shut-off valves (k4) and energize the M35 Material Processor close switch. Measure the pressure on the flow meter gauge (fm2) with the load valve (fm1) in the full open position.

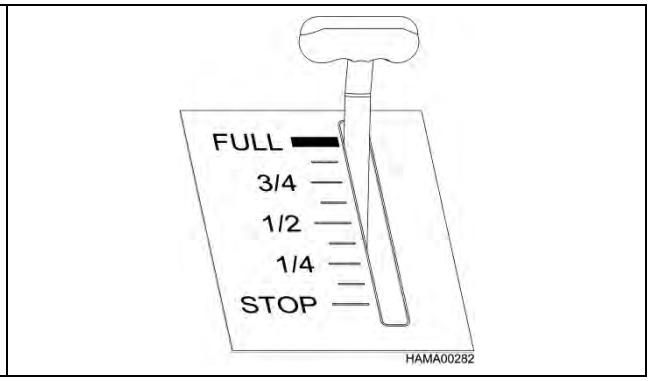
# TROUBLESHOOTING

## CHECKING THE HYDRAULIC FLOW AT RATED PRESSURE

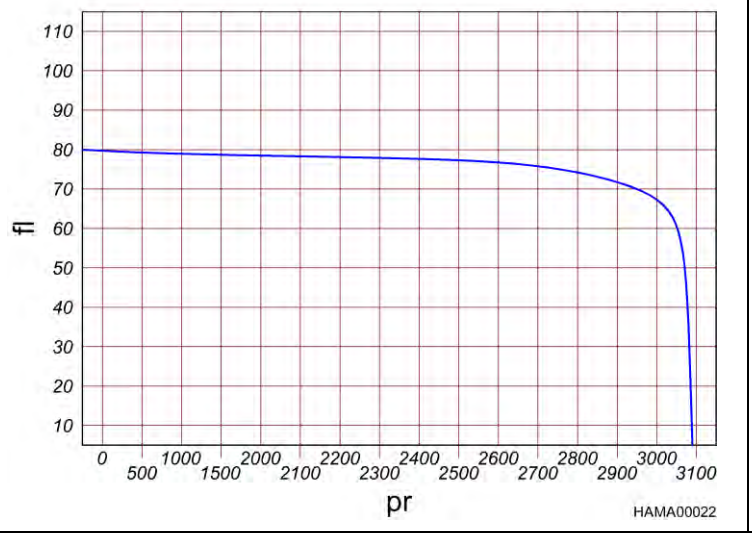
**3. Determine the circuit relief valve pressure and oil flow.**

**NOTE:** *First, warm the carrier's hydraulic system to operating temperature.* Measure the flow and pressure with the loading flow meter (t36). Adjust the load valve (f1) to zero restriction *(fully open)*. Set the engine throttle to the maximum *(full)* position. Energize the M35 Material Processor to close switch.




Slowly turn the loading valve knob (fm1) clockwise and record the pressure and flow at regular pressure intervals (pr) on graph paper. Record pressure on one axis of the graph and flow (fl) on the other. This is the circuit flow chart. Refer to the **"MODEL SPECIFICATIONS"** section of this manual for the correct flow at 1000 psi *(70 bar)*.




| | |
|---|---|
| **fl** | FLOW (gpm) |
| **pr** | PRESSURE (psi) |

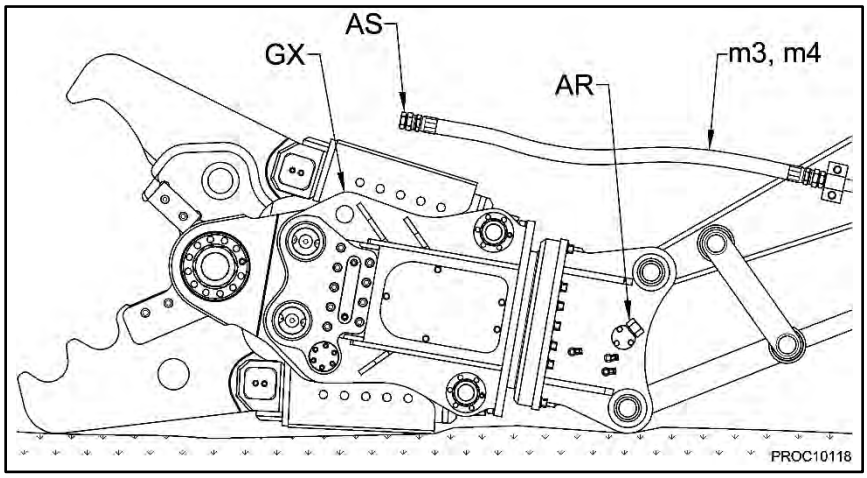
# TROUBLESHOOTING

## JAW DRIFT

- Some jaw drift may be experienced depending on the Material Processor's position.
- Acceptable drift may occur over a number of minutes.
- Rapid drift may indicate a problem with the Material Processor's cylinder, booster, or swivel manifold. The problem could also be in the carrier's hydraulic circuit.

## TO DETERMINE IF THE JAW DRIFT IS WITH THE M35 MATERIAL PROCESSOR OR THE CARRIER

1. Remove the hoses (m3 and m4) from the joint fittings on the outside of the Material Processor's frame and close the shut-off valves on the carrier.
2. Cap (AR) the joint fittings and plug (AS) the hoses. Fitting size is 20 JIC.




- **IF THE JAW DRIFTS:** The problem is in the cylinder, intensifier pilot checks or internal leakage in the swivel manifold of the M35 Material Processor (GX).
- **IF NO DRIFT OCCURS:** The problem is in the carrier's main control valve. Contact your carrier dealer.
  **NOTE:** *Drift due to the main control valve internal leakage may be inherent to the carrier and not repairable.*

# TROUBLESHOOTING

## ROTATION

The rotation speed is a direct result of the amount of flow (gpm – lpm) supplied by the rotation hydraulic circuit of the carrier. The chart below lists the recommended rotation speed and approximate flow required for your M35 Material Processor.

| MODEL | ROTATION SPEED | APPROXIMATE FLOW | | CARRIER RELIEF VALVE SETTING | |
|---|---|---|---|---|---|
| | rpm | gpm | *(lpm)* | psi | *(bar)* |
| **M35** | 6.5 - 10 | 2.5 - 4 | *(10 - 15)* | 3,000 | *(205)* |

Adjust the rotation flow so that the rpm is within the guidelines shown for the M35 Material Processor.

Flows are checked at a normal operating pressure of 1000 psi *(70 bar)*. The relief listed in the above chart is only necessary to protect the rotation supply componentry.

**NOTE:** ***The rotation motor drain line is to be routed straight to tank. Maximum back pressure should not exceed 150 psi (10 bar).***

# TROUBLESHOOTING

## ROTATION

**⚠ CAUTION**

Excessive rotation speed will result in damage to the hydraulic motor, pinion gear, and slewing ring.

**ROTATION**

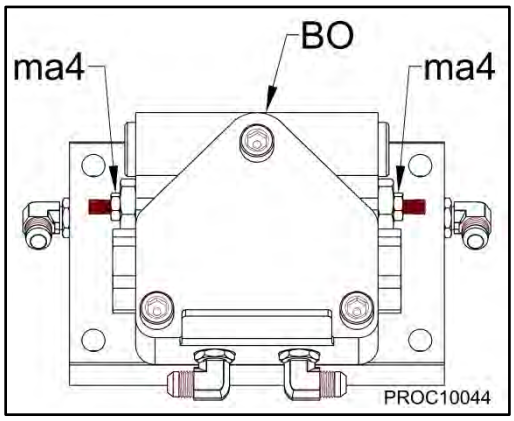
| PROBLEM | CAUSE | CHECK | REMEDY |
|---|---|---|---|
| Unit will not rotate. | Low or no flow | Check hydraulic flow. (See *M35 Processor rotation flow specifications*.) | Adjust rotation hydraulic circuit flow setting. |
| | Pressure setting of M35 Processor rotation counterbalance valves. | Check counterbalance valve pressure settings for both directions. | adjust counterbalance valve pressure settings. |
| | | | Replace counterbalance valve. |
| | Broken pinion gear or hydraulic motor shaft. | Check pinion gear and hydraulic motor shaft. | Replace pinion gear or hydraulic motor. |
| Unit will not hold position. | Pressure setting of M35 Processor rotation counterbalance valves. | Check counterbalance valve pressure settings for both directions. | adjust counterbalance valve pressure settings. |
| | | | Replace counterbalance valve. |
| | Broken pinion gear or hydraulic motor shaft. | Check pinion gear and hydraulic motor shaft. | Replace pinion gear or hydraulic motor. |

# TROUBLESHOOTING

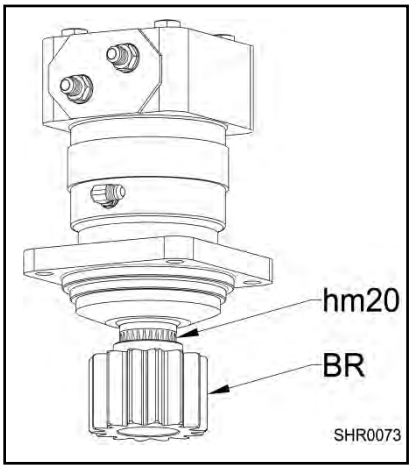
## ROTATION

### IF THE UNIT WILL NOT ROTATE

1. Check the rotation circuit hydraulic flow per the chart above.
   a. If the flow is within specification, install gauges into the rotation hydraulic circuit hose lines.
   b. Position the attachment so it will not rotate.
   c. Attempt to rotate the unit in both directions. Each gauge should read 2000 psi *(138 bar)*.
   d. If 2000 psi *(138 bar)* is not achieved, adjust the cross port relief valve cartridges (ma4) on the counterbalance valve (BO).



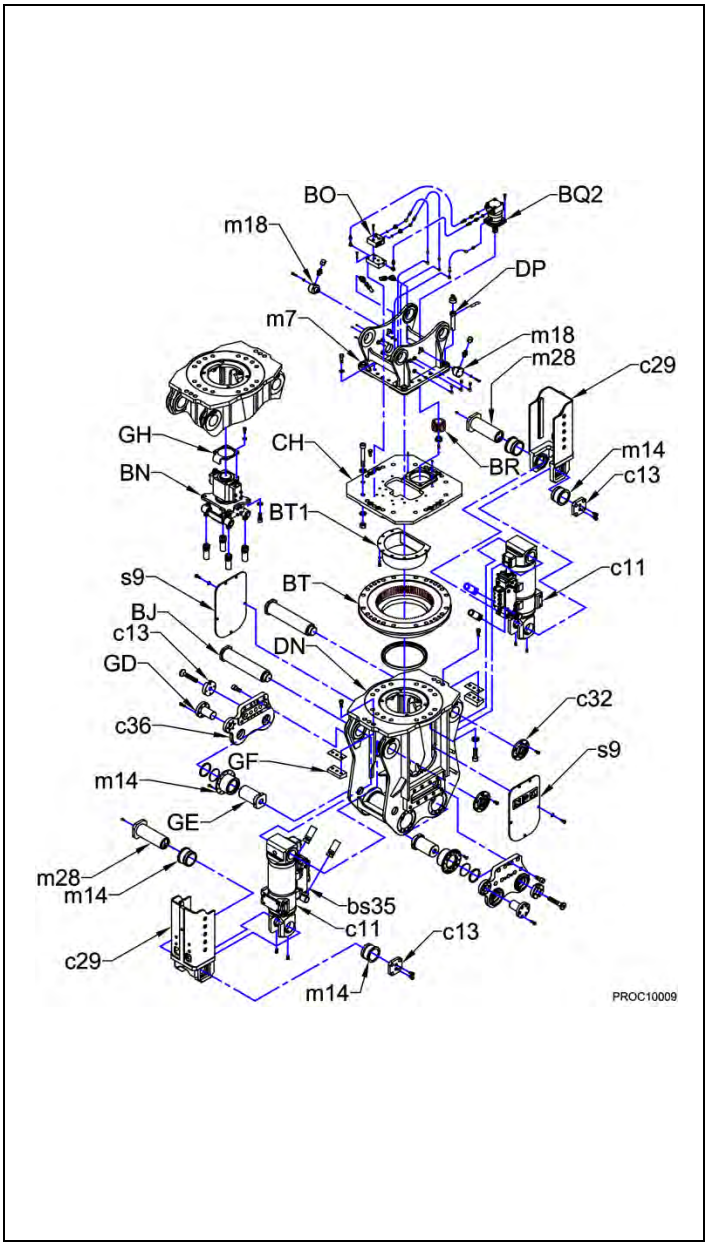

   e. If adjustment is not possible, call the NPK Service Department at 1-800-225-4379.
2. Check motor shaft and pinion gear.




### UNIT WILL NOT HOLD POSITION

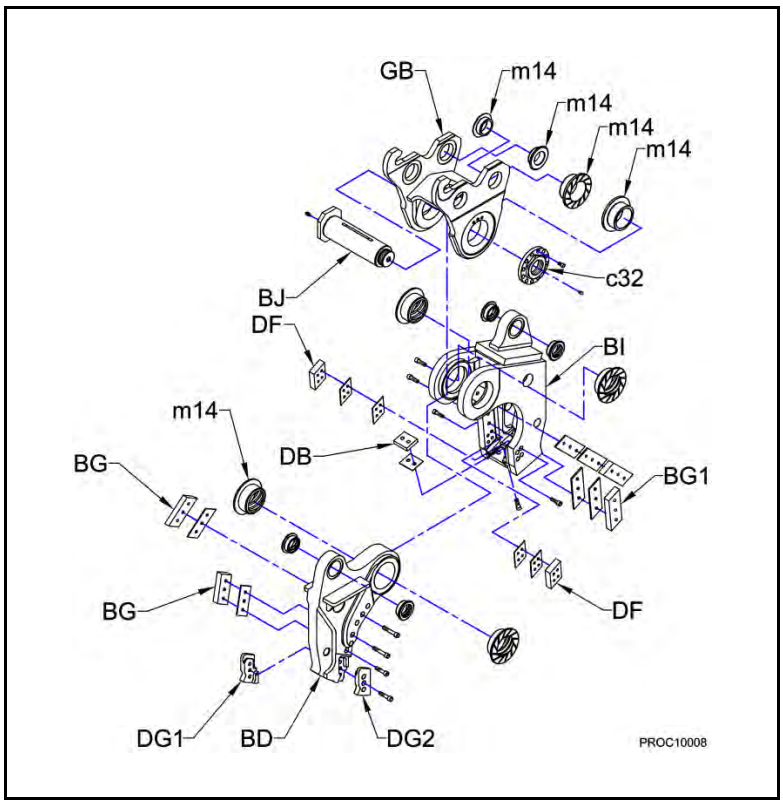
Follow steps 1a through 1e above.

# KEYWORDS FOR COMMON M35 PROCESSOR COMPONENTS



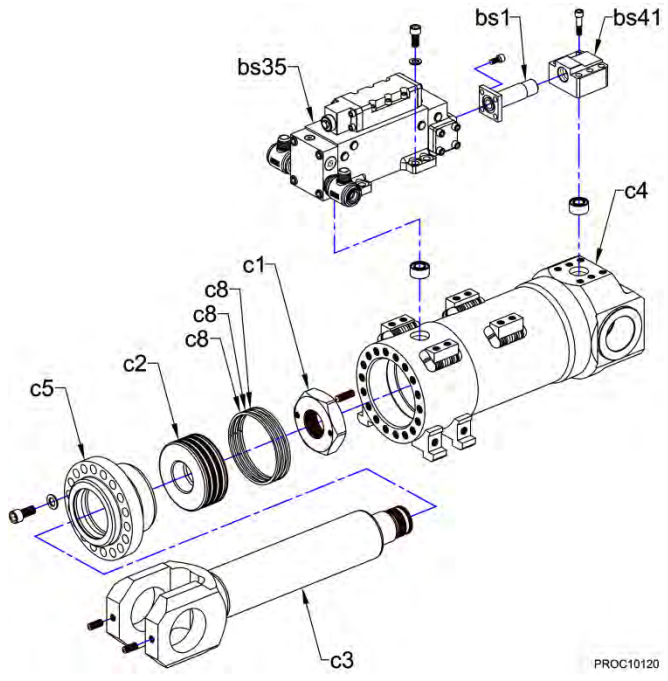

| | |
|---|---|
| BJ | PIN |
| BN | ROTARY JOINT ASSEMBLY |
| BO | ROTATION VALVE |
| BQ2 | HYDRAULIC MOTOR |
| BR | PINION GEAR |
| bs35 | BOOSTER ASSEMBLY |
| BT | SLEWING RING |
| BT1 | SLEWING RING COVER |
| c11 | CYLINDER ASSEMBLY |
| c13 | CYLINDER PIN LOCKING PLATE |
| c29 | CYLINDER ASSEMBLY COVER |
| c32 | PIVOT PIN NUT |
| c36 | CYLINDER PIN COVER PLATE |
| CH | TOP PLATE |
| DN | MAIN FRAME |
| DP | LOCK PIN |
| GD | HOOK PIN |
| GE | JAW FRAME PIN |
| GF | WEDGE PLATE |
| GH | STOP PLATE |
| m 7 | TOP BRACKET |
| m14 | BUSHING |
| m18 | JOINT FITTING |
| m28 | CYLINDER ROD PIN |
| s 9 | COVER PLATE |

# KEYWORDS FOR COMMON M35 PROCESSOR “K” JAW COMPONENTS




| | |
|---|---|
| BD | MALE JAW |
| BG | PRIMARY BLADE |
| BG1 | SECONDARY BLADE |
| BI | FEMALE JAW |
| BJ | PIN |
| c32 | PIVOT PIN NUT |
| DB | TUNNEL BLADE |
| DF | GUIDE BLADE |
| DG1 | PIERCING TIP (bolt on) |
| DG2 | PIERCING TIP (bolt on) |
| GB | JAW FRAME |
| m14 | BUSHING |

# KEYWORDS FOR COMMON M35 PROCESSOR CYLINDER COMPONENTS




| | |
|---|---|
| bs 1 | CONNECTOR PIPE |
| bs35 | BOOSTER ASSEMBLY |
| bs41 | MANIFOLD BLOCK |
| c 1 | CYLINDER ROD NUT |
| c 2 | PISTON |
| c 3 | CYLINDER ROD |
| c 4 | CYLINDER MAIN BARREL |
| c 5 | CYLINDER END CAP |
| c 8 | PISTON RING |

# WARRANTY STATEMENTS

"Use Genuine NPK Parts" 10/18

## NPK WARRANTY

## BOOM MOUNTED MATERIAL PROCESSORS, CONCRETE CRUSHERS, AND SHEARS

### APPLICATION FOR WARRANTY MUST BE MADE WITHIN 30 WORKING DAYS OF FAILURE / REPAIR.

### BASE WARRANTY (6 months or 600 hours)

NPK CONSTRUCTION EQUIPMENT, INC. ("NPK") warrants that Boom Mounted Material Processors, Concrete Crushers, and Shears sold by NPK will be free from defects in material or workmanship for a period of six (6) months or 600 operating hours, whichever occurs first, starting from the date of delivery to the first user.

### THIS WARRANTY DOES NOT APPLY TO:

- HYDRAULIC and MOUNTING INSTALLATION KIT PARTS, HOSES, or REPLACEMENT PARTS, which are covered by other warranties.

### NPK RESPONSIBILITY

NPK will, at its option, repair or replace with a new or reconditioned part, any warranted part that fails by reason of defective material or workmanship, free of charge delivered at a place of business of an NPK Dealer. Note: Parts replaced under warranty become the property of NPK.

During the six (6) month or 600 hour BASE WARRANTY period, NPK will pay the cost of labor at 75% of the posted shop rate that is necessary to install any repaired or replacement part during normal working hours. Overtime rates and travel expenses will not be reimbursed.

### USER RESPONSIBILITY

- ***Photos must accompany all warranties submitted to NPK. These photos can be 35mm, polaroid, or digital.***
- The installer, user, operator, repairer, assumes responsibility to read, understand and comply with NPK's written INSTALLATION, OPERATOR, SERVICE and WELDING INSTRUCTIONS.
- Returning Warranty Registration to NPK at the time of installation.
- All costs associated with transporting the boom mounted material processor, concrete crusher, or shear or equipment to which the boom mounted material processor, concrete crusher, or shear is installed, to an authorized NPK Dealer or other authorized location. NPK is not responsible for any expense incurred in field repair.
- Supplying a hydraulic oil sample from the carrier machine upon request by NPK.

### THESE WARRANTIES DO NOT COVER FAILURES RESULTING FROM:

- Installation, alteration, operation, maintenance, repair or storage which NPK judges improper.
- Not performing DAILY VISUAL INSPECTIONS as specified in the NPK MANUALS.
- Exceeding the steel cutter wear limit.
- Failures resulting from jaw / tooth wear that is beyond the limits as specified in the NPK Service or Instruction Manuals.
- Not following the NPK recommended welding procedure.
- Operation after discovery of defective or worn parts.
- Unreasonable delay in making a repair after being notified of a potential product problem.

### THESE WARRANTIES SPECIFICALLY EXCLUDE:

- Installations not approved by NPK.
- Hardface welding to build up wear surfaces.
- Replacement due to wear, e.g. crusher jaws and steel cutter.
- Repairs by other than an authorized NPK Dealer.
- Any attachment or alteration to the crusher jaws.
- Use of parts not sold by NPK. **THE USE OF "WILL FIT" PARTS WILL VOID ALL NPK WARRANTIES.**
- Labor charges that are deemed excessive by NPK.
- Parts shipping charges in excess of those which are usual and customary. (Air freight, unless pre-approved, will not be covered.)
- Duties, brokerage fees, and local taxes.

***WARRANTY REPAIRS DO NOT EXTEND THE STANDARD WARRANTY PERIOD.***

### LIMITATIONS AND EXCLUSIONS

Violation of any federal, provincial, state or local laws, ordinances, rules or regulations, or removal or alteration of product serial numbers void NPK's written product warranties. ***Application for warranty must be made within 30 days of failure / repair.***

***THIS PRODUCT MUST BE USED IN A SAFE AND LAWFUL MANNER IN COMPLIANCE WITH APPLICABLE OSHA REGULATIONS.***

The written product warranties made by NPK set forth NPK's only obligations with respect to any claims of failure, defects or deficiencies in products sold by NPK. **NPK MAKES NO OTHER WARRANTIES OR REPRESENTATIONS WHATSOEVER, EXPRESS OR IMPLIED, OF THE QUALITY, PERFORMANCE, DURABILITY, MATERIALS, WORKMANSHIP, SUITABILITY, CONDITION, DESIGN OR UTILITY OF PRODUCTS SOLD BY NPK, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, ALL SUCH OTHER WARRANTIES AND REPRESENTATIONS BEING HEREBY EXPRESSLY EXCLUDED. NPK SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, COSTS, LOSSES OR LIABILITIES ON ACCOUNT OF DELAY OR DOWNTIME.**

### DISCLAIMER REGARDING OTHER REPRESENTATIONS OR WARRANTIES

No person is authorized to grant any other warranties or to assume any other liability on NPK's behalf unless made or assumed in writing by an officer of NPK. No person is authorized to grant any warranties or to assume any liabilities on the seller's behalf unless made or assumed in writing by the seller.

Internet: www.npkce.com
As used in this warranty the term NPK means NPK CONSTRUCTION EQUIPMENT, INC., WALTON HILLS, OHIO, U.S.A.

# WARRANTY STATEMENTS

"Use Genuine NPK Parts" 6/08

## NPK WARRANTY REPLACEMENT PARTS

**APPLICATION FOR WARRANTY MUST BE MADE WITHIN 30 WORKING DAYS OF FAILURE / REPAIR.**

### REPLACEMENT PARTS WARRANTY (90 days)

NPK CONSTRUCTION EQUIPMENT, INC. ("NPK") warrants that new Replacement Parts sold by NPK will be free from defects in material or workmanship for a period of ninety (90) days, starting from the date of installation. NPK Replacement Parts Warranty ***does not*** cover labor or travel expenses. Note: Unexpired New Product Warranty has priority over Replacement Parts Warranty.

### THIS WARRANTY DOES NOT APPLY TO:

- Wear items such as upper and lower tool bushings, impact ring, retaining bars and pins.
- Tools (covered under separate Tool Warranty).

### NPK RESPONSIBILITY

NPK will, at its option, repair or replace with a new or reconditioned part, any warranted part that fails by reason of defective material or workmanship, free of charge delivered at a place of business of an NPK Dealer. Note: Parts replaced under warranty become the property of NPK.

### USER RESPONSIBILITY

- ***Photos must accompany all warranties submitted to NPK. These photos can be 35mm, polaroid, or digital.***
- The installer, user, operator, repairer, assumes responsibility to read, understand and comply with NPK's written INSTALLATION, OPERATOR and SERVICE INSTRUCTIONS.
- All labor costs.
- Any expense incurred by field repair.
- Supplying a hydraulic oil sample from the carrier machine upon request by NPK.

### THESE WARRANTIES DO NOT COVER FAILURES RESULTING FROM:

- Installation, alteration, operation, maintenance, repair or storage which NPK judges improper.
- Not performing DAILY VISUAL INSPECTIONS and/or RETIGHTENING of fasteners after initial 20 operating hours after repair.
- Exceeding the tool and/or tool bushing wear limit.
- Underwater operation.
- Operation after discovery of defective or worn parts.
- Unreasonable delay in making a repair after being notified of a potential product problem.

### THESE WARRANTIES SPECIFICALLY EXCLUDE:

- Installations not approved by NPK.
- Replacement due to normal wear.
- Use of parts not sold by NPK. **THE USE OF "WILL FIT" PARTS WILL VOID ALL NPK WARRANTIES.**
- Parts shipping charges in excess of those which are usual and customary. (Air freight, unless pre-approved, will not be covered.)
- Duties, brokerage fees, and local taxes.

***WARRANTY REPAIRS DO NOT EXTEND THE STANDARD WARRANTY PERIOD.***

### LIMITATIONS AND EXCLUSIONS

Violation of any federal, provincial, state or local laws, ordinances, rules or regulations, or removal or alteration of product serial numbers void NPK's written product warranties. ***Application for warranty must be made within 30 days of failure / repair.***

***THIS PRODUCT MUST BE USED IN A SAFE AND LAWFUL MANNER IN COMPLIANCE WITH APPLICABLE OSHA REGULATIONS.***

The written product warranties made by NPK set forth NPK's only obligations with respect to any claims of failure, defects or deficiencies in products sold by NPK. **NPK MAKES NO OTHER WARRANTIES OR REPRESENTATIONS WHATSOEVER, EXPRESS OR IMPLIED, OF THE QUALITY, PERFORMANCE, DURABILITY, MATERIALS, WORKMANSHIP, SUITABILITY, CONDITION, DESIGN OR UTILITY OF PRODUCTS SOLD BY NPK, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, ALL SUCH OTHER WARRANTIES AND REPRESENTATIONS BEING HEREBY EXPRESSLY EXCLUDED. NPK SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, COSTS, LOSSES OR LIABILITIES ON ACCOUNT OF DELAY OR DOWNTIME.**

### DISCLAIMER REGARDING OTHER REPRESENTATIONS OR WARRANTIES

No person is authorized to grant any other warranties or to assume any other liability on NPK's behalf unless made or assumed in writing by an officer of NPK. No person is authorized to grant any warranties or to assume any liabilities on the seller's behalf unless made or assumed in writing by the seller.

Internet: www.npkce.com

As used in this warranty the term NPK means NPK CONSTRUCTION EQUIPMENT, INC., WALTON HILLS, OHIO, U.S.A.

# NOTES

NPK MATERIAL PROCESSOR MODEL NUMBER

SERIAL NUMBER

NPK INSTALLATION KIT NUMBER

| | |
|---|---|
| EXCAVATOR MANUFACTURER | |
| MODEL NUMBER | |
| SERIES | |
| SERIAL NUMBER | |

DATE OF INSTALLATION

DATE OF 20 HOUR INSPECTION WARRANTY REGISTRATION SENT

# SERVICE RECORD

| | DATE |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

NPK
7550 INDEPENDENCE DRIVE WALTON HILLS, OHIO 44146
PHONE: 440-232-7900 FAX: 440-232-6294